



SOUTHEAST GAP ANALYSIS PROJECT



Species Modeling Report

Wood Duck

Aix sponsa

Taxa: Avian

Order: Anseriformes

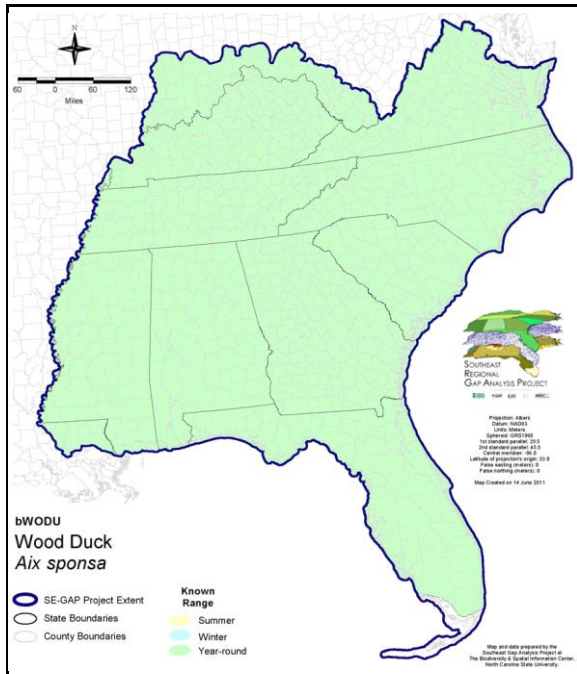
Family: Anatidae

SE-GAP Spp Code: **bWODU**

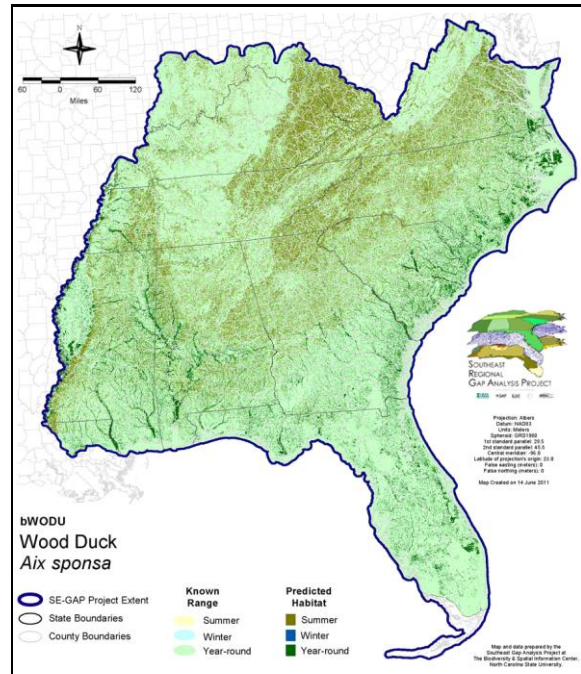
ITIS Species Code: 175122

NatureServe Element Code: ABNJB09010

KNOWN RANGE:



PREDICTED HABITAT:



Range Map Link: http://www.basic.ncsu.edu/segap/datazip/maps/SE_Range_bWODU.pdf

Predicted Habitat Map Link: http://www.basic.ncsu.edu/segap/datazip/maps/SE_Dist_bWODU.pdf

GAP Online Tool Link: <http://www.gapservice.ncsu.edu/segap/segap/index2.php?species=bWODU>

Data Download: http://www.basic.ncsu.edu/segap/datazip/region/vert/bWODU_se00.zip

PROTECTION STATUS:

Reported on March 14, 2011

Federal Status: ---

State Status: AL (GB), ID (G), KY (N), KY (N), NV (YES), NY (PB - GS), RI (Not Listed), UT (None), BC (4 (2005)), QC (Non suivie)

NS Global Rank: G5

NS State Rank: AK (SNA), AL (S5), AR (S4B,S4N), AZ (S2B,S3N), CA (S2), CO (S4B), CO (S4B), CT (S4B), CT (S4B), DC (S3N,S4B), DE (S5B), DE (S5B), FL (SNR), GA (S5), IA (S5B,S5N), ID (S4B,S1N), IL (S5), IN (S4B,S1N), KS (S4B,S5N), KY (S4S5B), KY (S4S5B), LA (S5), MA (S5B,S5M), MD (S5B,S3N), ME (S5B), MI (S5), MN (SNRB,SNRN), MO (S5), MS (S4B,S4N), MT (S5B), MT (S5B), NC (S5B,S4N), ND (SNRB), NE (S4), NH (S5B), NJ (S5), NM (S4B,S4N), NV (S3), NY (S5), OH (S5), OK (S4), OR (S4), PA (S5B), RI (S4B,S4N), SC (SNRB,SNRN,SNRM), SD (S5B), SD (S5B), TN (S5B), TX (S4B,S5N), UT (S2S3B,S3S4N), VA (S5), VT (S5B,S5N), WA (S3N,S4B), WI (S5B), WI (S5B), WV (S3N,S5B), WY (S3B), WY (S3B), AB (SU), BC (S4B,S4N), LB (SNA), MB (S5B), MB (S5B), NB (S4B), NF (S1N), NS (S4B), ON (S5), ON (S5), PE (S3S4B,S5N), QC (S5B), SK (S4B,S4M), YT (SNA)

SUMMARY OF PREDICTED HABITAT BY MANAGMENT AND GAP PROTECTION STATUS:

	US FWS		US Forest Service		Tenn. Valley Author.		US DOD/ACOE	
	ha	%	ha	%	ha	%	ha	%
Status 1	82,258.0	< 1	21,491.2	< 1	0.0	0	0.0	0
Status 2	171,662.2	< 1	126,975.6	< 1	0.0	0	3,882.3	< 1
Status 3	2,413.2	< 1	1,136,570.9	4	36,084.2	< 1	230,998.4	< 1
Status 4	55.8	< 1	0.0	0	0.0	0	15.7	< 1
Total	256,389.2	< 1	1,285,037.6	4	36,084.2	< 1	234,896.4	< 1
	US Dept. of Energy		US Nat. Park Service		NOAA		Other Federal Lands	
	ha	%	ha	%	ha	%	ha	%
Status 1	0.0	0	113,860.5	< 1	11.5	< 1	2,203.3	< 1
Status 2	0.0	0	8,076.3	< 1	3,679.4	< 1	4.2	< 1
Status 3	29,120.0	< 1	91,658.8	< 1	0.0	0	1,303.7	< 1
Status 4	0.0	0	0.0	0	0.0	0	0.0	0
Total	29,120.0	< 1	213,595.7	< 1	3,690.9	< 1	3,511.2	< 1
	Native Am. Reserv.		State Park/Hist. Park		State WMA/Gameland		State Forest	
	ha	%	ha	%	ha	%	ha	%
Status 1	0.0	0	597.1	< 1	25.2	< 1	0.0	0
Status 2	0.0	0	12,907.4	< 1	487,719.1	2	755.9	< 1
Status 3	14,568.4	< 1	339,616.7	1	165,303.5	< 1	106,276.2	< 1
Status 4	0.0	0	0.0	0	42,288.0	< 1	11.3	< 1
Total	14,568.4	< 1	353,121.2	1	695,335.8	2	107,043.4	< 1
	State Coastal Reserve		ST Nat.Area/Preserve		Other State Lands		Private Cons. Easemt.	
	ha	%	ha	%	ha	%	ha	%
Status 1	0.0	0	6,219.4	< 1	0.0	0	0.0	0
Status 2	10,610.3	< 1	60,931.0	< 1	3.2	< 1	1,313.0	< 1
Status 3	0.0	0	10,080.8	< 1	7,791.5	< 1	51,500.2	< 1
Status 4	0.0	0	0.0	0	1,811.3	< 1	0.0	0
Total	10,610.3	< 1	77,231.2	< 1	9,606.0	< 1	52,813.2	< 1
	Private Land - No Res.		Water		Overall Total			
	ha	%	ha	%	ha	%	ha	%
Status 1	0.0	0	0.0	0			226,666.2	< 1
Status 2	0.0	0	0.0	0			888,520.1	3
Status 3	430.1	< 1	0.0	0			2,223,716.4	11
Status 4	24,882,586.0	84	42,693.8	< 1			25,011,694.0	85
Total	24,883,016.1	84	42,693.8	< 1			28,350,596.6	100

GAP Status 1: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, and intensity) are allowed to proceed without interference or are mimicked through management.

GAP Status 2: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive use or management practices that degrade the quality of existing natural communities.

GAP Status 3: An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low-intensity type or localized intense type. It also confers protection to federally listed endangered and threatened species throughout the area.

GAP Status 4: Lack of irrevocable easement or mandate to prevent conversion of natural habitat types to anthropogenic habitat types. Allows for intensive use throughout the tract. Also includes those tracts for which the existence of such restrictions or sufficient information to establish a higher status is unknown.

PREDICTED HABITAT MODEL(S):

Summer Model:

Habitat Description: Wood ducks will utilize a wide variety of freshwater habitats such as creeks, rivers, bottomlands, swamps, marshes, beaver and farm ponds (Hepp & Bellrose 1995). They generally prefer slow-moving waters surrounded by deciduous or mixed woods, especially where large willows, cottonwoods, and oaks are present (Anderson et al. 1981, Hepp & Bellrose 1995). Amy Silvano 01Sept05

Nests in cavities in live or dead trees located in, near, or a distance from water (Potter et al. 1980). Trees are often older and larger than the typical second-growth. Frequently uses cavities made by Pileated Woodpeckers (Haramis 1990). Cavities are located 2-65 feet above ground, with those at least 30 feet above ground being preferred. Depth of preferred cavities has been found to average 10-19 inches (Bellrose et al. 1964). Will also nest in chimneys or nest boxes (Potter et al. 1980). Upon arrival in breeding areas, migratory females forage intensively and built up nutrient reserves prior to nesting. Nests are initiated as early as late January in the south, early March in the Midwest, and mid-March to early April in the north. Clutch size is 9-15 (usually 10-12), but more than one female may contribute eggs to a nest, resulting in nests with many more eggs (commonly up to 30 for successful nests in nest boxes). Often two broods per year are raised in the south, occasionally in the north. Incubation lasts 27-37 days, by female. Females with broods commonly move a kilometer or more from the nest site soon after hatching. Most juvenile mortality occurs during the first few weeks after hatching. Young first fly at about 9 weeks, abandoned by parent at 1-2 months. Yearlings may breed but often unsuccessfully or not at all. Most of the above information is from Dugger and Fredrickson 1992).

***Nesting information taken directly from NC-GAP State Notes. Amy Silvano

Ecosystem Classifiers: Wetlands (excluding Flatwoods), Open Water, Floodplain/Riparian as PMU's and Hardwood & Mesic Slope Forests as AMU's. Amy Silvano 01sept05

Modeling Notes: Hartke and Hepp (2004), stated that natural cavities used by breeding wood ducks were located <0.5 km from the nearest wetland or shoreline, with most nest within <0.16 Km. Ryan et al. (1998), found 82% of their study nest in upland woodland environments were located >1 Km from permanent water. However, in this study paratization rates were high in the floodplain nest location, which could account for the expanded use of upland nest locations. They also elucidated two additional studies in Missouri and Minnesota where there were similar results. Wood ducks generally use shallow waters or waters edge. Anderson et al. (1981), Nests in low slow moving waters of <18 inches deep. *****Do not restrict wet vegetation with and INTO buffer (i.e. all wetland habitats). Amy Silvano 01Sept05

Hydrography Mask:

Freshwater Only

Slow Current Only

Utilizes flowing water features with buffers of 1000m from and 60m into selected water features.

Utilizes open water features with buffers of 1000m from and 60m into selected water features.

Utilizes wet vegetation features with buffers of 500m from and unlimited into selected vegetation features.

Selected Map Units:

Functional Group	Map Unit Name
Water	Open Water (Fresh)
Wetlands	Atlantic Coastal Plain Blackwater Stream Floodplain Forest - Forest Modifier
Wetlands	Atlantic Coastal Plain Blackwater Stream Floodplain Forest - Herbaceous Modifier
Wetlands	Atlantic Coastal Plain Brownwater Stream Floodplain Forest
Wetlands	Atlantic Coastal Plain Clay-Based Carolina Bay Forested Wetland
Wetlands	Atlantic Coastal Plain Clay-Based Carolina Bay Herbaceous Wetland
Wetlands	Atlantic Coastal Plain Depression Pondshore
Wetlands	Atlantic Coastal Plain Large Natural Lakeshore
Wetlands	Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest - Taxodium/Nyssa Modifier
Wetlands	Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest - Oak Dominated Modifier
Wetlands	Atlantic Coastal Plain Northern Basin Peat Swamp
Wetlands	Atlantic Coastal Plain Northern Basin Swamp and Wet Hardwood Forest
Wetlands	Atlantic Coastal Plain Northern Pondshore
Wetlands	Atlantic Coastal Plain Peatland Pocosin

Wetlands	Atlantic Coastal Plain Sandhill Seep
Wetlands	Atlantic Coastal Plain Small Blackwater River Floodplain Forest
Wetlands	Atlantic Coastal Plain Small Brownwater River Floodplain Forest
Wetlands	Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall
Wetlands	Atlantic Coastal Plain Xeric River Dune
Wetlands	Central Appalachian Floodplain - Forest Modifier
Wetlands	Central Appalachian Floodplain - Herbaceous Modifier
Wetlands	Central Appalachian Riparian - Forest Modifier
Wetlands	Central Appalachian Riparian - Herbaceous Modifier
Wetlands	Central Florida Herbaceous Pondshore
Wetlands	Central Florida Herbaceous Seep
Wetlands	Central Interior Highlands and Appalachian Sinkhole and Depression Pond
Wetlands	Cumberland Riverscour
Wetlands	East Gulf Coastal Plain Interior Shrub Bog
Wetlands	East Gulf Coastal Plain Large River Floodplain Forest - Forest Modifier
Wetlands	East Gulf Coastal Plain Large River Floodplain Forest - Herbaceous Modifier
Wetlands	East Gulf Coastal Plain Northern Depression Pondshore
Wetlands	East Gulf Coastal Plain Northern Seepage Swamp
Wetlands	East Gulf Coastal Plain Small Stream and River Floodplain Forest
Wetlands	East Gulf Coastal Plain Southern Depression Pondshore
Wetlands	Floridian Highlands Freshwater Marsh
Wetlands	Lower Mississippi River Bottomland and Floodplain Forest
Wetlands	Lower Mississippi River Bottomland Depressions - Forest Modifier
Wetlands	Lower Mississippi River Bottomland Depressions - Herbaceous Modifier
Wetlands	Mississippi River Low Floodplain (Bottomland) Forest
Wetlands	Mississippi River Riparian Forest
Wetlands	North-Central Appalachian Acidic Swamp
Wetlands	North-Central Appalachian Seepage Fen
Wetlands	North-Central Interior and Appalachian Rich Swamp
Wetlands	South Florida Bayhead Swamp
Wetlands	South Florida Freshwater Slough and Gator Hole
Wetlands	South Florida Pond-Apple/Popash Slough
Wetlands	South Florida Willow Head
Wetlands	South-Central Interior Large Floodplain - Forest Modifier
Wetlands	South-Central Interior Large Floodplain - Herbaceous Modifier
Wetlands	South-Central Interior Small Stream and Riparian
Wetlands	Southern and Central Appalachian Bog and Fen
Wetlands	Southern Appalachian Seepage Wetland
Wetlands	Southern Coastal Plain Blackwater River Floodplain Forest
Wetlands	Southern Coastal Plain Herbaceous Seepage Bog
Wetlands	Southern Coastal Plain Nonriverine Basin Swamp
Wetlands	Southern Coastal Plain Seepage Swamp and Baygall
Wetlands	Southern Coastal Plain Spring-run Stream Aquatic Vegetation
Wetlands	Southern Piedmont Large Floodplain Forest - Forest Modifier
Wetlands	Southern Piedmont Large Floodplain Forest - Herbaceous Modifier
Wetlands	Southern Piedmont Seepage Wetland
Wetlands	Southern Piedmont Small Floodplain and Riparian Forest
Wetlands	Southern Piedmont/Ridge and Valley Upland Depression Swamp
Wetlands	Unconsolidated Shore (Lake/River/Pond)
Wetlands	Western Highland Rim Seepage Fen

Selected Secondary Map Units within 1000m of Primary Map Units:

Functional Group	Map Unit Name
Forest/Woodland	Southern Piedmont Dry Oak-Heath Forest - Hardwood Modifier
Forest/Woodland	Southern Piedmont Dry Oak-(Pine) Forest - Hardwood Modifier
Forest/Woodland	Southern Piedmont Mesic Forest
Forest/Woodland	Allegheny-Cumberland Dry Oak Forest and Woodland

Forest/Woodland	Allegheny-Cumberland Dry Oak Forest and Woodland - Hardwood Modifier
Forest/Woodland	Southern Ridge and Valley Dry Calcareous Forest
Forest/Woodland	Southern Ridge and Valley Dry Calcareous Forest - Hardwood Modifier
Forest/Woodland	Northeastern Interior Dry Oak Forest-Hardwood Modifier
Forest/Woodland	Southern and Central Appalachian Oak Forest
Forest/Woodland	Southern and Central Appalachian Oak Forest - Xeric
Forest/Woodland	Southern Interior Low Plateau Dry-Mesic Oak Forest
Forest/Woodland	Southern Interior Low Plateau Dry-Mesic Oak Forest - Evergreen Modifier
Forest/Woodland	Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest
Forest/Woodland	Atlantic Coastal Plain Mesic Hardwood and Mixed Forest
Forest/Woodland	Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland - Offsite Hardwood Modifier
Forest/Woodland	Northern Atlantic Coastal Plain Dry Hardwood Forest
Forest/Woodland	East Gulf Coastal Plain Southern Mesic Slope Forest
Forest/Woodland	East Gulf Coastal Plain Northern Mesic Hardwood Forest
Forest/Woodland	East Gulf Coastal Plain Northern Loess Bluff Forest
Forest/Woodland	East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland - Hardwood Modifier
Forest/Woodland	East Gulf Coastal Plain Northern Dry Upland Hardwood Forest
Forest/Woodland	East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland - Offsite Hardwood Modifier
Forest/Woodland	East Gulf Coastal Plain Limestone Forest
Forest/Woodland	East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest - Hardwood Modifier
Forest/Woodland	East Gulf Coastal Plain Southern Loess Bluff Forest
Forest/Woodland	Southern Coastal Plain Dry Upland Hardwood Forest

Winter Model:

Habitat Description: Habitat structure for wood ducks is generally similar between seasons (Hepp and Bellrose 1995, Dugger and Fredrickson 1992). Winter habitat for wood ducks includes wetlands with a variety of oaks, hickories, red maple, and ashes (Hepp and Bellrose 1995). Amy Silvano 01Sept05

Ecosystem Classifiers: Wetlands (excluding Flatwoods), Open Water, Floodplain/Riparian. Amy Silvano 01Sept05

Hydrography Mask:

Freshwater Only

Utilizes flowing water features with buffers of 1000m from and 60m into selected water features.

Utilizes open water features with buffers of 1000m from and 60m into selected water features.

Utilizes wet vegetation features with buffers of 500m from and unlimited into selected vegetation features.

Selected Map Units:

Functional Group	Map Unit Name
Coastal Dune & Freshwater Wetland	Atlantic and Gulf Coastal Plain Interdunal Wetland
Freshwater Tidal Marsh & Wetland	Atlantic Coastal Plain Central Fresh-Oligohaline Tidal Marsh
Freshwater Tidal Marsh & Wetland	Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh
Freshwater Tidal Marsh & Wetland	Atlantic Coastal Plain Northern Fresh and Oligohaline Tidal Marsh
Freshwater Tidal Marsh & Wetland	Florida Big Bend Fresh-Oligohaline Tidal Marsh
Water	Open Water (Fresh)
Wetlands	Atlantic Coastal Plain Blackwater Stream Floodplain Forest - Forest Modifier
Wetlands	Atlantic Coastal Plain Blackwater Stream Floodplain Forest - Herbaceous Modifier
Wetlands	Atlantic Coastal Plain Brownwater Stream Floodplain Forest
Wetlands	Atlantic Coastal Plain Clay-Based Carolina Bay Forested Wetland
Wetlands	Atlantic Coastal Plain Clay-Based Carolina Bay Herbaceous Wetland
Wetlands	Atlantic Coastal Plain Depression Pondshore
Wetlands	Atlantic Coastal Plain Large Natural Lakeshore
Wetlands	Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest - Taxodium/Nyssa Modifier
Wetlands	Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest - Oak Dominated Modifier
Wetlands	Atlantic Coastal Plain Northern Basin Peat Swamp
Wetlands	Atlantic Coastal Plain Northern Basin Swamp and Wet Hardwood Forest
Wetlands	Atlantic Coastal Plain Northern Pondshore

Wetlands	Atlantic Coastal Plain Peatland Pocosin
Wetlands	Atlantic Coastal Plain Sandhill Seep
Wetlands	Atlantic Coastal Plain Small Blackwater River Floodplain Forest
Wetlands	Atlantic Coastal Plain Small Brownwater River Floodplain Forest
Wetlands	Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall
Wetlands	Atlantic Coastal Plain Xeric River Dune
Wetlands	Central Appalachian Floodplain - Forest Modifier
Wetlands	Central Appalachian Floodplain - Herbaceous Modifier
Wetlands	Central Appalachian Riparian - Forest Modifier
Wetlands	Central Appalachian Riparian - Herbaceous Modifier
Wetlands	Central Florida Herbaceous Pondshore
Wetlands	Central Florida Herbaceous Seep
Wetlands	Central Interior Highlands and Appalachian Sinkhole and Depression Pond
Wetlands	Cumberland Riverscour
Wetlands	East Gulf Coastal Plain Interior Shrub Bog
Wetlands	East Gulf Coastal Plain Large River Floodplain Forest - Forest Modifier
Wetlands	East Gulf Coastal Plain Large River Floodplain Forest - Herbaceous Modifier
Wetlands	East Gulf Coastal Plain Northern Depression Pondshore
Wetlands	East Gulf Coastal Plain Northern Seepage Swamp
Wetlands	East Gulf Coastal Plain Small Stream and River Floodplain Forest
Wetlands	East Gulf Coastal Plain Southern Depression Pondshore
Wetlands	Floridian Highlands Freshwater Marsh
Wetlands	Lower Mississippi River Bottomland and Floodplain Forest
Wetlands	Lower Mississippi River Bottomland Depressions - Forest Modifier
Wetlands	Lower Mississippi River Bottomland Depressions - Herbaceous Modifier
Wetlands	Mississippi River Low Floodplain (Bottomland) Forest
Wetlands	Mississippi River Riparian Forest
Wetlands	North-Central Appalachian Acidic Swamp
Wetlands	North-Central Appalachian Seepage Fen
Wetlands	North-Central Interior and Appalachian Rich Swamp
Wetlands	South Florida Bayhead Swamp
Wetlands	South Florida Freshwater Slough and Gator Hole
Wetlands	South Florida Pond-Apple/Popash Slough
Wetlands	South Florida Willow Head
Wetlands	South-Central Interior Large Floodplain - Forest Modifier
Wetlands	South-Central Interior Large Floodplain - Herbaceous Modifier
Wetlands	South-Central Interior Small Stream and Riparian
Wetlands	Southern and Central Appalachian Bog and Fen
Wetlands	Southern Appalachian Seepage Wetland
Wetlands	Southern Coastal Plain Blackwater River Floodplain Forest
Wetlands	Southern Coastal Plain Herbaceous Seepage Bog
Wetlands	Southern Coastal Plain Nonriverine Basin Swamp
Wetlands	Southern Coastal Plain Seepage Swamp and Baygall
Wetlands	Southern Coastal Plain Spring-run Stream Aquatic Vegetation
Wetlands	Southern Piedmont Large Floodplain Forest - Forest Modifier
Wetlands	Southern Piedmont Large Floodplain Forest - Herbaceous Modifier
Wetlands	Southern Piedmont Seepage Wetland
Wetlands	Southern Piedmont Small Floodplain and Riparian Forest
Wetlands	Southern Piedmont/Ridge and Valley Upland Depression Swamp
Wetlands	Unconsolidated Shore (Lake/River/Pond)
Wetlands	Western Highland Rim Seepage Fen

CITATIONS: American Ornithologists' Union (AOU), Committee on Classification and Nomenclature. 1983. Check-list of North American Birds. Sixth Edition. American Ornithologists' Union, Allen Press, Inc., Lawrence, Kansas.

Anderson, S.H., C.S. Robbins, and J.R. Partelow. 1981. Habitat Management for Birds of Alabama. Technical Report Number FWS/OBS-81/39.3, Eastern Energy and Land Use Team, US Fish and Wildlife Service, Laurel, MD

- Bellrose, F. C., and D. J. Holm, editors. 1994. Ecology and management of the wood duck. Stackpole Books, Mechanicsburg, Pennsylvania. 588 pp.
- Bellrose, F.C. 1976. Ducks, geese and swans of North America. Stackpole Books, Harrisburg, Pa.
- Bellrose, F.C., K.L. Johnson and T.U. Meyers. 1964. Relative value of natural cavities and nesting houses for wood ducks. *Journal of Wildlife Management* 28:661-676.
- Droege, S., and J.R. Sauer. 1990. North American Breeding Bird Survey, annual summary, 1989. U.S. Fish and Wildlife Service, Biological Report 90(8). 22 pp.
- Dugger, K. M., and L. H. Fredrickson. 1992. Life history and habitat needs of the wood duck. U.S. Fish Wildl. Serv., Fish and Wildlife Leaflet 13(1.6). 8 pp.
- Fussell, J. III and M. Lyons. 1990. Birds of the Outer Banks [pamphlet]. Eastern National Parks and Monument Association Coastal Wildlife Refuge Society.
- Fussell, J.O. III. 1994. A birder's guide to coastal North Carolina. Chapel Hill and London: The University of North Carolina Press.
- Hartke, K.M., and G.R. Hepp. 2004. Habitat use and preferences of breeding female wood ducks. *Journal of Wildlife Management* 68(1). Pp 84-93
- Hepp, G. R., and J. E. Hines. 1991. Factors affecting winter distribution and migration distance of wood ducks from southern breeding populations. *Condor* 93:884-891.
- Hepp, G.R. and F.C. Bellrose. 1995. Wood duck (Aix sponsa). In A. Poole and F. Gill, eds., *The Birds of North America*, No. 169. The Academy of Natural Sciences, Philadelphia and The American Ornithologists' Union, Washington, DC.
- Hester, F. E., and J. Dermid. 1973. *The world of the wood duck*. J. B. Lippencott Co., Philadelphia. 160 pp.
- Kaufman K. 1996. *Lives of North American Birds*. Boston, New York: Houghton Mifflin Company.
- Kortright, F.H. 1967. *The ducks, geese, and swans of North America*. The Stackpole Company, Harrisburg, PA, and Wildlife Management Institute, Washington, D.C. 476 pp.
- Lacki, M. J., S. P. George, and P. J. Viscosi. 1987. Evaluation of site variables affecting nest box use by wood ducks. *Wildl. Soc. Bull.* 15:196-200.
- Livezey, B. C. 1991. A phylogenetic analysis and classification of recent dabbling ducks (tribe Anatini) based on comparative morphology. *Auk* 108:471-507.
- Nicholson CP. 1997. *Atlas of the breeding birds of Tennessee*. Knoxville: University of Tennessee Press.
- Palmer, R. S., editor. 1976. *Handbook of North American birds*. Vol. 3. Waterfowl (concluded). Eiders, wood ducks, diving ducks, mergansers, stifftails. Yale Univ. Press, New Haven. 560 pp.
- Pearson, T.G. 1959. *Birds of North Carolina*. Raleigh, NC: Bynum Printing Company.
- Potter, E. F., J. F. Parnell, and R. P. Teulings. 1980. *Birds of the Carolinas*. Univ. North Carolina Press, Chapel Hill. 408 pp.
- Ridlehuber, K. T., and J. W. Teaford. 1986. Wood duck nest boxes. Section 5.1.2, US Army Corps of Engineers Wildlife Resources Management Manual. Tech. Rep. EL-86-12. Waterways Expt. Station, Vicksburg, Mississippi. 21 pp.
- Root, T. 1988. *Atlas of wintering North American birds: An analysis of Christmas Bird Count data*. University of Chicago Press. 336 pp.
- Ryan, D. C., R. J. Kawula, and D R. J. Gates. 1998. Breeding biology of Wood Ducks using natural cavities in southern Illinois. *J. Wildl. Manage.* 62:112-123.
- Semel, B., P. W. Sherman, and S. M. Byers. 1988. Effects of brood parasitism and nest-box placement on wood duck breeding ecology. *Condor* 90:920-930.
- Terres, J.K. 1980. *The Audubon Society encyclopedia of North American birds*. Alfred A. Knopf, New York.
- U.S. Fish & Wildl. Serv. 1976. Nest boxes for wood ducks. U.S. Fish & Wildl. Serv. Wildl., Wildl. Leaflet 510. 14 pp.
- U.S. Fish & Wildl. Serv. 1988. SEIS 88. Final supplemental environmental impact statement: issuance of annual regulations permitting the sport hunting of migratory birds. x + 340 pp.