QUINNEY, T. E. 1983. Tree Swallows cross a polygyny threshold. Auk 100:750–754.
RENDELL, W. B. 1992. Peculiar behavior of a subadult female Tree Swallow. Wilson Bull. 104:756–759.
——— AND R. J. ROBERTSON. 1990. Influence of forest edge on nest-site selection by Tree Swallows. Wilson Bull. 102:634–644.
——— AND ———. 1994. Defense of extra nest-sites by a cavity nesting bird, the Tree Swallow (*Tachycineta bicolor*). Ardea 82:273–285.
ROBERTSON, R. J. AND H. L. GIBBS. 1982. Superterritory in Tree Swallows: a reexamination. Condor 84:313–316.
———, B. J. STUTCHBURY, AND R. R. COHEN. 1992. Tree Swallow. The Birds of North America, No. 11 (A. Poole, P. Stettenheim, and F. Gill, eds.). Academy of Natural Sciences, Philadelphia; The American Ornithologists' Union, Washington, D.C.
STUTCHBURY, B. J. AND R. J. ROBERTSON. 1985. Floating populations of female Tree Swallows. Auk 102:651–654.
——— AND ———. 1986. A simple trap for catching birds in nest boxes. J. Field Ornithol. 57:64–65.
——— AND ———. 1987a. Do nest building and first egg dates reflect settlement patterns of females? Condor 89:587–593.
——— AND ———. 1987b. Behavioral tactics of subadult female floaters in the tree swallow. Behav. Ecol. Sociobiol. 20:413–419.

JEREMY S. MITCHELL, *Dept. of Biological Sciences, Simon Fraser Univ., Burnaby, British Columbia V5A 1S6*; RALEIGH J. ROBERTSON, *Dept. of Biology, Queen's Univ., Kingston, Ontario K7L 3N6.* *Received 29 Feb. 1996, accepted 10 May 1996.*

Wilson Bull., 108(4), 1996, pp. 802–804

Swainson's Warblers nesting in early seral pine forests in East Texas.—Swainson's Warbler (*Limnothlypis swainsonii*) breeds locally throughout the southeastern United States on the south Atlantic and Gulf coastal plains, in the southern Appalachians, and on the southern Piedmont Plateau (Meanley 1966). They select areas with low, dense understories (Eddleman et al. 1980, Meanley 1971). Meanley (1945, 1966, 1969) described several habitats of Swainson's Warblers in the eastern coastal plains, and they also have nested in dense rhodendron-laurel thickets in the southern Appalachians (Brooks and Legg 1942). However, there is little information on the specific habitat features which may influence the distribution and abundance of this species, especially in the western portion of its breeding range. In this paper, I report on the first described use of early seral pine forests by Swainson's Warblers nesting in eastern Texas. I compare habitats selected in this study to those previously described and suggest possible relationships between habitat selection and abundance patterns.

I surveyed for Swainson's Warblers from April through June 1992 on the San Jacinto Ranger District, Sam Houston National Forest, San Jacinto County, Texas (95°07′W, 30°30′N). The district consists of approximately 24,000 ha of pine, pine-hardwood, and bottomland hardwood forest of various age classes. The district is managed for timber production, recreation, wildlife, and some oil and mineral extraction. Timber is managed primarily in even-age stands ranging from 4–40 ha on 70-year rotations. Harvest methods include thinning, clearcuts, seed-tree cuts, and shelterwood cuts. Large areas regularly are

prescribed burned. I used playback recordings to detect territorial males, primarily along maintained roads, old logging roads, and trails which transect much of the district. Males captured in mist nets were banded with unique combinations of colored leg bands and a U.S. Fish and Wildlife Service aluminum leg band. I located territories and determined whether each male was paired. I considered an individual interacting with another bird within the territory without hostile behavior to be paired. I returned to each territory 2–4 times during the breeding season. Stand ages were determined using the Continuous Inventory of Stand Condition database maintained by the U.S.D.A. Forest Service.

I monitored 38 territories during the 1992 season. Eleven (28.9%) territories were in loblolly pine (*Pinus taeda*) plantations (age range = 3–18 yrs; mean age = 14.0 ± 4.2 yrs) with dense understories composed primarily of yaupon (*Ilex vomitoria*), *Smilax* spp., *Viburnum* spp., and various sapling hardwood species. Sixteen (42.1%) were in sites previously logged to remove pine, infested with southern pine beetles (*Dendroctonus frontalis*). These sites ranged from 1–2 ha in size and were dominated by a dense growth of early successional shrub species and sapling trees. The remaining 11 (28.9%) territories were in relatively mature stands of loblolly pine with a sparse overstory and patches of dense understory. Eight of these territories were in mesic sites near streams or ephemeral forest swamps. The remaining three were in relatively xeric upland stands with a mixed pine-hardwood overstory and dense yaupon understory.

I confirmed nine paired males: three in plantations, five in logged sites, and one in a mature stand. I found a probable Swainson's Warbler nest in an active territory in a pine plantation on 21 May 1992. The nest closely resembled photographs by Graves (1992) and possessed the bulky outer layer of dead hardwood leaves characteristic of the species (Meanley 1969). The nest was empty and appeared to have been abandoned or predated since no eggs or young were observed during six visits I made the following three weeks. I observed an adult Swainson's Warbler foraging approximately 2 m from the nest during the first visit. The nest was approximately 1 m high and supported by a tangle of *Smilax* spp. suspended in pine saplings. I observed one pair feeding fledged young in a logged site located within the territory of the male. The young were still incapable of sustained flight and were more than 20 m within the logged site.

Early seral pine forest previously has not been described as potential breeding habitat for Swainson's Warblers. They generally use areas with a low, dense deciduous understory (Meanley 1971). River floodplain forest with dense understories of cane (*Arundinaria gigantea*), sweet pepperbush (*Clethra alnifolia*), or scrub palmetto (*Sabal minor*) have been identified as important breeding habitats on the upper and Gulf coastal plains (Meanley 1971). Swainson's Warblers in the southern Appalachian Mountains use dense rhodendron-laurel thickets in mature hardwood communities (Brooks and Legg 1942). Eddleman et al. (1980) found several territories in areas dominated by early successional tree species, such as sweetgum (*Liquidambar styraciflua*) plantations, and in late old field habitats with dense shrubs. These habitats possess a dense understory structure comparable to the pine plantations and logged sites used by Swainson's Warblers in eastern Texas. The understory foliage diversity patterns of these different habitats would probably be relatively similar despite differences in plant species composition, suggesting vegetative structural patterns may be an important factor influencing habitat selection and distribution of Swainson's Warblers.

Man-made areas of early seral forest, such as pine plantations and logged sites, may represent new habitat options for breeding Swainson' Warblers. There is no evidence to suggest that such habitat resulting from normal forest succession was not used in addition to historically abundant canebrake habitat. Cane was formerly a dominant understory feature of the lowlands of eastern and southeastern Texas, but with the introduction of domestic livestock, it has become relatively rare (Correll and Johnston 1970). Swainson's Warblers

appear common on the San Jacinto Ranger District, despite the lack of cane habitat. The paired individuals and nesting activity observed in pine plantations and logged sites suggests such areas may be important breeding habitat.

Apparent flexibility of habitat use by Swainson's Warblers may explain its relatively stable population in contrast to the decline of the Bachman's Warbler (*Vermivora bachmani*). The Bachman's Warbler may have been a cane specialist, and the probable extinction of the species parallels the decline of cane stands throughout the southeastern United States (Widmann 1897, Remsen 1986). The more generalist strategy of the Swainson's Warbler may have enabled it to continue exploiting alternative habitats such as dense thickets in forest openings to maintain population levels.

Acknowledgments.—I thank the staff of the San Jacinto Ranger District, Sam Houston National Forest, for assistance during this project. L. J. Carmical provided access to the district and Forest Service records. Comments from R. E. Brown, D. K. Carrie, R. N. Conner, J. Nelson, and D. C. Rudolph improved an earlier draft of this manuscript.

LITERATURE CITED

BROOKS, M. AND W. C. LEGG. 1942. Swainson's Warbler in Nicholas County, West Virginia. Auk 59:76–86.

CORRELL, D. S. AND M. C. JOHNSTON. 1970. Manual of the vascular plants of Texas. George Banta Co., Inc., Menasha, Wisconsin.

EDDLEMAN, W. R., K. E. EVANS, AND W. H. ELDER. 1980. Habitat characteristics and management of Swainson's Warbler in southern Illinois. Wildl. Soc. Bull. 8:228–233.

GRAVES, G. R. 1992. A case of aggregated nest placement and probable polygyny in the Swainson's Warbler. Wilson Bull. 104:370–373.

MEANLEY, B. 1945. Notes on Swainson's Warbler in central Georgia. Auk 62:395–401.

———. 1966. Some observations on habitats of the Swainson's Warbler. Living Bird 5: 151–165.

———. 1969. Pre-nesting and nesting behavior of the Swainson's Warbler. Wilson Bull. 81:246–257.

———. 1971. Natural history of the Swainson's Warbler. North Am. Fauna 69:1–90.

REMSEN, J. V., JR. 1986. Was Bachman's Warbler a bamboo specialist? Auk 103:216–219.

WIDMANN, O. 1897. The summer home of Bachman's Warbler no longer unknown. Auk 14:305–309.

N. ROSS CARRIE, *Dept. of Wildlife and Fisheries Sciences, Texas A&M Univ., College Station, Texas 77843.* (Present address: *HQ JRTC & Ft. Polk, AFZX-PW-EC, Ft. Polk, Louisiana 71459–7100*). *Received 21 Aug. 1995, accepted 2 March 1996.*

Wilson Bull., 108(4), 1996, pp. 804–807

Measurements of Snail Kite eggs from central Florida.—The Snail Kite (*Rostrhamus sociabilis*) is a raptor with a disjunct distribution among several lake and everglade wetlands in central and south Florida (Sykes et al. 1995). The objectives of the present study were to collect measurements of kite eggs, delimit egg size variation among wetlands, and determine if egg size was correlated with clutch size, hatching success, fledging success, and breeding chronology of kites in central Florida.

Methods.—I visited Snail Kite nests every 1–2 weeks during 1991 at East Lake Toho-