

Distribution and Status of the Swamp Rabbit in South Carolina

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Abstract: We conducted a survey from 1990 to 1995 to determine the distribution and status of the swamp rabbit (*Sylvilagus aquaticus*) in South Carolina. Populations appear largely confined to 3 counties in the Savannah river watershed of northwestern South Carolina. We found little evidence that a significant change in distribution has occurred in South Carolina since the species was first reported in the late 1930s. Swamp rabbits are restricted to bottomlands, but were found in a variety of successional habitats ranging from old-fields to mature hardwood forests.

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The swamp rabbit has been reported from 14 states in the Gulf Coastal Plain and lower Mississippi River Valley (Chapman and Feldhamer 1981). This distribution extends from the Gulf of Mexico, north to Illinois and Indiana, westward to eastern Texas, Oklahoma, and Kansas, and east to Georgia and South Carolina (Chapman and Feldhamer 1981). Swamp rabbits occur in swamps, river bottoms, and other wetland habitats (Allen 1985). The swamp rabbit is the least studied species of *Sylvilagus* (Chapman and Feldhamer 1981), and its current range and status throughout much of the southeastern United States is largely unknown (Dailey et al. 1993). Population declines attributable to habitat loss have been reported in Arkansas (Sealander and Heidt 1990), Indiana (Harrison and Hicke 1931, Terrel 1972, Whitaker and Abrell 1986), Kentucky (Sole 1994), and Missouri (Korte and Fredrickson 1977, Dailey et al. 1993). Habitat loss is primarily due to conversion of bottomlands to extensive row-crop agricultural fields (Allen 1985). Surveys of swamp rabbit distribution and status have been accorded high priority because of widespread population declines and continuing habitat loss (Korte and Frederickson 1977, Dailey et al. 1993, Sole 1994).

The current distribution and status of the swamp rabbit in South Carolina has received little attention. Sherman (1930) first reported the swamp rabbit in the state on

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Figure 1. Statewide distribution of the swamp rabbit in South Carolina. Dark Circles denote where occurrence has been confirmed; question marks represents unverified reports. Square denotes approximate area of Figure 2.

the basis of specimens collected in Anderson, Oconee, and Pickens counties during 1938–1939 (Fig. 1). He speculated that the species was undergoing a range expansion and may have recently colonized South Carolina from northern Georgia. Golley (1966) considered the distribution of the swamp rabbit ill defined in South Carolina. The swamp rabbit is currently classified as both a game animal and a species of special concern by the South Carolina Department of Natural Resources (SCDNR; unpubl. rep. 1995). Species of special concern are those in need of management or monitoring. We examined the distribution and status of the swamp rabbit in South Carolina.

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Methods

Swamp rabbit surveys were conducted from 1990 to 1995 in Abbeville, Anderson, Greenville, Greenwood, McCormick, Oconee, and Pickens counties of northwestern South Carolina. These counties are located within the Piedmont, perhaps the most anthropogenically altered physiographic province in the United States (Godfrey

1980). Over 80% of the Piedmont was cleared for agriculture prior to 1900 (Plummer 1975), but by 1980 only 20% of the region remained in cropland or pasture (Godfrey 1980). Now forest dominated by loblolly pine (*Pinus taeda*) and mixed pine-hardwoods occurs on upland sites, or hardwoods (*Quercus* spp., *Fagus grandifolia*, *Liriodendron tulipifera*, *Acer rubrum*) on bottomland sites. Dams constructed on the Savannah River and its tributaries during the 1970s inundated much of the bottomland habitat in northwestern South Carolina (Platt et al. 1999).

Swamp rabbit distribution was determined through field surveys of potentially suitable habitat located from aerial photographs and U.S. Geological Survey topographic maps. Additional survey sites were selected based on information obtained during informal interviews of SCDNR personnel and hunters, and by searching the SCDNR Heritage Trust database. Multiple sites were inspected along most rivers and creeks, with each site visited once. Both bottomlands and the adjacent uplands were searched for evidence of swamp rabbits. We determined the presence or absence of swamp rabbits at a particular site, but did not attempt to estimate the size of rabbit populations. The occurrence of swamp rabbits was ascertained by the presence of fecal pellets on logs, stumps, and other elevated substrates (Terrel 1972, Korte and Frederickson 1977, Whitaker and Abrell 1986, Dailey et al. 1993, Sole 1994). Swamp rabbits deposit >90% of fecal pellets on logs or stumps, which function as territorial markers (Zollner et al. 1996). We used dogs at several sites to flush rabbits (Lowe 1958, Toll et al. 1960, Kjolhaug and Woolf 1988). Additional county records were obtained from the Campbell Museum of Natural History (CUSC), Clemson University. Specimens listed in the text are followed by CUSC museum numbers in parentheses.

Results and Discussion

We conducted field surveys for swamp rabbits at 74 sites in northwestern South Carolina. The occurrence of swamp rabbits was documented at 31 sites along 15 creeks and rivers in Anderson (Beaver Dam, Big Generostee, Rock, Mountain, Six-and-twenty, Three-and-twenty, Watermelon, and Weem Creeks, Rocky River, and Pendleton Swamp), Oconee (Brasstown, Choestoea, and Coneross creeks and Tugaloo River), and Pickens (Eighteen Mile Creek) counties (Fig. 2). Additionally, museum specimens were available from Oconee (CUSC 2100, 2233, 2234) and Pickens (CUSC 2465) counties. All swamp rabbit occurrences in these counties were within the Savannah River drainage. We found no evidence of swamp rabbits in apparently suitable bottomland habitat of the adjacent Saluda River drainage in Anderson, Greenville, or Pickens counties. In Anderson County, populations occurred within 3 km of creeks in the Saluda River drainage so their absence was surprising. However, swamp rabbits disperse along riparian corridors and rarely enter upland habitats, which may have functioned as dispersal barriers between these 2 drainages (Lowe 1958, Allen 1985).

We found no evidence for the occurrence of swamp rabbits in Abbeville, southern Anderson, Greenville, Greenwood, or McCormick counties, although the species

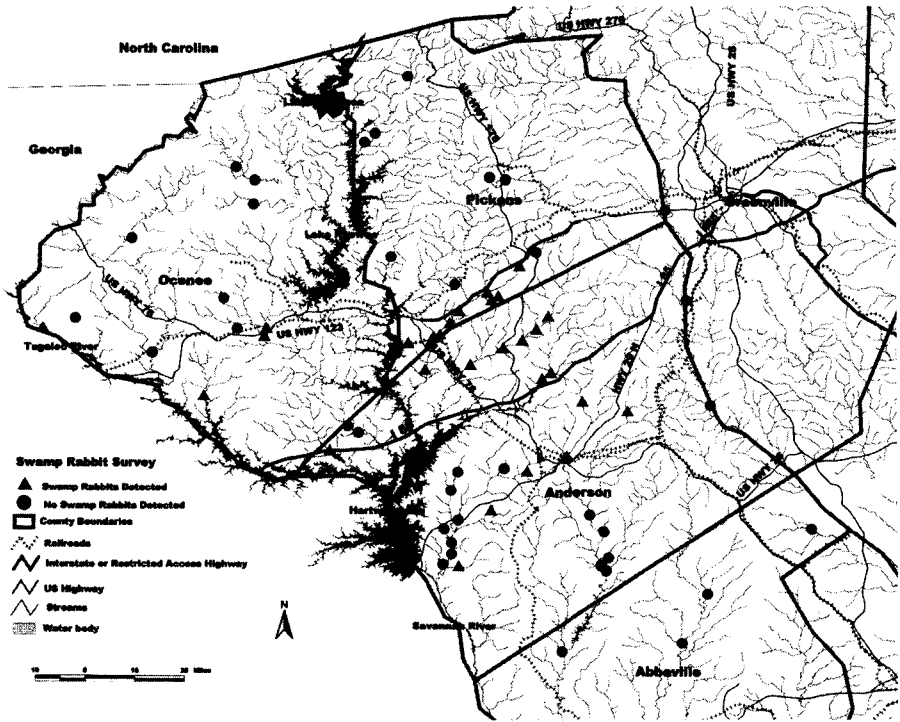


Figure 2. Distribution of the swamp rabbit in northwestern South Carolina based on field surveys conducted from 1990 to 1995. Five survey locations in Greenwood (1), McCormick (3), and Abbeville (1) counties are not shown; swamp rabbits did not occur at these sites.

is reported from adjacent counties of Georgia (Lowe 1958). However, swamp rabbits may be more widely distributed in South Carolina than indicated by our survey (Fig. 1). Museum specimens collected since 1990 are available from McCormick (CUSC 2339), Richland (CUSC 2330, 2331, 2332), and York (CUSC 2338) counties. Furthermore, anecdotal reports gathered during a survey of Piedmont fauna noted the occurrence of swamp rabbits as far east as Kershaw, Chesterfield, and Marlboro counties, although these records are questionable in the absence of specimens (Golley 1966).

Swamp rabbit populations in the Piedmont of northwestern South Carolina appear restricted to bottomland habitats. A similar dependence of swamp rabbits on bottomlands has been noted by others (Lowe 1958, Toll et al. 1960). We found swamp rabbits inhabiting a variety of successional habitats within bottomlands, ranging from old-fields to mature forests. Most sites were characterized by a dense ground layer of blackberry (*Rubus* spp.), honeysuckle (*Lonicera japonica*), common privet (*Ligustrum sinense*), and cane (*Arundinaria gigantea*). Rabbit sign was particularly abundant in dense thickets on the periphery of beaver (*Castor canadensis*) impoundments. Beaver foraging activity opens closed forests adjacent to impoundments,

contributing to greater shrub and herbaceous growth, and thereby increasing the quality of food and cover for swamp rabbits (Allen 1985).

According to Sherman (1939), local hunters claimed that swamp rabbits were absent in northwestern South Carolina "25 to 30 years ago" (ca. 1910), and he speculated the species was undergoing a range expansion. Large body size (up to 2.4 kg; Chapman and Feldhamer 1981) and the popularity of rabbits as game animals make it unlikely that swamp rabbits would have been previously overlooked, lending credence to hunter reports. Landscape-scale changes may have facilitated such a range expansion when conversion of bottomland forests to small-scale agricultural fields created a mosaic of successional habitats favorable to swamp rabbits. Similar habitat modifications are believed at least partially responsible for range extensions by several other species (e.g., loggerhead shrike, *Lanius ludovicianus*; green treefrog, *Hyla cinerea*; eastern coachwhip, *Masticophis flagellum*) in the South Carolina Piedmont (Gawlick and Bildstein 1993, Platt et al. 1999).

Habitat destruction is probably the greatest threat to the continued viability of swamp rabbit populations in South Carolina. Reservoirs created by dam construction extensively inundated bottomlands along the Seneca River where swamp rabbits formerly occurred (Sherman 1939), and remaining habitat is restricted to the floodplains of smaller tributary creeks and rivers. While we did not attempt to estimate population size, based on the abundance of sign found at most sites, swamp rabbits are common where suitable habitat is available. According to Lowe (1958), habitat availability is the most important limiting factor for populations in the Piedmont where extensive bottomlands are lacking.

The majority of swamp rabbit populations in northwestern South Carolina occurred on private land. The only publicly owned lands where swamp rabbits occurred are along Eighteen-Mile Creek, and Choestoea Creek-Tugaloo River, within Fants Grove and Chauga Wildlife Management Areas, respectively. Therefore, the continued existence of swamp rabbits in this region is largely dependent on land-use practices of private landowners.

Swamp rabbits may be particularly vulnerable to land-use practices that result in habitat fragmentation, because isolated lagomorph populations are prone to extinction (Newmark 1995). The minimum area required to support viable swamp rabbit populations remains unknown. Korte and Fredrickson (1977) stated that at least 100 ha of suitable habitat are required, but later studies (Dailey et al. 1993, Sole 1994) were 4.0 ha and 0.5 ha, respectively. Sole (1994) suggested the presence of rabbits in small tracts indicated a flexibility of habitat requirements. However, it is possible that rabbits inhabiting small tracts represent isolated individuals rather than viable populations. The role of corridors in linking core areas and fragmented tracts remains poorly understood, but is probably significant for maintaining viable populations (Dailey et al. 1993).

Flooding is an important source of mortality among some swamp rabbit populations (Chapman and Feldhamer 1981). Rabbits may drown during floods or be forced into uplands where the risk of predation is increased (Svihla 1929, Korte and Fredrickson 1977, Whitaker and Abrell 1986, Dailey et al. 1993). However, extensive

flooding is infrequent in bottomlands of the South Carolina Piedmont (pers. observ.) and not regarded as a major source of mortality.

Life history traits, such as relatively small litter size and delayed onset of sexual maturity, make swamp rabbit populations vulnerable to over-harvesting (Martinson et al. 1961). Terrel (1972) stated that removal of more than 45% of the autumn population would result in population declines, and Whitaker and Abrell (1986) attributed declines of some Indiana populations to over-hunting. The restricted distribution of the swamp rabbit in South Carolina coupled with limited habitat availability may result in an increased risk of local extirpation from hunting. However, annual harvest levels are probably less than 45% (B. Dukes, SCDNR, pers. commun.) and populations are not currently believed at risk from hunting. Therefore, we regard habitat destruction as the greatest threat to the continued viability of swamp rabbit populations in South Carolina.

It is difficult to assess swamp rabbit population trends in South Carolina given the paucity of previous survey data. Our study suggests populations remain largely confined to the Savannah River drainage in 3 counties of northwestern South Carolina, and a significant change in distribution has not occurred since the first collected specimens in the late 1930s. Unconfirmed reports (Golley 1966) and museum specimens from other counties suggest a more widespread distribution, but it remains unclear whether these originated from purposeful introductions by sportsmen or represent expanding populations. Additional surveys are therefore warranted.

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