
## Why study gray foxes on the SRS?

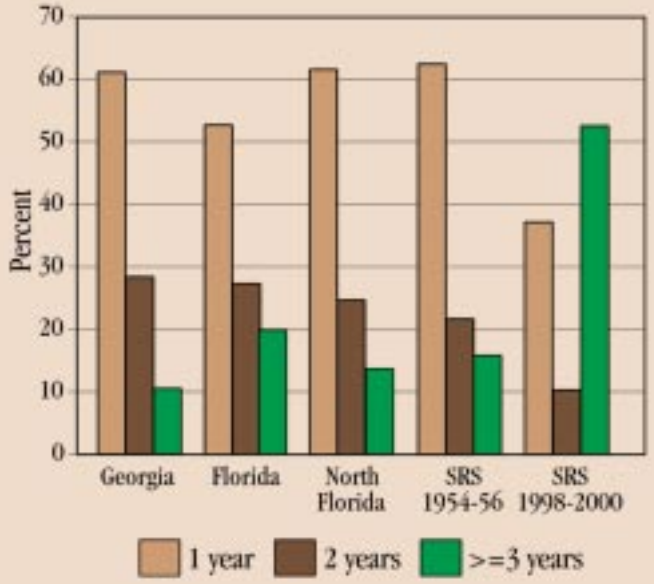
Gray foxes (*Urocyon cinereoargenteus*) are one of the most common furbearers in woodland habitats throughout the southeastern United States. They are frequently trapped for their fur and many foxhunting groups hunt them with hounds. Almost all that is known about gray fox populations comes from harvested populations, whereas virtually nothing is known of gray fox populations protected from harvest and harassment. This situation changed recently with a project designed to study gray foxes living on the U.S. Department of Energy's Savannah River Site (SRS). The SRS offers gray foxes sanctuary from both trapping and hunting, along with 78,000 ha of what may be the most favorable gray fox habitat in the Southeast.

What makes the SRS so favorable? First, the SRS provides a mixture of pine and hardwood forests that are preferred by gray foxes but avoided by a potential competitor, the red fox (*Vulpes vulpes*), which prefers open agricultural areas. The infrequent occurrence of domestic dogs on the SRS also might protect this gray fox population from highly fatal diseases such as canine distemper, which can be spread by contact with dogs. Finally, and perhaps most importantly, SRS gray foxes have been protected from hunting and trapping since the site was closed to public access in 1952. Thus, by studying this protected population, we can gain some insight into how trapping and/or hunting pressure may affect gray fox survival, age structure, sex ratios, and reproduction.

## Living long and living well

As it turns out, the SRS gray fox population is dramatically different from harvested populations. For example, in areas subjected to hunting and trapping, gray foxes live an average of 1.8 years. Even the population living on the SRS in the 1950s lived an average of only 1.6 years. Since then, the agricultural land on the SRS has been replaced with more suitable woodland habitat, fox harvest has been eliminated, and the average age of gray foxes on the SRS has doubled to 3.5 years. Furthermore, gray foxes on the SRS in the 1950s were not expected to live beyond 7.2 years, but now the maximum age is expected to be 14.0 years. This long life span is also reflected in the survival rate. Studies of harvested populations report that only 37-52% of all adults survive any given year. In contrast, adult foxes living on the SRS have a 61% chance of surviving every year.

Such a high survival rate and long life span have had unusual consequences for the age structure of the SRS gray fox population. Whereas most harvested populations are made up of approximately 60% 1-year-old animals, 22% 2-year-olds, and only 18% that are 3 years old or older, the age structure of the current SRS gray fox population is unlike any ever reported, with just 37% of the population being 1-year-old animals, only 10% 2-year-olds, and the majority of the individuals, 53%, being 3 years old or older.




*Percentage of foxes surviving in various age classes in the southeastern United States.*

What could cause such an unusual age structure? The answer may be a combination of good habitat, high survival rate, high density, and social structure. Most gray fox research indicates that population density ranges from 0.15 to 0.83 gray fox/km$^2$, whereas density on the SRS is approximately 1.0 gray fox/km$^2$. Using home range size and overlap to estimate population size, the total number of gray foxes on the SRS ranges from a conservative 355 to as many as 765. The SRS population, then, appears to be fairly dense. When gray foxes are 6-8 months old they typically begin to look for their own territories. Under high-density conditions, however, vacant home ranges are difficult to find, so most young foxes must leave the SRS to find their own territory. Thus, the number of 1-year-olds in the SRS population is rather low. Those few that do manage to find territories on the SRS are the only foxes around to become members of the 2-year-old age class the following year, resulting in the small proportion of 2-year-olds on the SRS. For the fox that does manage to establish a territory on the SRS, however, the high survival rate promises a long life, resulting in a large number of foxes that are 3 years old and older.

Furthermore, when densities are high, an 8-month-old female that cannot find her own territory might give up her first opportunity to breed in order to remain on her parents' home range and help raise her siblings. Her 8-month-old male littermate, however, is more likely to disperse off the site. This, then, should bias the sex ratio of gray foxes toward more females, and indeed, the sex ratio of SRS foxes is 0.7 male:1 female. The sex ratio of hunted and trapped populations is closer to 1:1. "Helper" females are known to occur in red foxes and, although they have never been documented in gray foxes, many researchers believe gray foxes are likely to exhibit the same tendency.

*A gray fox being released after attachment of a radio-transmitter, which was used to track the animal's movements on the SRS.*

Additional support for this hypothesis of "helper" females comes from the observation that 11% of SRS females are barren compared to an average of 4% barren females in harvested populations. Even more interesting is that those SRS females that do give birth have smaller litter sizes than harvested populations (3.6 young/litter vs. 4.2 young/litter, respectively).

The high rate of barren females and low litter size might seem to suggest that the SRS population has a low reproductive rate. However, the small litter size per SRS female is counterbalanced by the greater proportion of females in the SRS population. So, for every 100 foxes of both sexes, the SRS population has more females giving birth to fewer young per litter, whereas harvested populations have fewer females giving birth to more young per litter. The net result, then, is that the SRS population produces just as many young per capita (154 pups per 100 foxes) as every other population reported in the literature.

## What does all of this mean?

Because both harvested and protected populations have similar per capita reproductive rates, it appears that gray foxes have the ability to modify their reproductive behavior to compensate for low to moderate levels of trapping and/or hunting. In other words, low levels of harvest are unlikely to cause a gray fox population to decline. Furthermore, the high density, high reproductive rate, high survival rate, and old age structure strongly suggest that the gray fox population on the SRS serves as a source population for surrounding areas. A source population is one that produces a surplus of individuals that the habitat cannot support, thus the extra foxes leave the population and colonize new areas. The high reproductive rate and high survival rate strongly imply that the SRS gray fox population fits this description. With this protected population as a baseline for comparison, we may begin to understand how gray fox populations respond to changes in habitat quality and harvest pressure. Such protected populations are valuable research tools, for only by studying populations in the absence of hunting and trapping pressure can we begin to understand the effects of such activities upon the foxes themselves.