

NEBRASKA'S

Threatened and Endangered Species



*Southern
Flying Squirrel*

NEBRASKA GAME AND PARKS COMMISSION

Southern Flying Squirrel — A threatened species

Status

The southern flying squirrel (*Glaucomys volans*) is found throughout the deciduous forests of eastern North America from southern Ontario to the Gulf Coast, with isolated populations in Mexico and as far south as Honduras. Its distribution in North America is more southerly than that of its close relative, the northern flying squirrel (*Glaucomys sabrinus*). The northern variety is found primarily in coniferous forests in most of Canada and in the northern United States from Maine to California. The ranges of the two species overlap in some parts of the north-central and northeastern United States. Although the northern flying squirrel is larger, the southern variety is more aggressive and tends to be dominant.

Only the southern flying squirrel is found in Nebraska, and it is found only in remnant tracts of eastern deciduous forest in the southeastern corner of the state. It is known to occur in the forested bluffs along the Missouri River from the far southeastern corner of the state north to about Nebraska City. Historically, it probably occurred over a wider area when the deciduous forest in the state was more extensive than it

is today. Although the southern flying squirrel is considered threatened in Nebraska and is fully protected, it is quite common in many eastern states.

Description

The southern flying squirrel is easily distinguished from other Nebraska tree squirrels by its smaller size and by its gliding membrane, or patagium, a fold of skin that extends from the wrist of the front leg to the ankle of the hind leg. When the front and hind legs are extended, the membrane forms a wing-like gliding surface. The furred, broad and horizontally flattened tail serves as a rudder and stabilizer during glides. The eyes are noticeably large, an adaptation for its nocturnal habits. The ears are more prominent than in other tree squirrels. Whiskers are also prominent.

Southern flying squirrels are quite small. Adults usually are nine to 10 inches long including the tail, and they weigh between two and four ounces. Their fur is soft, silky and moderately long. The upper body is grayish to brownish in color, and the underparts are creamy white. The eyes are surrounded by a black ring, and a black border extends along the

edge of the gliding membrane.

Flying squirrels produce several vocalizations including a high pitched "tseet" and other chirping sounds. Some vocalizations are above the frequency range of the human ear. Some researchers have speculated that flying squirrels use high-pitched sounds for navigation, similar to the echolocation system of bats. Although flying squirrels have an excellent sense of hearing, they do not have the highly specialized hearing system of bats, and echolocation is unlikely.

Habits

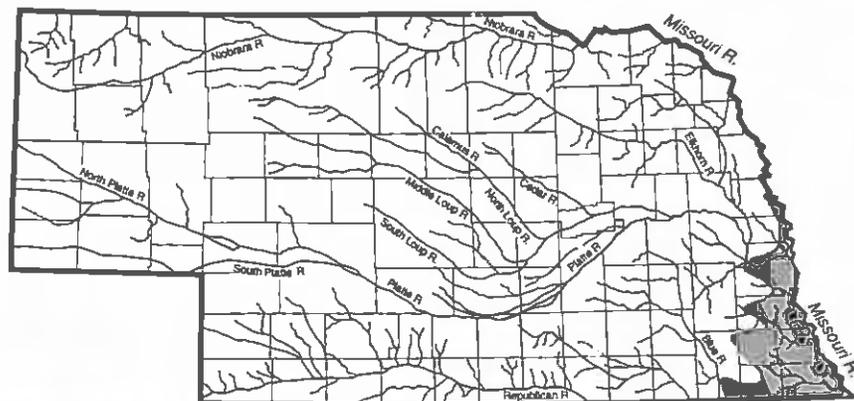
Undoubtedly the most unusual habits of the southern flying squirrel are its gliding ability and its nocturnal behavior. Unlike fox squirrels or gray squirrels that are active by day, the southern flying squirrel is probably the most nocturnal of all mammals in Nebraska. Other gliding mammals from various parts of the world also tend to be nocturnal, and a possible explanation for this association is that gliding in daylight might attract the attention of hawks or other diurnal (daytime) predators.

The gliding of a flying squirrel is spectacular. Glides begin after the squirrel climbs to a lofty treetop perch and assesses the landing site by moving its head up and down and from side to side, apparently triangulating to judge distance. It then launches itself with all four legs extended at right angles from the body, stretching the flying membrane.

With tremendous agility, flying squirrels can steer around branches or other obstacles. Most steering is done with the tail, but squirrels also vary the tension on the membrane to steer and to control speed. They usually land on the vertical trunk of another tree, invariably upright with the hind feet touching first.

Upon landing, they scurry to the opposite side of the tree to elude any pursuing predator. Glides occasionally extend for more than 50 yards, but

Southern Flying Squirrel Distribution in Nebraska



■ Suitable Habitat

● Known Populations Since 1985

are usually much shorter. Flying squirrels appear to have a maximum gliding ratio of about three horizontal feet for every vertical foot, a glide ratio that would allow them to travel the length of a football field from a perch 100 feet high.

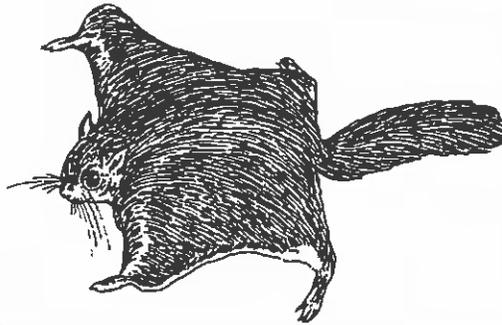
Southern flying squirrels do not hibernate, although they may remain in their nests for several days during severe winter weather. In winter they form groups in a common nest to conserve warmth. The number of animals in the winter congregations varies by latitude, with larger congregations found in northern climates. One tree cavity in Illinois was reported to contain 50 squirrels. In Nebraska, eight squirrels have been found in one nest box.

The population density of flying squirrels depends on the quality of the habitat. In favorable habitat, densities can approach five squirrels per

Reproduction

Southern flying squirrels show two periods of breeding activity. The first is in February and March, and the other is from late May through July. Females can produce two litters per year but only under favorable conditions. Litters, usually of three or four, but up to seven young, are born following a gestation period of 40 days.

Newborn young are hairless with eyes and ears closed. They are tiny, weighing less than a quarter-ounce each. The gliding membrane is



visible as a transparent fold of skin. The ears open at about three weeks of age, and a week later the eyes open. The young are weaned at six to eight weeks and are capable of gliding soon thereafter. Young typically remain with the female until the birth of the next litter.

Adults are sometimes seen together as pairs, but males typically leave females before the young are born and do not assist in caring for the young. The females are devoted parents. They seldom leave the newborn young, defend them rigorously and will move the young to a new nest if disturbed. An accumulation of parasites in the nest may cause the female to move the young even if no other disturbances are present.

Flying squirrels reach sexual maturity at about one year. They do not form tight pair-bonds. Females

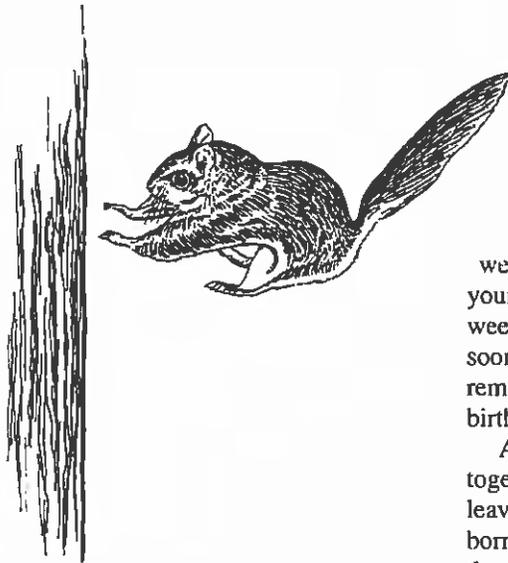
frequently have different mates in subsequent breeding seasons.



Food

Southern flying squirrels are primarily vegetarian, but will occasionally eat animal foods. Nuts, primarily acorns and hickory nuts, are preferred foods and make up the bulk of the diet. Flying squirrels will also consume various seeds, fruits, berries, mushrooms, buds, flower blossoms and tree bark. Animal items that occasionally may be eaten include insects, bird eggs and nestlings, small nestling mammals, carion, and adult shrews and mice.

Nuts are gathered and stored as winter approaches. The shortening of day length rather than temperature triggers the urge to store food. Nuts are buried individually or are cached in nest cavities or other cracks and crevices in trees. Several hundred nuts can be stored in a night. In good nut-production years, the stored nuts carry the squirrels through the winter and even into spring and summer.



acre. Estimates of home range size, the area used for normal day-to-day activities, range from about one acre to five acres. Females defend their home range, at least during parts of the year, and there is little or no overlap with the home range of other females. Males do not defend territory, and their home ranges often overlap with those of other males.

Nuts are eaten in a characteristic pattern. Flying squirrels usually cut a fairly smooth circular or oval opening on the side or end of a nut. On larger, heavy-shelled nuts they will make a second opening or remove an entire end in a single cut. Other tree squirrels usually crush nuts without leaving the shells intact.

The feeding pattern of flying squirrels more closely resembles that of deer mice or white-footed mice, which also inhabit cavities and nest boxes in southeastern Nebraska, but these species usually do not eat large, heavy-shelled nuts, and their tooth marks are finer. Flying squirrels will accept a "helping hand" by visiting bird feeders where they consume seeds, suet and peanut butter.

Habitat

In broad terms, southern flying squirrels require deciduous forests as habitat. Specifically, they require mast-producing trees such as oaks, hickories and walnuts for food, cavities in dead or live trees for shelter and some form of water.

Cavities used by flying squirrels are often constructed by woodpeckers, although any natural or artificially constructed cavity with an entrance hole larger than one inch in diameter might be used. Cavities are typically lined with strips of inner bark and leaves, but lichens, moss, feathers and other materials have been incorporated into nests. Cavities are used throughout the year. Flying squirrels inhabit a primary nest cavity that is used more or less continuously and one or more secondary nest cavities used as feeding stations or as refuge if the primary nest is disturbed. Outside leaf nests are seldom used in northern climates, but are fairly common in warmer areas.

The water requirements of flying squirrels are not well understood. They obviously obtain some water from their food. Free-standing water is consumed when available, but

their range is not limited to areas with available surface water. Where surface water is not available, squirrels appear to be physiologically adapted and get sufficient water from food, dew and rains. They probably make use of water that temporarily collects in tree cavities.

Limiting Factors

Flying squirrels have been known to live 13 years in captivity, but seldom live five years in the wild. A variety of predators and internal and external parasites can affect them. Predators include owls, domestic cats, hawks, snakes, bobcats, raccoons, weasels and foxes. Predation is probably no more significant for flying squirrels than it is for other tree squirrels. External parasites reported from flying squirrels in-

clude fleas, lice and mites, and internal parasites include nematodes and protozoans. None of those parasites are known to be substantial limiting factors. Few diseases have been reported in flying squirrels, and none are thought to be significant.

The amount and quality of habitat are probably the most important factors limiting flying squirrel populations in Nebraska. The range of the southern flying squirrel coincides closely with the range of several species of oaks and hickories. Eastern Nebraska is near the western edge of distribution of several oak and hickory species and the southern flying squirrel. Because many of the mast-producing trees produce nut crops irregularly, a diversity of tree species is needed to assure an ample supply of nuts each year, and the lack of diversity of mast-producing





Its small size, gliding membrane and large eyes distinguish the southern flying squirrel from other Nebraska tree squirrels.

trees may be a limiting factor for flying squirrels.

Although Nebraskans have little control over the natural diversity of mast-producing trees, the loss of habitat can be controlled. The primary reason the southern flying squirrel is threatened in Nebraska is the loss of deciduous timber habitat and the potential for this loss to continue. Habitat has been lost for several reasons. The conversion of forest to cropland and the use of forested Missouri River bluffs for homesites are the two most significant. Researchers from Peru State College found that 42 percent of the timber in Nemaha County was lost from 1856 to 1977. Most of the loss has occurred since 1955, primarily through conversion to cropland.

Changes in the remaining forested areas can be detrimental to flying squirrels. Logging removes mature oak timber that is important to flying squirrels as a food source and for the cavities the trees contain. Removal of trees for firewood can be detrimental because dead trees containing cavities are often cut, and the best mast-producing species are also the best species for firewood.

Management and Outlook

Because flying squirrels are nocturnal and are not valued as a game species, they have not been studied as extensively as other tree squirrels. Much of our knowledge about flying squirrels has been gained from observing them in captivity. Flying

squirrels are doing well without human assistance in areas of their range where habitat is abundant. Management practices have rarely been implemented specifically to benefit flying squirrels.

Flying squirrels readily use nest boxes placed for their benefit or for other species. Nest boxes have been used in Nebraska and other areas in attempts to determine the status and distribution of flying squirrels. By periodically checking nest boxes and capturing and tagging the inhabitants, considerable information can be gathered. The number of squirrels using an area and their survival can be estimated, and movements can be monitored. Nest boxes can be used as a management tool when a shortage of cavities exists. Such a situation can occur in a young timberstand where trees are old enough to produce mast, but cavities are in short supply.

Nebraska can never expect large populations of flying squirrels unless the loss of habitat is dramatically reversed and forested areas are expanded. However, flying squirrel populations could increase. First, wholesale conversion of eastern Nebraska woodlands to cropland



A variety of mast-producing trees like these at Indian Cave State Park in Nemaha and Richardson counties provide quality habitat for the southern flying squirrel.



A young southern flying squirrel at Indian Cave State Park.



Tree removal adversely affects flying squirrels as well as other woodland wildlife.

would have to cease. The effects of commercial logging or firewood cutting can be moderated by leaving a few large dead trees. The effects of homesites might not be serious if tree removal is minimized.

Homeowners should consider erecting nest boxes and feeders and should keep pets from ranging freely.

If the loss of mature deciduous

timber in southeastern Nebraska can be reversed, natural plant succession will eventually replace some of the lost habitat. Through natural succession, remaining woodlands and pastures would eventually become mature oak-hickory forest — just what the flying squirrel needs. The future of the species in Nebraska would then be brighter.

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Note: New data on the occurrence and distribution of this species are being collected constantly, and some of the information in this publication may be outdated. It should be used for a general understanding of the status of this species in Nebraska and not as the sole source of locational information for any report, project, regional/local planning or environmental impact assessment. For current information on this or other threatened and endangered species, or for additional copies of this publication, contact the Wildlife Division, Nebraska Game and Parks Commission, P.O. Box 30370, Lincoln, NE 68510.



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