



Population and Home Range Survey of Southern Flying Squirrels at Brookhaven National Laboratory

BRADLEY BUCKALLEW¹ and JENNIFER HIGBIE²

Presbyterian College, Clinton, SC 29325

Brookhaven National Laboratory, Upton, NY 11973



Abstract

Southern flying squirrels, small, nocturnal mammals that are abundant along the eastern seaboard of the United States, play an important role in the ecosystem distributing the seeds of various plants and trees while feeding, and are an important prey animal for nighttime predators. This study has determined the presence of southern flying squirrels on Brookhaven National Laboratory's property. To capture the squirrels, two methods were used. PVC sections were cut and mounted 2.7 meters high in trees to simulate day hides. These were checked regularly for occupancy, but failed to produce results. In the wake of the PVC's failure, Sherman traps were mounted on trees at a height of about 1.7 m and baited in the evening and checked the subsequent morning with four trap nights per week. Along with these trapping methods, horizontally mounted PVC was used at the same height of the traps to check for presence. Motion cameras were also used to obtain images of the squirrels interacting with the traps and PVC. Throughout the course of the investigation, 38 captures were made between the Sherman traps and a small mammal study also occurring in the same area. Standard mammal measurements were taken for each southern flying squirrel and 16 of the individuals were ear-tagged. Five of these were later recaptured and their average movement was 69.2 m per day. The average measurements for the squirrels at BNL were within 10% of measurements from other studies, except the for weights, which were higher. This difference might be attributed to the lack of precision in the hanging scales used for this investigation. The images from the motion cameras indicate that the squirrels were active between 8:30 PM and 11:30 PM and in a variety of temperatures. The failure of the PVC hides is most likely due to the abundance of natural shelter available. Unfortunately not enough data was collected for a population estimate or a complete home range. Future studies in the next two years will accumulate more data throughout Brookhaven National Laboratory's property, allowing for a population estimate. Future studies will also include using radio collars to track the southern flying squirrels, resulting in home range data.

Introduction

One of the common small mammals, but often overlooked in New York, is the southern flying squirrel. The completely nocturnal nature of this creature prevents it from being spotted by the casual observer. Even though it is not often seen, the southern flying squirrel is quite prevalent in New York and throughout its range, which extends from the eastern seaboard as far west as the Mississippi River. It ranges from Maine to Florida and even has pockets as far south as Central America.

The southern flying squirrel cannot fly as its name implies, but instead glides from tree to tree using a skin membrane call a patagium. This membrane extends from the wrist of the forelimb to the ankle of the leg, providing a large surface area for air resistance. By controlling the tension of the patagium and using its tail, the squirrel is able to direct the course of its glide without bumping into anything.

The diet of the southern flying squirrel varies greatly, from insects to fungus, but their main food supply comes from nuts and acorns. These come from hardwood trees, such as oaks and hickories. The squirrels store nuts and acorns in vast quantities during the fall in preparation for winter. The squirrels reside in holes that can often be found in snags or in trees that have received the attentions of a woodpecker. During the summer, when the temperatures are higher, the squirrels also build outside nests in the limbs of trees, but during the winter the squirrels stay inside warmer holes, often gathering in numbers for increased warmth.

Southern flying squirrels have two breeding seasons a year, once from February to March and a second time from June to July. Individual females often only participate in one season per year unless they are particularly healthy. The gestation period is forty days and the average litter is three to four. The young are born completely dependent, but are out on their own by the time the female gives birth to the next litter.

The population number of southern flying squirrels at Brookhaven National Laboratory (BNL) has not been previously calculated or studied. The purpose of this study is to determine the presence of flying squirrels on the property and determine their relative population.



Sherman trap secured to tree

Materials and Methods

The first approach involved two foot sections of 2-inch diameter PVC. These were cut and installed as day hides for the squirrels. Most of these sections were left smooth on the inside, but a subset were scored on the inside to determine if the squirrels needed a better grip to enter the hides. Each of the sections was then capped on the top end to reduce light emission. A grid of fifty locations was created over the assigned study area and at each of these locations PVC sections were mounted vertically to the nearest tree around a height of 2.6 meters. The sections were mounted using a circular bracket that was secured onto the tree. The PVC was then inserted into the bracket and held secure by a bolt and wing nut. At each of the 50 locations, a smooth section of PVC was mounted, while 26 roughened sections were mounted evenly throughout, adjacent to the smooth sections. Tree species, overstory, understorey, circumference and facing were taken for each location. The PVC sections were checked periodically throughout the study to monitor for inhabitation.

Thirty Sherman traps were used to capture the flying squirrels. Each week, six locations were chosen for trapping, with five Sherman traps per location. The chosen spots mirrored the locations of mounted PVC to ensure that the entire study area was covered throughout the course of the investigation. At each location, the traps were mounted approximately 1.6 meters high on a variety of tree species. The circular brackets used to mount the PVC sections were modified to fit the rectangular shape of the Sherman traps. The brackets were then mounted into the tree and once the trap had been placed inside, tie wraps were used to secure the trap in the bracket. Care had to be taken to ensure that the external pressure from the bracket did not prevent the Sherman trap from fully closing. Overstorey, understorey, circumference and facing were taken at each trap along with tree species. The traps were installed at the beginning of each week and removed at the end of the week with four trap nights in between. The traps were baited with a mixture of peanut butter and oats. The traps were checked early each morning to reduce the amount of time each squirrel spent in the trap. Captured squirrels were ear tagged, weighed and measured for total length, tail length and hindfoot length. If the squirrel was a recapture, the tag number was noted along with weight.

In the latter part of the study, the some of the PVC hides were modified to determine if the squirrels disliked the PVC itself or if they simply did not need the hides. Ten of the PVC sections were shortened to one foot in length. The cap remained on one end of the tube, leaving only one entrance. These tubes were then mounted to trees horizontally about 1.6 meters high in the same fashion as the hides. The location of the tubes was the same as the Sherman traps each week and the tubes were checked along with the traps. The tubes were baited and the presence or absence of the bait denoted if a squirrel had visited. Two motion cameras were used to capture images of the squirrels interacting with the traps and PVC.



Vertically mounted PVC

Results

The vertically mounted PVC sections resulted in no flying squirrel captures. They were observed a total of 570 trap nights with no signs of use throughout the investigation.

The Sherman traps resulted in 31 captures over 480 trap nights, a success rate of 6.46%. In addition to this, seven more captures were made in a separate small mammal survey that utilized Sherman traps placed on the ground. These squirrels were processed in the same manner as the squirrels captured in the tree mounted Sherman traps. The average weight of these individuals was 72.3 grams, while the average total length and tail length were 21.4 cm and 8.97 cm respectively. As the map shows, the captures were made throughout the study area, but one area in particular resulted in a high number of captures.

Of the captured squirrels, 16 individuals were successfully tagged. Five of these individuals were later recaptured. Using a Geographic Information System (GIS), the recapture locations were marked and the distance between them were calculated. As the map shows, the squirrels are capable of significant movement, with tag 9 moving 376 m in just one day, while tag 14 moved 900+ m over the course of 11 days. Contrary to that data, the map also indicates that the squirrels stay in the same vicinity, with tag 14 moving just 9.8 m one night and tag 8 being caught in the same location three nights in a row, though this might be due to learned behavior. The average distances tag numbers 8, 9, 11, 14 and 87 travelled per day were 50.5 m, 104.6 m, 12.4 m, 78.6 m and 109.1 m respectively.

Horizontally mounted PVC sections had a success rate of 5.88%, with 68 trap nights and 4 confirmations of presence.

The motion cameras successfully took images of flying squirrel activity five nights. Based on the time of the images, the most active time for the flying squirrels was from 8:30 PM to 11:30 PM since all of the encounters took place within this time period. The cameras also showed the squirrels to be active in a variety of temperatures, ranging from 14.4 to 21 degrees Celsius.



Capture/Recapture numbers and locations



Map of southern flying squirrel movements based on recapture data

Discussion

The lack of success from the vertically mounted PVC seems to suggest that either the flying squirrels dislike PVC or that they have no need for the structure itself. Since the squirrels willingly entered the horizontally mounted PVC to retrieve the bait, it seems that the second explanation is the most likely. The area tested at BNL contained a plethora of snags and cavities so that the squirrels already had an abundance of hiding and living space. The squirrels simply had no need for the artificial PVC hides and therefore did not use them.

The total length and tail length of the individuals captured were within 10% of similar measurements made on squirrels from Indiana and Florida [2]. The average weight differed by 14.8% and 39% respectively. This could be due to different population characteristics caused by climate. The southern flying squirrels found further north could weigh more to survive in colder temperatures. This discrepancy could also be due to the use of multiple scales in this study, which may have not been perfectly calibrated.

The presence of southern flying squirrels has been proven on BNL property. Future studies will expand the project to the rest of BNL property and will further investigate their movements using radio collars.



Flying squirrel investigating trap



Flying squirrel entering horizontal PVC

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