



# Population Density of Southern Flying Squirrel (*Glaucomys volans*) at Brookhaven National Laboratory

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Picture taken by Maria Brown

## Abstract

Even though the Southern Flying Squirrel (*Glaucomys volans*) are prevalent in hardwood forests in the eastern half of the United States, the fact that they are nocturnal means they rarely cross paths with any human. Through this experiment, we sought to find out if, due to geographic isolation, the Flying Squirrel populations on Long Island differ genetically from those found on the mainland. We caught squirrels with baited Sherman traps and took genetic samples via cheek swabs. The DNA was then extracted using a Qiagen DNeasy Blood and Tissue Kit, and sent to Brookhaven National Laboratory's Biology facility for DNA sequencing. We were able to capture 68 squirrels out of 575 total trap nights (11.83% return). And from the 68 squirrels, 69 DNA samples were extracted. Out of the 69 DNA samples, 43 went through PCR successfully (62.32%).

## Introduction

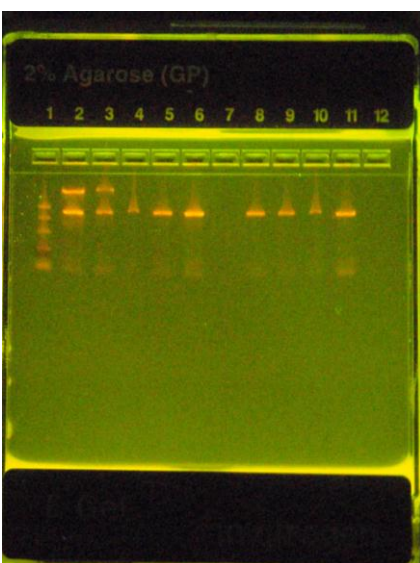
The southern flying squirrel (*Glaucomys volans*) are prevalent in hardwood forests in the eastern half of the United States [1], east of 100W latitude, and in pockets in Mexico and Central America [2]. They prefer to inhabit hardwood forests that contain seed producing trees such as oak and maple. They are omnivores and have a wide array of food in their diet including: seeds, bark, and insects. Because of their varied diet and their fairly large home range, flying squirrels play an important role in the dispersal of seeds of hardwood trees and spores of fungi. Flying squirrels are very common but due to their nocturnal nature, they rarely cross paths with any human. Even though they are called flying squirrels, they are incapable of extended flight, and can only glide due to the loose skin between their wrists and ankles. Glide distance is directly proportional to launch height. For example, a glide from the top of an oak tree, approximately 18-meters, a flying squirrel can glide nearly 50-meters [1].



Mounted Sherman trap, at approximately 1.8 meters



Sherman trap baited with peanut butter and oatmeal ball and nestlette



Gel Electrophoresis of PCR products of squirrel DNA

## Materials and Methods

Previous studies over the past two years at Brookhaven National Laboratory reveal that there is a large and stable population of southern flying squirrel within the borders of the laboratory proper. Sherman traps were used to catch squirrels and trap locations were spread out to determine whether a geographically diverse population exists. Traps were baited with peanut butter and oatmeal balls. Nestlettes (cotton squares) were also used to provide the squirrels with nesting material. Traps were attached to trees by a modified C-Clamp. Trap location points were recorded using ESRI ArcPad V.8 on a Trimble GeoXT unit. The following information were recorded, giving a brief summary of the nearby habitat characteristics: (a) overstory; (b) understory; (c) tree species (to which trap was affixed); (d) tree breast height diameter; and (e) current weather. A range of eight to twenty traps were placed in a wide array of locations. A greater number of traps were placed at locations where no squirrels had been previously caught (i.e., Gamma Forest with twenty traps). Traps were spread out in these areas, generally several meters from each other, but this differed based on the size and density of the forest. Sherman traps were opened during the late afternoon in order to reduce the chance of diurnal animals from eating the bait or setting off the traps. Since flying squirrels are nocturnal and very active in the early morning, there is a very rare chance that they would be trapped for more than eight-hours. If the weather forecast predicted a high chance of overnight rain (above 40% based on NOAA and weather.com for Upton, NY), traps were not opened to ensure that the squirrels would not be at risk of hypothermia. Once captured the squirrel was anesthetized. It was then weighed and its measurements were taken: body length, hind foot length, hind foot pad length, and its gender, any markings, or signs of breeding were noted. The squirrel was then ear tagged and its number was recorded. Genetic DNA samples were taken from squirrel's inner cheek using cotton swabs. For most of the captures, two cotton swabs were used in order to increase DNA return. The DNA was extracted using the buccal swab protocol provided with Qiagen DNeasy Blood and Tissue Kit. The DNA samples went through PCR according to a routine PCR reaction instructions from BioLabs New England. The PCR products were then tested for DNA in a electrophoresis gel. Successful samples with bright bands were then sent to Brookhaven National Laboratory for DNA sequencing.



After anesthetizing, the squirrel was placed into a bag for weighing purposes



Once all measurements were taken, a DNA sample was taken via cheek swab

Picture taken by Tamer Marshood

## Results

Out of 575 trap nights, sixty-eight total squirrels were captured (17 recaptures). This yields a success rate of 11.83%. Forty-six mice were also captured (forty-four *Peromyscus leucopus* and two *Mus musculus*). A rate of 7.68%. According to the figures below, there is a ratio of 37% to 57% of females to males respectively. This ratio changes when only the recaptured squirrels are considered, 65% female and 35% male. Out of 69 PCR products, 43 were successful and able to be sequenced. This yields a success rate of 62.32%. Two samples were contaminated and twenty-four did not show bright band on the electrophoresis gel.

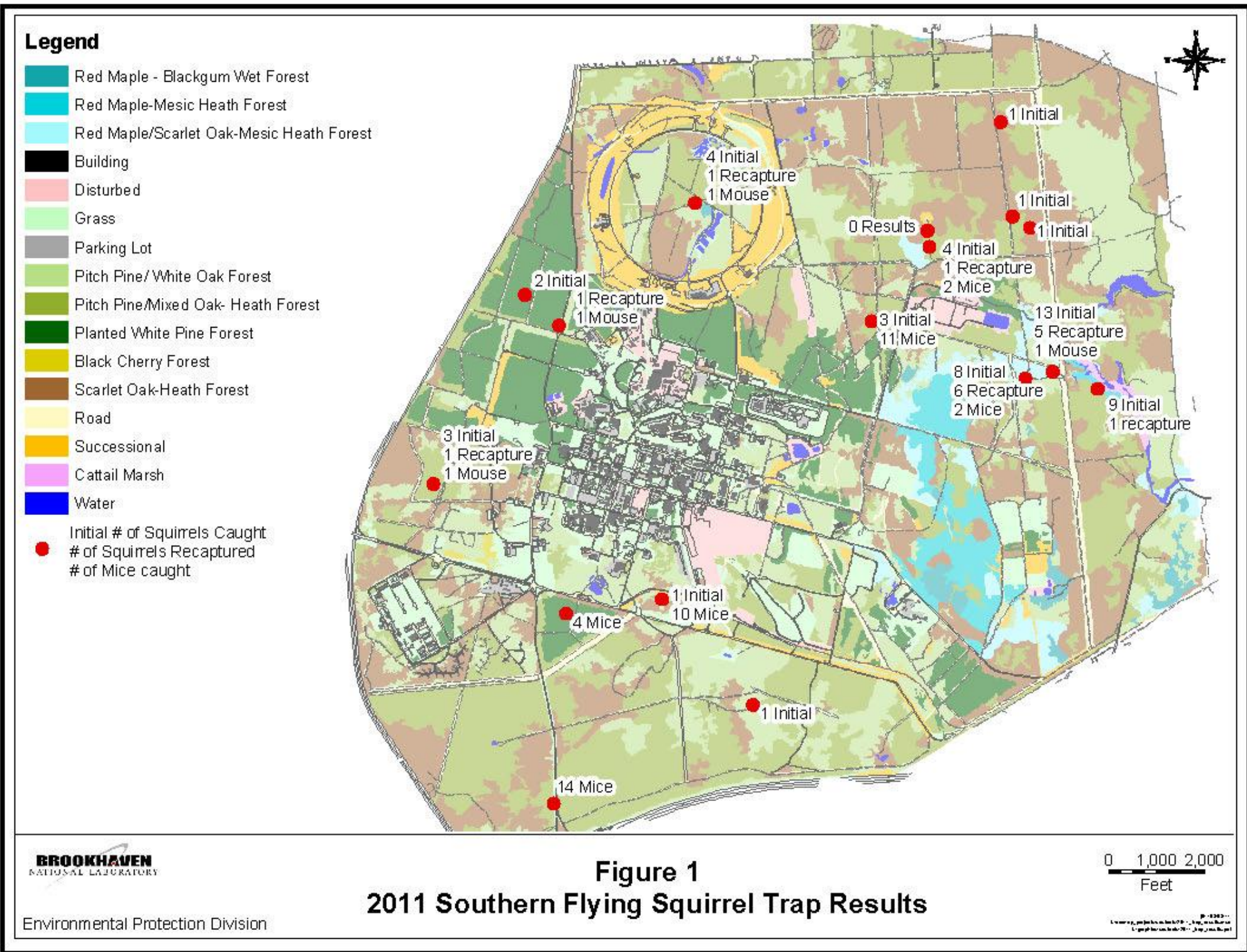
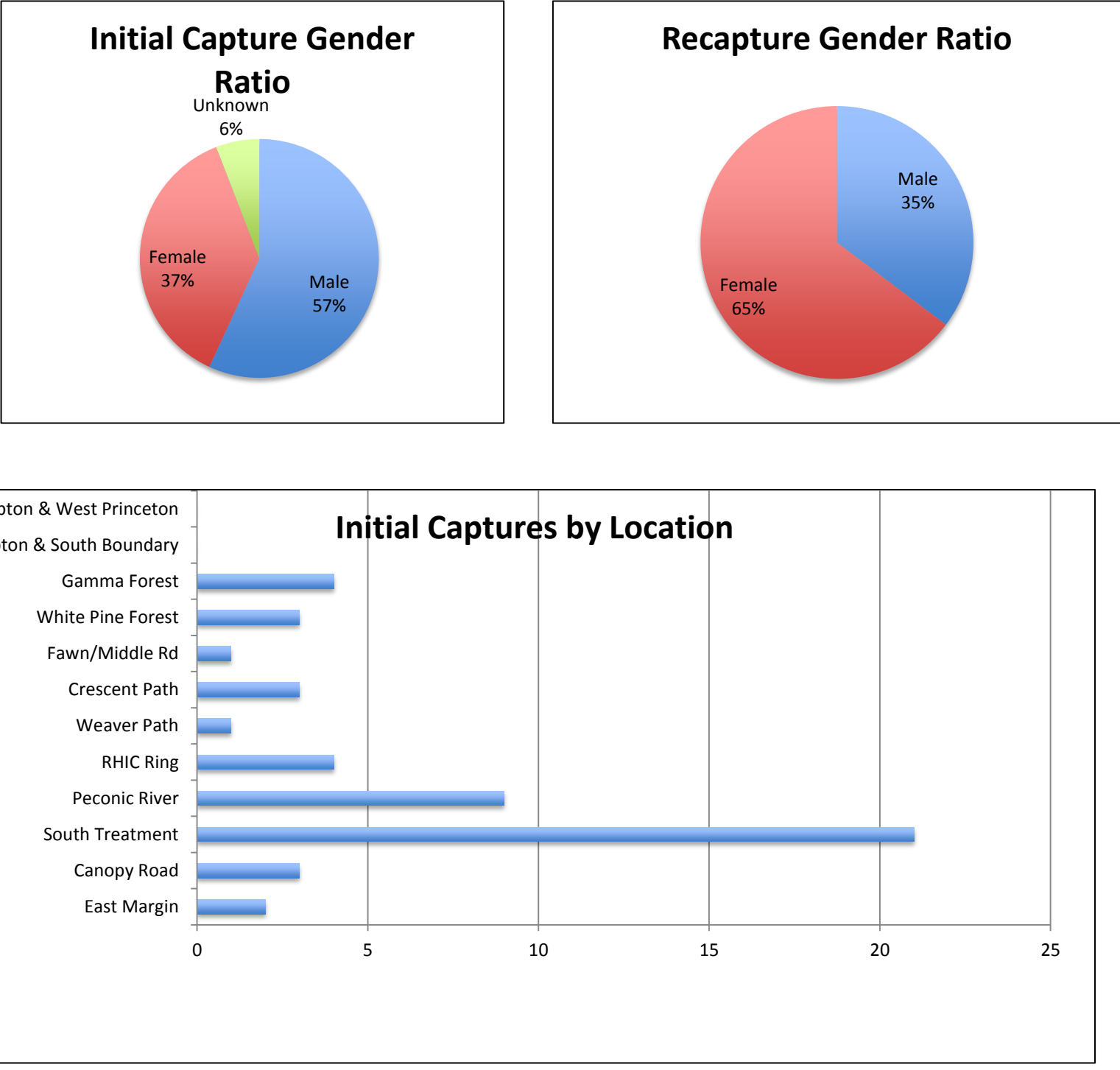


Figure 1  
2011 Southern Flying Squirrel Trap Results



## Discussion

The fairly large number of captured squirrels (68), in a ten week time period, shows that these squirrels are prevalent in a variety of forests throughout Brookhaven National Laboratory. The results support the fact that squirrels have a large diet and can thrive on a broad range of forest types. The Southern flying squirrels are present in areas that have varying understory and overstory. Many of the locations have a mixture of Oak and Pine trees. Some locations have an oak dominant overstory (i.e., Along Peconic River) and some have a Pine dominant overstory (i.e., White Pine Forest along West Fifth). Throughout all these locations, it has been noted that varying understories also exist.

There is a possibility that many of the recaptured females are breeding or taking care of young. The average weight of these females is 64.05g, with a standard deviation of 11.49. With these calculations, this hypothesis may not be true, but it could also be because females are more loyal to one area and tend to depend on a constant food source, unlike males who tend to have a larger home and forage area/range [1].

On the evening of July 26th, weather forecast was unfortunately not checked and severe thunderstorms and rain were predicted. The following morning, two squirrels were captured and both were wet and shivering, but still very alert with normal breathing patterns and quick recovery time. The following morning, nine squirrels were captured (one recapture). This may be because during difficult weather, the squirrels may be more inclined to not forage and wait until the next evening to forage.



Understory of Gamma Forest, within outer gate: Low to medium height of Huckleberry and Blueberry



Understory of Gamma Forest, within inner gate: Medium to high height of Huckleberry and Blueberry



Understory of White Pine Forest: Mainly pine needles and some fungus

## Future Work

Mice & forage times  
Along South Boundary and Upton Road, where fourteen mice were captured, an additional research project could be setting cameras in order to get a time stamp to when the mice forage. Based on that time, researchers may be able to find the time to open the traps the night before. Since mice are known to forage earlier and more often than southern flying squirrels, it may benefit the research by opening the traps once mice are not as active. There should be a high probability of catching squirrels in that area because three squirrels were caught in similar forest structure (Pitch-Pine/ White Oak) along the south end of Canopy Road. This method can also be used in the Crescent Road section where eleven mice were captured and in the Upton/West Princeton location where 4 mice were captured.

## Acknowledgements

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## References

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