

**A Sampling of Habits and Movement:
The Southern Flying Squirrels at Brookhaven National Laboratory**

TAMER MARSHOOD

United States Department of Energy
Community College Institute (CCI)
Brookhaven National Laboratory

Hudson County Community College

Courtney Buckley
SUNY College of Environmental Science and Forestry
Syracuse, NY 13210

Jennifer Higbie
Brookhaven National Laboratory
Upton, New York

August 12, 2011

Prepared in partial fulfillment of the requirements of the Office of Science, Department of Energy's Community College Institute under the direction of Timothy Green in the Environmental Department at Brookhaven National Laboratory.

Participant: _____

Research Advisor: _____

Table of Contents

ABSTRACT.....	iii
INTRODUCTION.....	1
MATERIALS AND METHODS.....	1
RESULTS.....	3
CONCLUSION.....	4
ACKNOWLEDGEMENTS.....	5
REFERENCES.....	6
FIGURES.....	7

ABSTRACT

A Sampling of Habits and Movement: The Southern Flying Squirrels at Brookhaven National Laboratory

Tamer Marshood (Hudson County Community College, Jersey City, NJ 07306, Courtney Buckley (SUNY College of Environmental Science and Forestry, Syracuse, NY 13210), Jennifer Higbie (Brookhaven National Laboratory, Upton, NY 11973).

Observational research was conducted to collect home range information on the southern flying squirrels that inhabit the 5,265 acre ecosystem of Brookhaven National Laboratory (BNL). This project was a part of a larger natural history study whose purpose is to provide BNL scientists with a better understanding of the ecosystem they are responsible for and how that ecosystem might be affected by laboratory operations. Eight radio collars, each with a unique frequency, were attached to nine individual animals (one collar was used twice), mostly adults, from six locations about the laboratory. The animals were tracked daily for a six week period, though not all animals were tracked for the full six weeks. Using radio telemetry the animals were located both during the daytime, when they rested, and during the nighttime, when triangulation was used (so as to not disrupt their nocturnal activity) to determine their movements. The recorded information was then compiled to determine a home range for each animal. The largest home range is 9.68 hectares and the smallest is 1.21 hectares. Four squirrel home ranges are over 6 hectares while two home ranges are under 3 hectares. The average home range is 6.0 hectares. Interestingly, the animals with the two smallest home ranges were both caught on the same day and at the same location. This research not only confirms the presence of southern flying squirrels all about the BNL property, it also offers a sampling of southern flying squirrel activity at BNL.

INTRODUCTION

Southern Flying Squirrels (*Glaucomys Volan*), sciuromorpha rodents [2], easily distinguished by their white bellies, gray fur, and a patagium, a "gliding membrane", a flap of loose skin that extends from wrist to ankle [3], inhabit the 5,265 acre ecosystem of Brookhaven National Laboratory (BNL). Population estimates are yet unknown; however, this study did confirm the presence of squirrels throughout multiple sections of the BNL ecosystem. Squirrels are known to be terrestrial animals who prefer to inhabit "deciduous and mixed forests." They generally average in length between 198-255mm, weight between 46-85g and much of their diet consists of insects, nuts, seeds, and fruits [3]. Observational research to gather a sampling of squirrel home range information and habitat behavior at BNL was carried out for a period of six weeks, from June 20, 2011 to July 29, 2011, throughout 4 different sections of the campus, all either oak or pine forests or a combination of both oak and pine. A similar study in Arkansas [4] estimated squirrel home ranges to be 3.8ha (3.9ha) and 7.8ha (9.0 ha) for females and males respectively; another study in western Maryland [5] estimated home range size for adult squirrels to be 2.45 ha for males and 1.95 ha for females. This study estimated home range sizes for a sampling of 6 southern flying squirrels throughout the BNL campus.

MATERIALS AND METHODS

Phase one was to prepare the radio collars which would be used to track the animals. The collars had to be small and light enough to fit comfortably around the squirrels' necks without weighing them down. Eight M1420 Radio Telemetry Transmitters, each with a unique

frequency, a pulse rate of 33 ppm, pulse width 17 ms, and weighing 0.8 g, were attached with fishing line to a circle shaped hollow rubber tubing which would go around the squirrels necks. To prevent the collar from being chewed off, while simultaneously maintaining squirrel comfort, the tubing, prior to being attached to the transmitter, was dipped in a rubber coating (so the cayenne pepper would stick), then covered with a layer of cayenne pepper (to prevent chewing), and then dipped in rubber coating once again to provide a smooth and comfortable outer surface.

Phase two was to trap and collar the animals. H.B. Sherman LFA perforated folding traps, dimensions 0.62 x 8.89 x 22.86 cm, weight 0.80 g, baited with peanut butter-oatmeal balls, were hung, an average of 185.3 cm high on the trunks of oak and pine trees in several locations about the BNL campus. Nestlets, tightly packed cotton squares the animal could tear apart and use as nesting material, were also placed in the traps. Traps were opened five days a week, generally between 1500 and 1830 hours, and checked the following morning at 0700 hours. When a squirrel was caught, following anesthetization with isoflurane, it was measured, ear-tagged, and fitted with a radio transmitter collar.

Phase three was to observe squirrel activity by tracking the individual radio transmitters. The objective was to record squirrel activity throughout different times of the day and in varying weather conditions. This was accomplished by using a Communications Specialists Inc. R-1000 Telemetry Receiver, dimensions: 3.8 x 6.6 x 15.5 cm and weighing 352 g, with a Communications Specialists Inc. RA-150 148-152 MHz Folded Yagi Directional Antenna. During the day, when the squirrels rested, their exact GPS location could be determined and captured into a Trimble GeoExplorer GeoXT 2008 Handheld Series GPS. During the evening, when the squirrels were active, triangulation was used to determine transmitter locations from a

distance, so as to not disrupt squirrel activity.

The final phase of the project, following the six week observation, was to calculate home range size and recapture the squirrels in order to retrieve the radio collars. The recorded transmitter locations, with the use of ESRI's ArcInfo 9.2 with Hawth's tools extension, were then used to calculate home range size.

RESULTS

A total of nine squirrels, 6 males and 3 females, were fitted with radio transmitters, one collar was reused after it was prematurely detached from the squirrel. Six transmitters remained attached long enough to allow at least a thirty-eight day observation period, five collars remained attached from forty-four to forty-six days. Each transmitter was located several times per week during varying hours of the day. Three squirrels were never recaptured and therefore their collars were never retrieved.

Nighttime triangulation produced mostly usable information. The amount of recorded usable information increased throughout the study as researchers' became more accurate with their technique. Four transmitters each resulted in a home range size of at least 6.1 hectares, the largest home range being 9.7 hectares (see figures 1 and 2). Two transmitters, however, resulted in showing much smaller home range sizes of 1.2 and 3.0 hectares respectively (see figure 1). The average home range size for the sampling is 6.0 hectares, males averaging 6.7 hectares and females averaging 4.6 hectares.

CONCLUSION

The home range sizes for the sampling of southern flying squirrels on the BNL campus are split into two groups. Two of the six squirrels showed home range sizes of under 3 ha, while the other four squirrels showed to have home ranges from 6.1-9.7 ha. Interestingly, the two squirrels with smaller home ranges showed similar home range characteristics to both the home range estimates presented from a squirrel study in western Maryland [5] as well as squirrel statistics provided by the University of Michigan which says, "Home ranges in both sexes range in size from about .5 to about 1.5 hectares," [6]. The other four squirrels behavior, however, is closer to that of the squirrels observed in a study done in Arkansas [4]. Also, both of the squirrels with smaller home range sizes were captured on the same trap night, and remained in the same trap location throughout the study. This suggests that squirrel activity, even throughout the BNL property, might differ from one location to the next; possibly as an outcome of habitat characteristics. Another similarity between them is that neither of the two squirrels with smaller home range sizes were never recaptured for radio collar retrieval. These two squirrels, one a male juvenile and the other an adult female (Figure 1), may possibly be related; the female could be the male's mother which may offer an explanation to their similar behavior. The split in the behavior of the sample is quite interesting and might make an excellent topic for future research.

This research has shown the presence of southern flying squirrels throughout several parts of the BNL campus. It has also shown, when compared to previous studies and publications [4][5][6], typical squirrel home range activity in all sampled sections of the BNL campus.

ACKNOWLEDGEMENTS

I would like to thank the United States Department of Energy and Brookhaven National Laboratory for making this all possible. Thank you also to Noel Blackburn and the BNL Office of Educational Programs: Mike Stegman, Ken White, Mel Morris, Kathy Gurski, Salvador Gonzalez, Cynthia Biancarosa, Krystal Violet and Joseph Heard, for your dedication. Much appreciation goes to Jennifer Higbie for all of her guidance and support throughout this project. A very special thank you goes to Courtney Buckley and Michael Norman for both their collaborative efforts and for their enthusiasm. I would also like to thank Tim Green for his leadership and Rich Lagattolla for his support. Much love and gratitude goes to my family, Dad, Mom, Ruba, and Daniel for your continued love; I would not be here without you guys.

REFERENCES

- [1] Arbogast, Brian S. "A Brief History of the New World Flying Squirrels: Phylongey, Biogeography, and conservation Genetics." *Journal of Mammalogy* 88(4):840–849, 2007
- [2] Dolan, Patricia G., Dillford C. Carter. "Glaucmys Volans." *Mammalian Species* 78: 1-6, 15 June 1977
- [3] *Glaucmys volans* (Linnaeus, 1758). Encyclopedia of Life, available from <http://www.eol.org/pages/347431>. Accessed 8 August 2011.
- [4] Stone, K D et al. "Using Geographic Information Systems to determine home range of the southern flying squirrel (*Glaucmys volans*)." *American Midland Naturalist* 137 (1997) : 106- 111. Print.
- [5] Bendel, P R, and J E Gates. "Home Range and Microhabitat partitioning of the southern flying squirrel (*Glaucmys volans*)." *Journal of Mammalogy* 68.2 (1987) : 243-255. Print.
- [6] Fox, D. and M. Mulheisen. 1999. "Glaucmys volans" (On-line), Animal Diversity Web. Accessed August 09, 2011
http://animaldiversity.ummz.umich.edu/site/accounts/information/Glaucmys_volans.html.

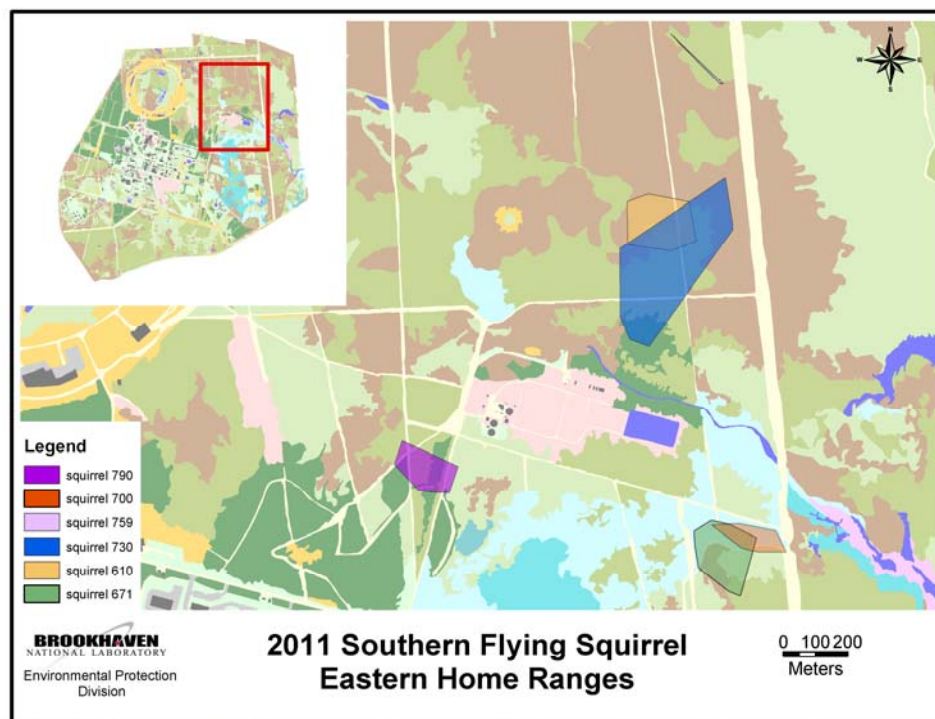


Figure 1. Eastern Home Ranges

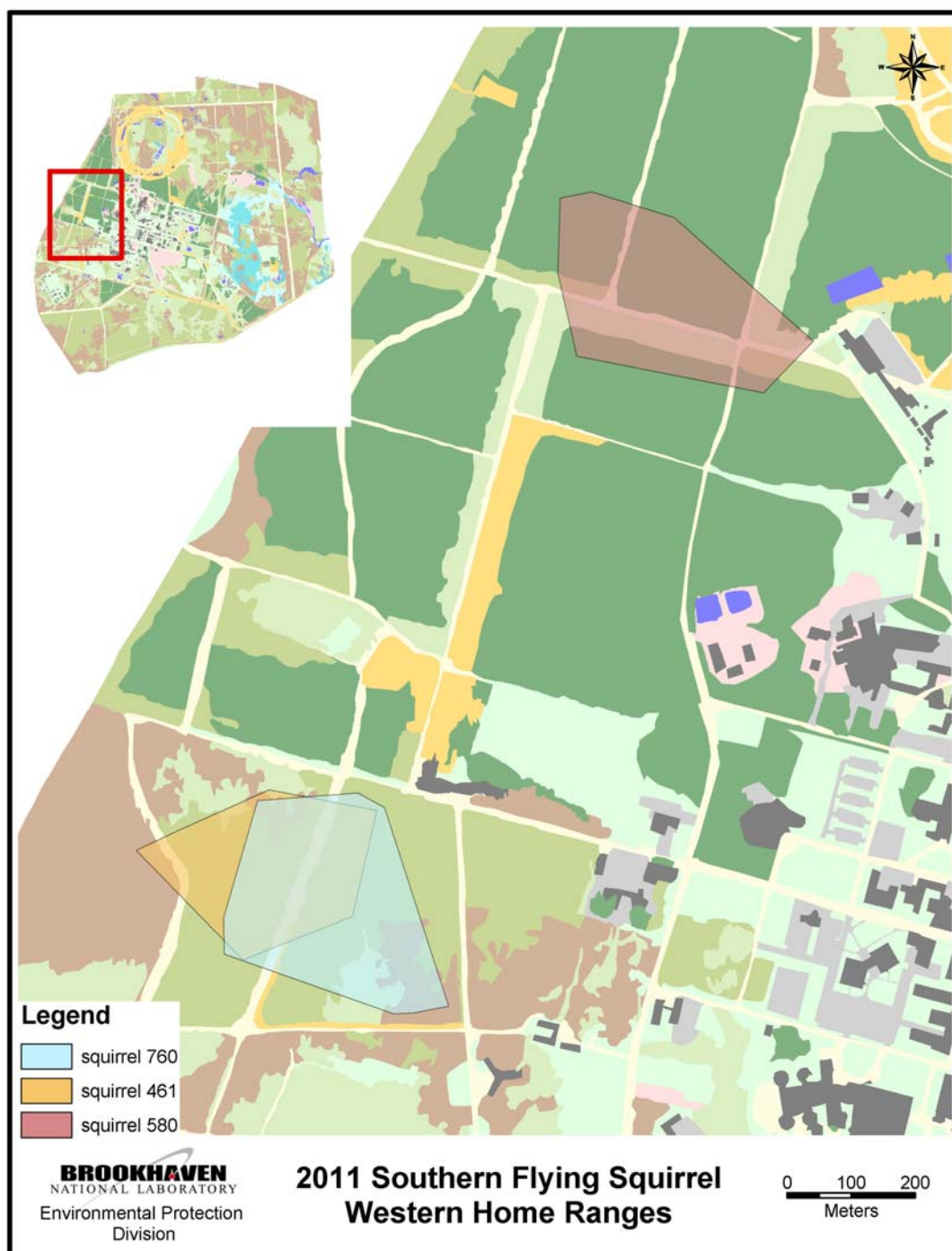


Figure 2. Western Home Ranges