AN EIGHT-WEEK SURVEY TO QUANTIFY THE SMALL MAMMAL POPULATION LEVELS AT BROOKHAVEN NATIONAL LABORATORY

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Abstract

An Eight-Week Survey To Quantify The Small Mammal Population Levels At Brookhaven National Laboratory. CAROL F. C. PALADINO (Suffolk County Community College Ammerman Campus, Selden, New York), JENNIFER HIGBIE (Brookhaven National Laboratory, Upton, New York)

An area of 170 acres was surveyed at Brookhaven National Laboratory (BNL) to discover the population levels of small mammals. Using a Geographic Information System 30 locations were chosen in various vegetation types. During the first 3 weeks, 30 Sherman traps were used in a grid formation. In the remaining 5 weeks, 25 traps were placed in either a grid or transect formation for three consecutive nights for a total of 2,347 trap nights. The data revealed that the species diversity among small mammals is low, as only 5 species were found: *Mus domesticus* (House Mouse), *Peromyscus leucopus* (White Footed Mouse), *Zapus hudsonsius* (Meadow Jumping Mouse), *Glaucomys volans* (Southern Flying Squirrel), and *Tamias striatus* (Eastern Chipmunk). Based on the data from the mice and chipmunk captures, the ideal locations for traps appeared to be in places with little to no vegetation and a decrease access to a food source. As food supplies increased, capture rates declined. The vegetation combination of either grass/greenbrier or huckleberry/blueberry for the under-story with an over-story mix of oak/maple/pine was the preferred area for the flying squirrels. No small mammals were captured in the grassy fields. The percentage of captures to trap nights (<1%) suggests the lack of diversity among the small mammal species within the study area. Further investigation into this lack of diversity in the mammal population should be conducted. Different capturing methods can be used, including pitfalls, to potentially increase the variety of species captured. Additional studies should be conducted to look at the full 5265 acres that encompasses all of BNL.

Introduction

The small mammal population is an important aspect to the ecosystem. They are distributors of seeds and a food source for larger predators. The small mammals range from different breeds of mice, shrews, moles, and voles, including chipmunks and flying squirrels too (Conner 1971). A survey is an informative way to gather data on populations and diversity. The data on the small mammal population levels are reliant upon proper evaluation (Adams *et al.* 2009, Flowerdew *et al.2004*). Since most of these small mammal species are nocturnal, overnight trapping methods are required to document them. The trapping techniques used are to insure that the small mammals would be released unharmed once data is obtained. It is estimated that the levels of the small mammal population are low with little diversity of species.

Materials & Methods

Using a Geographic Information System (GIS), 30 locations were selected in a 170-acre area at BNL for eight-weeks (Figure 1). It was initiated on June 8th and concluded on July 30th, 2009. Vegetation varied across all sites. Trapping was conducted three consecutive nights each week. Each trap was baited with a combination of peanut butter, rolled oats, and birdseed that was rolled into a ball and placed in the back of each trap.

Weather conditions were recorded to see if weather had an affect on trapping. At each trapping location, a data logger was placed every Monday and removed the following Monday to be placed at a new site. The last week the data loggers were pulled on Friday. Weather conditions were recorded every morning before traps were checked at each site, making note of any extreme weather conditions that occurred the previous night.

Every site had a formation, which determines how the traps were setup. The first week,

two sites were set with 30 folding Sherman traps (H. B. Sherman Inc., Tallahassee, Fl.; 23.0 cm x 7.7 cm x 9.1 cm) that were placed in a grid configuration of 5 x 6 that were always positioned 5 m apart. When amounts of traps declined the grid arrangement was 5 x 5. There were different quantities of traps used at certain sites (Table 1). The trap layout at locations was alternated between grids and transects configurations. For this survey there were a total of 2,347 trapping nights (Table 1).

A Global Positioning System (GPS) was used to take the location of each site. After each site was setup, the headings in degrees in two cardinal directions were recorded in grid configuration while only one heading was recorded for each transect. There were 29 locations where the headings were taken from trap # 1 with exception to site # 24, which was at the midpoint. In consideration to the small mammals during the warm weather months of June and July, the sites were initially setup on Mondays after 5 pm when temperatures were 65 degrees or higher. If temperatures were less than 65 degrees, they were setup between 3 and 5 pm. Every Tuesday through Thursday morning, the traps were checked between 6:45-9:45 am and closed for the day to prevent a small mammal from being trapped during the heat of the day. In the late afternoons, each Tuesday and Wednesday, the traps were reopened and rebaited, if necessary. Every Thursday morning the traps were removed, after they were checked for captures.

Each capture was marked to identify recaptures in the future. Every animal caught was weighed and photographed. Most of the small mammals were sexed and shaven on the either the left or right hindquarters so they would be easily identifiable upon recapture. The exception was the Southern Flying Squirrel *(Glaucomys volans).* As part of a different study, flying squirrels were given a numbered ear tag.

Results

There were only five different species caught, the three mice species were the House Mouse *(Mus domesticus)*, the White Footed Mouse *(Peromyscus leucopus)*, and Meadow Jumping Mouse *(Zapas hudsonsius).* The other two species were the Southern Flying Squirrel *(G. volans)* and the Eastern Chipmunk *(Tamias striatus)* (Table 2). Two other species, not categorized as small mammals, that were captured were labeled as "Other"(Figure 7). All animals were captured in 15 of the 30 sites sampled (Figure1). There were a total of 22 captures, five of these being recaptures, throughout the study area at BNL. There were no captures of shrews, voles or moles.

Every capture of the House Mouse *(M. domesticus)* occurred in a location with a varied environment, different from the others (Figure 2). There were two adult males, one adult female and one undetermined. The average adult male was 16 grams, while the only adult female was 15 grams. The White Footed Mice *(P. leucopus)* were all caught in areas with similar over-stories (Figure 3). Of the seven captured, six were males, five adults and one juvenile. The last one was undetermined, but had the weight of a juvenile. The average adult male weighed 26 grams. There were no females captured. There was one juvenile, sex undetermine, that weighed 15.5 grams. There was only one Meadow Jumping Mouse *(Z. hudsonsius)* captured (Figure 4), which escaped before being sexed, but according to its weight of 11.5 grams, was a juvenile. The Southern Flying Squirrel *(G. volans)* captures were in diverse surroundings that were on the edge of two different vegetation types (Figure 5). Two of these were new captures, with one male juvenile weighing 65.5 grams, and one adult female weighing 79 grams. Only one Eastern Chipmunk *(T. striatus)* was captured (Figure 6). It escaped before being sexed, but weighed over

60 grams. There were two other captures that were not classified as small mammals, one baby opossum and a frog (Figure 7).

The only documented recaptures were that of the Southern Flying Squirrel *(G. volans.* Ear tag #8 was recaught three times in this study at site 19, while two others were only caught once each (ear tag # 9 and #11). Of those caught two were adult males and one adult female. The average adult male weighed 76.7 grams and the one adult female weighed 73.7 grams.

Weather conditions ranging from heavy rainfall to clear skies for the overnight had no affect on capture. The captures of three of the five species were caught in the worse of these conditions as well as one non-small mammal species.

There were raids on 10 sites by a larger mammal of unknown species, presumably a raccoon that stole bait from the traps. Sometimes only a part of a site had been raided, but most of the times all traps had been impacted, which happened 15 times. Of these 10 sites, 5 were raided twice while the other 5 were raided only once (Table 1). Four of these sites (2, 20, 25, and 26) had small mammals caught there as well, suggesting that these sites are more diverse then the rest.

Discussion And Conclusion

The results show that the population is not as diverse as it should be. Considering that there is a wide range of vegetation types, including an array of under-story with over-story combinations, there should have been a wide assortment of moles, voles, and shrews caught in addition to the species that were captured. It was interesting to note that Conner (1971) in his research of mammals on Long Island did not capture the Least Shrew *(Cryptotis parva)*, even though the vegetation on Long Island would be the perfect habitat for it. It has been found on

Staten Island and in Connecticut and it could be just eluding capture (Conner 1971).

In a study done for the specific captures of shrews, the trapping method used was pitfall traps (Brooks and Doyle 2001). There were 3,880 trap nights in that study successfully capturing 2,124 small mammals of nine different species, but only 341 were actually shrews (Brooks and Doyle 2001). The study had a capture rate 55%, as compared to the results of this study capturing 15 new small mammals in 2,347 trap nights, which was less than 1% (0.64%).

In another study on four different methods of trapping; Longworth traps, large and small Sherman traps, and pitfalls, were tested to distinguish each technique (Anthony *et al*. 2005). Most captures were with the pitfall traps with the majority being shrews; the other three had greater species diversity and less captures (Anthony *et al.* 2005, Brooks, & Doyle 2001). In the areas that consisted of a huckleberry and blueberry combination under-story, only Southern Flying Squirrels *(G. volans)* were captured. This is considered one of their food sources (Conner 1971). All of the different species captured feed on a variety of material, including leaves, insects, seeds, nuts, and fruits when in season.

During this study it was revealed that the Southern Flying Squirrel *(G. volans)* may have exhibited new learned behaviors. Sherman traps were used in a different study that had taken place at the same localities of this study. One squirrel was recaptured three times. From being captured the first time, they revisited the site presumably knowing that there would be food and being rewarded for going into the trap. Once these studies sites were separated the recaptures stopped.

Further research should be conducted to include all 5265 acres that encompass BNL. Different trapping methods should be considered to effectively increase the variety of species captured. These capturing techniques should include the use of pitfalls in addition to Sherman

traps. Increasing both the nights per week of trapping and types of traps used, should obtain greater information about the diversity of the small mammals species present. Also, it ought to be established what the population levels are during the three other seasons of the year, to obtain a full year of data that covers the fluctuation of food sources.

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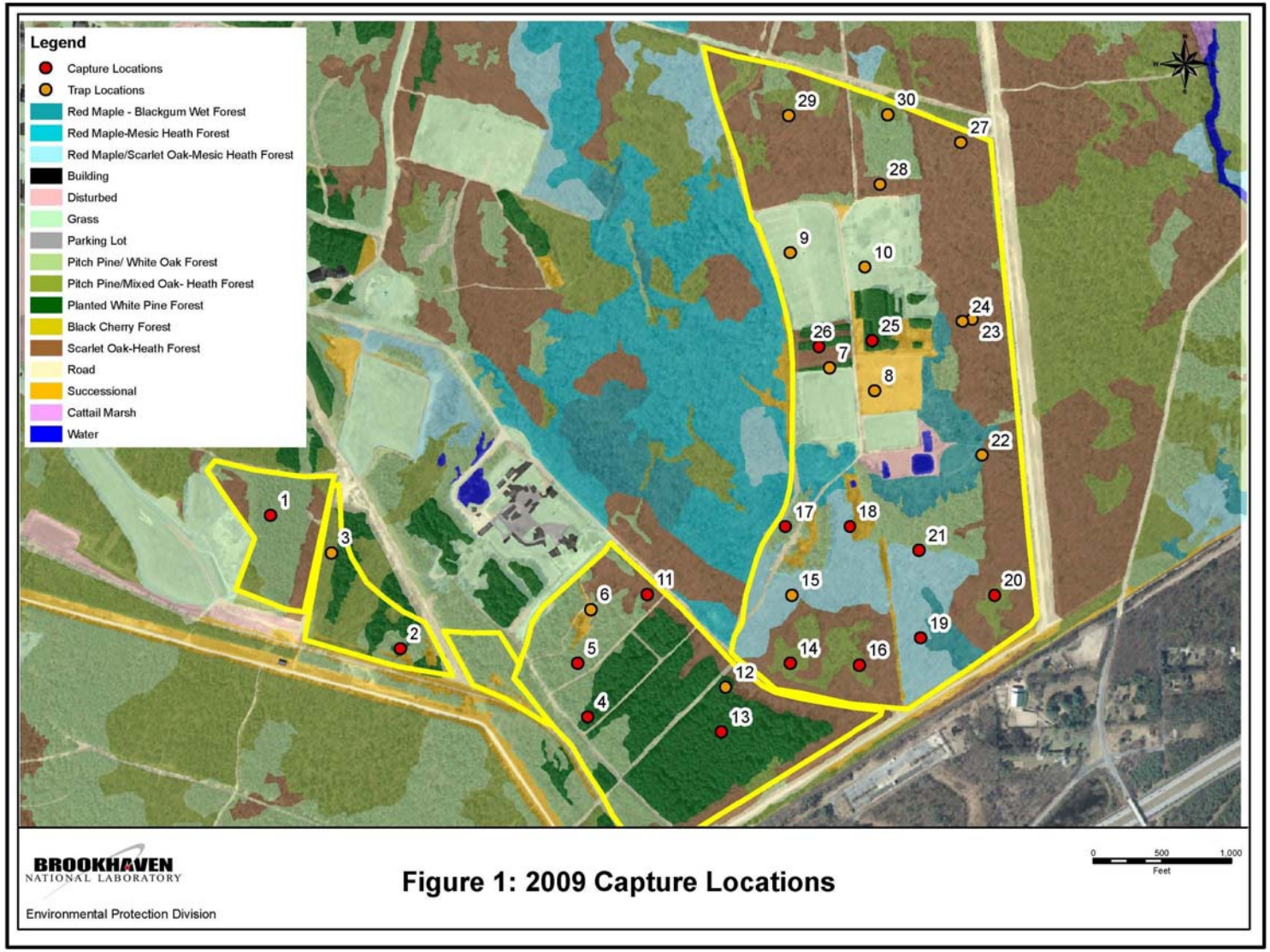

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Figure 1: 2009 Capture Locations

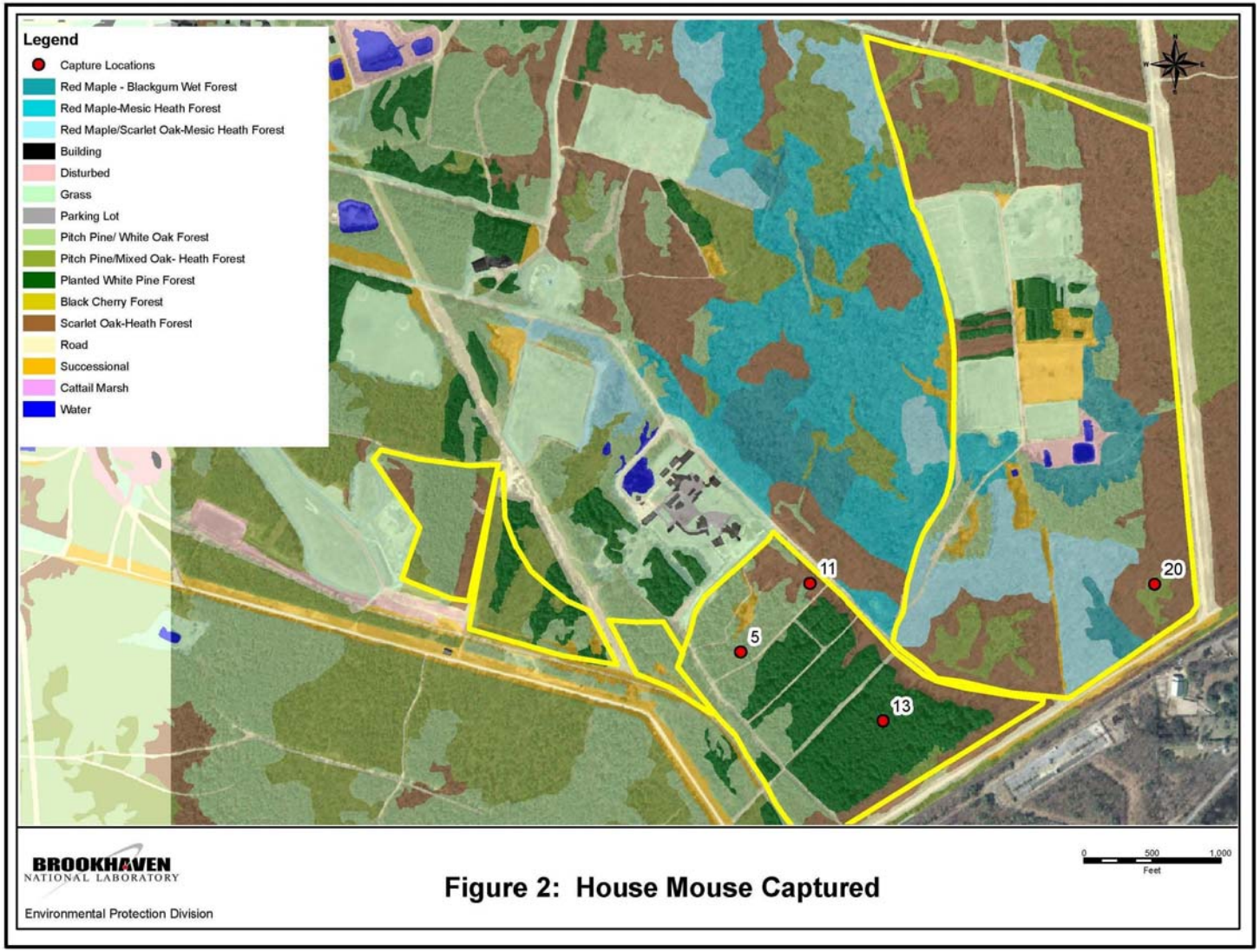

Figure 2: House Mouse Captured

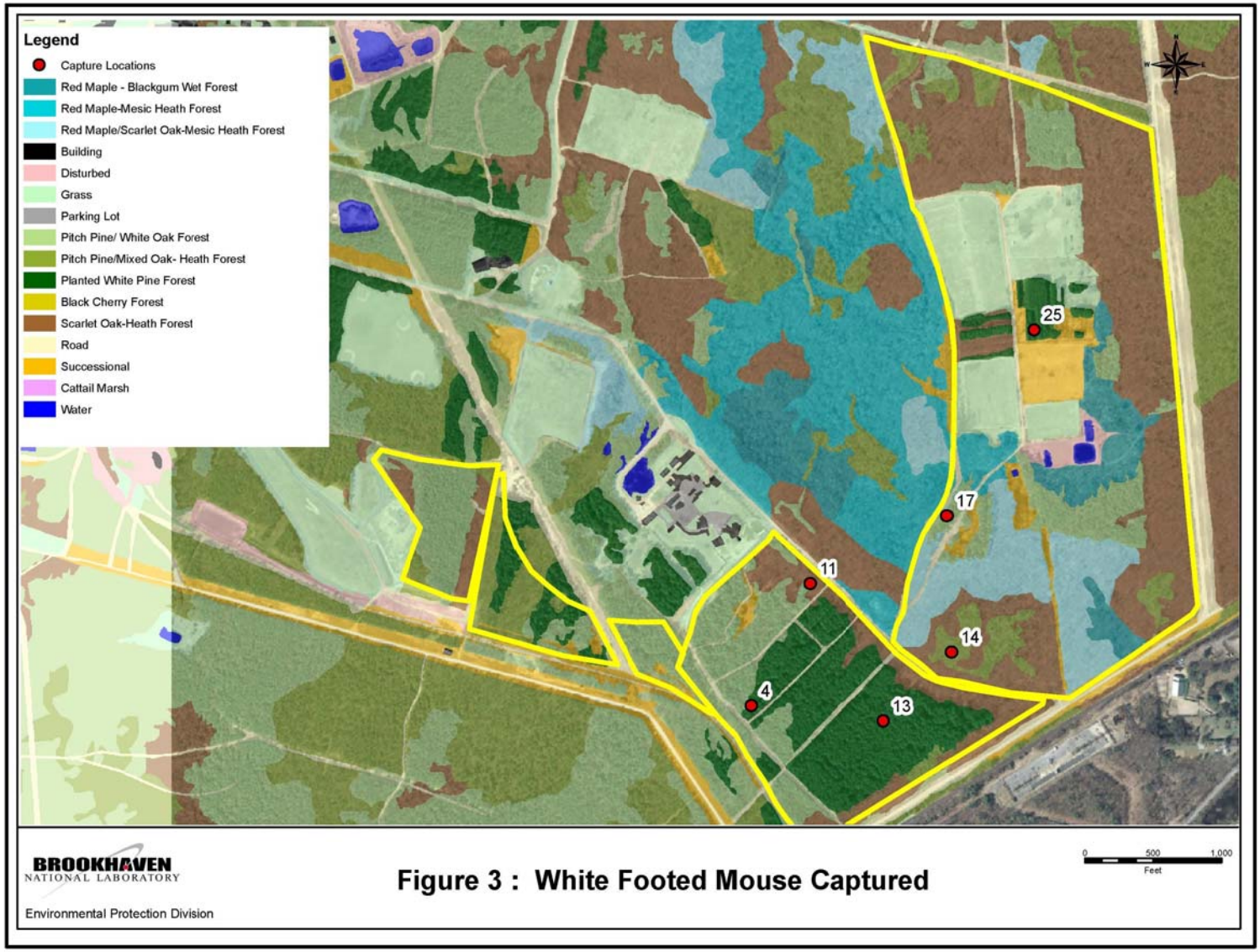

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Figure 3 : White Footed Mouse Captured

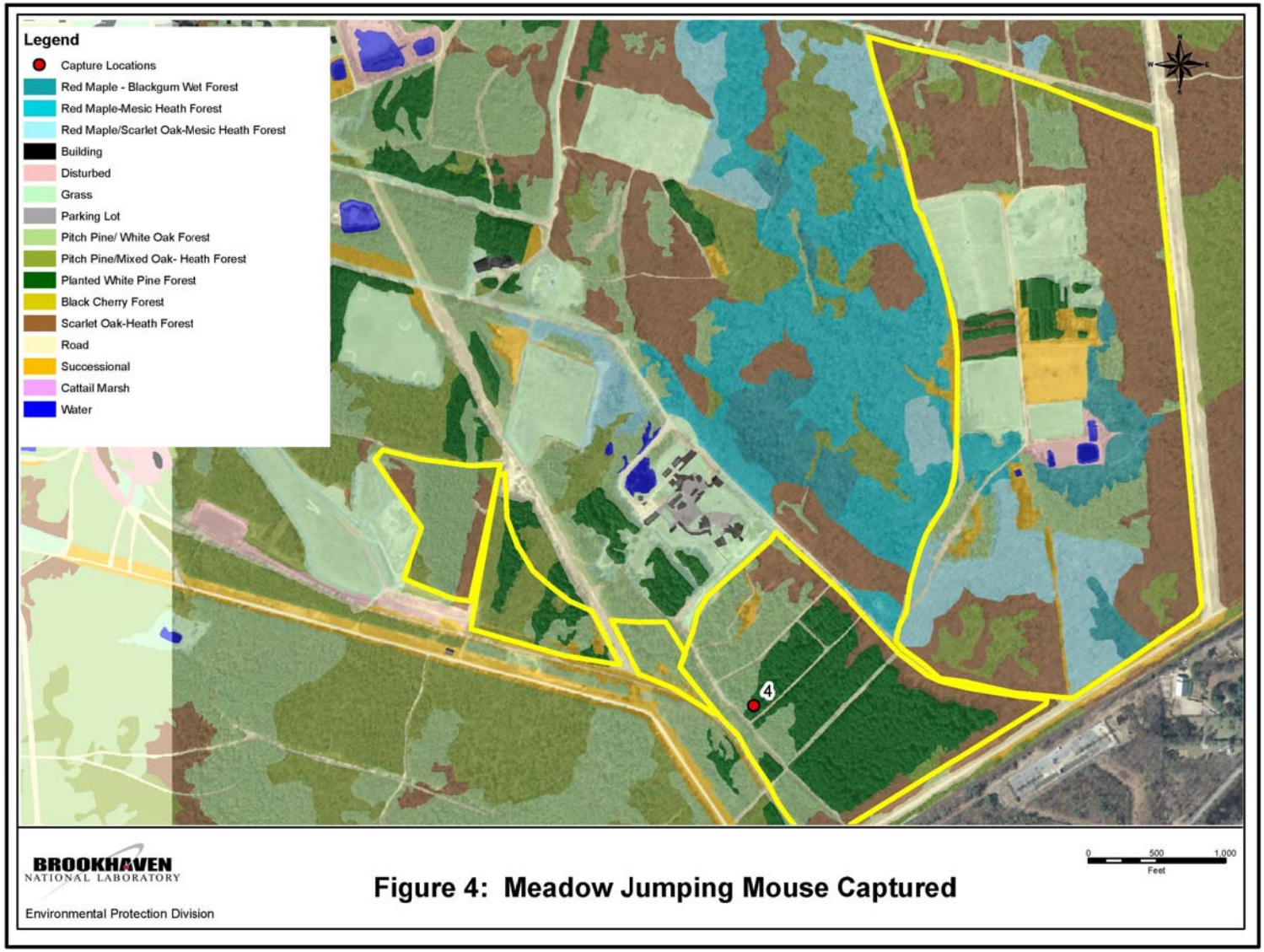

Figure 4: Meadow Jumping Mouse Captured

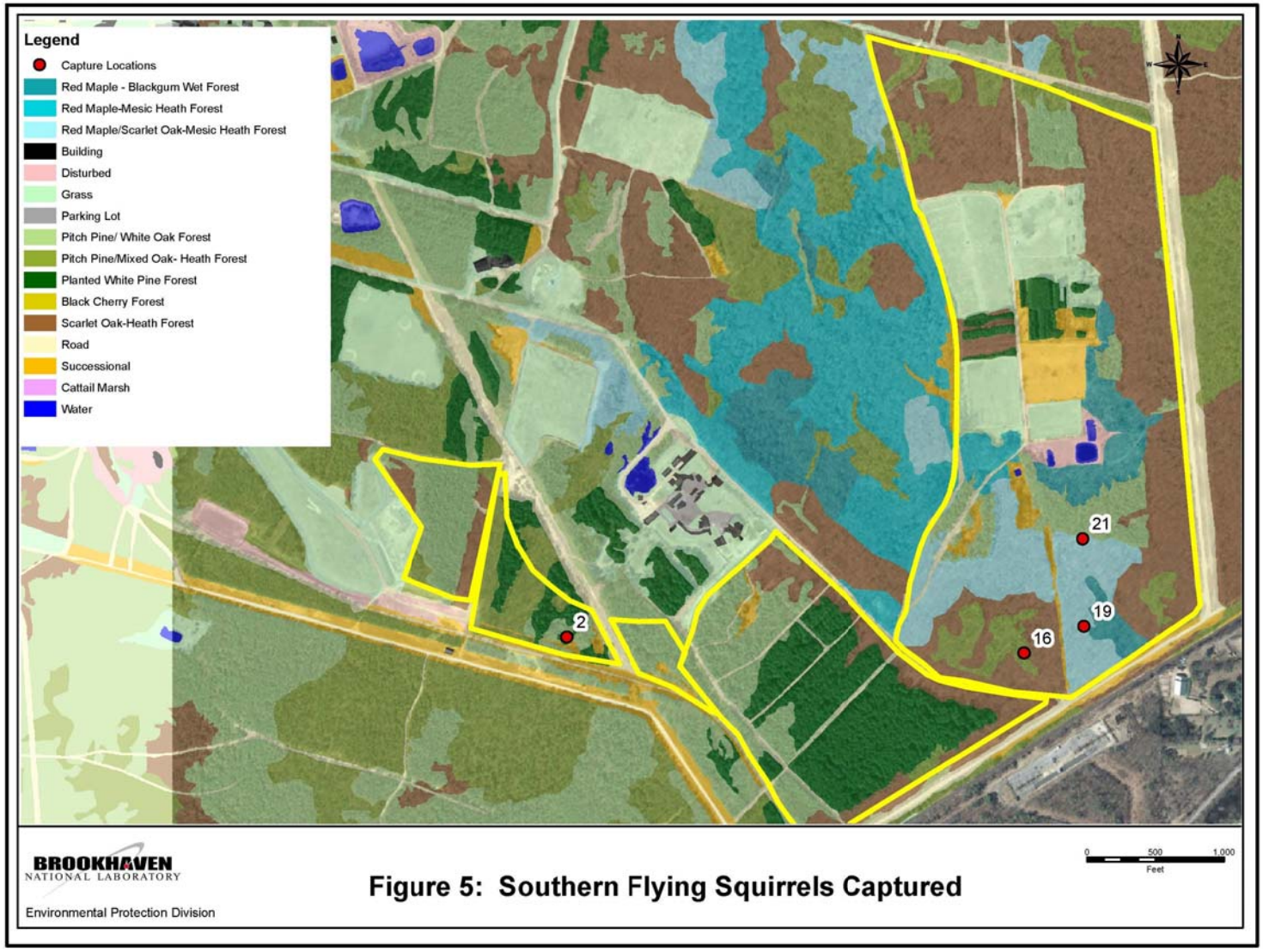

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Figure 5: Southern Flying Squirrels Captured

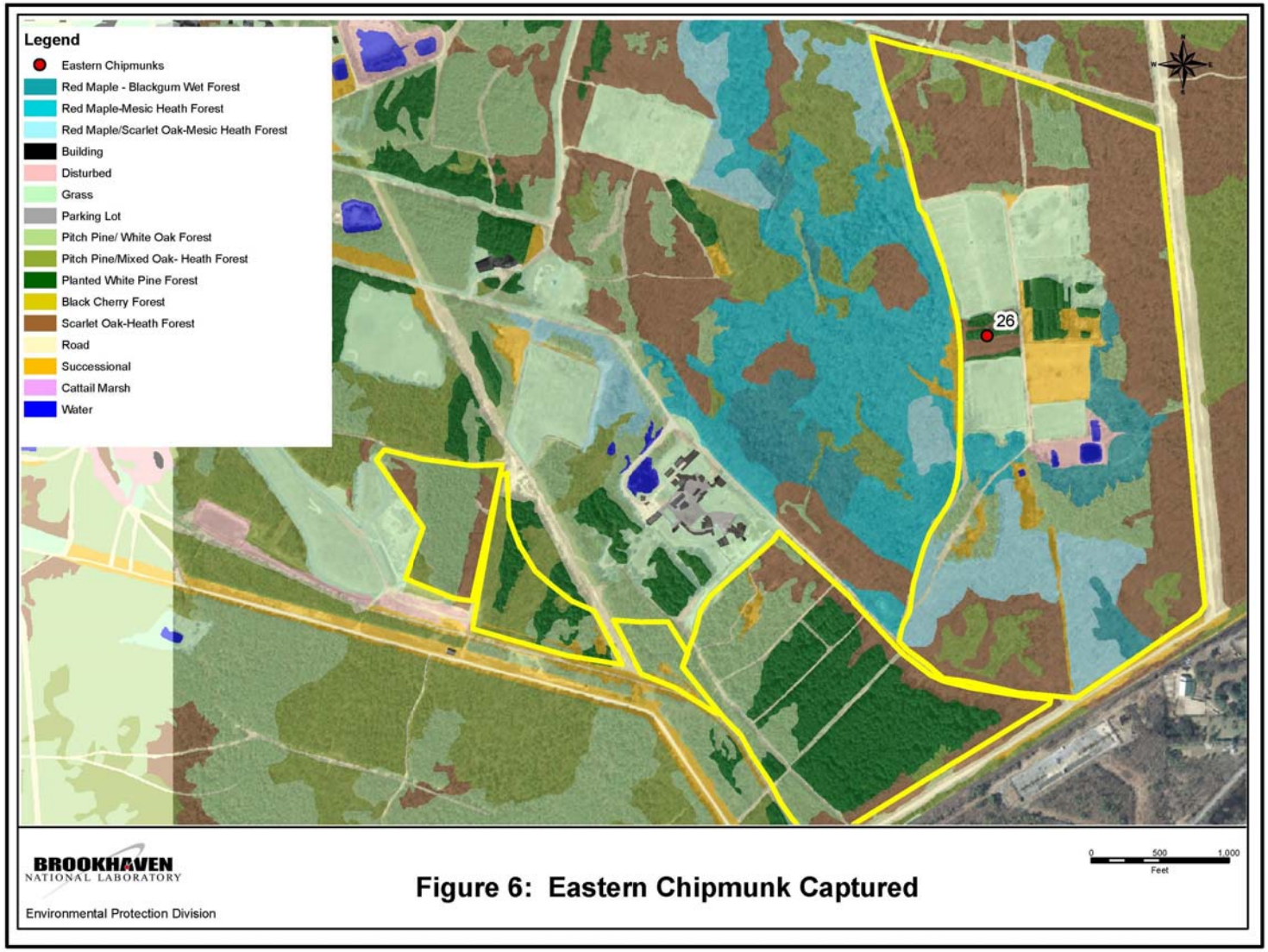

Figure 6: Eastern Chipmunk Captured

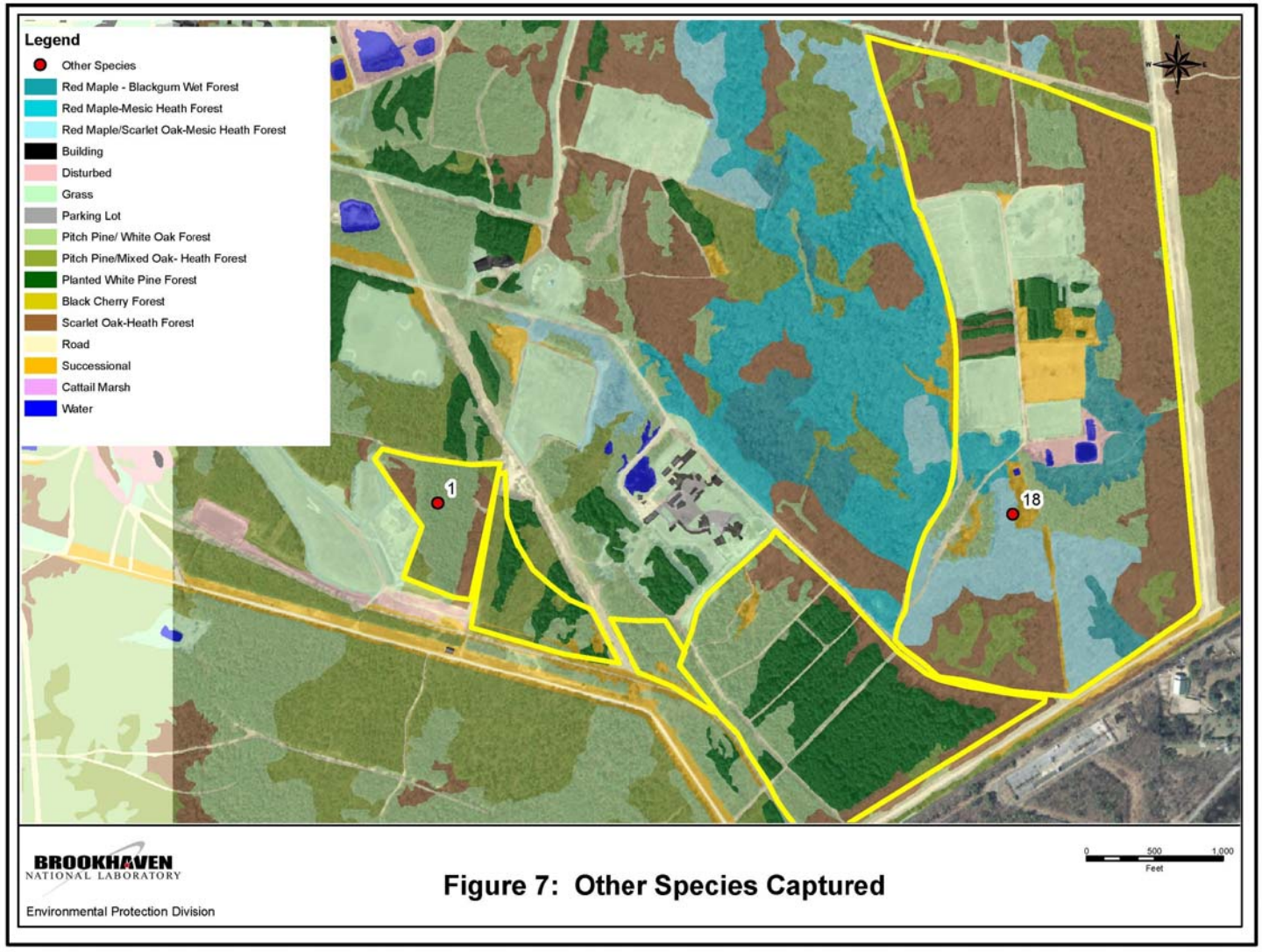

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Figure 7: Other Species Captured

Tables

Table 1 Sites listed with setup configuration with number of traps set, number of nights set, and the number of times the site was raided.

Site	Setup	Week	Traps	Nights Deployed	Traps Nights	Times Raided
1	Grid	1	30	3	90	0
2	Grid	1	30	3	90	2
3	Grid	2	30	3	90	2
4	Grid	2	30	3	90	0
5	Grid	2	30	3	90	0
6	Grid	2	30	3	90	0
7	Transect	3	30	3	90	0
8	Grid	3	30	3	90	0
9	Grid	3	30	3	90	0
10	Transect	3	30	3	90	0
11	Grid	4	25	3	75	0
12	Grid	4	25	3	75	1
13	Grid	4	25	2*	50	0
14	Grid	4	25	2*	50	0
15	Grid	5	25	3	75	0
16	Transect	6	25	3	75	0
17	Transect	5	25	3	75	0
18	Grid	5	25	3	75	0
19	Grid	6	25	3	75	0
20	Transect	5	25	3	75	1
21	Transect	6	25	3	75	0
22	Grid	6	25	3	75	0
23	Grid	7	25	3	75	2
24	Transect	7	25	3	75	2
25	Transect	7	25	3	75	2
26	Grid	7	25	3	75	1
27	Transect	8	25	3	75	0
28	Transect	8	24	3	72	1
29	Grid	8	25	3	75	0
30	Grid	8	25	3	75	1
			Total Trap Nights	**2,347**	**Total Raids**	**15**

*Batteries died in GPS and sites were located the following day.

Table 2 All species that were caught at each site in this study. *Mudo*- House Mouse, *Pele*-White Footed Mouse, *Zahu*-Meadow Jumping Mouse, *Glvo*-Southern Flying Squirrel, and *Tast*-Eastern Chipmunk.

Site	*Mudo*	*Pele*	*Zahu*	*Glvo*	*Tast*	*Other*
1	0	0	0	0	0	1
2	0	0	0	1	0	0
3	0	0	0	0	0	0
4	0	1	1	0	0	0
5	1	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	1	1	0	0	0	0
12	0	0	0	0	0	0
13	1	1	0	0	0	0
14	0	1	0	0	0	0
15	0	0	0	0	0	0
16	0	0	0	2	0	0
17	0	1	0	0	0	0
18	0	0	0	0	0	1
19	0	0	0	3	0	0
20	1	0	0	0	0	0
21	0	0	0	1	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0
25	0	2	0	0	0	0
26	0	0	0	0	1	0
27	0	0	0	0	0	0
28	0	0	0	0	0	0
29	0	0	0	0	0	0
30	0	0	0	0	0	0