

**Delmarva Fox Squirrel Surveys at  
Prime Hook National Wildlife Refuge  
and Prime Hook State Wildlife Area  
Sussex County, Delaware**



May 2004

***Three-Square Wildlife Services, LLC***

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# Summary Delmarva Fox Squirrel Survey Report for the Prime Hook National Wildlife Refuge and Prime Hook Wildlife Area in Sussex County, Delaware, May 2004

Submitted by Three-Square Wildlife Services, LLC, Cambridge, Maryland

## Introduction

The Delaware Department of Natural Resources and Environmental Control contracted Three-Square Wildlife Services, LLC (TSWS) to conduct a survey during May of 2004 to determine the presence/absence of the Delmarva fox squirrel (*Sciurus niger cinereus*, DFS) in sections of the Prime Hook National Wildlife Refuge (PHNWR) and Prime Hook Wildlife Area (PHWA) in Sussex County, Delaware (Figure 1a).

The area surveyed within PHNWR included two locations that were labeled Section A (Figure 1b) and Section B (Figure 1c). The Section A survey area was made up of primarily mixed hardwoods (red maple (*Acer rubrum*), hickory (*Carya ovata*), and red and white oaks (*Quercus* spp.) with little understory. The west side of Section B had a similar mixture of the hardwoods found in Section A as well as some mature loblolly pines (*Pinus taeda*). The east side of Section B was comprised of about eight percent loblolly pines.

One area within the PHWA was selected (Figure 1d). Trees in this section included mixed hardwoods (tulip poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*), hickory (*Carya ovata*), sweet gum (*Liquidambar styraciflua*), and red and white oaks (*Quercus* spp.) This area had more understory than PHNWR that included American holly (*Ilex opaca*), sweet pepper bush (*Clethra alnifolia*) and greenbrier (*Smilax rotundifolia*).

## Methods

Study duration: *Pre-bait period*: May 20 – 25, 2004  
*Trapping period*: May 26 – 30, 2004

The prescribed DFS trapping protocol issued by the U.S. Fish and Wildlife Service (USFWS) was incorporated when setting traps. Tomahawk live traps (#103) were used for the trapping effort. Section A had fifty-two traps in five transects running north and south. Two separate areas within Section B contained a total of forty-two traps in four transect lines. PHWA had thirty traps set in two transects. Global Positioning System locations were recorded for each station using a Garmin GPS III Plus locator (Figure 4).

A pre-bait period of six days was first carried out (an extra day was added due to poor pre-bait use). This consisted of baiting the fixed open live traps with corn. All traps were checked daily and replenished with corn when necessary.

The pre-bait was followed with a five-day trap session. Traps were initially baited with corn and set in the early morning. Traps were checked for squirrels around noon and again around 4:00 -5:00p.m. Traps were closed after the second set and shut down during the night.

## Summary DFS Report for PHNWR and PHWA, Delaware, May 2004 (cont'd)

Temperature iButton Thermochrons are normally used during DFS surveys, ([www.ibutton.com/ibuttons/thermochron.html](http://www.ibutton.com/ibuttons/thermochron.html)) , however, were not working properly during this sampling session. Data from a weather station in Georgetown ([www.nhc.noaa.gov](http://www.nhc.noaa.gov)) is shown in Figure 3 to give an indication of the temperatures during the survey. Temperature in the survey areas under the canopy were most likely cooler than those presented in this figure.

### Results

There was no significant precipitation during this survey. Temperatures were cool during the pre-bait and warmer during the trapping session.

Pre-bait squirrel use was minimal (Figures 2a, 2b and 2c). Non-target species such as raccoons were responsible for much of the pre-bait use. This was indicated by the fact that the traps were rolled away from their original position.

Two DFS were captured at PHNWR (Table 1). One was caught in Section B at trap 21. A second DFS was captured in Section A at trap 33. In addition to the traps, digital cameras had been placed at some of the traps to photograph any animals that might pass near the traps. Several photographs were obtained of DFS. Figure 1b and 1c show the locations of the photographs. Figure 5 shows two of the photographs as well as the DFS caught in traps. Several additional visual sightings of DFS on the ground in the woods were also observed. No Eastern gray squirrels (*Sciurus carolinensis*) were captured in Section A. No DFS were caught or sighted at PHWA. Five Eastern gray squirrels were trapped in Section B and five were caught at PHWA.

DFS were present in the PHNWR. It is not understood as to why more DFS weren't captured, however, the cameras show there were more than indicated from trap efforts.

**Table 1.****Summary Report for DFS Captures at Prime Hook National Wildlife Refuge, Delaware, May 200**

<b>Date</b>	<b>Trap #</b>	<b>Time</b>	<b>Sex</b>	<b>Wt (kg)</b>	<b>Ear Tag # Right    Left</b>	<b>Age</b>	<b>Comments</b>
5/26	21 B	pm	Female	0.95	1124    1125	Adult	Hair sample
5/30	33 A	pm	Female	0.95	1176    1177	Adult	Hair sample



Prime Hook National Wildlife Refuge DFS Survey Area



Prime Hook Wildlife Area DFS Survey Area

Delmarva fox squirrel study area at Prime Hook National Wildlife Refuge and Prime Hook Wildlife Area, in Sussex County, Delaware, May 2004

Figure 1a

# Prime Hook National Wildlife Refuge

Sussex County, Delaware

Section A



Figure 1b

# Prime Hook National Wildlife Refuge

Sussex County, Delaware

Section B







-  DFS trap locations in May, 2004
-  Delmarva fox squirrel camera captures
-  Delmarva fox squirrel trap capture
-  Eastern gray squirrel trap captures

Figure 1c



## Prime Hook Wildlife Area

Sussex County, Delaware



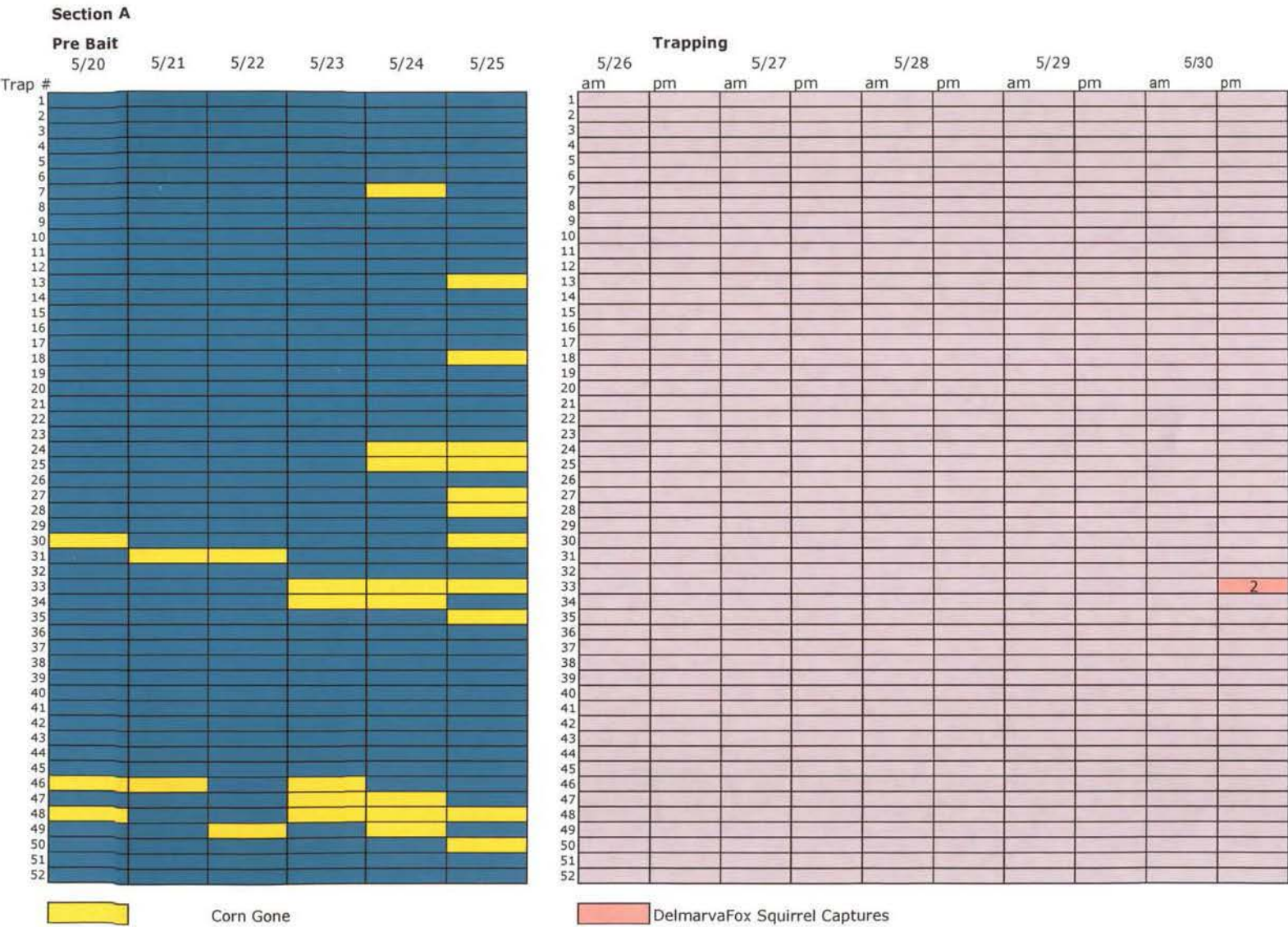
DFS trap locations in May, 2004



Eastern gray squirrel captures

Figure 1d

**Delmarva Fox Squirrel Survey at Prime Hook National Wildlife Refuge**  
Sussex County, Delaware, May 2004





# Delmarva Fox Squirrel Survey at Prime Hook Wildlife Area

Sussex County, Delaware, May 2004

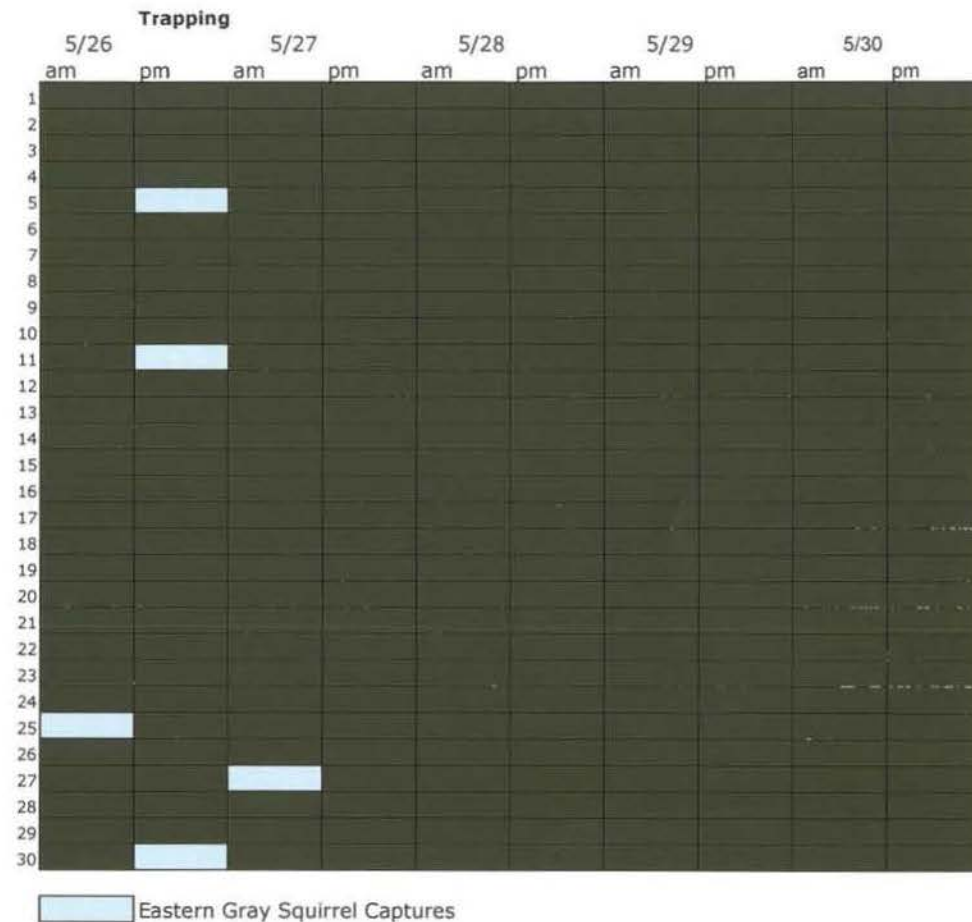
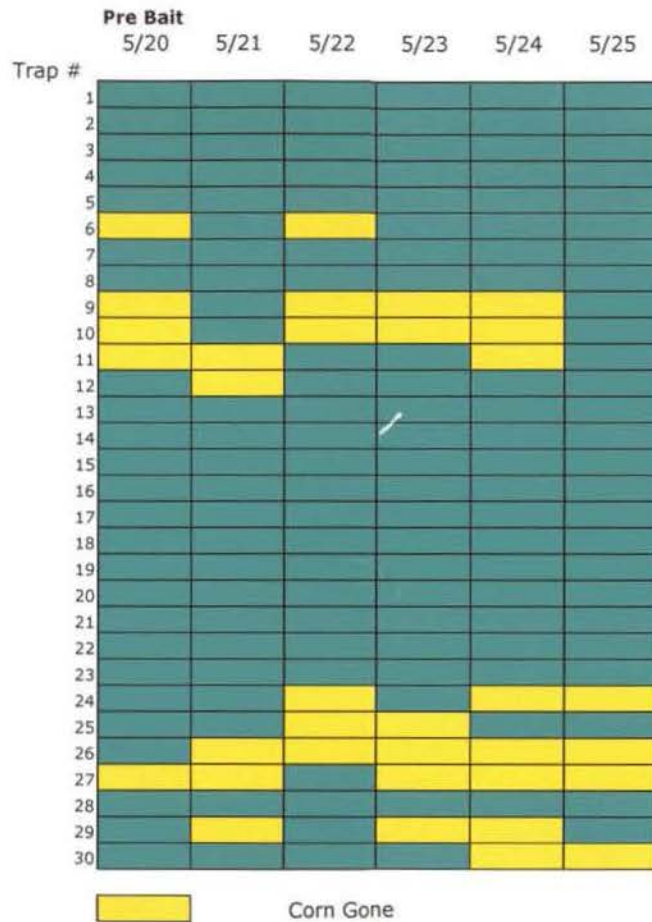


Figure 2c

Three-Square Wildlife Services, LLC

Temperatures during DFS survey at the Prime Hook Sites, Sussex County, Delaware, May, 2004

Georgetown, DE/Sussex County

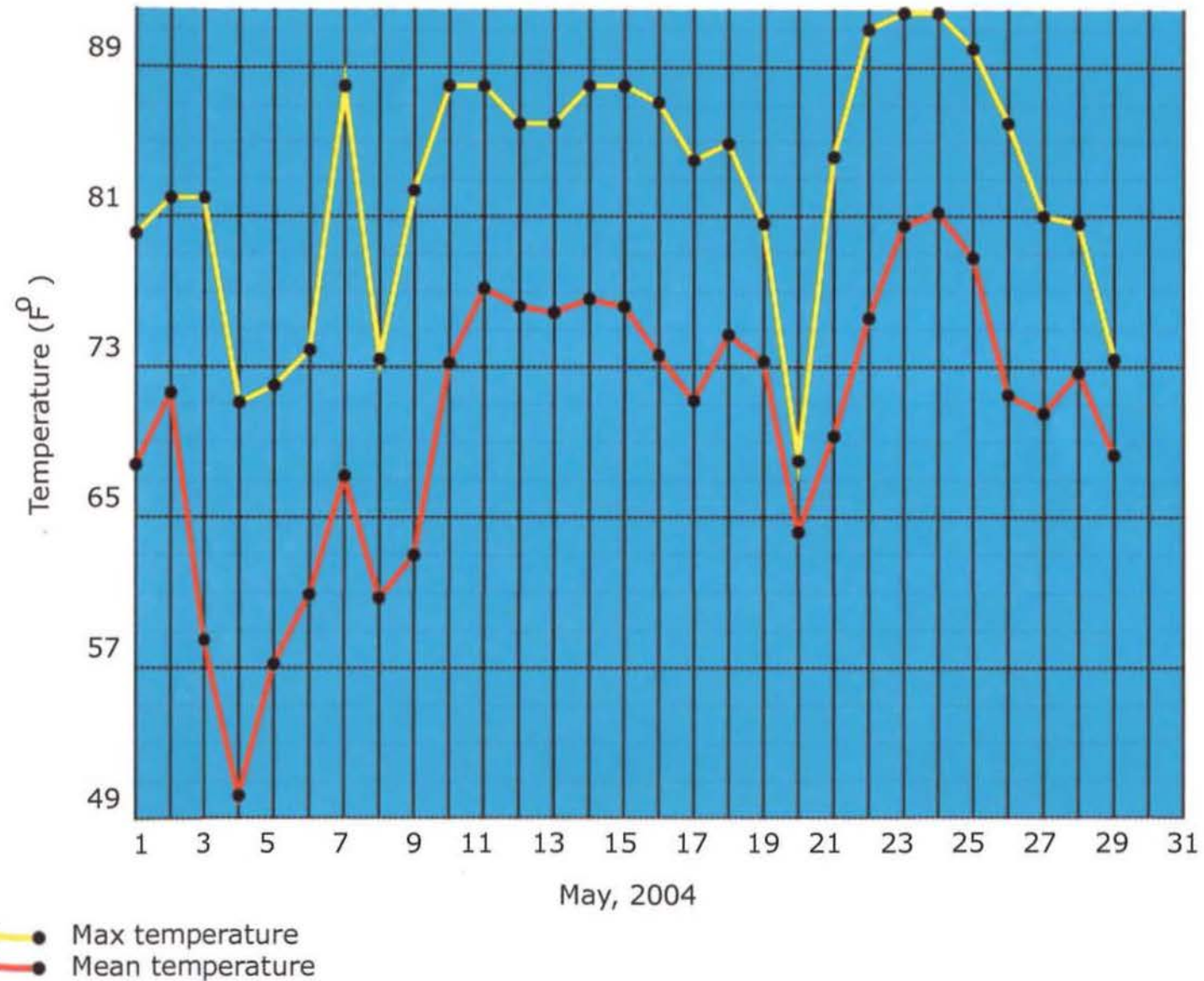


Figure 3

# Delmarva Fox Squirrel Survey, May 2004

GPS Station Locations at Pime Hook National Wildlife Refuge

Sussex County, Delaware

Section A

<i>Station</i>	<i>Latitude (N)</i>		<i>Longitude (W)</i>		<i>Station</i>	<i>Latitude (N)</i>		<i>Longitude (W)</i>	
1	38	81.932	75	25.575	31	38	81.450	75	25.717
2	38	81.909	75	25.584	32	38	81.433	75	25.727
3	38	81.876	75	25.571	33	38	81.433	75	25.750
4	38	81.815	75	25.579	34	38	81.572	75	25.720
5	38	81.721	75	25.635	35	38	81.565	75	25.730
6	38	81.770	75	25.557	36	38	81.643	75	25.733
7	38	81.742	75	25.549	37	38	81.645	75	25.737
8	38	81.743	75	25.590	38	38	81.698	75	25.746
9	38	81.655	75	25.549	39	38	81.750	75	25.735
10	38	81.636	75	25.558	40	38	81.749	75	25.733
11	38	81.593	75	25.567	41	38	81.973	75	25.432
12	38	81.549	75	25.578	42	38	81.927	75	25.450
13	38	81.522	75	25.591	43	38	81.849	75	25.432
14	38	81.434	75	25.578	44	38	81.838	75	25.487
15	38	81.474	75	25.580	45	38	81.803	75	25.531
16	38	81.382	75	25.602	46	38	81.697	75	25.155
17	38	81.366	75	25.698	47	38	81.734	75	25.170
18	38	81.744	75	25.625	48	38	81.735	75	25.157
19	38	81.720	75	25.632	49	38	81.799	75	25.243
20	38	81.651	75	25.611	50	38	81.803	75	25.263
21	38	81.603	75	25.607	51	38	81.822	75	25.216
22	38	81.650	75	25.661	52	38	81.833	75	25.310
23	38	81.583	75	25.634					
24	38	81.572	75	25.632					
25	38	81.550	75	25.634					
26	38	81.507	75	25.633					
27	38	81.442	75	25.649					
28	38	81.391	75	25.656					
29	38	81.355	75	25.655					
30	38	81.386	75	25.693					

\*Data collected with a Garmin GPSIII+.  
Accuracy +/- 15 meters.

## Delmarva Fox Squirrel Survey, May 2004

GPS Station Locations at Pime Hook National Wildlife Refuge  
Sussex County, Delaware  
Section B

<i>Station</i>	<i>Latitude (N)</i>		<i>Longitude (W)</i>		<i>Station</i>	<i>Latitude (N)</i>		<i>Longitude (W)</i>	
<b>1</b>	38	81.538	75	28.600	<b>22</b>	38	81.755	75	28.963
<b>2</b>	38	81.527	75	28.637	<b>23</b>	38	81.932	75	28.932
<b>3</b>	38	81.519	75	28.672	<b>24</b>	38	81.877	75	28.877
<b>4</b>	38	81.504	75	28.725	<b>25</b>	38	81.845	75	28.845
<b>5</b>	38	81.488	75	28.761	<b>26</b>	38	81.765	75	28.805
<b>6</b>	38	81.457	75	28.784	<b>27</b>	38	81.750	75	27.378
<b>7</b>	38	81.416	75	28.783	<b>28</b>	38	81.735	75	27.396
<b>8</b>	38	81.408	75	28.756	<b>29</b>	38	81.711	75	27.427
<b>9</b>	38	81.429	75	28.700	<b>30</b>	38	81.699	75	27.486
<b>10</b>	38	81.401	75	28.651	<b>31</b>	38	81.675	75	27.519
<b>11</b>	38	81.322	75	28.606	<b>32</b>	38	81.637	75	27.554
<b>12</b>	38	81.374	75	28.581	<b>33</b>	38	81.599	75	27.563
<b>13</b>	38	81.726	75	28.715	<b>34</b>	38	81.533	75	27.541
<b>14</b>	38	81.730	75	28.754	<b>35</b>	38	81.551	75	27.563
<b>15</b>	38	81.719	75	28.786	<b>36</b>	38	81.556	75	27.602
<b>16</b>	38	81.835	75	28.875	<b>37</b>	38	81.736	75	28.447
<b>17</b>	38	81.875	75	28.875	<b>38</b>	38	81.762	75	28.489
<b>18</b>	38	81.927	75	28.927	<b>39</b>	38	81.778	75	28.524
<b>19</b>	38	81.654	75	28.973	<b>40</b>	38	81.748	75	28.613
<b>20</b>	38	81.687	75	28.909	<b>41</b>	38	81.776	75	28.645
<b>21</b>	38	81.739	75	28.011	<b>42</b>	38	81.816	75	28.649

\*Data collected with a Garmin GPSIII+.  
Accuracy +/- 15 meters.

## Delmarva Fox Squirrel Survey, May 2004

GPS Station Locations at Pime Hook Wildlife Area  
Sussex County, Delaware

<i>Station</i>	<i>Latitude (N)</i>		<i>Longitude (W)</i>	
1	38	83.854	75	26.949
2	38	83.825	75	26.959
3	38	83.799	75	26.973
4	38	83.774	75	26.973
5	38	83.786	75	27.012
6	38	83.782	75	27.006
7	38	83.726	75	27.002
8	38	83.701	75	27.034
9	38	83.641	75	27.041
10	38	83.656	75	27.031
11	38	83.657	75	27.070
12	38	83.639	75	27.081
13	38	83.620	75	27.104
14	38	83.636	75	27.123
15	38	83.619	75	27.167
16	38	83.611	75	27.219
17	38	83.607	75	27.206
18	38	83.612	75	27.259
19	38	83.616	75	27.611
20	38	83.664	75	27.806
21	38	83.677	75	27.815
22	38	83.709	75	27.834
23	38	83.729	75	27.858
24	38	83.740	75	27.869
25	38	83.765	75	27.884
26	38	83.703	75	27.894
27	38	83.814	75	27.991
28	38	83.851	75	27.922
29	38	83.881	75	27.940
30	38	83.910	75	27.966

\*Data collected with a Garmin GPSIII+.  
Accuracy +/- 15 meters.

Figure 4c      **Three-Square Wildlife Services, LLC**



DFS trapped and photographed during the survey at the Prime Hook National Wildlife Refuge in Sussex County, Delaware, May 2004. Photos below courtesy of Delaware Department of Natural Resources and Environmental Control.