

# New Jersey American Kestrel Nest Box Project 2006-2012

**New Jersey Department of Environmental Protection  
Division of Fish and Wildlife**

Dave Chanda, Director

Dave Jenkins, Chief  
Endangered and Nongame Species Program

**Prepared by:** Peter Winkler and Melanie Mason



**Project Staff:** MacKenzie Hall, Brian Henderson, Melanie Mason, William Pitts,  
Robert Somes, Peter Winkler

## Project Summary

Since 2006, the Endangered and Nongame Species Program (ENSP) has administered a nest box program for American kestrels (*Falco sparverius*). The nest box program was modeled after [Dr. John Smallwood's program at Montclair University](#). The majority of the lumber for the nest boxes was donated by Opdyke Lumber in Frenchtown, NJ, and the boxes were constructed by various scout and school groups. At the height of the program ENSP staff and volunteers monitored over 250 nest boxes. During the 2010-12 breeding seasons, ENSP monitored a subset (~120) of the most productive boxes in an effort to maximize resources while maintaining coverage of historically utilized habitat. Over the seven years the program has been running, more than 600 kestrels have been banded and locational data of recaptured banded birds continues to be collected both in and out of state.

## Background

In February of 2012, the American kestrel was formally listed as a State Threatened species. Various sources of data have shown a recent decline in both breeding (Smallwood et al. 2009) and migratory (Farmer et al. 2009) kestrel populations in the Northeast. In 2004 ENSP embarked on a [survey campaign](#) during the breeding season and the findings were alarming: only 9 of the 100 routes surveyed for kestrels were positive. American kestrels are a secondary cavity nester, which means they utilize cavities in trees that are either naturally occurring or excavated by woodpeckers; they do not hollow out their own (NatureServe 2012). Kestrels prefer cavities facing open areas with no obstructions, which limit the availability of nesting sites (Hawk Mountain 1997). Tree/snag removal and competition with other species (squirrels and the introduced European starling, for example) compound this problem (Weitzel 1988, Varland and Laughin 1993, Hawk Mountain 1997). A lack of suitable nesting sites is one hypothesis for the decline in kestrel numbers. Fortunately, kestrels will also utilize cavities in eaves of buildings, barns and constructed nest boxes (Hawk Mountain 1997). Studies demonstrating the adaptability of kestrels indicate they successfully nest in constructed nest boxes located next to large highways (Varland and Laughin 1993).

To bolster kestrel numbers and gain access to a study population, ENSP collaborated with Dr. John Smallwood from Montclair University. Dr. Smallwood has led a successful kestrel nest box program in northwestern New Jersey since 1995. Following his protocol ENSP developed a nest box program in central New Jersey and is currently expanding to southern New Jersey. The program is executed with few resources and depends heavily on volunteers for nest box materials, construction, placement and monitoring.

## Methods

In 2005, building off of work done with Dr. Smallwood on kestrel habitat (Smallwood et al. 2009a), the Endangered and Nongame Species Program created a statewide map of potential kestrel habitat. The New Jersey Department of Environmental Protection currently has four year classes of Land Use / Land Cover data. At the onset of the nest box program the most recent version was the 1995 Land Use / Land

Cover. To create the Land Use / Land Cover dataset, aerial photos are interpreted and classified into various land use/land cover categories using a modified Anderson Classification system (Anderson et al. 1976). The Anderson Classification system is a standard hierarchical system developed for classifying remotely sensed data and allows different levels of classification. NJDEP uses a modified level III system. Utilizing the New Jersey Department of Environmental Protection’s (NJDEP) 1995 Land Use/ Land Cover data as a base, ENSP reclassified the data at the modified Anderson III level based on the suitability of the classes for kestrels. Level III codes which represented open as well as herbaceous classes were recoded as kestrel habitat and extracted. These extracted classes were dissolved into contiguous patches of kestrel habitat. Patches were divided into three size categories based on number of kestrel breeding territories the patch could support: small (0-250 ha, one or two), medium (250 – 1000 ha, 2-10 territories), or large (>1,000 ha, greater than 10 territories).

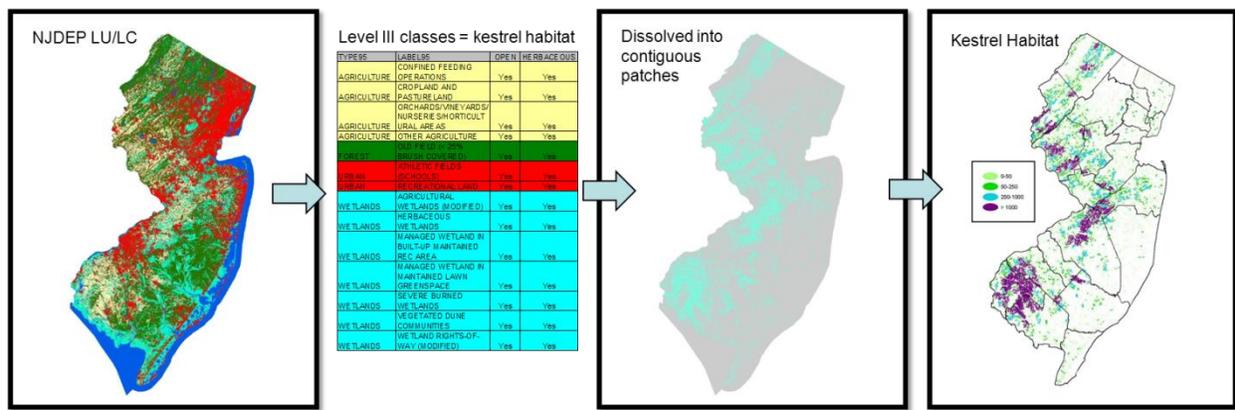


Figure 1. Process of delineating kestrel habitat map



Three study areas (Clinton, Amwell Valley and Assunpink) were created within central New Jersey and an attempt was made to place nest boxes equally among the different patch categories. Nest boxes were placed opportunistically; staff would go door to door or work with partner organizations to place nest boxes on structures within suitable habitat. Nest boxes were placed on various structures including; buildings, fence posts, poles and trees. In 2007 ENSP entered into an agreement with Jersey Central Power and Light (JCP&L) to install nest boxes on their utility poles. Stipulations were in place limiting the type of poles that could be used but this sped up the installation process.

Figure 2. Map of 3 study areas (Clinton, Amwell Valley and Assunpink)

Since the inception of the project the NJDEP has updated their LU/LC data twice, in 2002 and 2007. Below is a breakdown of habitat and nest boxes using the 2002 NJDEP LU/LC as a base for the patch network within the study areas from 2006-2008.

Table 1. Patch statistics categorized by patch size and number of nest boxes per category. Patch network created using the 1995 Land Use / Land Cover.

Patch Size	# Patches	Total Hectares of Kestrel Habitat	# Nest Boxes
0-250	5,807	43,343	74
250-1000	40	17,998	81
>1000	10	19,633	89



A mixture of staff and volunteers monitor the nest boxes. ENSP developed a survey protocol (see Appendix I) for nest box monitors to follow as well as an online data entry website hosted on Google sites. ENSP conducts the first round of nest box checks to perform maintenance and add initial bedding. After the initial check is completed, nest box monitors inspect the boxes once every 12-15 days and any kestrel activity in or around the nest box is noted. This timeline aims to ensure that monitors discover and remove unwanted starling nests during the egg or early nesting stage. Once a kestrel clutch is found, approximate hatch and banding dates are predicted. ENSP then attempts to capture and band adults during the latter stages of incubation and band the young at 16-22 days old. Nestlings are aged utilizing 2 aging guides, *Photographic Guide for Aging Nestling American Kestrels* (Griggs & Steenhof 1993) and *A Photographic Timeline of Hawk Mountains Sanctuary's American Kestrel Nestlings* (Klucaarits & Rusbuldt 2007).

## Results and Discussion

Over the seven years since project inception a few aspects have changed in response to new data and fluctuating resources. The first three years of the project were based on supplying equal numbers of nest boxes in each of the three size categories of patches to determine if there was a preference by kestrels. From 2006-2008, on average, 81% of the occupied (at least 1 egg) nest boxes were in the top two categories (>250 ha).

Table 2. Percentage of occupied nest boxes in patches > 250 hectares.  
Patch network created using the 1995 Land Use / Land Cover.

Study Year	Percentage of occupied nest boxes in patches > 250 hectares
2006	84%
2007	82%
2008	78%

After the third season, we decided to focus resources on a subset of the most productive nest boxes. The subset was determined by selecting boxes that had been used by kestrels at least once in the previous three seasons. Boxes not identified for monitoring included those that were in suboptimal locations, where volunteer help was lacking, where landowner support was lacking, or where nest boxes failed (box broke or the supporting structure fell down).

### Nest box Use

Nest box placement has been successful; we have determined that open habitat patches >250 ha are most suitable and should be the priority for kestrel management. Over the seven years of the nest box program, ENSP monitored at its height 259 nest boxes in 2008, and of those, 101 were used by kestrels at least once. The year with the highest number of occupied nest boxes for kestrels was 2009 with 54 active pairs, and the most successful year was 2012 with 40 successful pairs. As the study evolved over the years, ENSP monitored fewer nest boxes yet maintained a high success rate and almost the same total number of successful breeding pairs by concentrating on the most productive areas identified in previous years. This change allowed us to maximize staff and volunteer time as well as the number of pairs monitored.



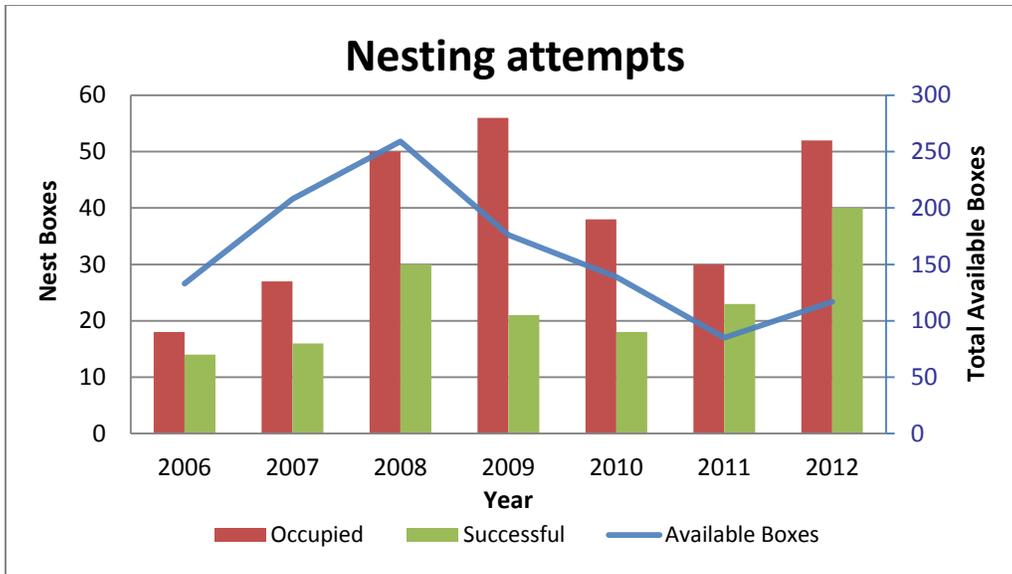


Figure 3. American kestrel Nest Box use 2006-2012

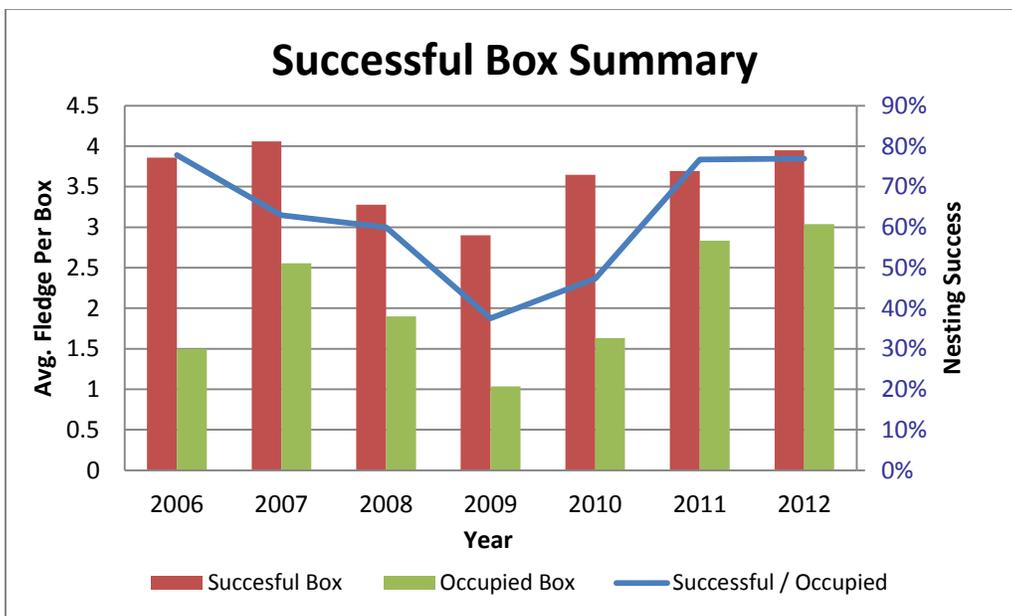


Figure 4. Average number of Fledglings per successful versus occupied nest box and overall success of boxes occupied

Based on Mayfield's method (Mayfield 1961) for determining daily survival probabilities of nests during a breeding season, kestrel reproductive success was calculated for 2012. Daily Survival Probability (DSP) is the probability that a nest will survive one day. Based on the observations of monitors throughout the season, we were able to ascertain more accurately the number of exposure days per nesting attempt. During the season a total of 1,941 exposure days were recorded for all nests, which accounted for both egg and nestling exposure. Based on these exposure days, a nest DSP of 99.4% was

calculated. A nest survival probability (the probability that a nest will fledge one young) was 66.8%. Further analysis of nest survival into stages, we discovered that daily survival during egg-laying, incubation and nestling stages was 96.9%, 83.0 % and 83.0%, respectfully. These calculations were based on a 65 day kestrel nesting cycle.

In 2012, 76% of kestrel nests were successful. Average production at nests across the three study areas was 2.91 chicks per occupied nest, the second highest since project inception (Table 3). This is above the one young/nest threshold for a stable raptor population and is encouraging. The total number of occupied nests includes two opportunistic bandings, a non-ENSP and an unmonitored ENSP nest box that both occurred in the Amwell Valley region, plus the 50 ENSP monitored.

Out of the 50 ENSP documented occupied nests, a total of 12 failed. The causes of most failures were unknown but if reasonable evidence was present, that reason was noted (e.g., fresh predator claw marks on the box, abandonment, etc.). Unfortunately the new study area in south Jersey yielded no active pairs in 2012, though individuals were seen in close proximity to nest box locations and during scouting events.

Table 3. Kestrel Production by study area and yearly average over the course of the project.\*S and F denote nesting success and failure respectfully. Success is determined by at least one chick reaching a band-able age. \*\*Because no nesting attempts occurred in the expanded South Jersey region those numbers were not used when calculating kestrel production in 2012.

Nesting Area	# Nests	Known Outcome Nests*		# Chicks Banded	Average Production						
		S	F		2012	2011	2010	2009	2008	2007	2006
Amwell Valley	33	25	8	105	3.18	2.56	1.95	.70	1.92	2.38	1.36
Clinton	12	9	3	34	2.83	2.86	1.09	1.63	2.06	3.00	1.75
South Jersey	0	0	0	0	0	NA	NA	NA	NA	NA	NA
Assunpink	7	6	1	19	2.71	3.80	1.63	.80	1.56	1.67	1.67
<b>Total</b>	<b>52</b>	<b>40</b>	<b>12</b>	<b>158</b>	<b>2.91**</b>	<b>3.07</b>	<b>1.55</b>	<b>1.05</b>	<b>1.84</b>	<b>2.35</b>	<b>1.59</b>

## Habitat Loss and Fragmentation

To investigate one of the possible reasons for decline, we examined kestrel habitat within New Jersey. The NJDEP has four year classes (1986, 1995, 2002 & 2007) of photo-interpreted hand-digitized Land Use/Land Cover (LU/LC) data. Following the same methods involved in creating the habitat patch network for placing boxes for the nest box program, we created the patch network for each of the 4 eras available and compared the habitat.

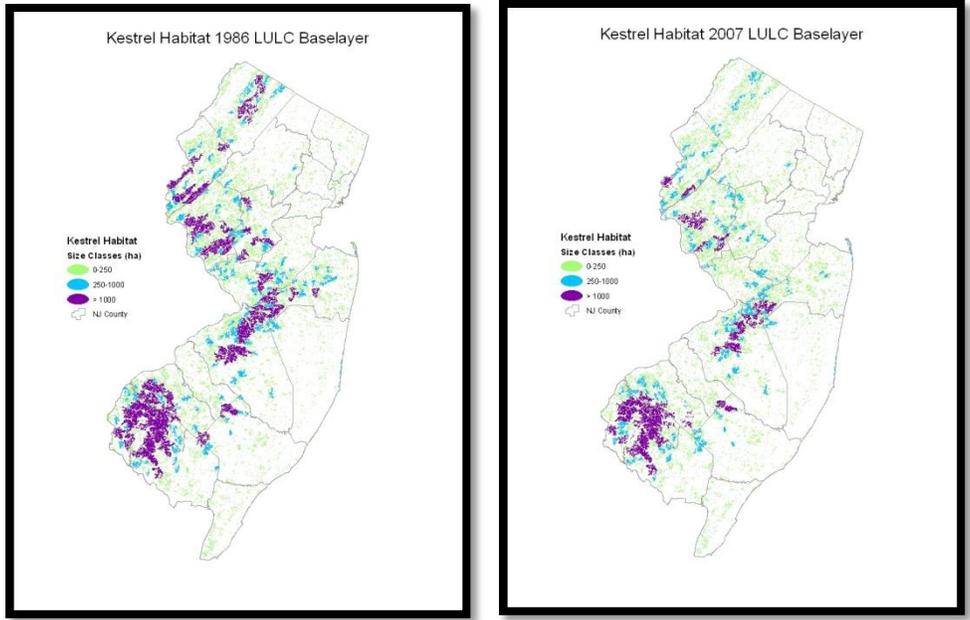


Figure 5 Potential American kestrel habitat from 1986 – 2007. Notice the loss of the “purple” (>1,000 ha) patches from 1986-2007 in central and northern New Jersey

Potential Kestrel habitat as depicted through the NJDEP LU/LC from 1986-2007 has decreased and become more fragmented. Over the 21 year period, about 75,400 ha of potential kestrel habitat was lost (rate of ~3,600 ha/year). Overall, the number of patches increased. However, within the top two categories (>250 ha, preferred kestrel habitat), the number of patches, sum and average patch size all decreased.

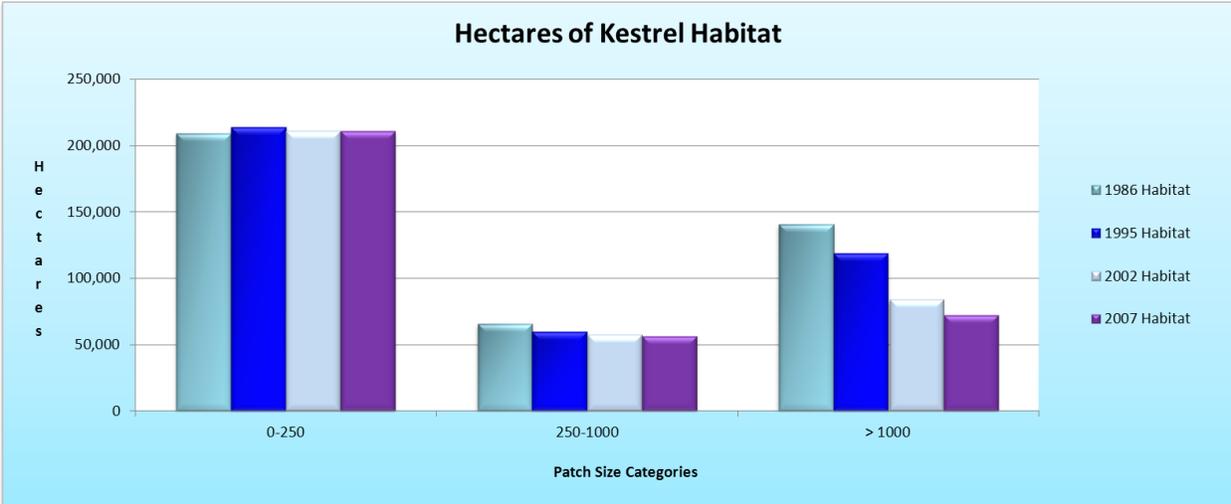


Figure 6. Hectares of kestrel habitat by patch categories

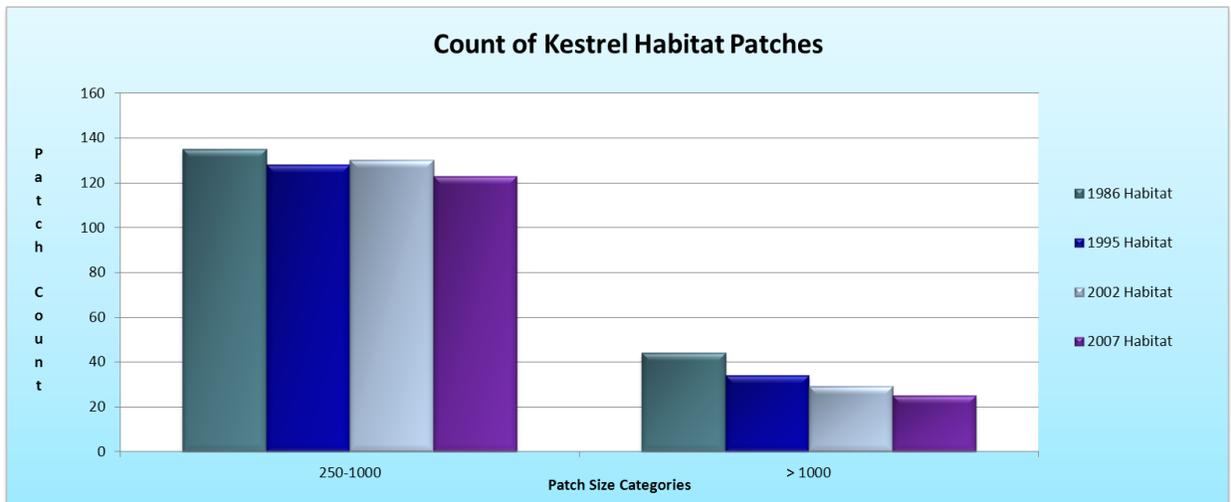


Figure 7. Count of number of patches for the top categories (> 250 ha)

Since we created the potential habitat patches using the 2007 LU/LC, we went back and looked at the percentage of occupied boxes using this patch network because it represents the land use at the time the nest box program was started in 2006. The table below summarizes the occupied boxes in the 2 largest patch sizes.

Table 4. Percentage of active nest boxes in patches >250 ha (NJDEP 2007 LULC source for patches) in size for all study years (2006-2011)

Study Year	Percentage of occupied nest boxes in patches >250 ha
2006	67%
2007	67%
2008	74%
2009	77%
2010	82%
2011	80%
2012	73%

## Banding and Re-Sightings

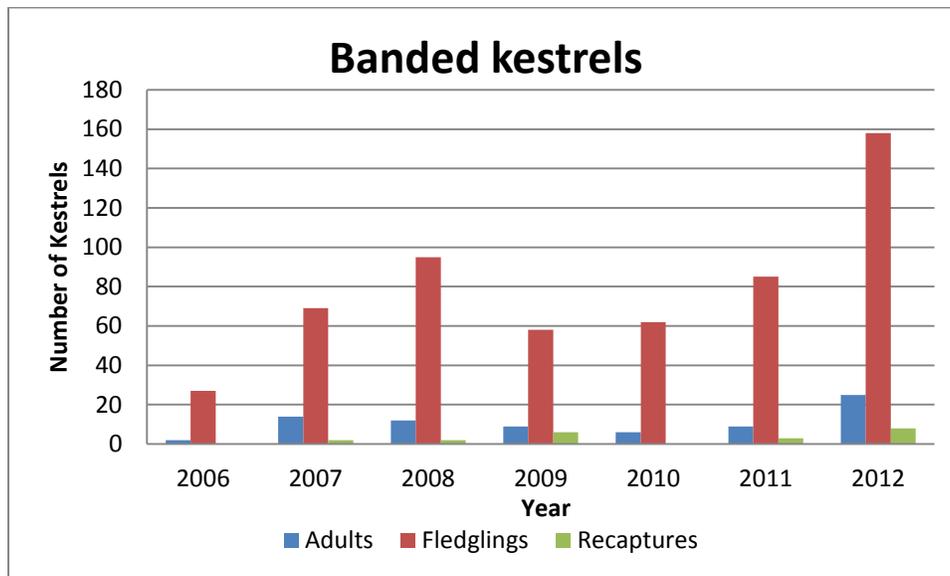


Figure 8. American kestrels banded 2006-2012



During the initial project year, banding birds was not a priority; therefore only 27 nestlings at 8 nest boxes were banded. Since the initial year banding has become a priority and over the course of the project, 554 (Female 48%, Male 46%, Unknown 6%) nestlings have been banded at 76 nest boxes. Of all the nestlings banded, 25% (138) were banded at just 8 nest boxes that have been consistently occupied. Females perform more than 80% of incubating (Smallwood and Bird 2002) so the majority of adults caught and banded at nest boxes were females, accounting for 87% (67) of adults banded while males accounted for 13% (10). This trend was consistent with recaptured adults, with females making up 75% (18) and males 25% (6). We determined the sex ratio of banded chicks to be skewed to males, at 1.42 males to 1 female in 2012.



An attempt was made in 2012 to catch and band more adult kestrels. By doing so we hoped to gain insight into dispersal/migration patterns and to breeding site fidelity. The 2012 season led to the initial banding of 158 fledglings and 25 adults. An additional 8 adults were recaptured in ENSP nest boxes. Of these, three were banded as adults from previous years at ENSP nest boxes, four were previously banded as fledglings in various locations in northern New Jersey, Pennsylvania and Connecticut, and one adult was previously banded in Pennsylvania. ENSP-banded kestrels have been recaptured in Connecticut, Delaware and Virginia

with the furthest documented in Lively, Virginia in 2011 (~208 miles distant). All recapture data has been mapped (see Appendix II).

Table 5. American kestrel banding summary at ENSP nest boxes 2006-12

	2006	2007	2008	2009	2010	2011	2012	AVG
Banded Adults	2	14	12	9	6	9	25	11
Banded Fledgling	27	69	95	58	62	85	158	79.1
Recapture	0	2	2	6	0	3	8	3
Number Boxes Banded	7	17	29	20	17	23	40	21.9

## Summary

The nest box program has evolved over its seven years of study. It began as a test to evaluate where ENSP should concentrate monitoring efforts, and has led us to focus on nest boxes in larger contiguous areas (> 250 HA). The program's success could not have been possible without all the volunteers who have helped construct and/or monitor the nest boxes, and the landowners who have generously given us permission to access their properties. Over the course of the project, nest box monitors have donated over 500 hours and traveled over 4,000 miles to monitor our network of nest boxes. In the coming 2013 season we will again concentrate on capturing adults to obtain more information on adult fidelity and survival. If we are successful at recapturing adults, we may attempt to outfit a group of adults with light-level geolocators to discover where these New Jersey breeders spend the winter. Results of our nest box program have followed a pattern found at other nest box programs in our region, where kestrels show an increase in occupancy followed by a decline. However, the 2012 season proved to be our most successful year. Is this a sign of a kestrel comeback? Only time will tell. Unlike many of the other nest box programs, we have not consistently monitored the same set of nest boxes. Since 2009 we have relocated nest boxes from unproductive areas to higher quality habitat according to our mapping model. This has made a direct comparison to other programs difficult. In the coming seasons ENSP is looking forward to working with landowners and new partners to investigate and, hopefully, reverse the population decline of the American kestrel. One such new partnership is with the Peregrine Fund, which has launched a new initiative called the [American Kestrel Partnership](#). One of the goals of the partnership is to standardize and compile data from various independent nest box programs. ENSP looks forward to participating in this initiative and sharing information on New Jersey's kestrel population.

## Acknowledgments

The Endangered and Nongame Species Program would like to acknowledge and thank Dr. John Smallwood of Montclair University and Dr. Keith Bildstein of Hawk Mountain. Both took time to coach us on how they have managed their successful nest box programs and steered us in the right direction.

### Nest Box Monitor Partners

Charles Barreca, Mike Bisignano, Alan Boyd, Gary Casabona, Richard Dey, Cameron Douglas (DuPont), Gretchen Fowles, John Fox, Maria and Sean Grace, MacKenzie Hall, Brian Henderson, Kathy Klink, Kim Korth, Zack Mahon, Melanie Mason, Michael Newhouse, Thomas Palchanes, Sharon Petzinger, Trisha Pitcher, William Pitts, Claudia Rocca, Carolina Safer, John Schmerler, Tom Smith, Robert Somes, Sharon Wander, Wade Wander, Peter Winkler, Louise Wilkens, Melissa Woerner & Patrick Woerner

### Nest Box Placement Partners

JCP&L, Duke Farms, Hillsborough Township, Rutgers Sneider farm, Rutgers Cream Ridge Farm, Franklin Township Somerset County, Hunterdon County Parks, New Jersey Conservation Foundation, Upper Raritan Watershed Association, Janssen, Verizon, New Jersey Audubon, Pinelands Preservation Alliance, Land Owner Incentive Participants, Warren County Rod and Gun Club, and numerous private landowners.

### Nest Box Construction Partners

Opdyke Lumber – Frenchtown NJ, Tom Hartman, Ridge and Valley Charter School Blirstown, Middlesex County Vo-Tech High School Old Bridge, Delaware Township School Sergeantsville, Atlantic County Special Services Schools District Mays Landing, Boy Scout Troop 136 Long Valley, Boy Scout Trout 10 Lakehurst, Washington Crossing Audubon Society

## Funding

Funding provided by the U.S. Fish & Wildlife Service through State Wildlife Grants, with matching contributions from Kestrel Project volunteers. Thanks to everyone who contributes to the Endangered and Nongame Species Program through the Check-Off for Wildlife on their NJ State Income Tax, and by purchasing Conserve Wildlife License Plates!

## Literature Cited

Anderson, J.R., E.E. Hardy, J.T. Roach, and R.E. Witmer. 1976. *A land use and land cover classification system for use with remote sensor data*. U.S. Geological Survey Professional Paper 964. 28 p.

Farmer, C. J. & J. P. Smith, 2009. Migration monitoring indicates widespread declines of American kestrels (*Falco sparverius*) in North America. *Journal of Raptor Research*, 43: 263–273.

Griggs, G. R. and K. Steenhof. 1993. Photographic Guide for Aging Nestling American Kestrels. U.S. Department of the Interior Bureau of Land Management, Raptor Research and Technical Assistance Center, Boise, Idaho 26p.

Hawk Mountain Sanctuary Association. 1997. Nestboxes for kestrels. Kempton, PA: Hawk Mountain Sanctuary Association. <http://hawkmountain.org>

Klucsarits, J. R. and J. J. Rusbult. 2007. A Photographic Timeline of Hawk Mountain Sanctuary's American Kestrel Nestlings. Columbus, Ohio: Zip Publishing 37p.

Mayfield, H. 1961. Nesting Success Calculated From Exposure. *The Wilson Bulletin*. 73:255-261

NatureServe. 2011. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: January 26, 2012).

Smallwood, John A. and David M. Bird. 2002. American Kestrel (*Falco sparverius*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/602>

Smallwood, J. A., M. F. Causey, D. H. Mossop, J. R. Klucsarits, B. Robertson, S. Robertson, J. Mason, M. J. Maurer, R. J. Melvin, R. D. Dawson, G. R. Bortolotti, J. W. Parrish Jr., T. F. Green & K. Boyd, 2009b. Why are American kestrel (*Falco sparverius*) populations declining in North America? Evidence from nestbox programs. *Journal of Raptor Research*, 43: 274–282.

Smallwood, J. A., P. Winkler, G. I. Fowles & M. A. Craddock, 2009a. American kestrel breeding habitat: The importance of patch size. *Journal of Raptor Research*, 43: 308–314.

Varland, Daniel E. and Loughin, Thomas M. 1993. Reproductive success of American kestrels along an interstate highway in central Iowa. *The Wilson Bulletin*. 105(3):465-474

Weitzel, Norman H. 1988. Nest-site competition between the European starling and native breeding birds in northwestern Nevada. *The Condor* 90:515-517.

## Appendices

Appendix I ENSP – American kestrel Nest Box Survey Protocol

Appendix II ENSP – American kestrel Re-sightings

New Jersey Department of Environmental Protection  
Division of Fish and Wildlife  
Endangered and Nongame Species program  
**American Kestrel Nest Box Survey Protocol**  
*(Falco sparverius)*



# 2012 American kestrel Nest Box Survey Protocol

**Volunteer Commitment dates: April 22, 2012 – August 12, 2012 (~ 8 visits, biweekly)**

## **Kestrel Nest Box Program Overview**

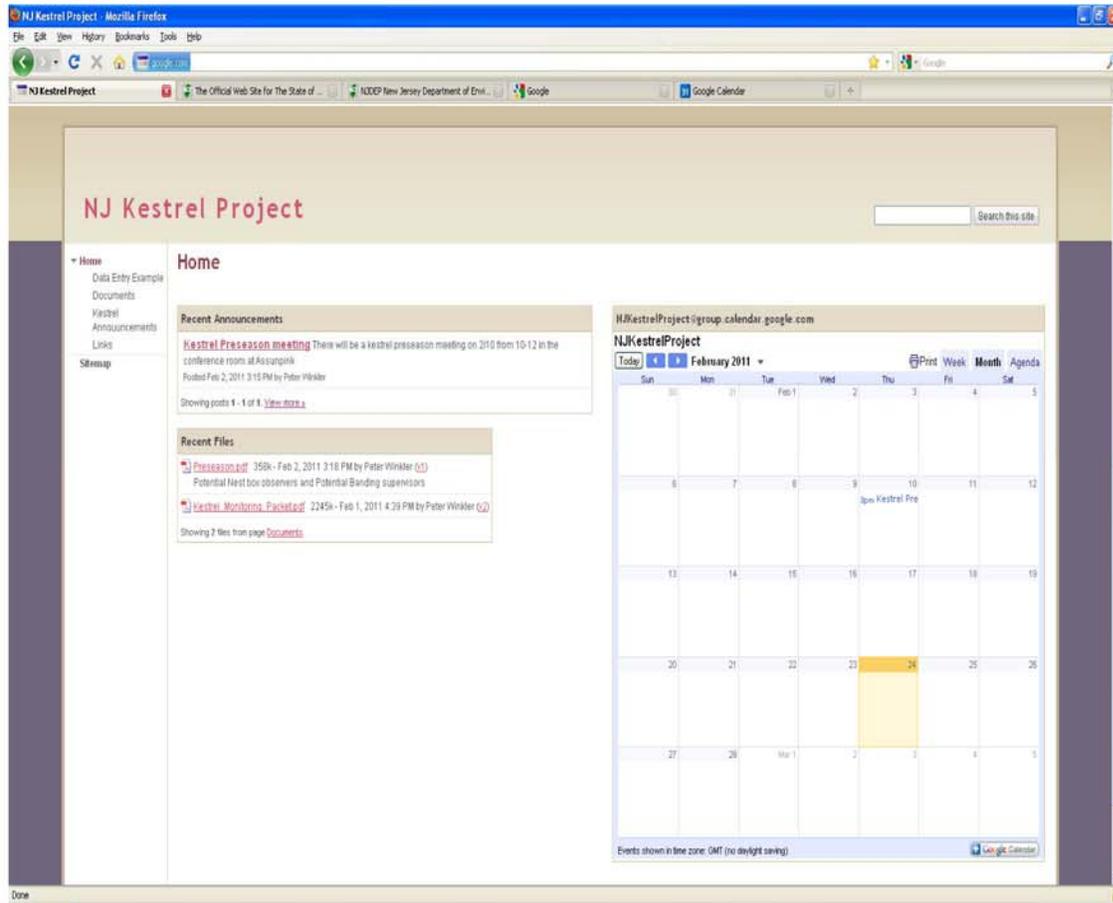
The American kestrel is North America's smallest and most colorful falcon. Kestrels prefer large contiguous open habitats where they hunt for small prey. They are obligate second cavity nesters and have been declining across the Northeast. There are several theories as to why kestrels are declining. One possibility is the lack of suitable nest sites. Kestrels depend on existing cavities in trees to nest. They do not excavate their own cavities and studies have shown them to be nest site limited. Nest box programs have been successful in increasing local populations of kestrels. In 2006 the Endangered and Nongame Species (ENSP) Program started a nest box program modeled after Dr. John Smallwood's nest box program from Montclair University. ENSP also worked with Dr. Smallwood to create a GIS kestrel habitat patch map. Working in conjunction with Smallwood, ENSP tested which patches kestrels preferred. We evenly distributed nest boxes in 3 categories of kestrel patches; 0-250ha, 250-1000ha and > 1000ha. Over the 5 year study, kestrels showed preference to occupy nest boxes in the top 2 categories (> 250 ha). In 2010 ENSP changed focus and are now concentrating on the most productive nest boxes in these large patches of kestrel habitat. We are currently concentrating on a mark recapture study of our small kestrel population in central New Jersey.

## **Reporting Time**

The nest box program is funded through the State Wildlife's Grant from the USFWS service. In order to receive federal funding, ENSP must demonstrate a 25% matching rate. The best way for us to meet our match is to document and claim volunteer time spent on the project. For ENSP to earn all the funding we have budgeted for this project, our volunteers must document their time spent on the project accurately including mileage while checking nest boxes. To participate as an ENSP volunteer, you must be a member of [NJ's Wildlife Conservation Corps](#) (WCC). Visit the webpage to download the application. Bring your completed forms to the first round of nest box surveys.

## **Website**

In order to facilitate better communication with our volunteers, ENSP created a kestrel nest box program website utilizing Google sites. This site is intended only for people associated with the kestrel project.



The site is organized into the following site map;

[Home page](#) – Recent announcements, recent files and calendar

[Documents](#) – any useful documents will be posted to this page ( Survey Protocols, nest box program manuals, etc)

[Kestrel Announcements](#) – a blog where ENSP can post messages to all volunteers as well as volunteers can post questions / observations to the entire group.

[Links](#) – links to various kestrel resources, other nest box programs.

Data Entry Example – each volunteer will have a page customized to his/her nest box route. The page will have a Google map with your nest boxes as well as a Google spreadsheet. In order to access the spreadsheet and enter data the nest box observers will need to create a [Google account](#). Once you have an account ENSP can share the spreadsheet with you so you can enter data.

## PROTOCOL FOR THE 2012 FIELD SEASON

### Nest box Monitoring

ENSP staff will conduct the first round of nest box checks beginning in April to perform maintenance and add initial bedding. You will be notified once the initial round of checks has been completed for your assigned boxes and the banding supervisor for your area will accompany you for the first round of checks.

- All nest box checks are performed in daylight hours in the absence of strong wind and rain.
- Check assigned boxes every 12-15 days. This timeline aims to ensure that volunteers discover and remove unwanted starlings during their egg or early nesting stage.
- Record your observations WHILE YOU ARE IN THE FIELD on the provided data sheet.
- Approach the box with as little noise as possible and place ladder on structure box is mounted on.
- Use pliers to pull scaffold nail out of box. It is usually used in the lower left side of box to keep it closed. Most boxes open on the left side. A helpful hint: put the nail back in the nail hole loosely while you are checking the box. Carry additional nails with you in case one is missing or lost in the process of checking the box.
- Either slide a paint scraper inside between the side panel and bottom of box or place other hand at opening of box side to ensure nothing falls out as you open the box. Carefully open side of box.
- Take note of contents of box and perform proper steps.
  - i. Bird species present other than starlings or house sparrows – note species, number of eggs / young and leave alone.
  - ii. Starling or house sparrows present – remove nest and contents note species, number of eggs / young and replace with fresh bedding
  - iii. Mammal present – remove nest if no young are present. If young are present leave alone until they leave nest.
- If a nest box is being used by starlings, house sparrows or squirrels remove nesting material and add new bedding to the box (about 2” of bedding to cover the bottom of the box).
- If starling or house sparrow eggs are found remove and destroy them away from nest box location so you do not attract predators (simply dropping the eggs on the ground with the nesting material is sufficient). If any other songbirds other than starlings and house sparrows are using the box, leave them in the box undisturbed. There are various links on the kestrel page to guides for cavity nesting birds. Species most likely to use the boxes include Eastern bluebird, house wren, Carolina wren, Carolina chickadee.
- Once kestrel eggs are found, return in 5-7 days to determine the full clutch size. Please report this data to ENSP immediately (via the online data forms and blog so other monitors know of your progress) so that we can calculate hatch dates and banding dates. In the case where the adult does

not flush off the eggs when you are checking (i.e. they stay put when you open the box) do not handle the adult bird and check during your next visit. If the same thing occurs on the next visit, please let your banding supervisor know ASAP so we can check and potentially band the adult.

- Return to the nest box once within 6-8 days of the predicted hatch date to record number of chicks hatched.
- ENSP will notify you of the banding date (16-22 days after hatching) that will also be the final visit to the nest box for the current breeding season.
- Do not disturb the boxes after the 24th day after hatching. This is a critical time for the chicks and if disturbed may lead to the chicks leaving the nest box before they are ready to fledge resulting in a fatal fall.

### **Reporting Data**

Report your observations online either by accessing the Google spreadsheet through the direct link emailed to you, your data entry page from the kestrel website or by logging into your account on [www.google.com](http://www.google.com) If accessing through the Google homepage, sign into your account first, then click the “More” tab above the Google search bar, then click “Even more”, then “Documents and Spreadsheets” under the Communicate, Show, and Share heading. Click on the document name to open it, open the worksheet with your name on it (see tabs at bottom of spreadsheet), and enter your data. When finished, click “Save and Close” in the upper right corner. Submittal of this data in a timely fashion is critical to the success of the project because we will be using it to set up a banding schedule. Please only edit or enter data on your own worksheet. If you have any questions or are having difficulty, contact your banding supervisor.

### **Data Entry**

A data sheet is provided at the end of this document. Use this while you are in the field and then when you return from the field, you should transcribe your data onto the online Google spreadsheet. Doing this as soon as possible enables you to quality control your data as soon as you can so if there are any discrepancies you can clarify and correct for these while the information is still fresh. Below is a description of the data elements and explanations of what data should be entered.

- **Monitor** – this is already filled in, the name of the nest box monitor for the current year.
- **Nest Box ID** – Nest box ID, Unique identifier for each nest box consisting of the 2 digit abbreviation for the survey area followed by the nest box number within that survey area. You will find this number on the outside of the box.
- **Date** – date of the survey
- **Occupied** – Yes/No field describing the active occupancy of the nest box. Only say yes if there is evidence that the box is actually being used. If there is nesting material other than the bedding we placed in the box (nesting material including twigs and leaves, kestrel pellets, feathers, prey remains or a bird exiting the nest box on arrival) the answer is YES.
- **Species** – the species present; if you do not know, unknown is acceptable
- **# eggs** – count of eggs present
- **# young** – count of young present

- **Action** – your action at the nest box (replaced bedding, removed starling eggs, etc)
- **Kestrel activity** – if a kestrel was observed, describe the observation (Female fled on approach, Male incubating, etc)
- **Comments** – anything else relevant that doesn't fit with the rest of data sheet (Northern Harrier observed in adjacent field)
- **Start/End Time** – start/end time (Used to calculate volunteer hours for grant match), include drive time
- **Mileage** – total mileage for that survey period (Used to calculate volunteer contribution for grant match)

### **Equipment Checklist**

- Extension ladder (either self-supplied or available at central locations throughout the study areas)
- Bedding
- Pliers
- Data sheets
- Monitoring protocol
- Map of box locations
- Scrapper
- Extra scaffold nails



# Kestrel Re-sightings

*Summary of re-sightings data from NJDEP  
ENSP's American kestrel nest box program from  
2006-2012*

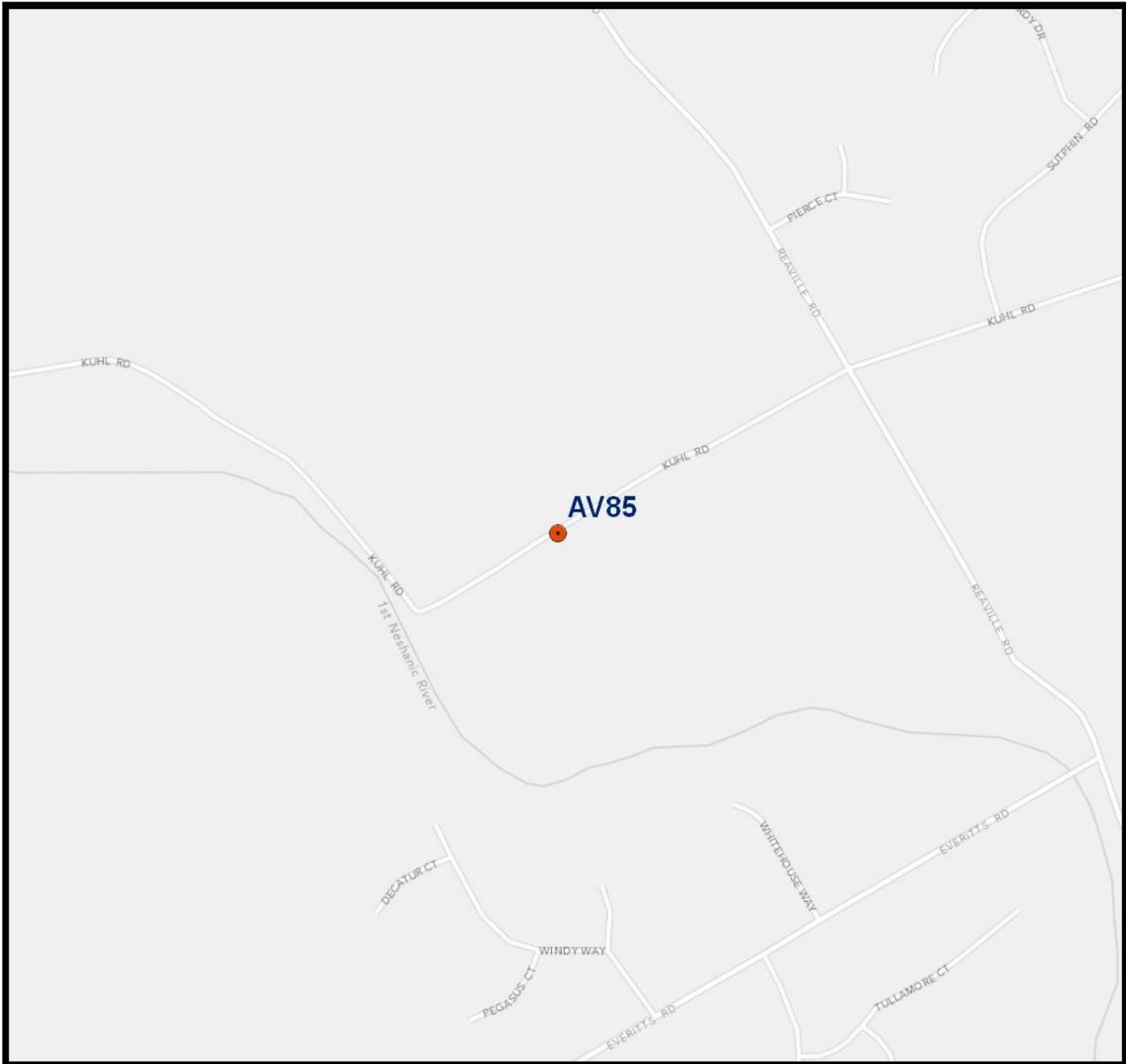


ID	DATE	BAND_NUM	LEG	SEX	AGE
HC09	05/23/07	1373-21207	Right	Female	Adult
HC07	06/04/08	1373-21207	Right	Female	Adult
CL49	06/26/07	1373-21235	Right	Female	Young
CL41	05/24/11	1373-21235	Right	Female	Adult
ST01	07/04/07	1443-35128	Right	Male	Young
CL42	05/19/09	1443-35128	Right	Male	Adult
ST01	06/15/08	1443-35235	Left	Female	Young
CL76	06/15/09	1443-35235	Left	Female	Adult
ST01	06/17/08	1443-35255	Left	Male	Young
CL76	05/19/09	1443-35255	Left	Male	Adult
HM01	06/28/08	1493-94735	Right	Female	Young
AS25	06/02/09	1493-94735	Right	Female	Adult
HM01	06/21/09	1493-94750	Right	Male	Adult
AV55	05/24/11	1493-94750	Right	Male	Adult
CP01	06/21/05	1593-46512	Left	Female	Young
CL43	06/02/08	1593-46512	Left	Female	Adult
BT01	07/02/09	1593-54802	Right	Female	Adult
AV58	05/21/12	1593-54802	Right	Female	Adult
CP01	06/05/06	1593-82811	Left	Female	Young
AV51	05/17/07	1593-82811	Left	Female	Adult
UN01	06/13/06	1593-82830	Left	Male	Young
AV85	05/17/07	1593-82830	Left	Male	Adult
NW01	06/29/11	1623-16838	Left	Female	Young
AV81	05/10/12	1623-16838	Left	Female	Adult
AS25	07/05/11	1623-19220	Left	Female	Young
MF01	05/21/12	1623-19220	Left	Female	Adult
NM01	06/22/07	1623-37922	Right	Female	Young
AV37	05/02/12	1623-37922	Right	Female	Adult
BK01	06/24/11	1623-38215	Right	Male	Young
CL60	05/17/12	1623-38215	Right	Male	Adult
CL55	06/24/09	1623-43678	Right	Female	Young
CL67	05/24/11	1623-43678	Right	Female	Adult
AV58	06/26/08	1623-43709	Left	Male	Young
OG01	08/21/12	1623-43709	Left	Male	Adult
AV84	05/20/10	1623-43732	Right	Female	Adult
AV83	05/10/12	1623-43732	Right	Female	Adult
AS26	05/23/11	1623-43774	Right	Female	Adult
AS19	05/01/12	1623-43774	Right	Female	Adult
ST01	05/24/10	1783-10836	Right	Female	Adult
AV20	05/07/12	1783-10836	Right	Female	Adult
AV84	05/24/11	1783-21801	Left	Female	Adult

<b>ID</b>	<b>DATE</b>	<b>BAND_NUM</b>	<b>LEG</b>	<b>SEX</b>	<b>AGE</b>
AV62	06/04/12	1783-21801	Left	Female	Adult
AV83	06/28/11	1783-21842	Left	Female	Young
VA01	09/06/11	1783-21842	Left	Female	Adult
TK01	05/31/12	1783-22209	Right	Female	Young
DO01	08/29/12	1783-22209	Right	Female	Young
AV29	05/19/08	2003-79742	Right	Female	Adult
AV30	07/01/09	2003-79742	Right	Female	Adult
AV85	05/15/08	2003-79748	Right	Female	Adult
AV85	05/18/09	2003-79748	Right	Female	Adult

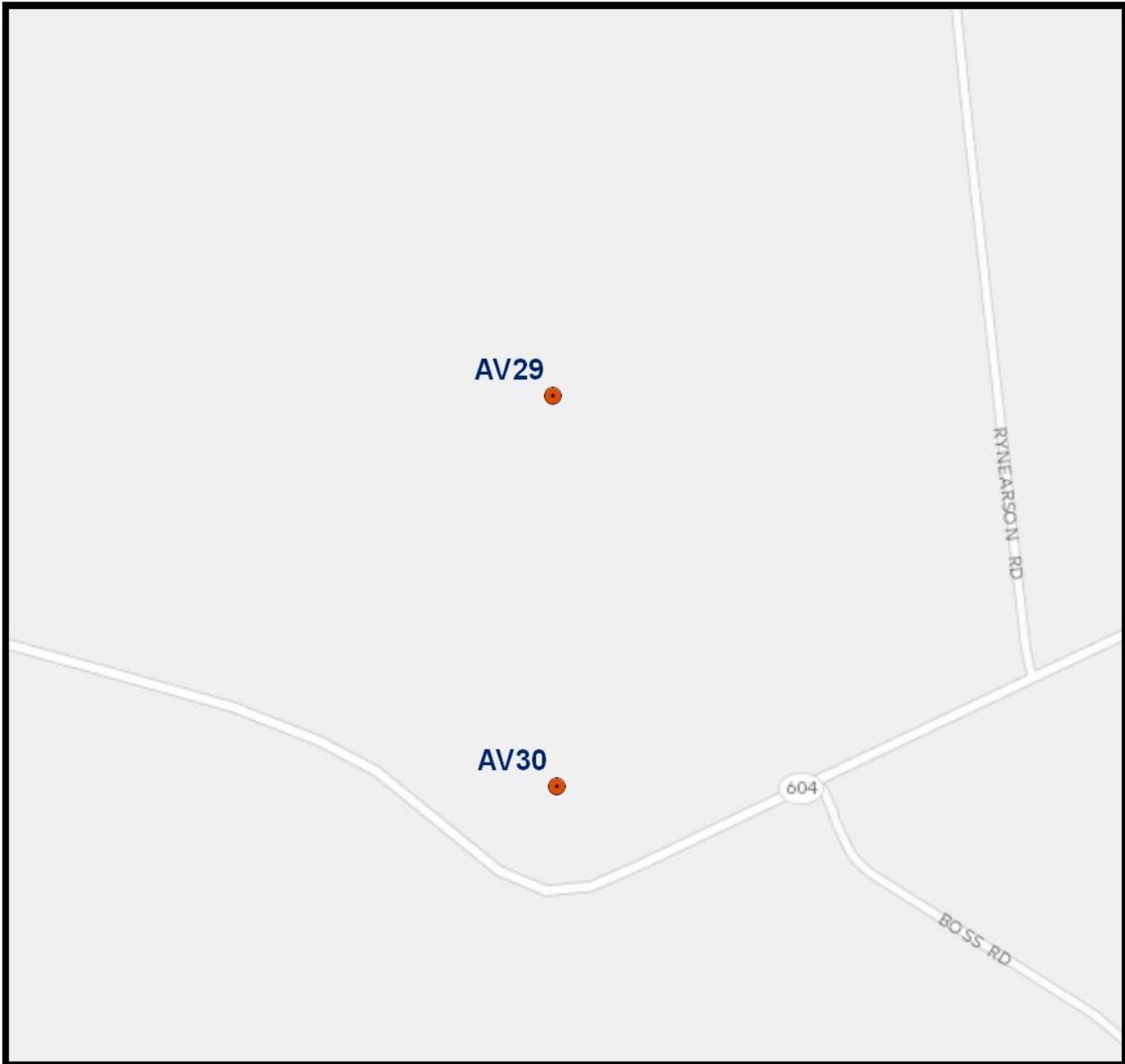
# Band Number 2003-79748

- Female adult banded 5/15/08 at ENSP nest box AV85
  - Fledged 4 young
- Recaptured 5/18/09 at ENSP nest box AV85
  - Nesting attempt failed



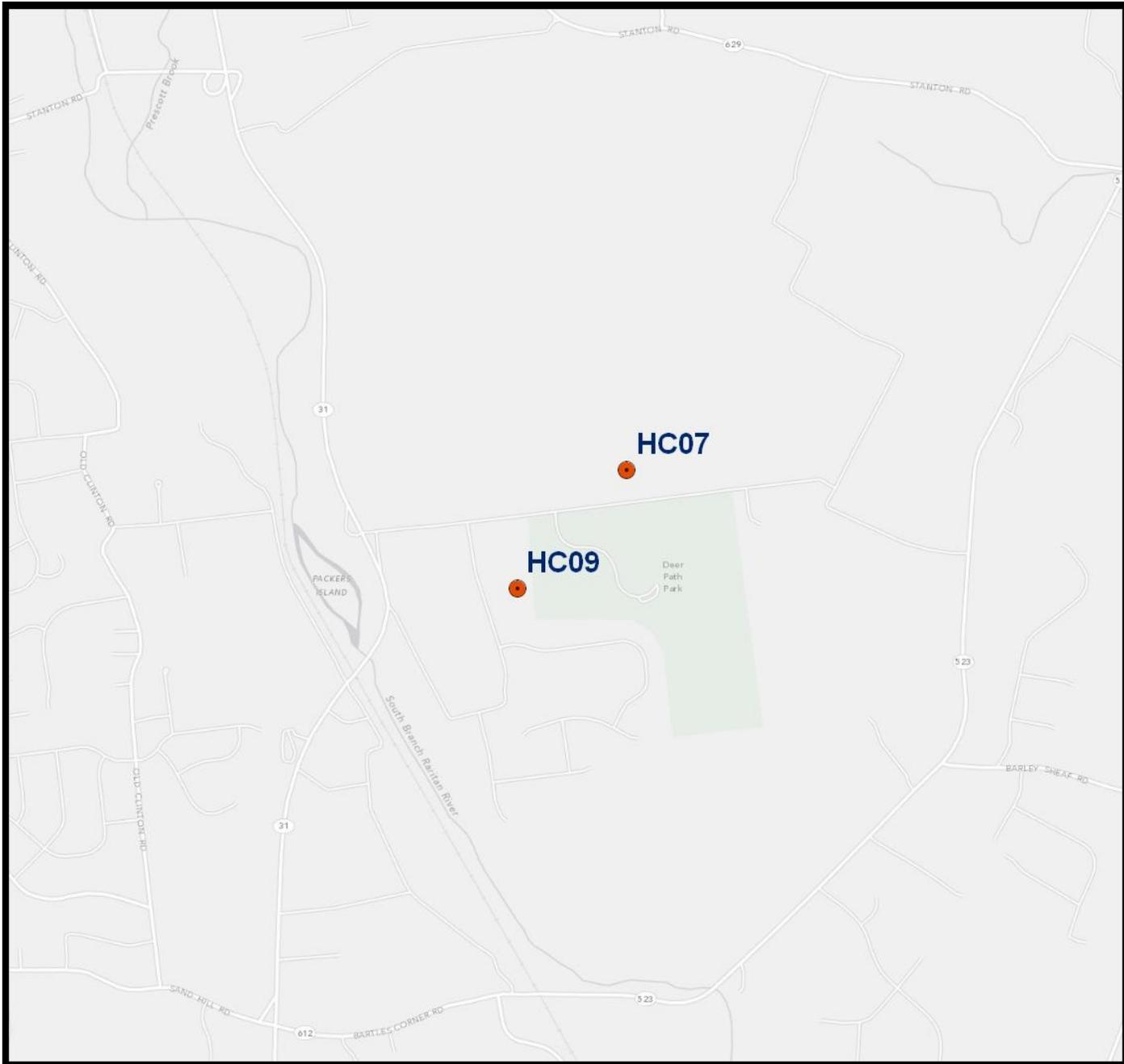
# Band Number 2003-79742

- Female adult banded 5/19/08 at ENSP nest box AV29
  - Fledged 5 young
- Recaptured 7/1/09 at ENSP nest box AV30
  - ~ .25 miles from previously known breeding site
  - Fledged 2 young



# Band Number 1373-21207

- Female adult banded 5/23/07 at ENSP nest box HC09
  - Fledged 3 young
- Recaptured 6/4/08 at ENSP nest box HC07
  - ~ 0.5 miles from previously known breeding site
  - Fledged 4 young



# **Band Number 1623-43732**

- Female adult banded 5/20/10 at ENSP nest box AV84
  - Fledged 4 young
  
- Recaptured 5/10/12 at ENSP nest box AV83
  - ~ 0.66 miles from previously known breeding site
  - Fledged 4 young



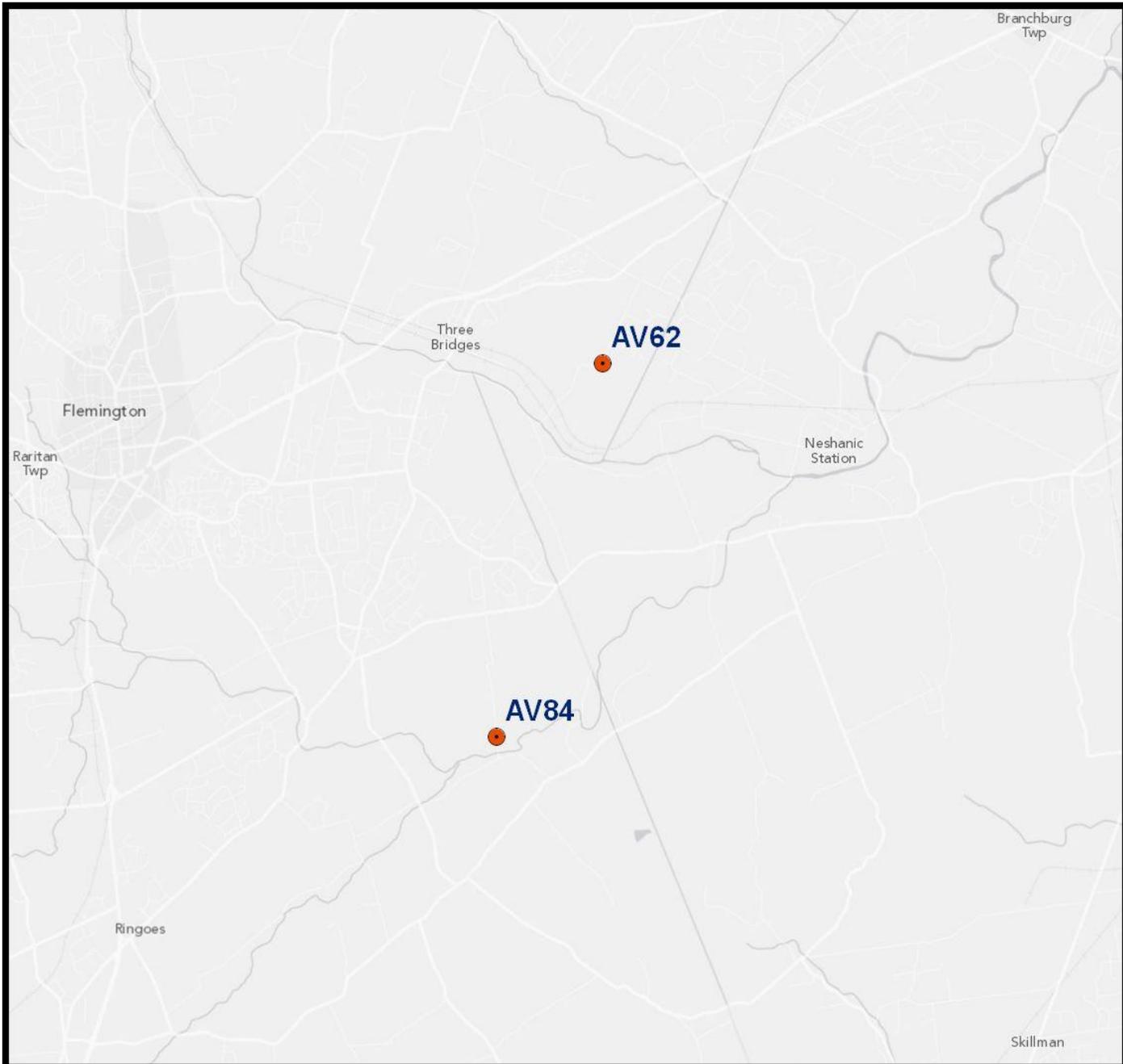
# Band Number 1623-43678

- Female young banded 6/24/09 at ENSP nest box CL55
- Recaptured 5/24/11 at ENSP nest box CL67
  - ~ 2.25 miles from natal site
  - Fledged 4 young



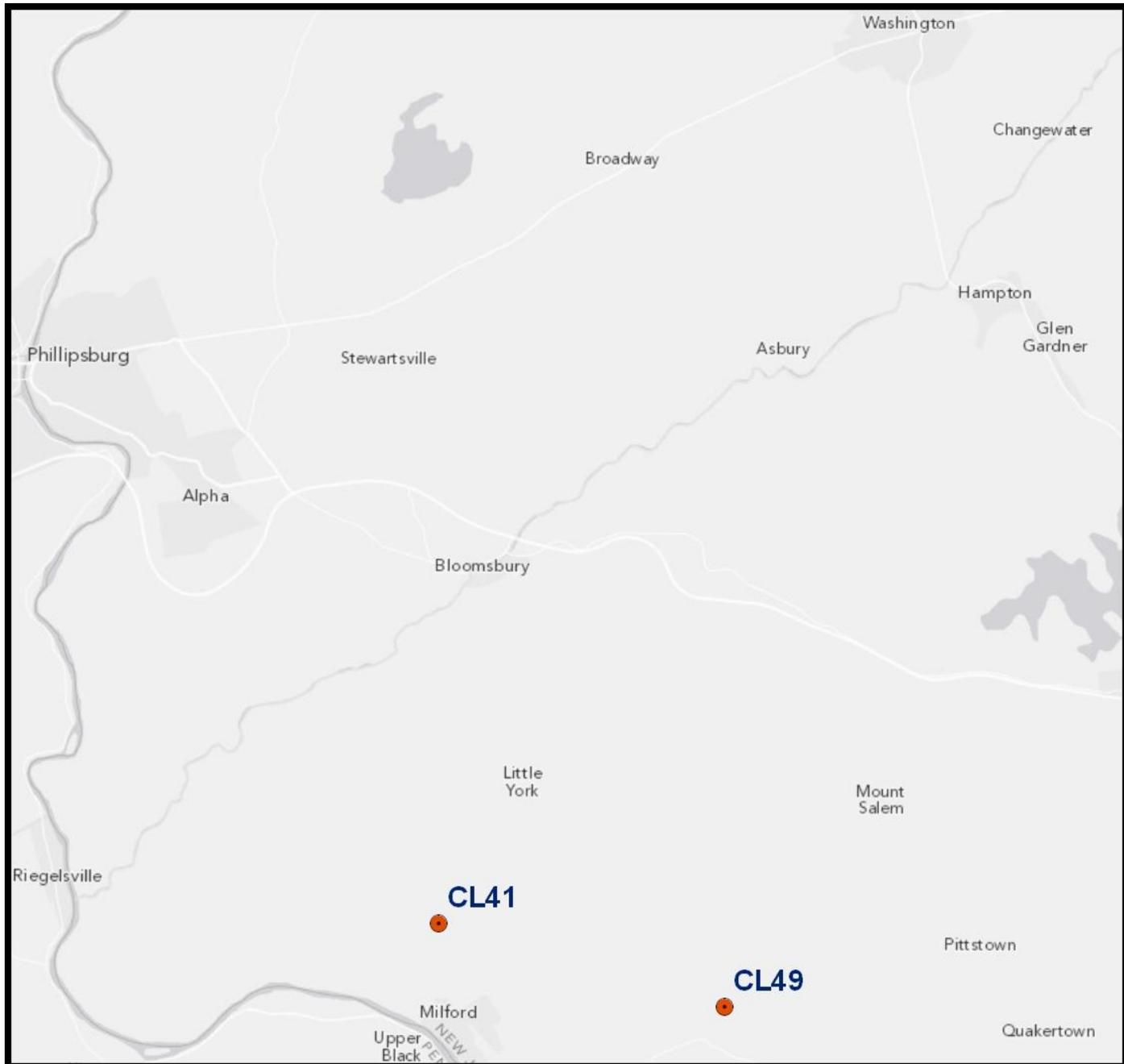
# Band Number 1783-21801

- Female adult banded 5/24/11 at ENSP nest box AV84
  - Fledged 5 young
- Recaptured 6/4/12 at ENSP nest box AV62
  - ~ 3.5 miles from previously known breeding site
  - Fledged 2 young



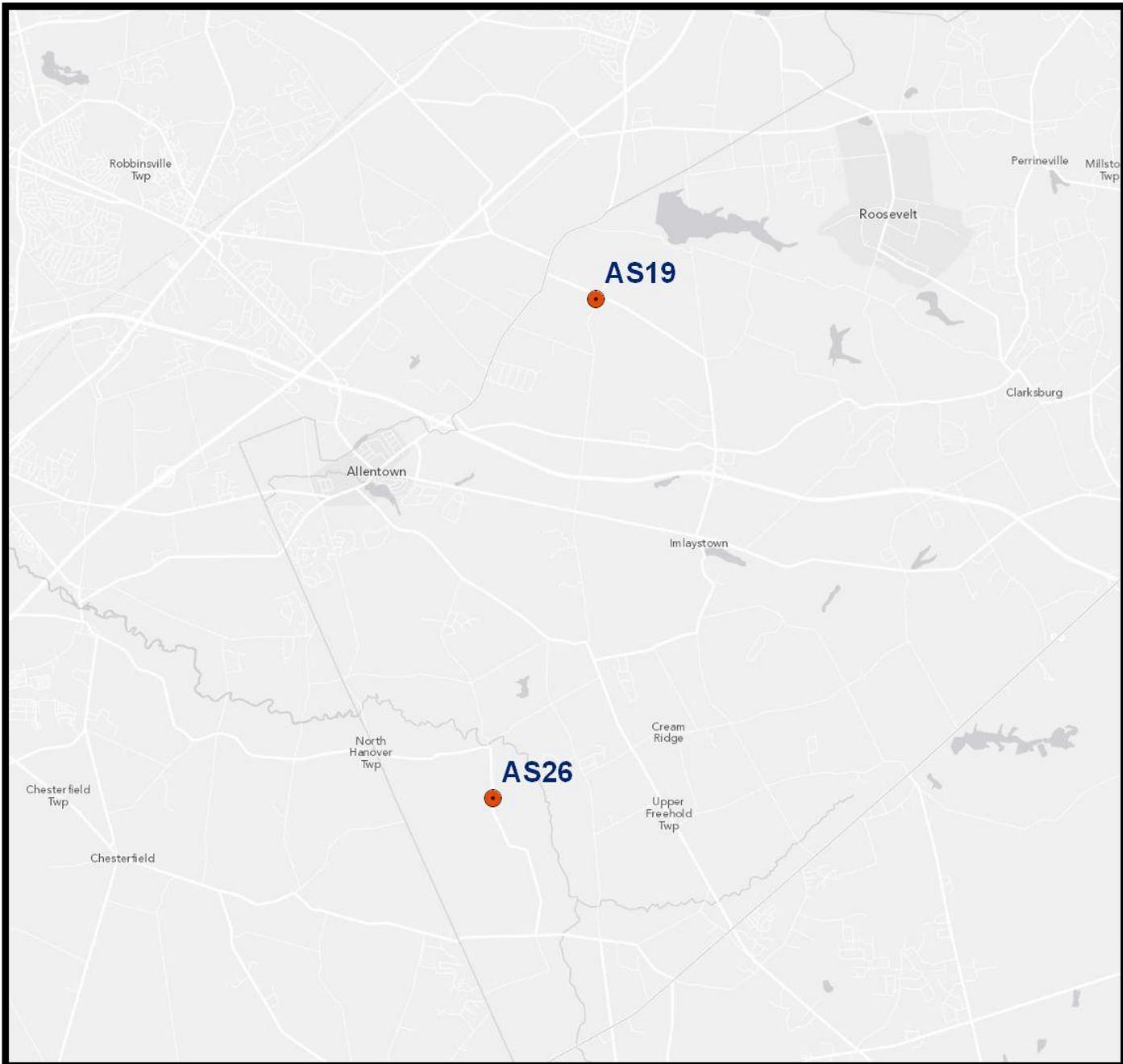
# Band Number 1373-21235

- Female young banded 6/26/07 at ENSP nest box CL49
- Recaptured 5/24/2011 at ENSP nest box CL41
  - ~ 4 miles from natal site
  - Fledged 5 young



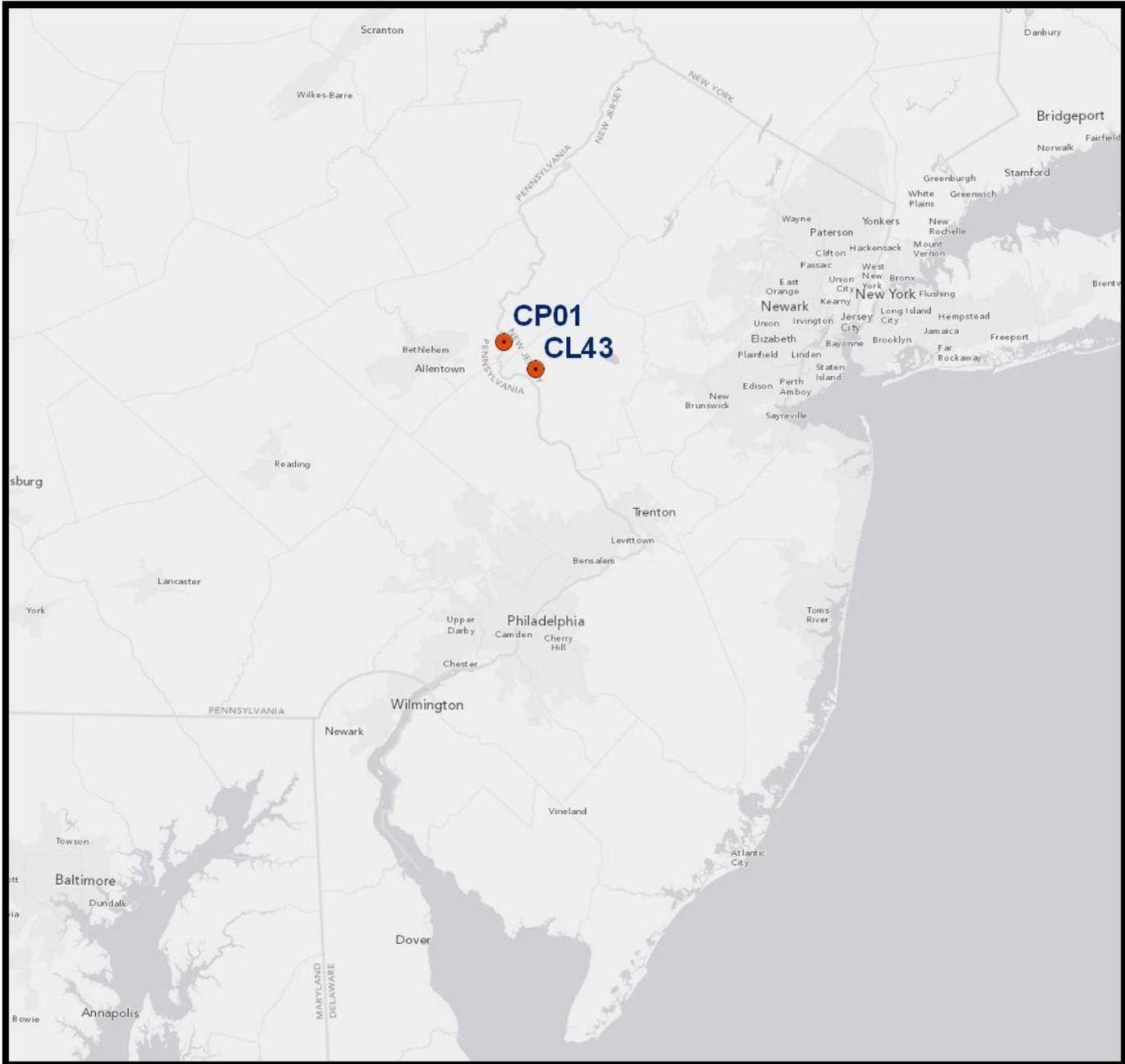
# Band Number 1623-43774

- Female adult banded 5/23/11 at ENSP nest box AS26
  - Fledged 5 young
- Recaptured 5/1/12 at ENSP nest box AS19
  - ~ 5.7 miles from previously known breeding site
  - Fledged 4 young



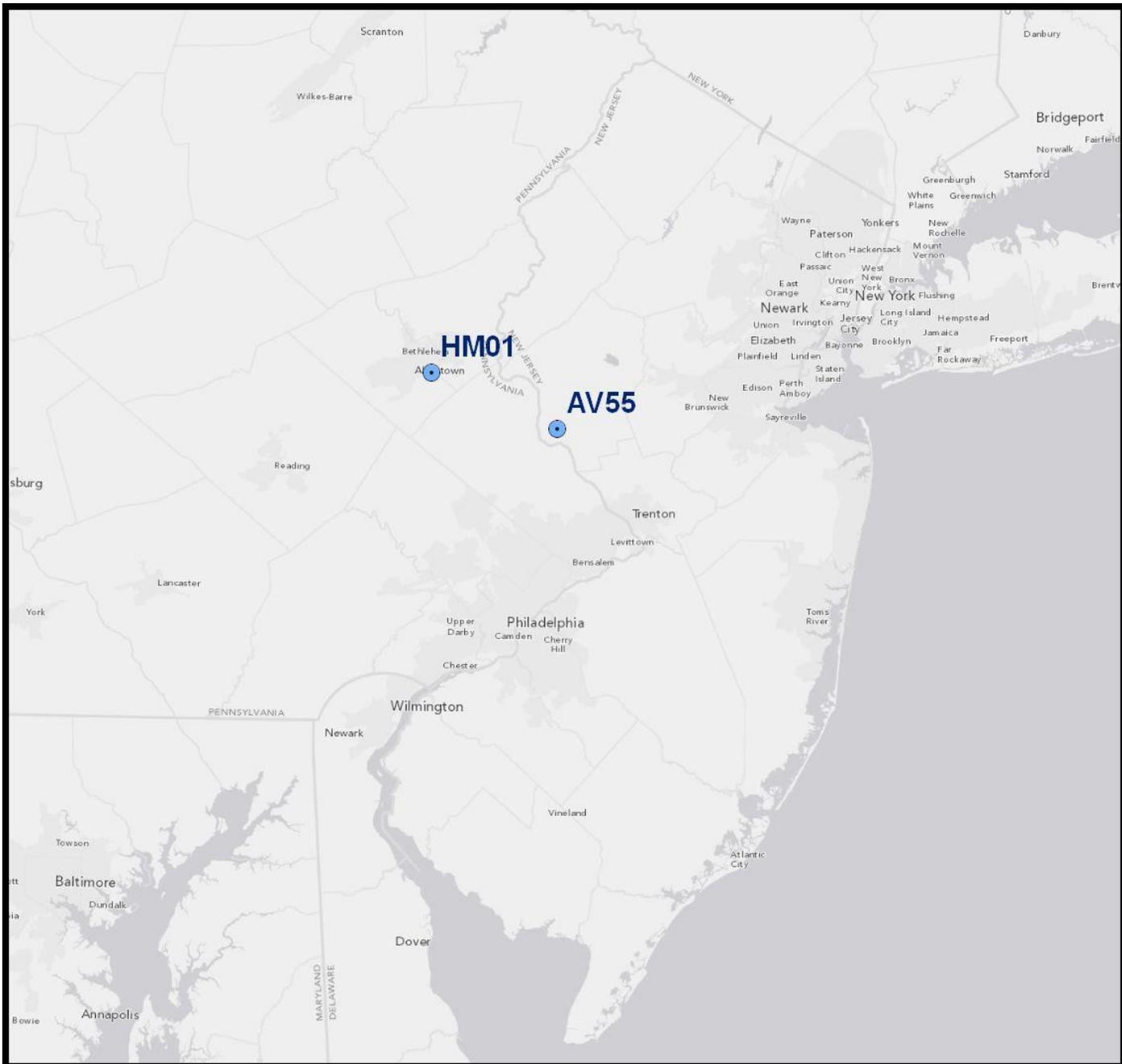
# Band Number 1593-46512

- Female young banded 6/21/05 in Carpenterville, NJ
- Recaptured 6/2/08 at ENSP nest box CL43
  - ~ 7.2 miles from natal site
  - Fledged 3 young



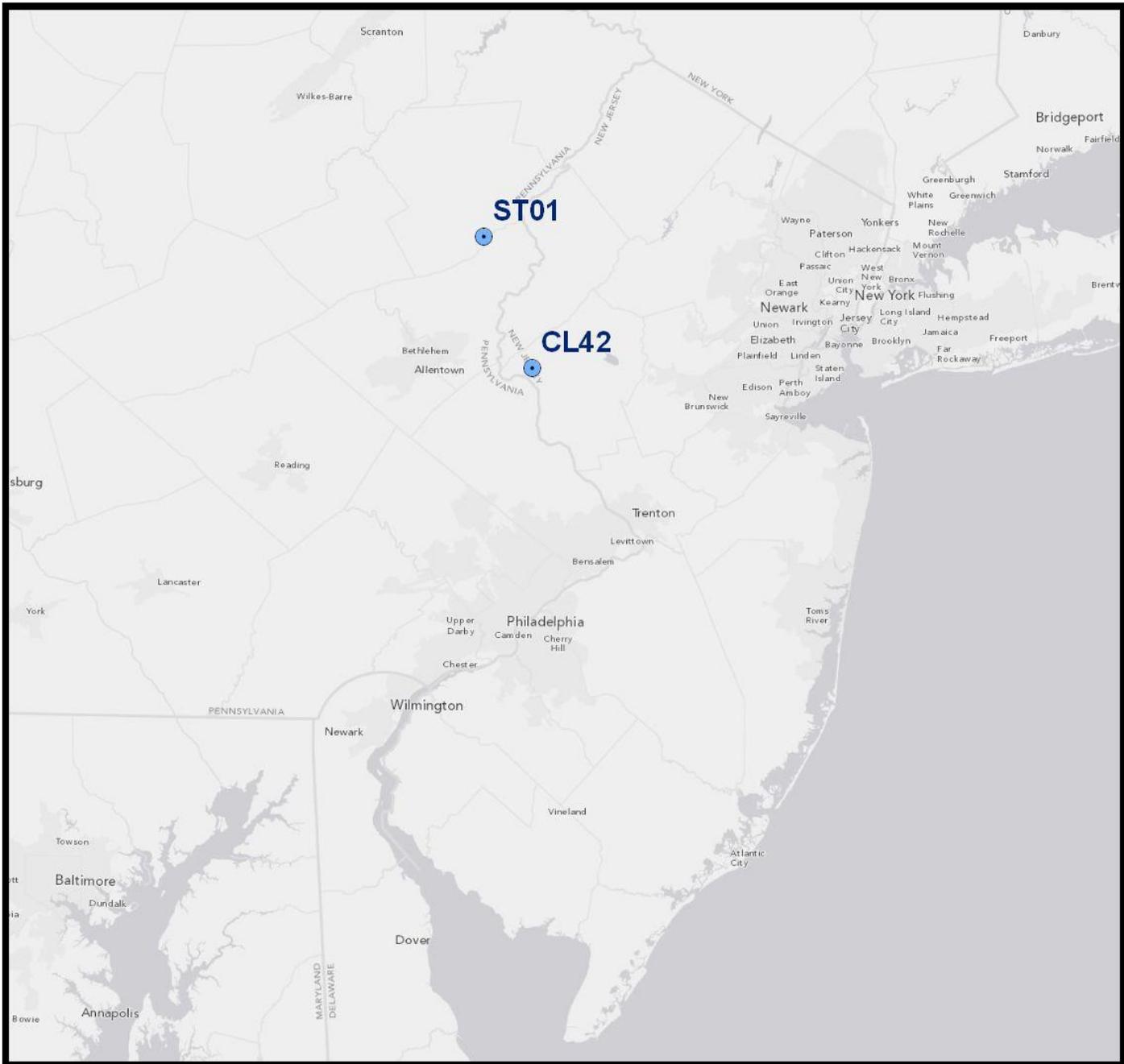
# Band Number 1493-94750

- Adult male banded 6/21/09 in Allentown, PA
- Recaptured 5/24/2011 at ENSP nest box AV55
  - ~ 24 miles from previously known breeding site
  - Nesting attempt failed



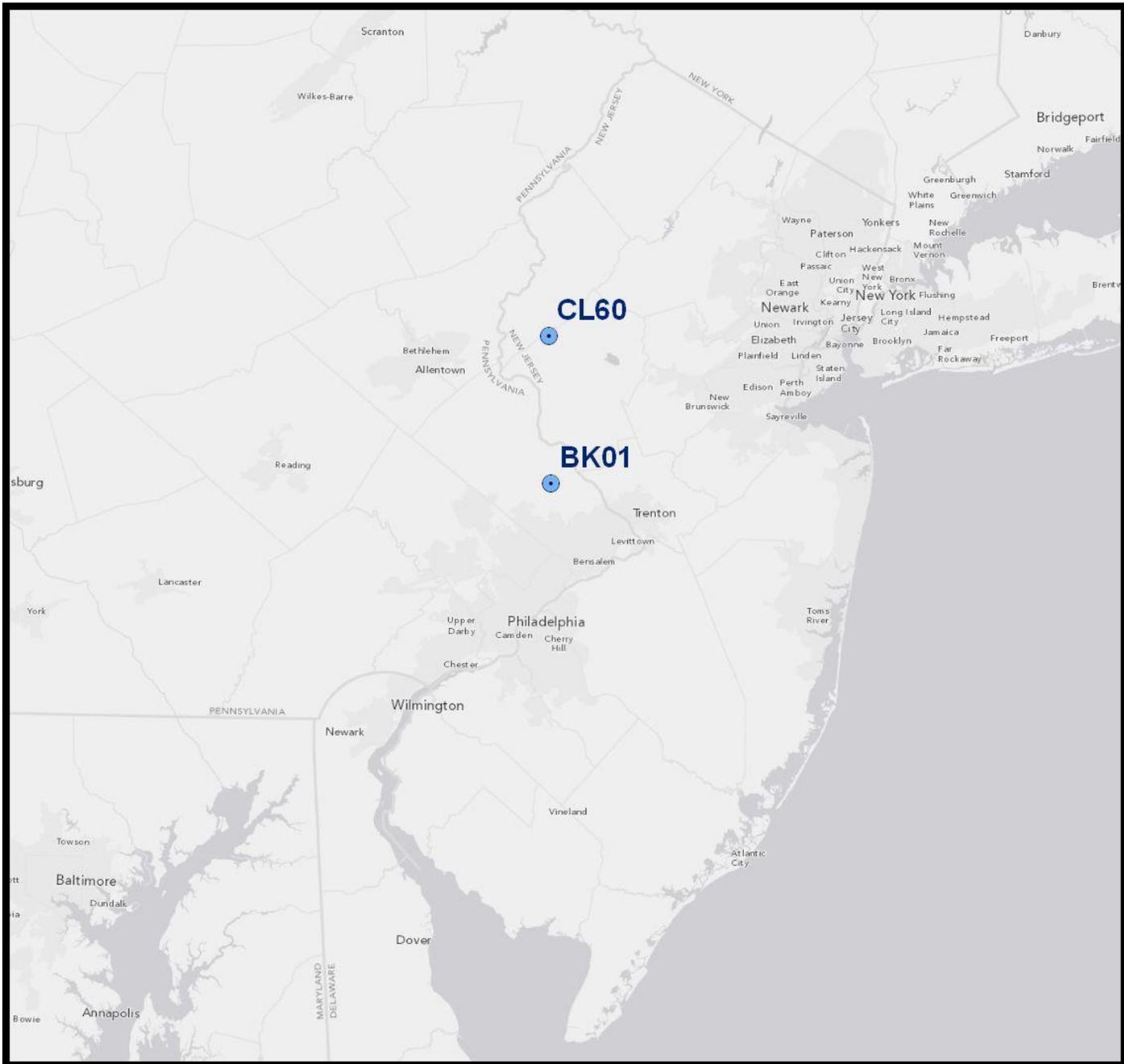
# Band Number 1443-35128

- Male young banded 7/4/07 in Stroudsburg, PA
- Recaptured 5/19/09 at ENSP nest box CL42
  - ~ 25 miles from natal site
  - Nesting attempt failed



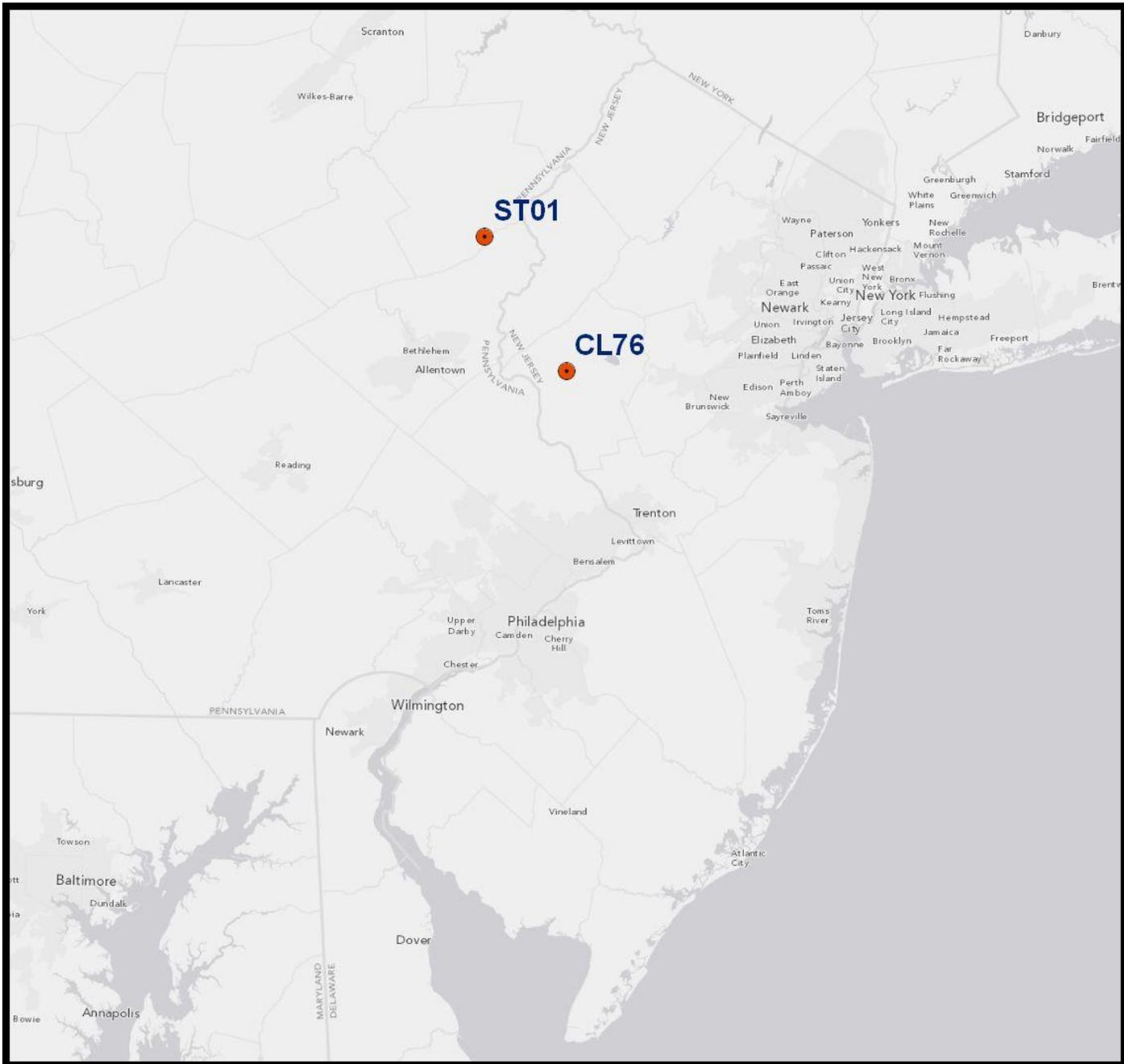
# Band Number 1623-38215

- Male young banded 6/24/11 in Buckingham, PA
- Recaptured 5/17/12 at ENSP nest box CL60
  - ~ 25 miles from natal site
  - Fledged 4 young



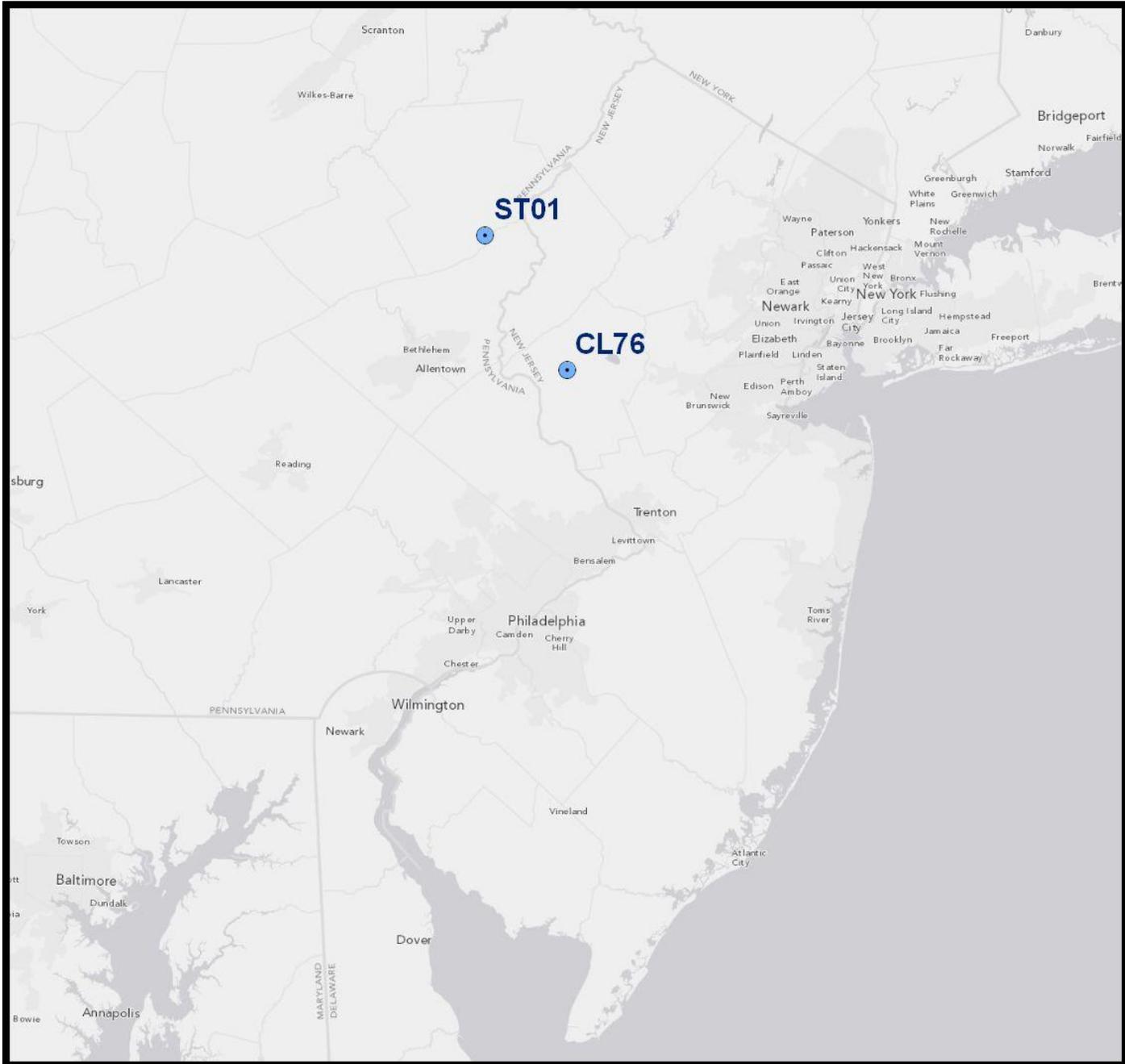
# Band Number 1443-35235

- Female young banded 6/15/08 in Stroudsburg, PA
- Recaptured 6/15/09 at ENSP nest box CL76
  - ~ 27 miles from natal site
  - Nesting attempt failed



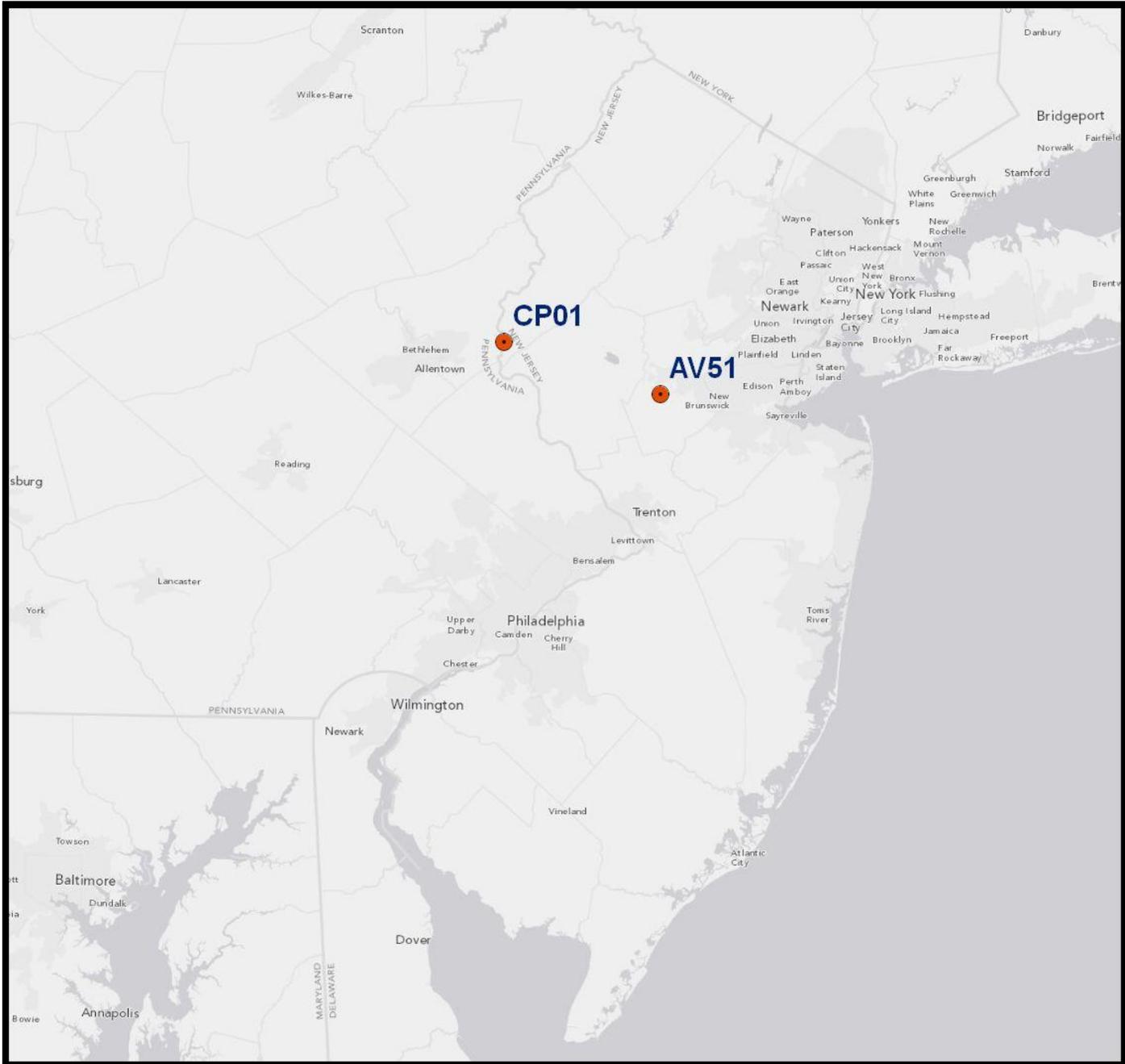
# Band Number 1443-35255

- Male young banded 6/17/08 in Stroudsburg, PA
- Recaptured 5/19/09 at ENSP nest box CL76
  - ~ 27 miles from natal site
  - Nesting attempt failed



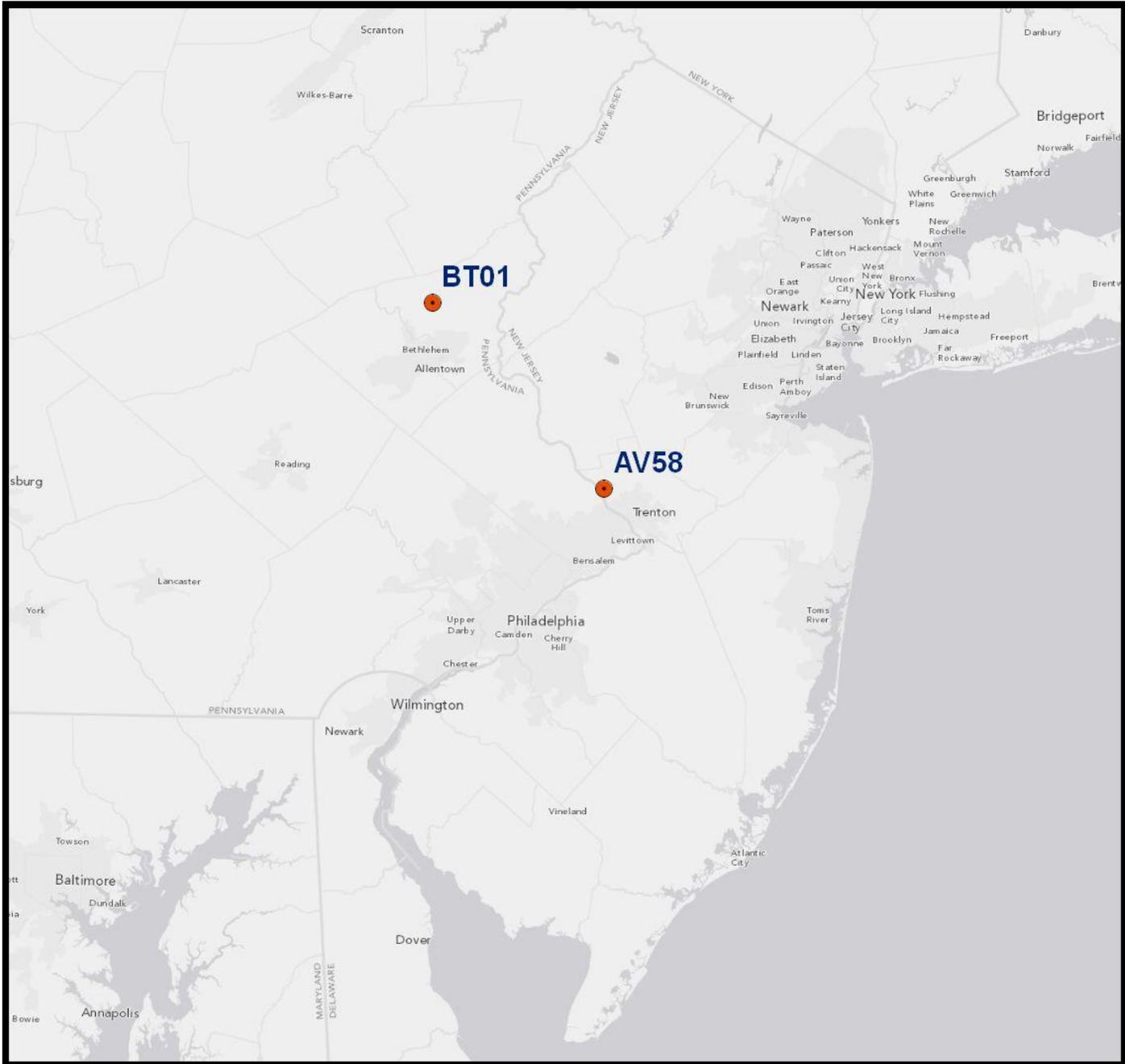
# Band Number 1593-82811

- Female young banded on 6/5/06 in Carpentersville, NJ
- Recaptured 5/17/07 at ENSP nest box AV51
  - ~ 29 miles from natal site
  - Nesting attempt failed



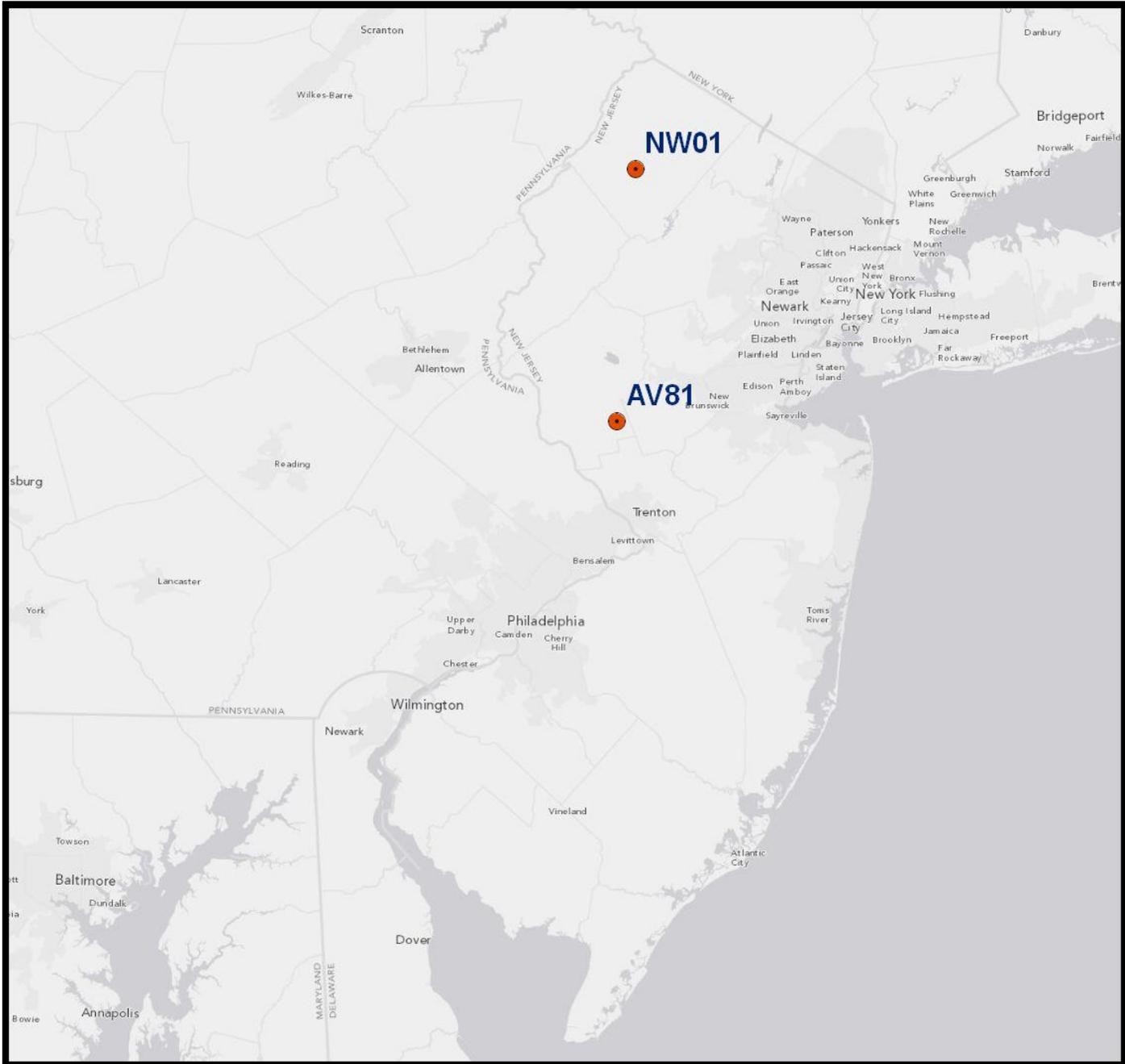
# Band Number 1593-54802

- Female young banded 7/2/09 in Bath, PA
- Recaptured 5/21/12 at ENSP nest box AV58
  - ~ 43 miles from natal site
  - Fledged 4 young



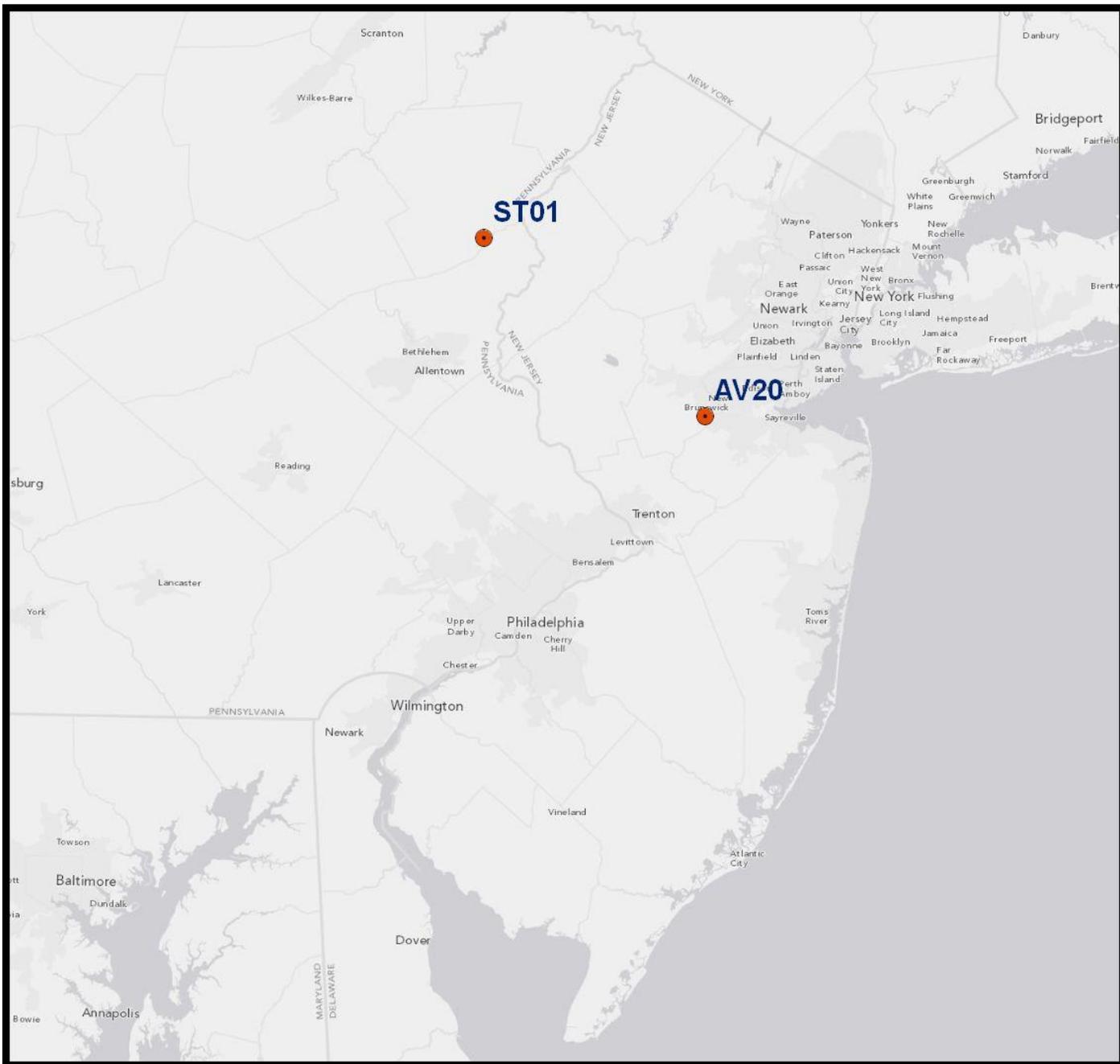
# Band Number 1623-16838

- Female young banded 6/29/11 in Newtown, NJ
- Recaptured 5/10/12 at ENSP nest box AV81
  - ~ 43 miles from natal site
  - Fledged 5 young



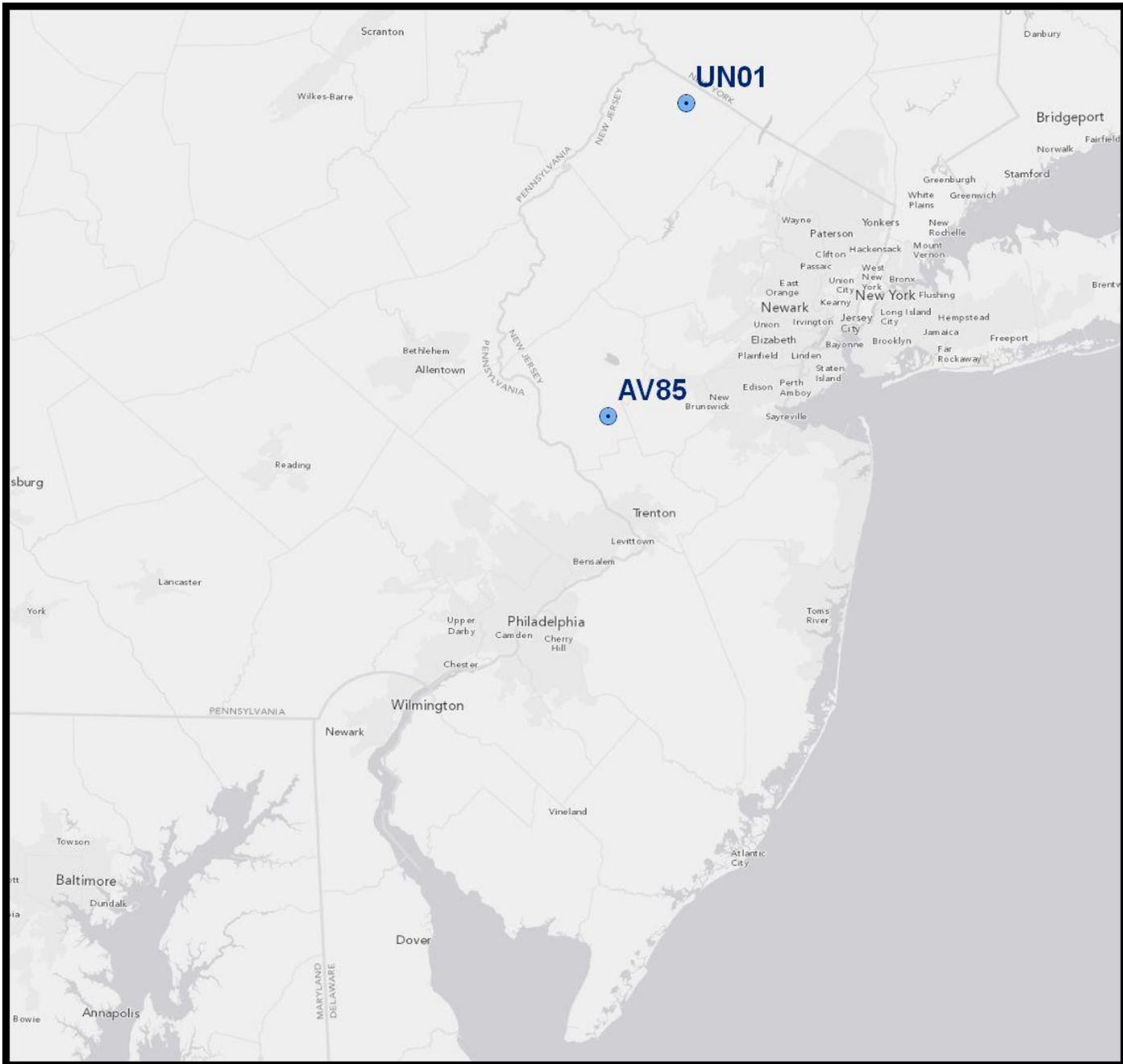
# Band Number 1783-10836

- Female adult banded 5/24/10 In Stroudsburg, PA
- Recaptured 5/7/12 at ENSP nest box AV20
- ~ 49 miles from previously known breeding site
- Fledged 5 young



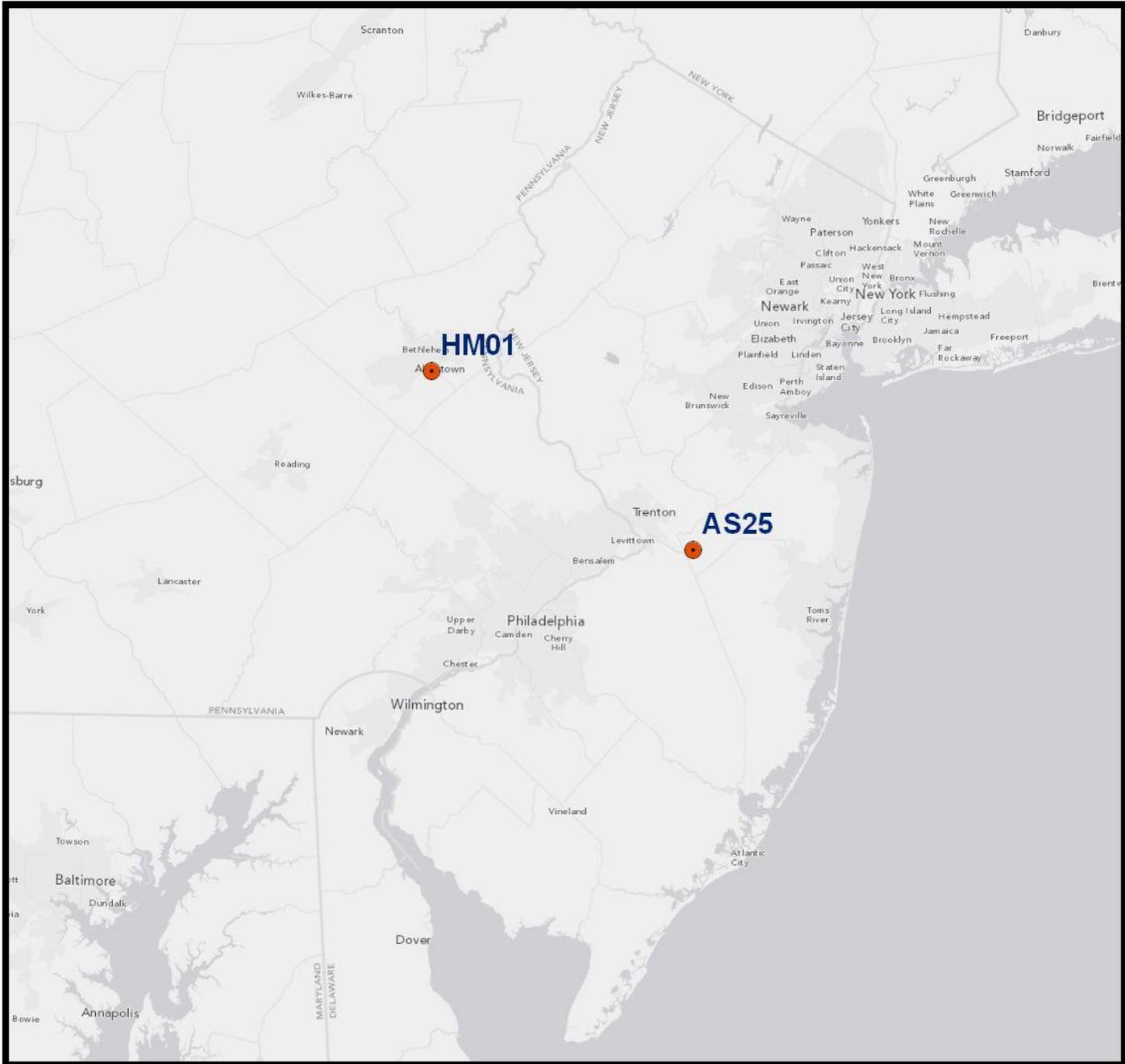
# Band Number 1593-82830

- Male young banded 6/13/06 in Unionville, NJ
  - Orange patagial tag “}” affixed
- Recaptured 5/17/07 at ENSP nest box AV85
  - ~ 55 miles from natal site
  - Fledged 4 young



# Band Number 1493-94735

- Female young banded 6/28/08 in Allentown, PA
- Recaptured 6/2/09 at ENSP nest box AS25
  - ~ 55 miles from natal site
  - Nesting attempt failed



# Band Number 1623-37922

- Female young banded 6/22/07 in New Milford, CT
- Recaptured 5/2/12 at ENSP nest box AV37
  - ~ 95 miles from natal site
  - Fledged 2 young



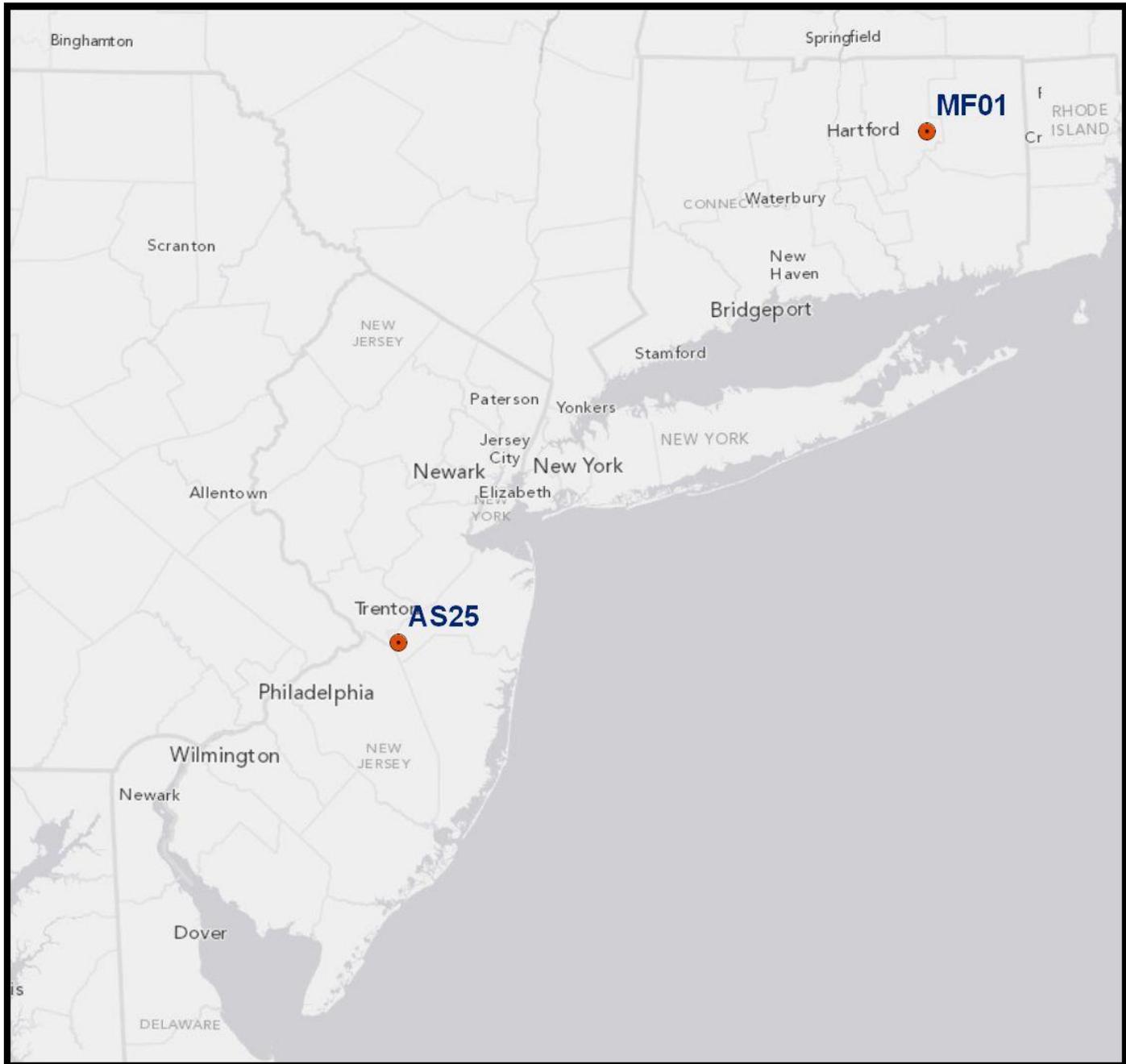
# Band Number 1623-43709

- Male young banded 6/26/08 at ENSP nest box AV58
  - Recaptured 8/21/12 in Orange, CT
    - ~ 118 miles from natal site



# Band Number 1623-19220

- Female young banded 7/5/11 at ENSP nest box AS25
  - Recaptured 5/21/12 in Mansfield, CT
    - ~ 166 miles from natal site



# Band Number 1783-21842

- Female young banded 6/28/11 at ENSP nest box AV83
- Found dead on road 9/6/11 in Lively, Virginia
  - ~ 208 miles traveled from natal site

