

# Effects of deer overabundance on bird populations in the Long Island Central Pine Barrens

Raffaele Vesia, Department of Earth and Marine Sciences, Dowling College, Oakdale, NY 11769

Timothy Green and Jennifer Higbie, Department of Environmental Health and Safety, Brookhaven National Laboratory, Upton, NY 11973

Fred Rispoli, Department of Mathematics and Computer Science, Dowling College, Oakdale, NY 11769

## Abstract

A recorded increase in the white-tailed deer population over the last thirty years and its effects on the bird population is being investigated in Brookhaven National Laboratory. To study this relationship, counts of birds and deer recorded from the years 2000 to 2014 have been obtained. We have found that there is no significant impact of deer overabundance on the counts of birds. relevance of this investigation to the Department of Energy's mission is to assist Brookhaven National Laboratory's stewardship of the land it uses for certain activities such as deer culls. I learned how to conduct regression and correlation tests in Microsoft Excel and paired t, two-tailed t, and Mann-Whitney tests in Minitab.

## Introduction

Deer overabundance has been recently recognized as a problem affecting a large portion of the northeastern United States (United States Department of Agriculture 2014). Deer populations at the time of European settlement ranged from 8 to 20 per square mile (Research Review 2012). The deer populations in northeastern United States forests were kept at these levels into the late 1800s and early 1900s. Subsequently, the deer population has increased dramatically, especially in New York State since 1985. The United States Department of Agriculture has identified a target density of 20 deer per square mile and The Office of Environmental Protection at Brookhaven National Laboratory has a target density range of between 10 and 30 deer per square mile. However, counts of deer recorded at Brookhaven National Laboratory and in New York State have exceeded the target deer density range. In New York State, one possible consequence of deer overabundance is a decline in bird populations (figure 1). The incidence of deer overabundance at Brookhaven National Laboratory may be related to impacts on the population of birds there as well.

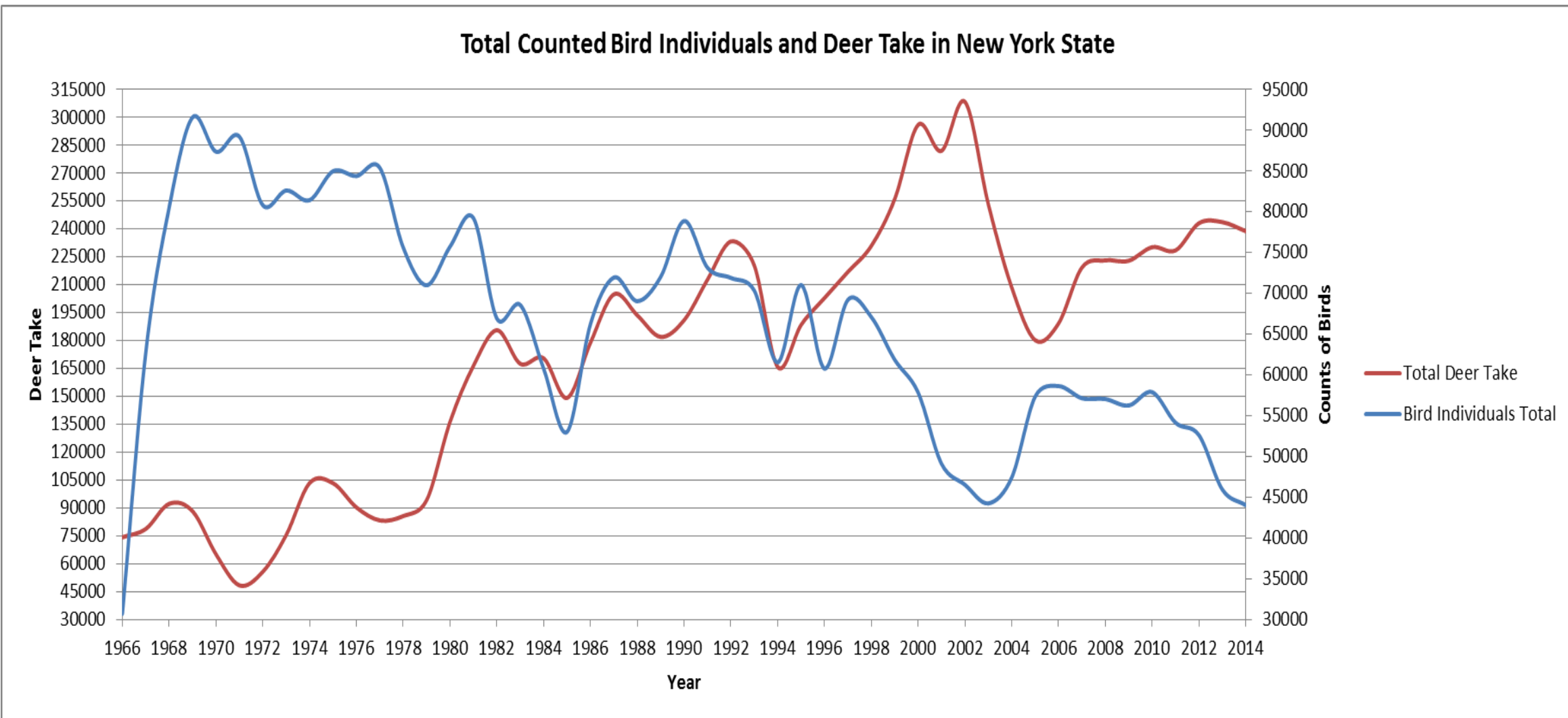


Figure 1. Line graph of total counts of birds and deer take in New York State.

The construction of the solar farms at Brookhaven National Laboratory between the years 2010 and 2011 may have affected the population of birds. The clearing of trees in the Biology Fields to create space for solar farm construction may have adversely affected the canopy nesting bird populations. Additionally, ground nesting birds may have proliferated due to the increased availability of treeless land and vegetation that could be used for inhabitation. The counts of birds by nesting types in the years before and after the solar farms were construction were examined. In early April 2012, there was a wildfire in the first North Transect and first, second, and third Z-Paths at Brookhaven National Laboratory. The wildfire had burned away vegetation on the ground floor of the forests and burned down trees, leaving behind stands of dead trees after the fire had dissipated. In that case, the wildfire may have impacted the populations of birds at these areas. The counts of birds in the years before and after the wildfire were examined. Changes in the counts of birds by all four nesting types were examined for fifteen year intervals between the years 2000 and 2014 in New York State, Eastern Long Island, and Brookhaven National Laboratory. It was hypothesized that the counts in nesting birds have changed over time.

## Materials and Methods

Data containing counts of deer and birds were obtained from the Waste Management Division at Brookhaven National Laboratory (Green and Higby, unpublished data 2014). Both sets of data were collected from the years 2000 to 2014. Other counts of deer and birds in New York State were obtained from the New York State Department of Environmental Conservation and from the North American Bird Breeding Survey, respectively. Bird counts for Eastern Long Island were also collected as well. Bird counts were recorded from the years 1966 to 20145 (North American Bird Breeding Survey 2015). Deer counts were recorded from the year 1954 to the year 2014 (New York State Department of Environmental Conservation 2015). Datasets containing counts of birds and deer were organized on a Microsoft Excel spreadsheet. Bird counts were classified by using the North American Bird Breeding Survey and the Cornell Lab of Ornithology websites. The nesting types were classified as ground, canopy, cavity, and treetop nesting birds. Counts of birds were summed by total number of birds, bird species, and by each nesting type in every recorded year. Counts of deer collected at Brookhaven National Laboratory had already been classified by the season they were recorded at for each year. Deer counts for each season were summed together to represent the total counts of deer for the entire year. All datasets were analyzed in Microsoft Excel 2010 and Minitab 17.

## Results and Discussion

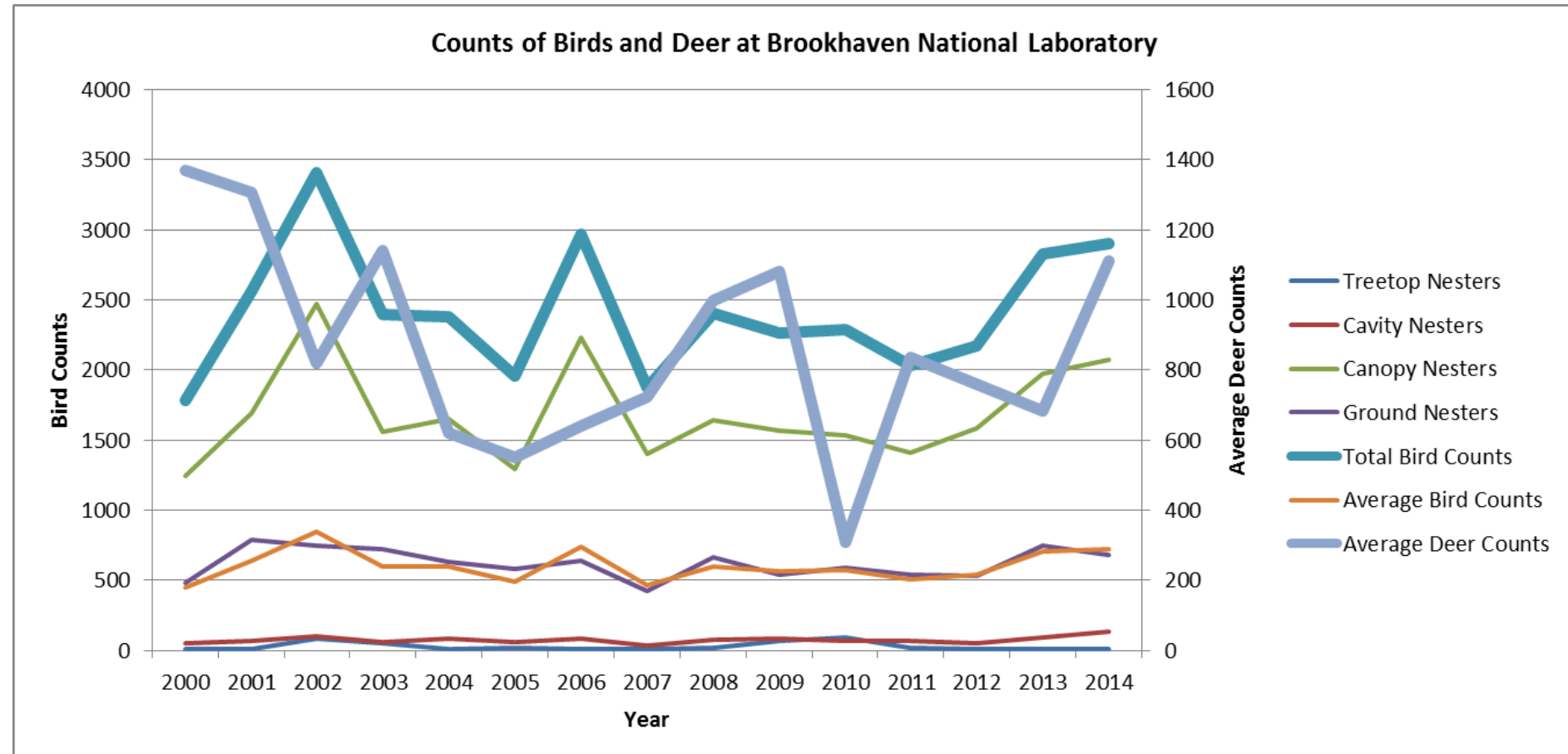


Figure 2. Chart with counts of birds and deer recorded at Brookhaven National Laboratory.

There appears to be a relationship between changes in bird counts and changes in deer counts. A similar relationship is also apparent in canopy nesting birds.



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science



**BROOKHAVEN**  
NATIONAL LABORATORY

**DOWLING COLLEGE**  
LONG ISLAND, NEW YORK

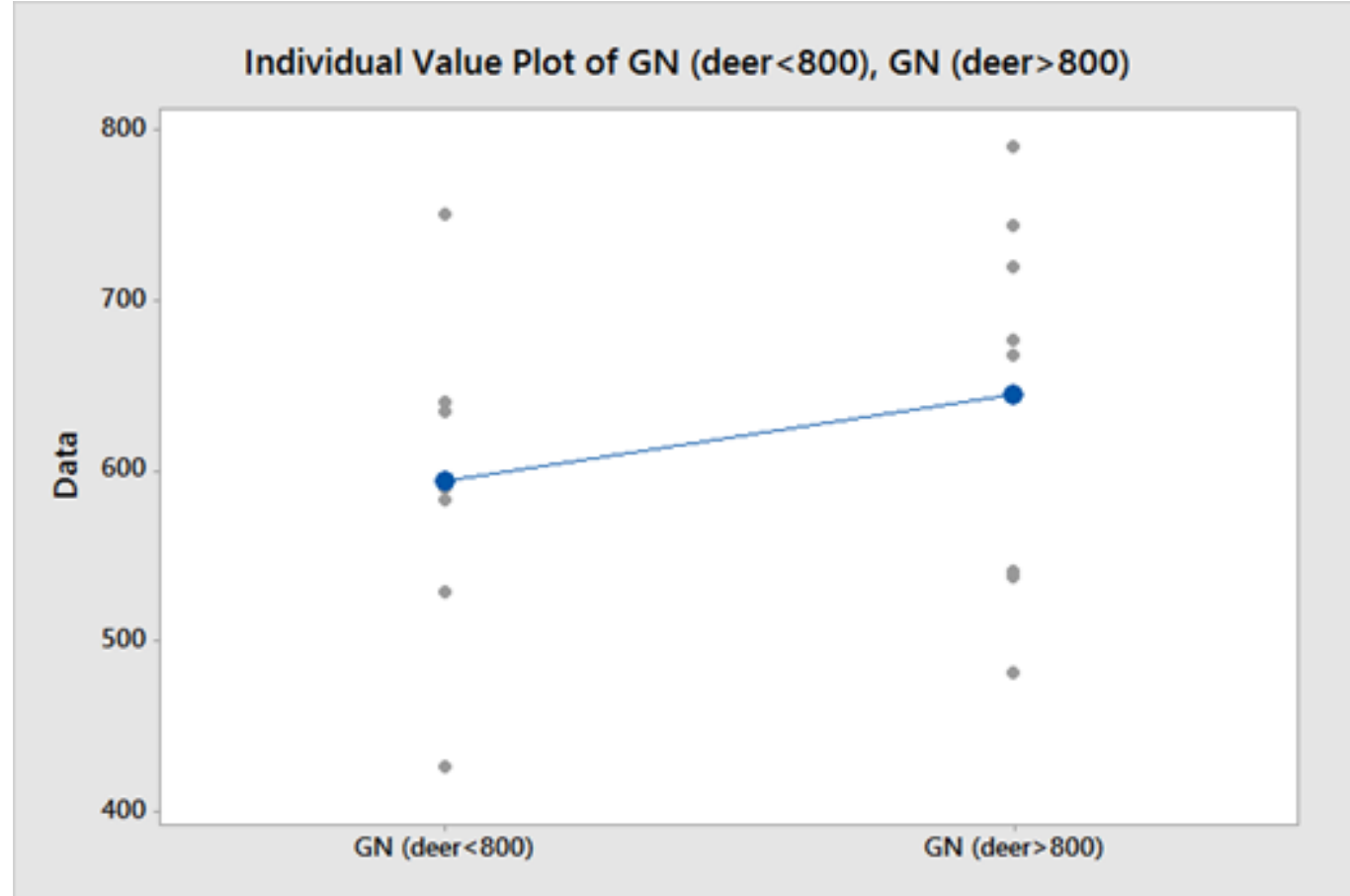


Figure 3. Not a statistically significant test (p-value= 0.368). The results of the two-tailed t-test indicate that there is no significant difference between the counts of ground nesting birds on years when there are less than 800 counts of deer and on years when there are greater than 800 counts of deer. This may suggest that ground nesting birds are not being affected by higher or lower counts of deer.

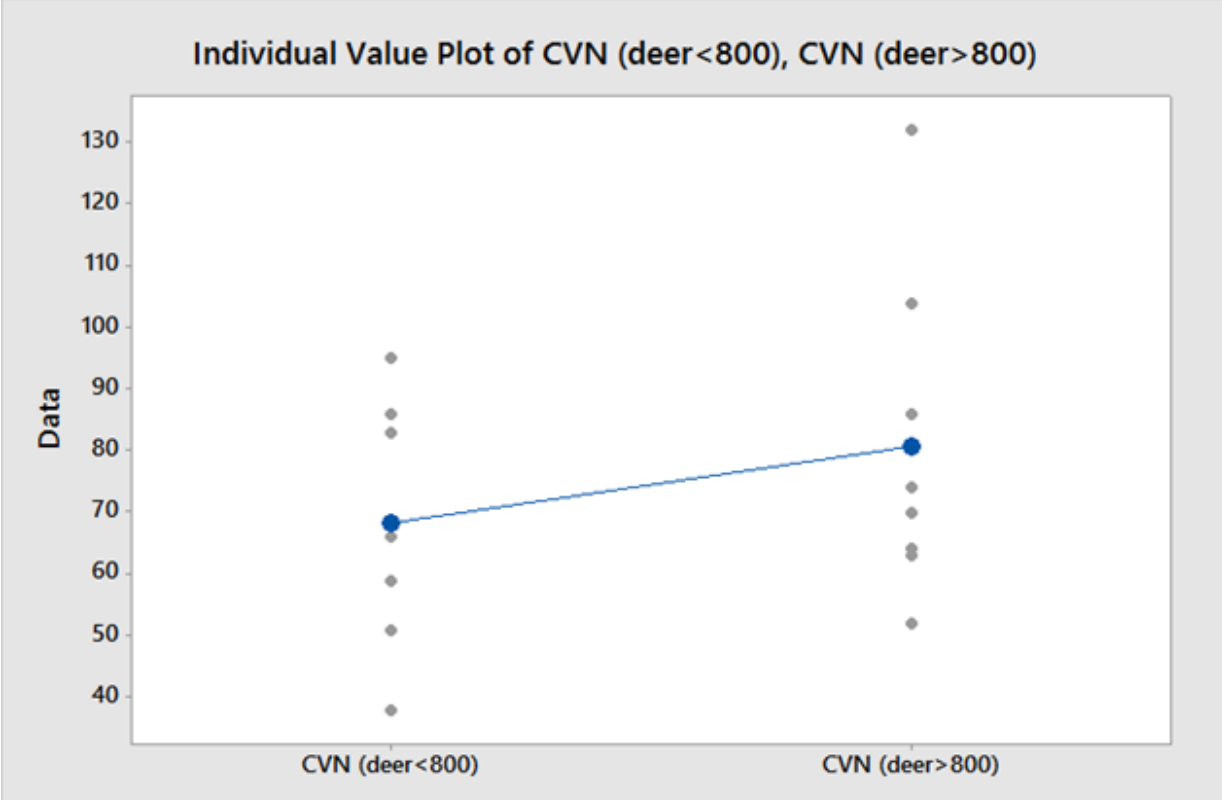


Figure 5. Not a statistically significant test (p-value= 0.327). The results of the two-tailed t-test indicate that there is no significant difference between the counts of cavity nesting birds on years when there are less than 800 counts of deer and on years when there are greater than 800 counts of deer. This may suggest that cavity nesting birds are not being affected by higher or lower counts of deer.

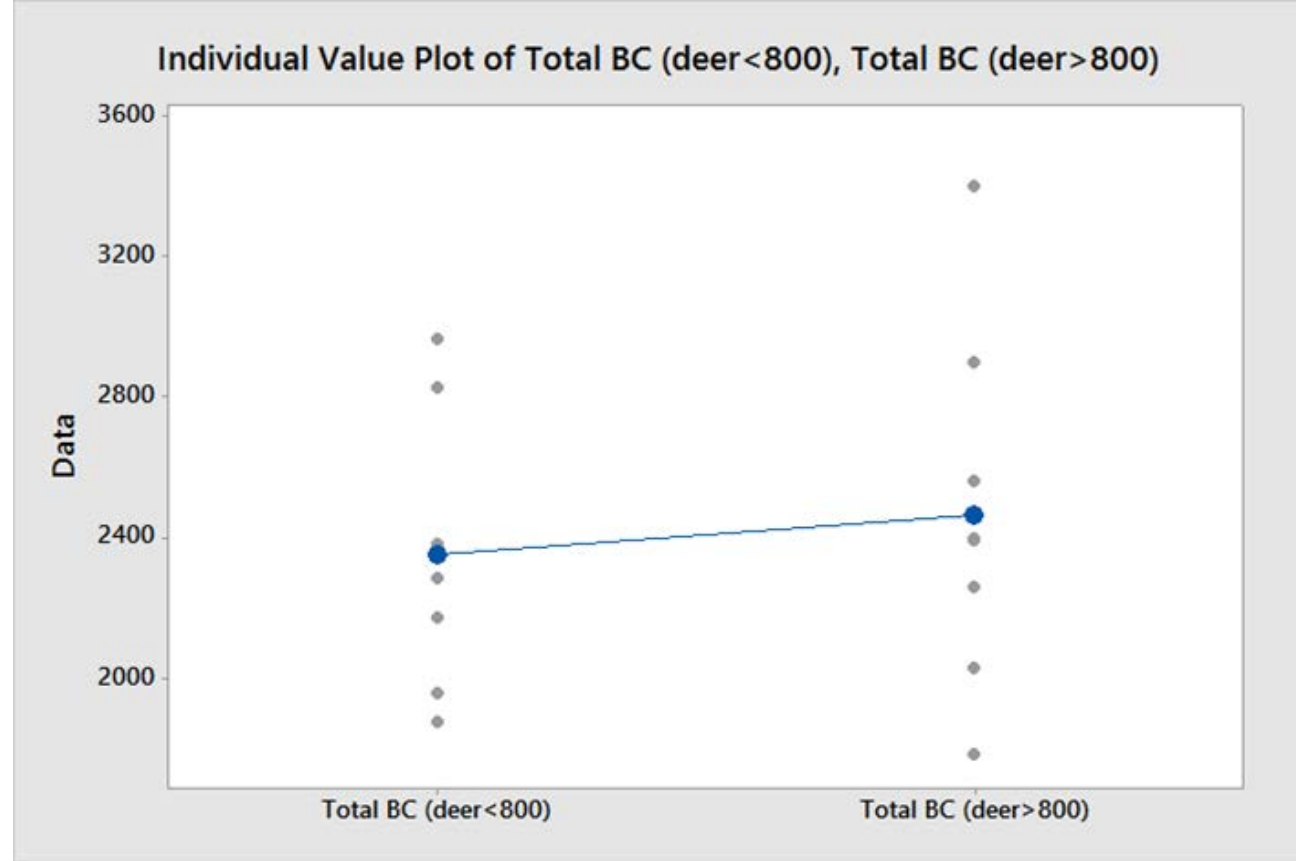


Figure 7. Not a statistically significant test (p-value= 0.640). The results of the two-tailed t-test indicate that there is no significant difference between the total counts of birds on years when there are less than 800 counts of deer and on years when there are greater than 800 counts of deer. This may suggest that the total counts of birds are not being affected by higher or lower counts of deer.

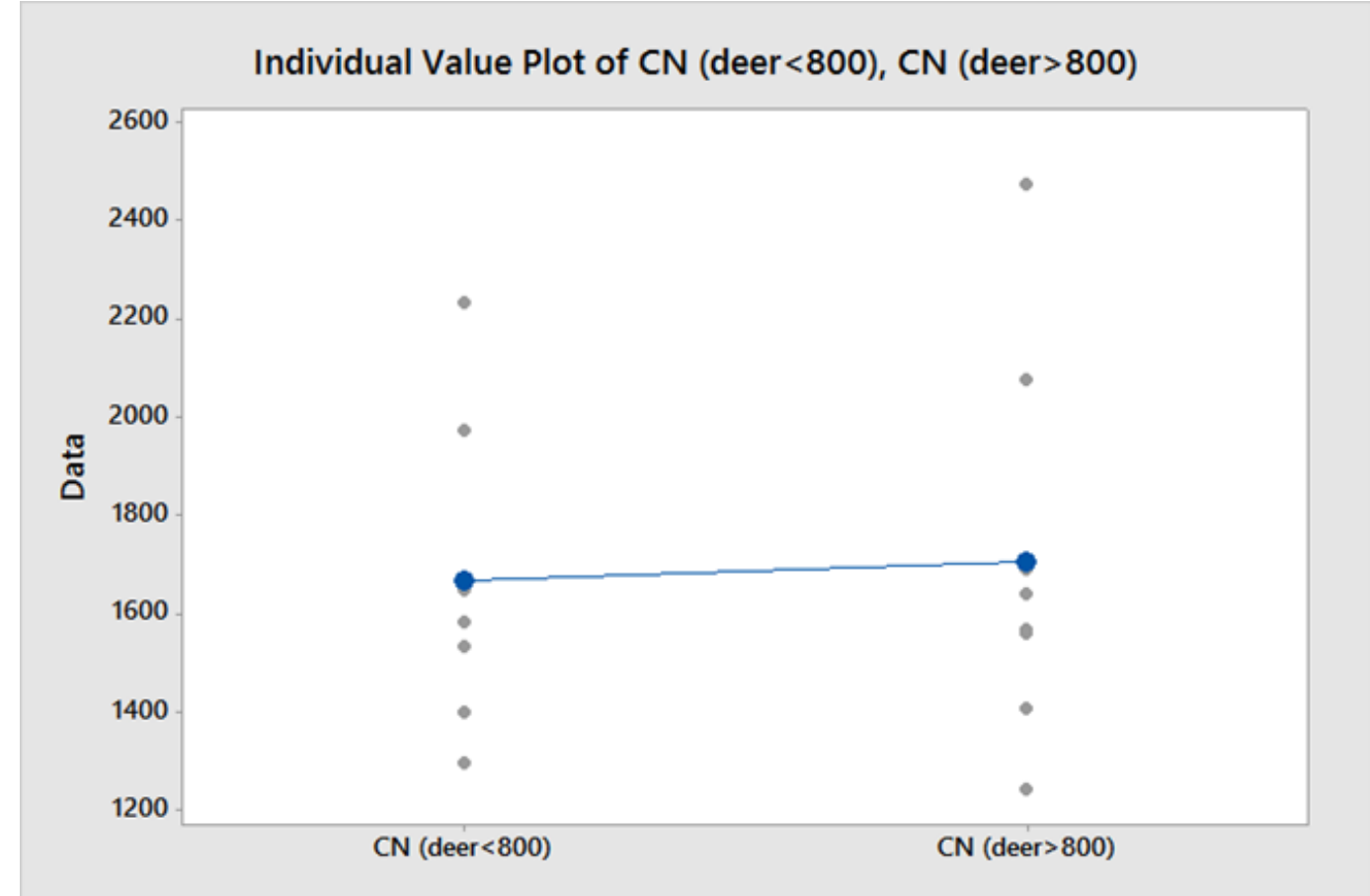


Figure 4. Not a statistically significant test (p-value= 0.832). The results of the two-tailed t-test indicate that there is no significant difference between the counts of canopy nesting birds on years when there are less than 800 counts of deer and on years when there are greater than 800 counts of deer. This may suggest that canopy nesting birds are not being affected by higher or lower counts of deer.

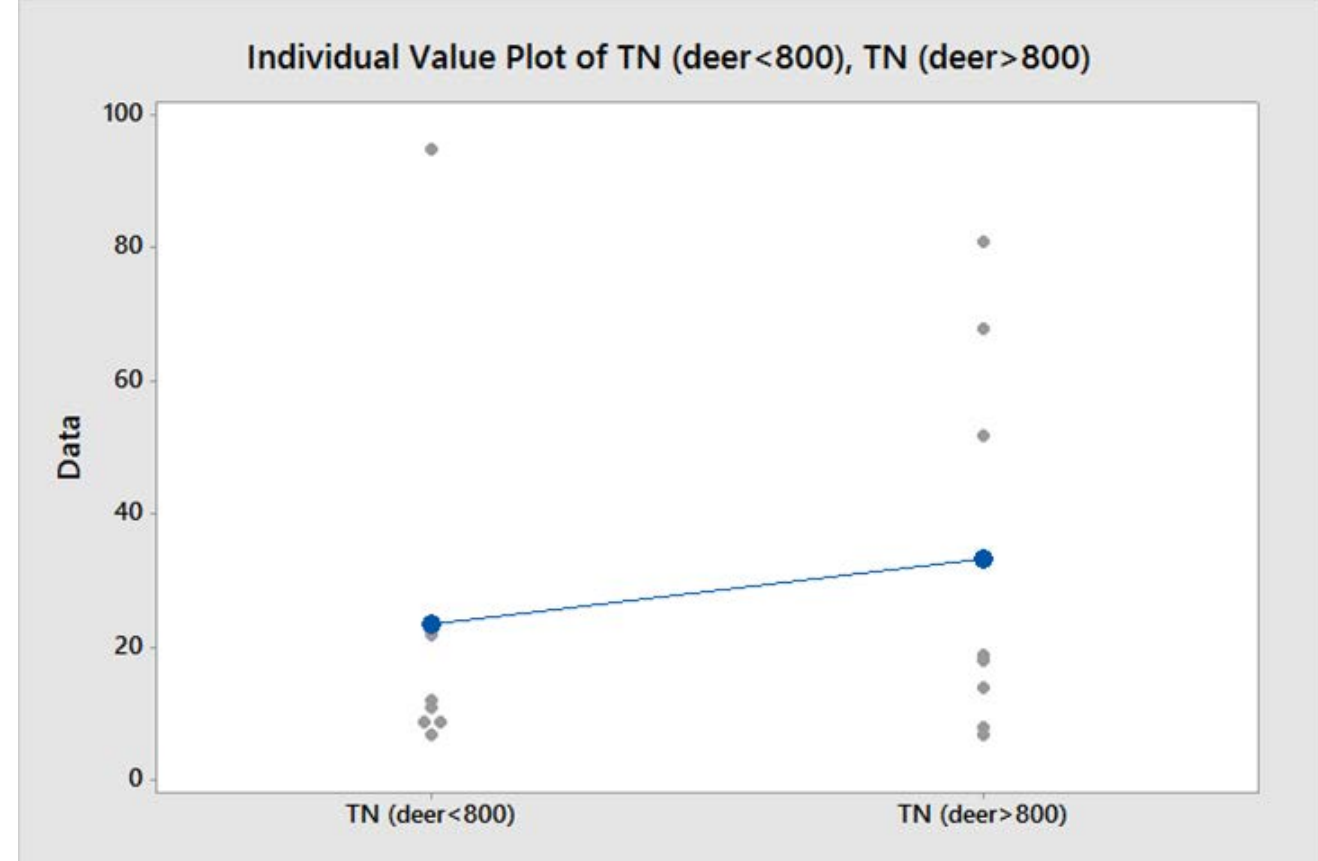


Figure 6. Not a statistically significant test (p-value= 0.548). The results of the two-tailed t-test indicate that there is no significant difference between the counts of treemap nesting birds on years when there are less than 800 counts of deer and on years when there are greater than 800 counts of deer. This may suggest that treemap nesting are not being affected by higher or lower counts of deer.

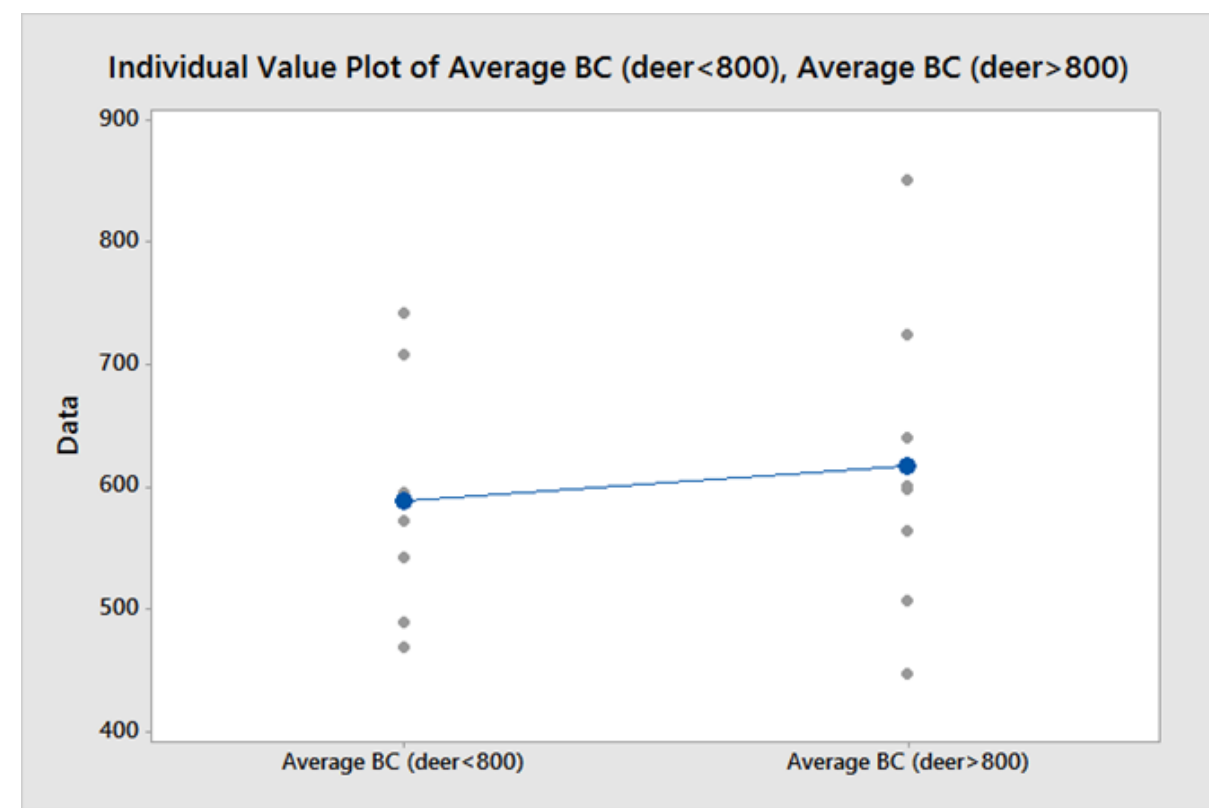


Figure 8. Not a statistically significant test (p-value= 0.639). The results of the two-tailed t-test indicate that there is no significant difference between the average counts of birds on years when there are less than 800 counts of deer and on years when there are greater than 800 counts of deer. This may suggest that the average counts of birds are not being affected by higher or lower counts of deer.

There was no significant difference between the changes in the total counts of birds before and after the solar farms were constructed (p-value= 0.899). This relationship also does not exist for counts of ground (p-value= 0.394), canopy (p-value= 0.649), cavity nesting birds (p-value= 0.696), and treemap nesting birds (p-value= 0.6650). This may imply that the construction of the solar farms did not significantly impact nesting birds in the Biology Fields at Brookhaven National Laboratory. There is a relationship between the average counts of total bird species before and after the wildfire at Brookhaven National Laboratory. The average counts of bird species after the fire are significantly less than the average counts of bird species before the fire had occurred at North Transect 1 and at Z-Paths 1,2, and 3 (p-value= 0.007). It might be possible that losses of plants by the wildfire may have disallowed some bird species to nest. Although the average counts of ground nesting birds had increased after the wildfire in 2012, there is no significant difference between the average counts of ground nesting birds before and after the wildfire at Brookhaven National Laboratory (p-value= 0.533). The average counts of ground nesting bird species before the wildfire were significantly greater than after the wildfire (p-value= 0.015). This relationship may be attributed to the loss of plant composition on the forest floor by the wildfire. The average counts of canopy nesting birds (p-value= 0.030) and canopy nesting bird species (p-value= 0.023) are significantly greater before the wildfire than after the wildfire. This may indicate that canopy nesting birds were adversely affected by the wildfire because of the loss of trees. Brookhaven National Laboratory did not have any significant changes in the counts of birds by all four nesting types for over a fifteen year interval ( p-value= 0.332). Although there was a recorded increase in ground, canopy, and cavity nesting birds, there is no significant difference in the counts of birds by nesting types between the years 2000 and 2014. The lack of this relationship may be due to Brookhaven National Laboratory being a natural preserve for wildlife. These preserved areas such as forests and wetlands may provide habitat for a variety of bird species. Yet, in rest of New York State and Eastern Long Island, there are less preserved areas and more development of unprotected land, which reduces the amount of habitat for birds. This may account for the significant decreases in the counts of birds in New York State (p-value= 0.00) and on Eastern Long Island (p-value= 0.00).

## Conclusion

The overabundance of deer at Brookhaven National Laboratory are not having a significant impact on birds. More research must be done to determine what environmental variables are inducing changes in the bird counts at Brookhaven National Laboratory. Meanwhile, the construction of the solar farms at the Biology Fields did not have any significant impact on birds. However, the wildfire that had occurred in 2012 did significantly impact the number of bird species at the affected areas. Finally, the number of birds in New York State and Eastern Long Island have significantly changed over time, although they did not at Brookhaven National Laboratory.

## Acknowledgements

This project was supported in part by the U.S. Department of Energy, Office of Science, Office of Workforce Development for Teachers and Scientists (WDTS) under the Visiting Faculty Program (VFP).

## References

1. United States Department of Agriculture, Long Island White-tailed Deer Damage Management Demonstration Project Report. (August 2014). 1-21. Animal and Plant Health Inspection Service, Wildlife Services.
2. Research Review, US Forest Service Northern Research Station, No. 16, 2012
3. Green, Timothy and Higby, Jennifer, Flyover Population Analysis. (2014). [unpublished data]. Waste Management Division, Department of Environmental Health and Safety, Brookhaven National Laboratory, Upton, NY 11973
4. Green, Timothy, Bird BNL 2014. (2014). [unpublished data]. Waste Management Division, Department of Environmental Health and Safety, Brookhaven National Laboratory, Upton, NY 11973
5. Pardieck, K.L., D.J. Ziolkowski Jr., M.-A.R. Hudson., North American Breeding Bird Survey Dataset 1966 - 2014, version 2014.0. (2015). U.S. Geological Survey, Patuxent Wildlife Research Center. [www.pwrc.usgs.gov/BBS/RawData/](http://www.pwrc.usgs.gov/BBS/RawData/)
6. New York State Department of Environmental Conservation, Deer and Bear Harvests: White-tailed Deer. (2015). Outdoor Activities. <http://www.dec.ny.gov/outdoor/42232.html>