



# Investigating Changes in Land Cover, Habitat & Bird Biodiversity in a Lower Delaware Watershed Town; Haddonfield, NJ from late 1800s to 2012

**Rosy Tucker;**  
Environmental Science Student,  
Haddonfield Memorial HS/Rutgers University  
**Ron Smith; Advisor,**  
Haddonfield Memorial HS  
Environmental Science Program

## Abstract

Much of the lower Delaware Watershed in NJ has undergone significant landscape changes over the last century. Extensive natural areas, first converted for agriculture, have become swallowed by suburban expansion. Current research informs us of the impacts of habitat loss and fragmentation on native wildlife, but seldom does the opportunity arise to establish specific landscape changes within a defined region and documentation of the corresponding effects on a particular group of species.

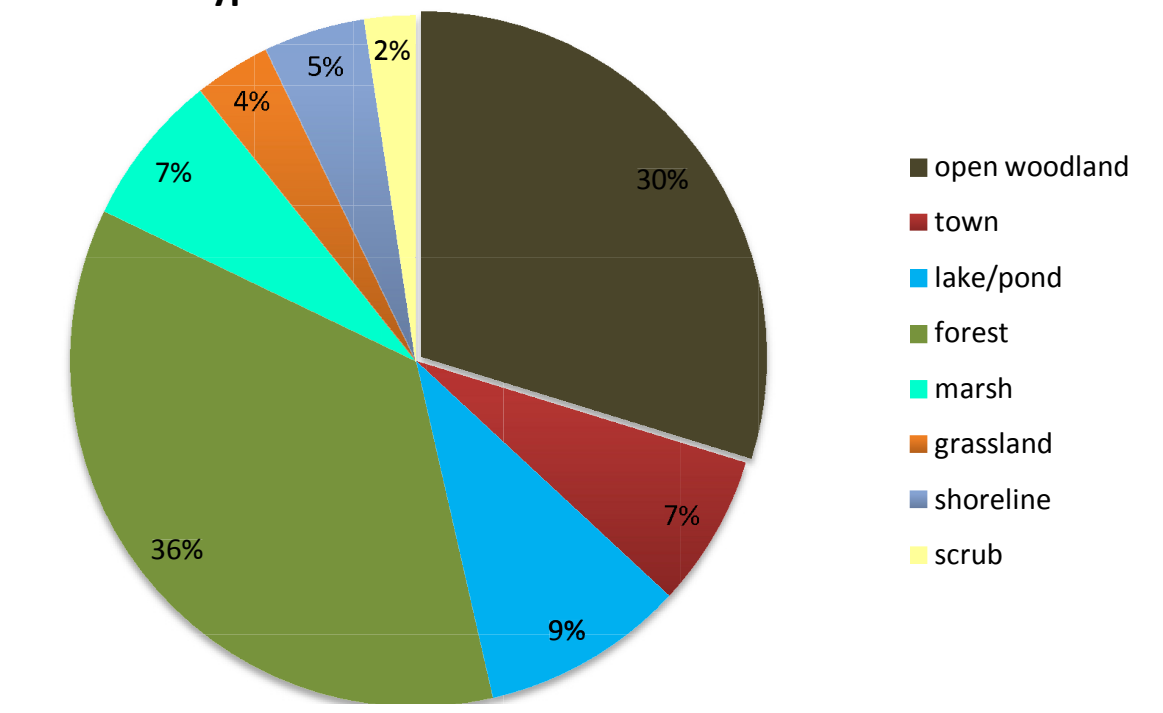
Birds are excellent indicator species as they are omnipresent, relatively easy to identify, often dependent on specific habitats and have been studied more extensively than most other groups of organisms. From the Historical Society of Haddonfield and the Philadelphia Academy of Natural Sciences of Drexel University, we accessed bird biodiversity and habitat data and documents from naturalist Samuel Rhoads, a collector for the Academy, for Haddonfield from the late 1800s to draft a list of species present from that time frame. Over a two year period we observed and documented species present from the same sites visited by Rhoads as well as adjacent locales to establish a modern comparison. Using journal entries, historic maps and property

descriptions we were able to generate a GIS map of Haddonfield land cover for the late 1800s. Land cover types were quantified and compared and bird lists were examined in light of available and quality habitat. Loss and changes in avian diversity were identified and quantified.

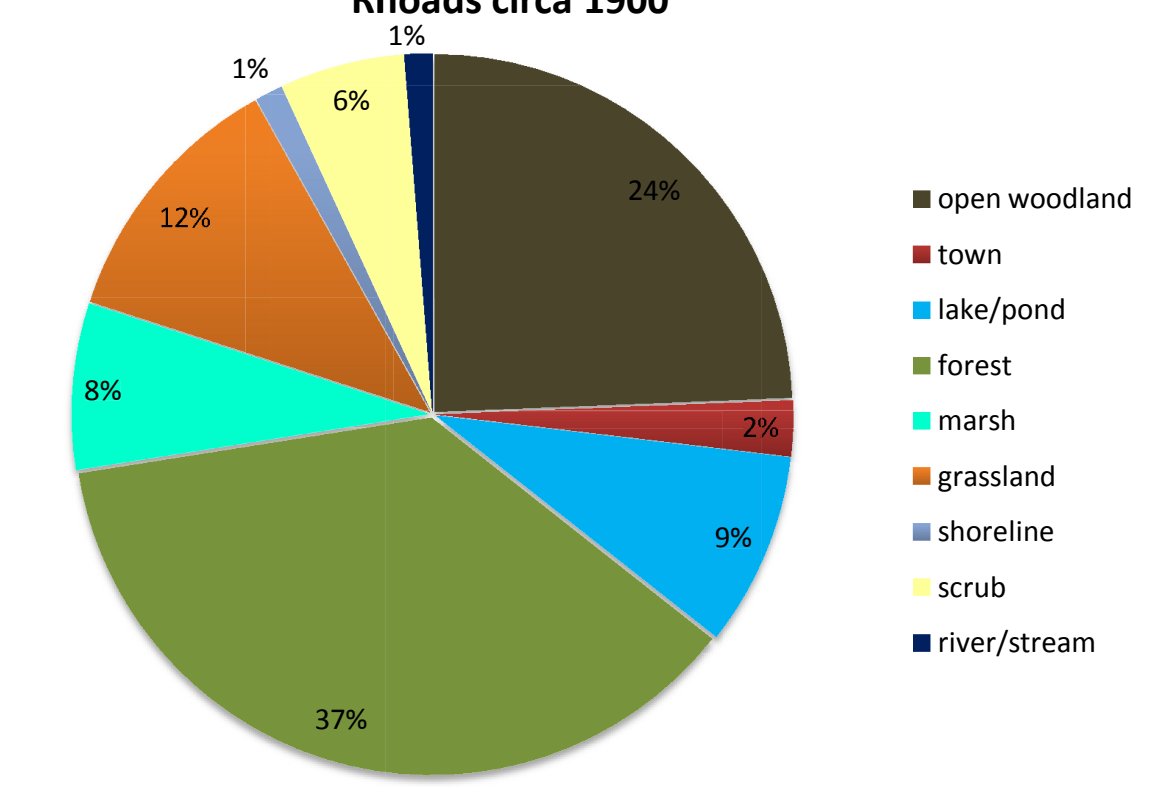
With the extent of anthropogenic disturbance to natural systems throughout the Delaware Watershed we suggest that investigating and revealing specific case studies can serve as important historical, educational and scientific tools for municipalities and regions so that preservation imperatives will be developed to protect and manage remaining open space.



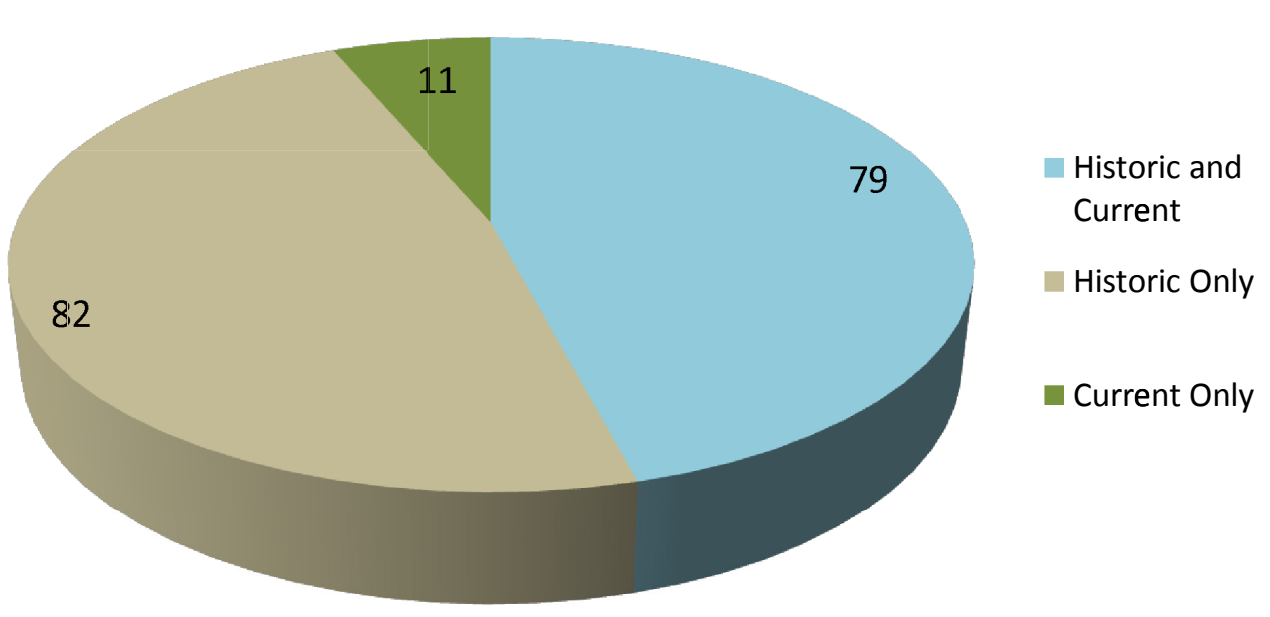
Habitat Type of Birds Found in Haddonfield 2010-12



Habitat Type of Birds Found in Haddonfield by Samuel Rhoads circa 1900



Birds Observed in Haddonfield; Comparison of Historic and Current Sightings (Total Species = 172)



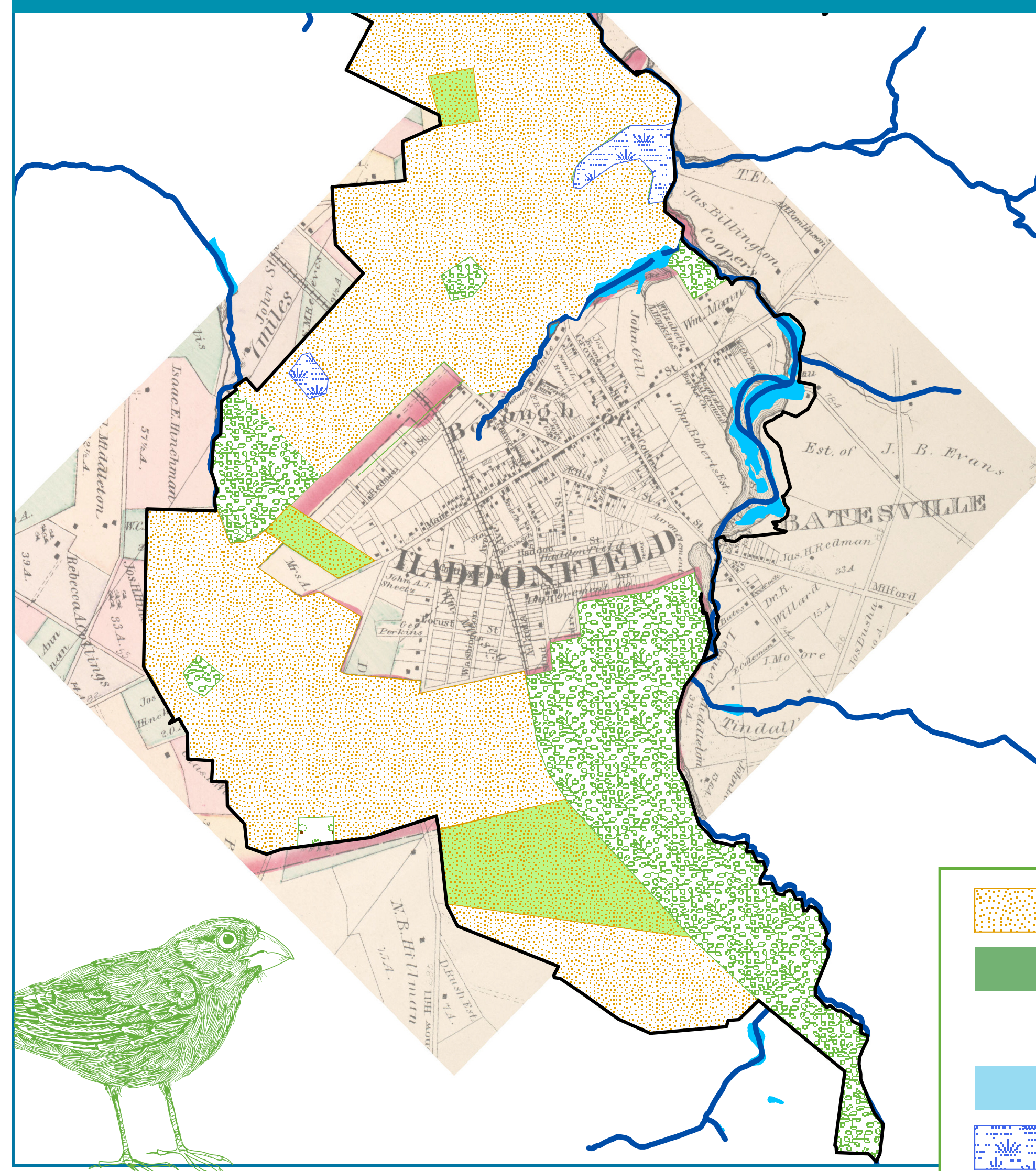
## Bird Species Richness Comparison

We provide here a list of species not observed by Rhoads in the late 19th and early 20th century. Analyses of these species reveals that human activity including climate change, introduction of non-native species, and land/ habitat conversion are the potential factors contributing to this difference in species richness.

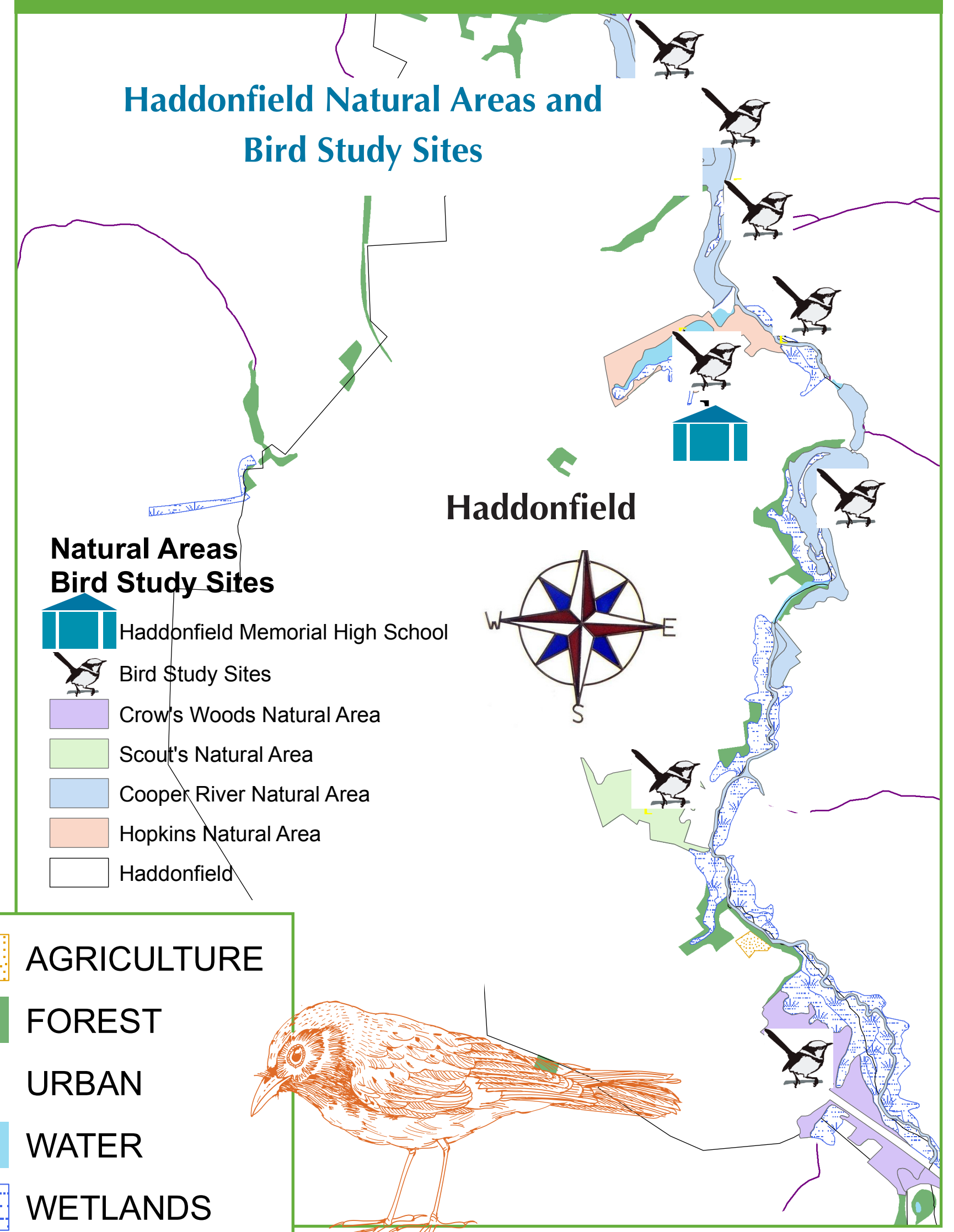
Also provided is a list of sample species catalogued by Rhoads in the late 19th / early 20th century which were not observed during our surveys. It is possible that some of these species may still be present in southern New Jersey, but their abundance was so low in our area that we did not see/ hear them. We propose that changes in habitat (reduction of forest cover and non-woody open space) is the main reason for the loss of many native bird species in our area.

A full list of bird species from the Rhoads and Tucker surveys is available upon request.

## Land Cover in Haddonfield Circa 1877

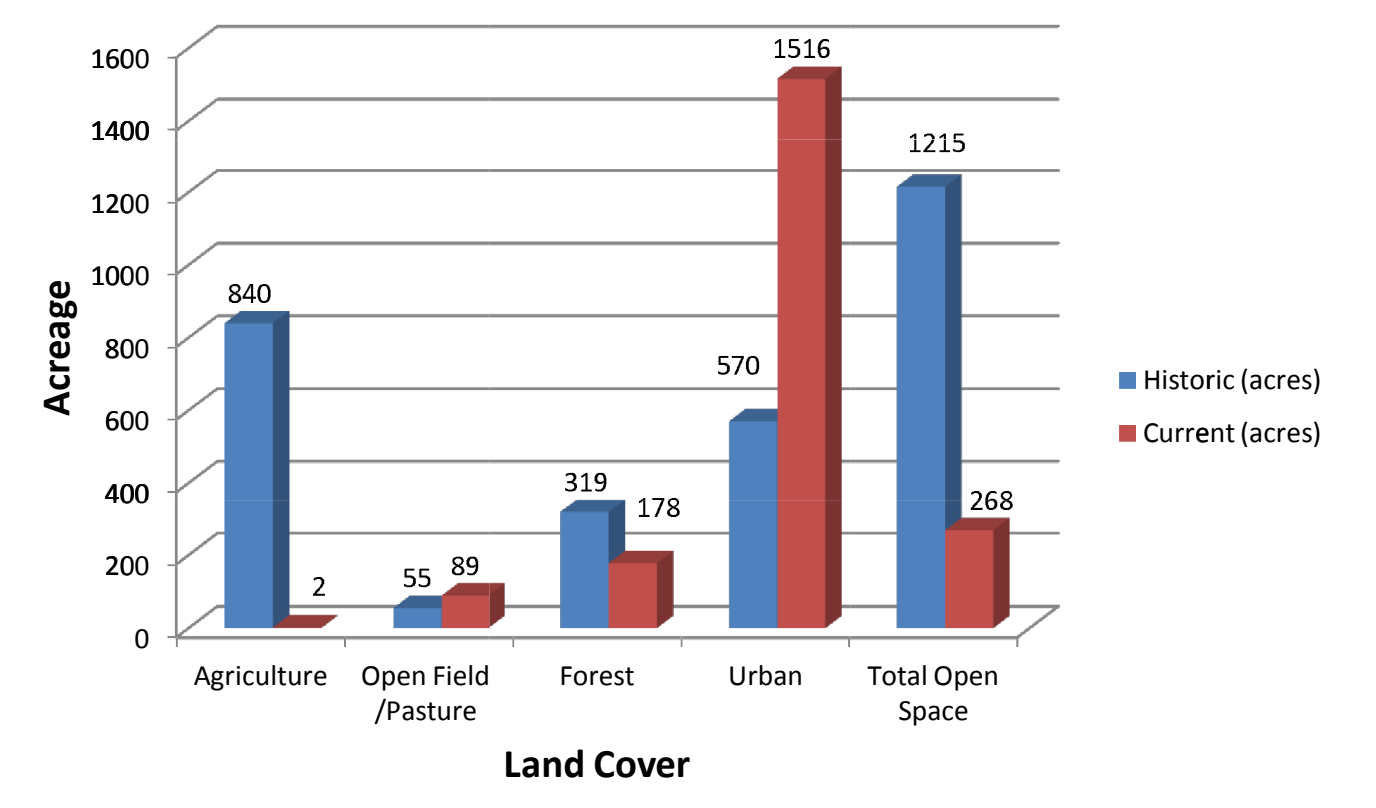


## Land Cover in Haddonfield 2012

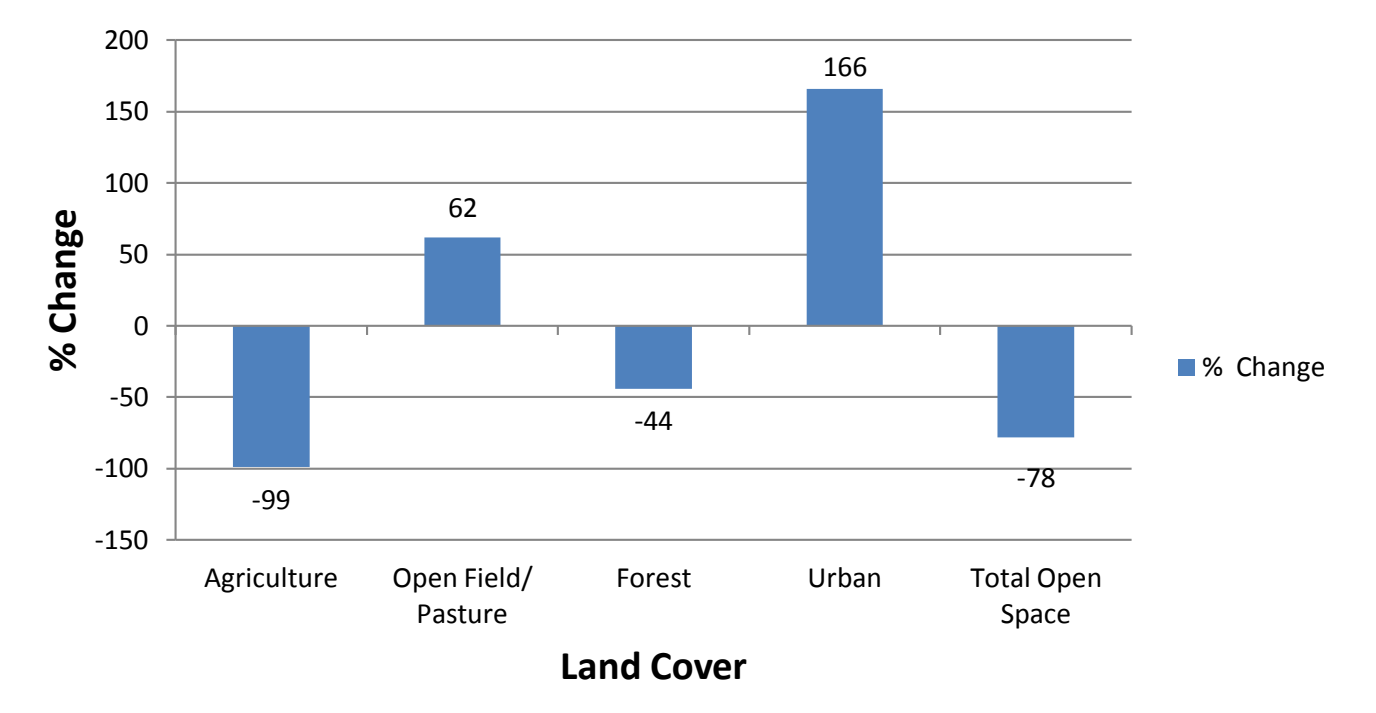


| Birds Observed in Haddonfield in the 21st Century, but Absent from Rhoads Surveys | A Sampling of Birds Observed in Haddonfield in the Late 19th/ Early 20th Centuries, Absent from Our Surveys |
|---|---|
| Black capped chickadee  | Alder Flycatcher  |
| Fish Crow   | Northern Bobwhite   |
| House Finch   | Bobolink  |
| Laughing Gull   | Brown headed Nuthatch   |
| Ring billed Gull  | Cliff Swallow   |
| Double crested cormorant  | Connecticut warbler   |
| Great Horned owl  | Grasshopper Sparrow   |
| Snowy Egret   | Hooded Merganser  |
| Northern Mockingbird  | Horned Lark   |
| Mourning Dove   | Marsh Hawk (Harrier)  |
| Red bellied Woodpecker  | Northern Shrike   |

Total Acreage of Land Cover Types in Haddonfield from 1877 to Present (2012)



Change in Land Cover in Haddonfield from 1877 to Present (2012)



## Habitat Changes

The major trends in habitat change during the 100+ years between the Rhoads and Tucker bird surveys include marked reduction in Forest Cover, Grassland and Agricultural land and overall available open space acreage along with an increase in developed/ residential areas.

Birds observed during both time periods as divided by preferred habitat is provided for comparison. (top right)

