

# AMERICAN KESTRELS:

Analyzing landscape suitability for American Kestrel nest boxes in Wisconsin



## Background

American Kestrels (*Falco sparverius*) are the smallest species of raptors in North America, weighing at usually about 80-160 grams. Unfortunately, their numbers have been reported to be in decline all across the United States<sup>1</sup>. Many state nest box programs across the country claim that they have seen less and less breeding pairs in their nest boxes<sup>1</sup>. Little is known for the cause of the decline of these species, some speculations include an increase in predator populations like Cooper's Hawks or destruction of habitat. This research aims to investigate whether the nest boxes installed are in suitable places and to determine other suitable areas in the region for future nest boxes. A map will be created to compare with current nest box sites and their status of occupancy.

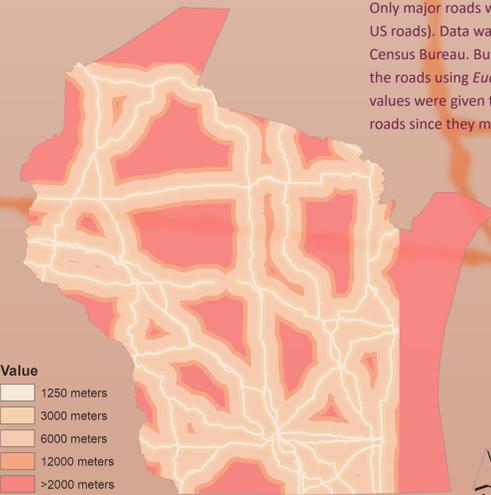


## Methods

Wisconsin was used as a study site for this project. The program boasts of high occupancy rates compared to other kestrel nest box programs. The landscape factors investigated were distance to water features and major roads, land cover and vegetation type, and population density<sup>2</sup>. All layers were converted to rasters, clipped to the state extent and assigned appropriate values. All layers were to be reclassified and summed in a raster calculator to calculate suitability.

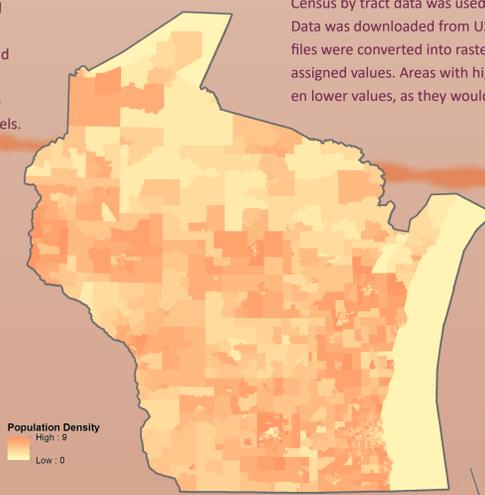
### Roads

Only major roads were used (interstate and US roads). Data was downloaded from US Census Bureau. Buffers were created around the roads using *Euclidean Distance*. Higher values were given to farther distances from roads since they may pose as a risk to kestrels.



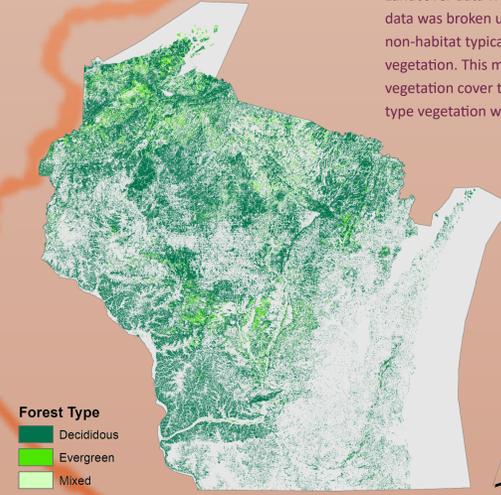
### Census

Census by tract data was used for population density. Data was downloaded from US Census Bureau. Shapefiles were converted into rasters and reclassified to assigned values. Areas with higher densities were given lower values, as they would disturb kestrel habitat.



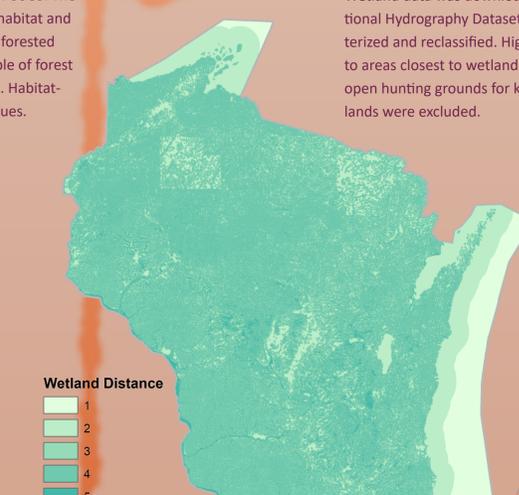
### Vegetation

Landcover data was downloaded from USGS. The data was broken up into three parts: habitat and non-habitat typical to the kestrel and forested vegetation. This map shows an example of forest vegetation cover that was reclassified. Habitat-type vegetation were given higher values.



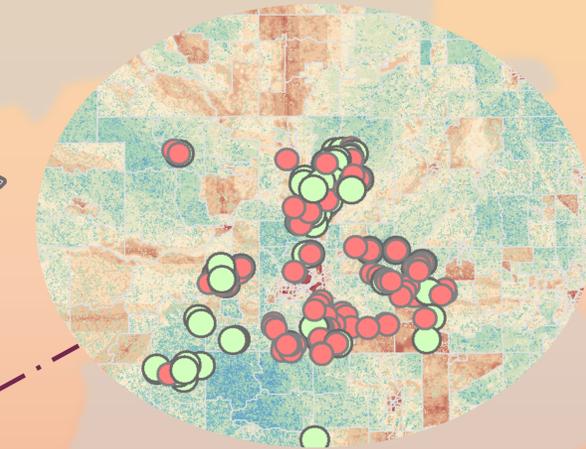
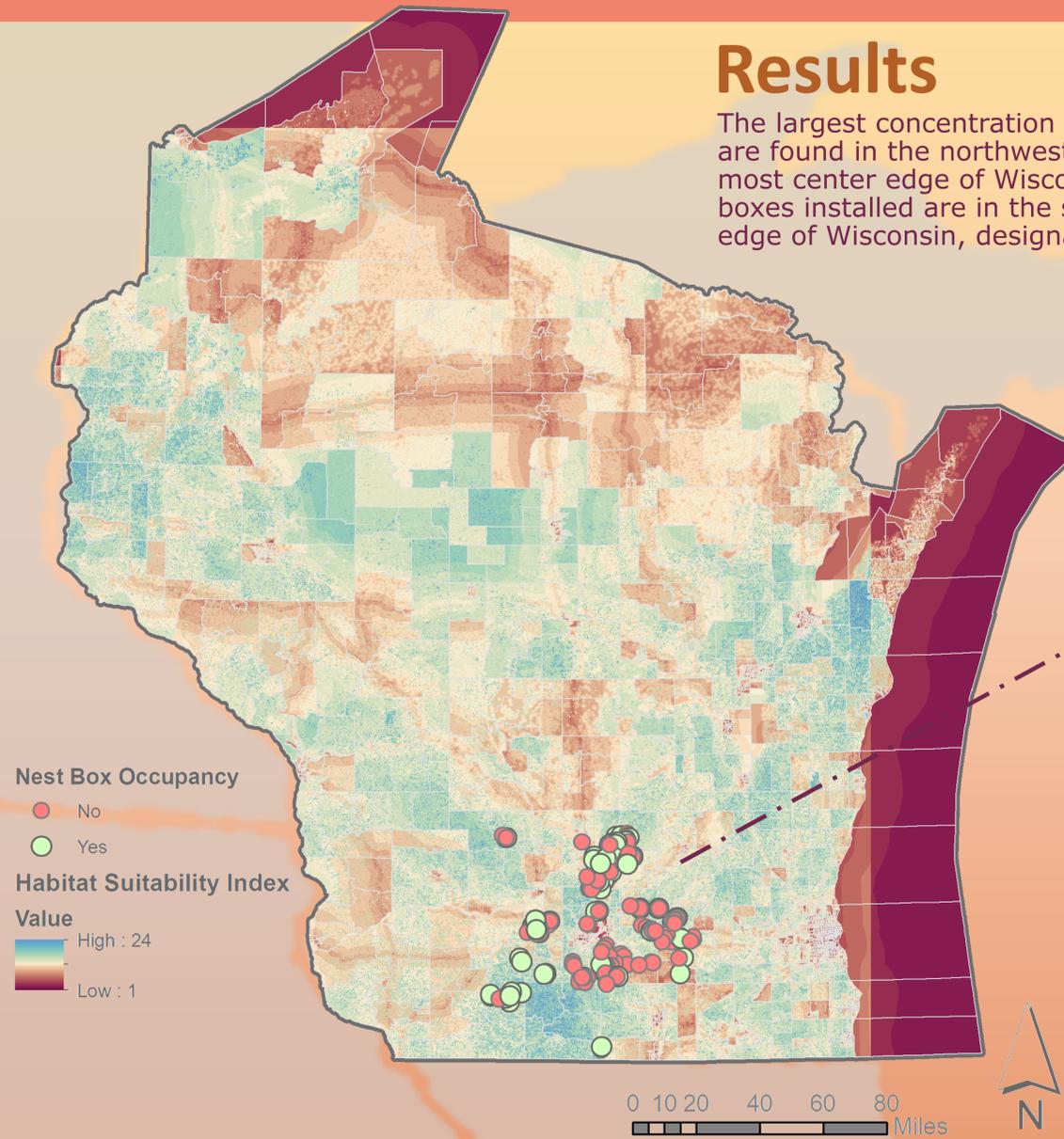
### Wetlands

Wetland data was downloaded from USGS National Hydrography Dataset. The shapefiles rasterized and reclassified. Higher values were given to areas closest to wetlands as they provide open hunting grounds for kestrels. Forested wetlands were excluded.



## Results

The largest concentration of suitable blue areas are found in the northwest corner and southern-most center edge of Wisconsin. Most of the nest boxes installed are in the southern most central edge of Wisconsin, designated as suitable areas.



## Conclusion

Although nest boxes installed were in suitable areas, there are still a lot of unoccupied boxes in the same area. This may be due to errors in weighting factors. To further investigate, we recommend creating regression models to determine the weight of each variable. Other factors to consider would be openness in areas and comparing other state sites.

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UEP 294 | Fall 2018

All maps use NAD1983 South Wisconsin State Plan Projection  
 Data Sources:  
 Wetlands- United States Geological Survey (USGS) National Hydrography  
 Vegetation- MRLC-Resolution Land Characteristics consortium  
 Roads/Census/State Borders- US Census Bureau

1. Smitko, John A., Mark F. O'Leary, David H. Moser, James R. Kluczynski, Ebb Robertson, Sue Robertson, Joey Mason et al. 2008. "Why Are American Kestrel (*Falco Sparverius*) Populations Declining in North America? Evidence from Nest-Box Programs".  
 2. Milligan, Megan C. and James L. Dickerson. 2016. "Habitat Quality and Nest-Box Occupancy by Five Species of Oak Woodland Birds". *The Auk* 133 (2): 429-38.