Nest Location Trends of the Rhode Island Osprey Population: Past, Present, and Future.

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Introduction

Despite being historically threatened, the Osprey (*Pandion haliaetus*) population in the United States has made a significant comeback. Using citizen-science data of Osprey nest location and occupancy from 2010-2020, this study aims to understand trends in the distribution and abundance of active Osprey nests in Rhode Island, then use predictive modeling to forecast how these will change in the future.

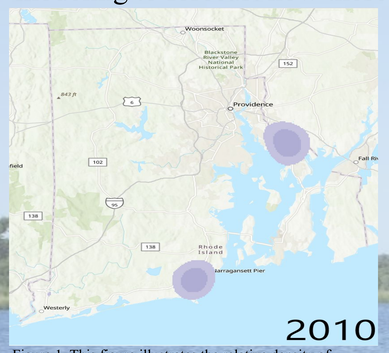


Figure 1. This figure illustrates the relative density of active or successful Osprey nests in Rhode Island in 2010. Darker colors indicate higher densities.

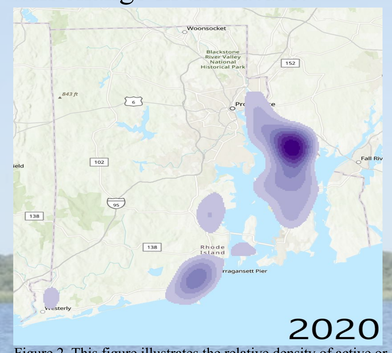


Figure 2. This figure illustrates the relative density of active or successful Osprey nests in Rhode Island in 2020. Darker colors indicate higher densities.

Methods

- Data were collected by volunteers with the ASRI Osprey Nest Monitoring Program from 2010 – 2020.
- The coordinates of all nests that were labeled as “active” or “successful” at the end of each breeding season were uploaded into ArcGIS Pro 3.0.3.
- Calculated predictor variables for each nest included yearly mean distances from nests to coastal waters, freshwater bodies, forest habitat, and neighboring nests.
- A General Linear Model (GLM) was then used in R (4.0.3) to identify significant relationships between nest density and the following variables: all distance-based variables, the number of volunteers in each year, the number of fledglings from the previous year, the number of fledglings from two years previous, and time (years).
- An Akaike Information Criterion (AIC) was used to determine model fit between covariates and nest density.
- Using the rates of change of the mean distance to coastal waters and mean distance to the nearest neighbor, areas of possible future Osprey nesting were identified in ArcGIS.

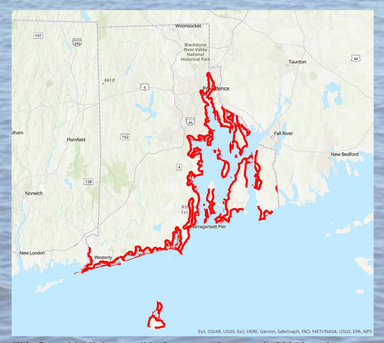
Results

Table 1. This table shows the results of the simple linear regression models between each variable and the number of active or successful Osprey nests. a=0.05. P-values in bold are significant.

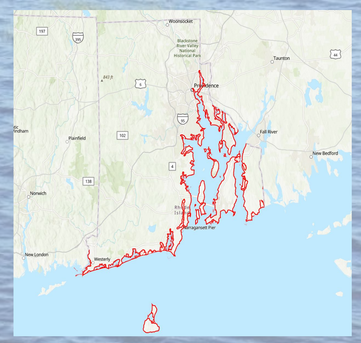
Variable	P-Value
Mean Distance to Coastal Waters	**0.584e^-4**
Mean Distance to Freshwater Bodies	0.445
Mean Distance to Forest Habitat	0.551
Mean Distance to Nearest Neighbor	**0.586e^-6**
Number of Volunteers	**0.024**
Number of Fledglings in Previous Year	0.330
Number of Fledglings Two Years Previous	**0.015**
Time (Years)	**0.003**

Table 2. This table shows the results of the AIC table that was used to identify the most parsimonious model.

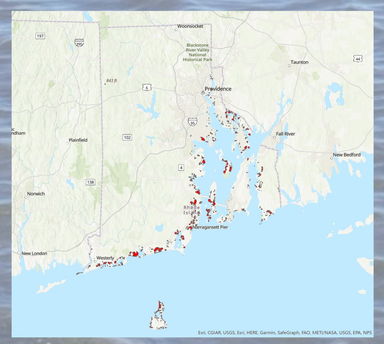
Model	AIC Weight.
Number of Fledglings Two Years Previous	0.90
Mean Distance to Nearest Neighbor	0.09



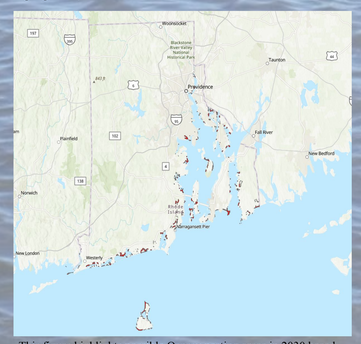
This figure highlights possible Osprey nesting areas in 2025 based on predictive modeling in ArcGIS Pro. This model highlights 31,653 hectares.



This figure highlights possible Osprey nesting areas in 2030 based on predictive modeling in ArcGIS Pro. This model highlights 16,436 hectares.



This figure highlights possible Osprey nesting areas in 2025 based on predictive modeling in ArcGIS Pro that overlap with local conservation areas. This model highlights 4,541 hectares, 14.3% of the total area.



This figure highlights possible Osprey nesting areas in 2030 based on predictive modeling in ArcGIS Pro that overlap with local conservation areas. This model highlights 2,617 hectares, 15.9% of the total area.

Discussion

The most parsimonious model for predicting the number of active and successful Osprey nests present each year is the number of years since the beginning of the study. However, because time is a function of the other covariates, the second most parsimonious model for predicting the number of nests present each year, the number of fledglings from 2 years prior, provides more insight into this trend. Thus, the more Osprey that fledge, the greater number of nests there will be 2 years later. This is because Osprey remain on their wintering grounds during the breeding season following their fledging (Bierregaard et al. 2020, Henny and Velzen 1972). Furthermore, this explains why there is no significant relationship between the number of active or successful nests and the number of Osprey that fledged in the previous year.

The most parsimonious model for predicting *where* active or successful Osprey nests will be located is their proximity to other active or successful nests. This same trend has been observed in other recovering Osprey populations (Lohmus, 2008). These findings support the information center hypothesis (ICH) in Osprey. This hypothesis suggests that birds will breed in a colonial manner to share information, specifically, observing where individuals are returning from after successful hunts. This hypothesis has previously been supported in Osprey (Greene, 1987).

The spatial models that identified areas of possible future Osprey nesting showed that there will be a reduction of 15,061 hectares of possible nesting areas from 2025 – 2030. However, this is not caused by habitat loss, but rather because the mean distances from nests to coastal waters and the mean distances between nests are declining. Thus, there is a more limited area where Osprey may possibly nest, and they would be doing so in a denser manner. However, do note that these predictive models do not dictate exactly where Osprey will nest in the future, but rather identify areas where Osprey are most likely to have active or successful nests based on their distance to one another and distance to coastal waters. These models do not consider changes in habitat availability, nest density issues, or sea level rise.

Literature Cited

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Background image by Lincoln Dark (2021)