Quantifying Characteristics of Heron and Egret Nesting Colonies on the Upper Mississippi River National Wildlife and Fish Refuge with GIS

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Introduction and Objective

Since 2009, geo-referenced aerial photography of all known nesting colonies of great blue heron (*Ardea herodius*) and great egret (*Ardea alba*) on the refuge have been obtained, allowing precise identification of individual nest locations. This dataset provides opportunities to conduct spatial analyses that quantify colony characteristics such as size, density, and shape, and relate those characteristics to landscape variables such as land cover/use.

Our objective was to explore various geo-spatial analyses that can be conducted with the refuge's geo-referenced heron and egret nest data.

Data and Methods

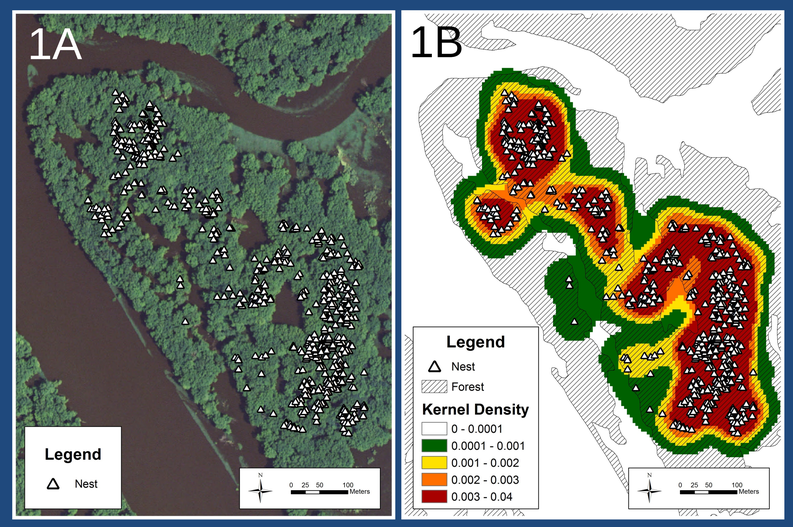
Data

- Geo-referenced true color vertical photos taken app. 450 m above ground level during April–May of each year 2009–2014.
- Land cover/use data produced by the Upper Mississippi River Restoration Program, Long Term Resource Monitoring element.

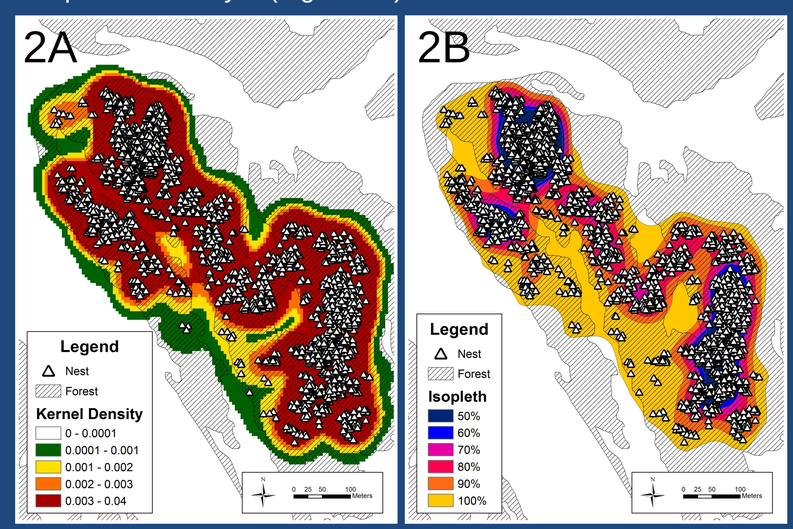
Operations conducted in Arc Map 10

- Digitization of individual nests within each colony for each year (Figure 1A).
- Creation of a composite data layer of all nests across all years (2009–2014) for each colony.
- Calculation of 100% kernel densities using search radii of 56 meters (the radius of a 1-ha circle) around each nest (Figures 1B and 2A).
- Construction of isolpleths encompassing varying proportions of nests in each colony using the composite nest data layer (Figure 2B); the 100% isopleth was used to delineate colony boundaries.
- Determination of 2010 15-class land cover/use proportions within a 500-ha buffer around each colony centroid (Figure 3A).
- Development of core (100% forest), dominant (60–90% forest), and other forest (<60% forest) cover classes.
- Determination of core, dominant, and other forest cover class proportions within a 500-ha buffer around each colony (Figure 3B).

Geo-referenced aerial photo and digitized nests of the Smith Slough colony in Pool 8 during 2009 (Figure 1A); 100% kernel densities of the Smith Slough colony in 2009 (Figure 1B).



100% kernel densities of nests in the Smith Slough colony using the composite (2009–2014) nest data layer (Figure 2A); isopleths encompassing varying proportions of nests in the composite data layer (Figure 2B).



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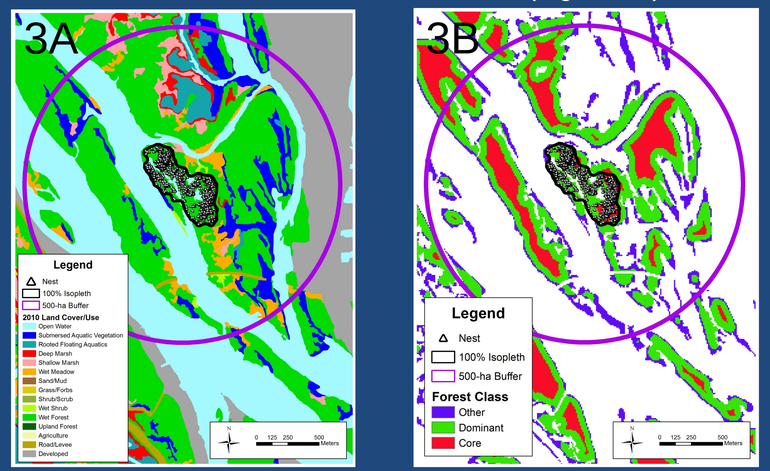
Composite (2009–2014) data layer of nests in the Smith Slough colony, and a 500-ha buffer around the colony centroid, overlaid on 2010 15-class land cover/use data (Figure 3A) and core/dominant/other forest cover class data (Figure 3B).



Preliminary Results

Results for the Smith Slough colony in Pool 8 provided an example of information generated from analyses

Mean nests per year (2009–2014)	494
Mean colony size (ha; 2009–2014)	15
Mean nest density (nests/ha; 2009–2014)	32
% deep marsh within 500-ha buffer (2009)	2
% shallow marsh within 500-ha buffer (2009)	2
% rooted floating aquatics within 500-ha buffer (2009)	3
% wet forest within 500-ha buffer (2009)	38
% core forest within 500-ha buffer (2009)	8
% dominant forest within 500-ha buffer (2009)	21
% other forest within 500-ha buffer (2009)	9