

Spatiotemporal Exploratory Models: Deriving Spatial Waterfowl Inputs for Disease Risk Modeling



Credit: Glenn Barkley

Figure 1. Northern Pintail, a possible candidate species for STEM modeling.

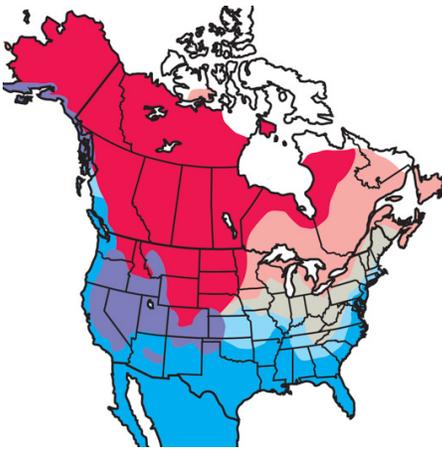


Figure 2. Northern pintail temporal distribution. Credit: Audubon

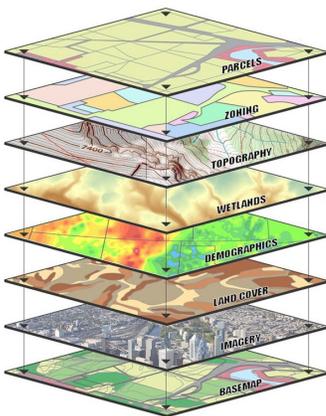


Figure 3. GIS data layers visualization. Credit: Onatario County, NY

The Challenge: Disease risk modeling can be an important tool for identifying areas of high transmission risk within and between animal populations, allowing for strategic allocation of limited resources for disease surveillance and prevention. Acquiring a spatial understanding of the distributions of high risk populations is a critical first step in developing predictive disease transmission models. One such disease is highly pathogenic avian influenza, outbreaks of which have caused concern for both domestic and wild populations in the United States.

The Science: We aim to test the use of a recent technique, Spatiotemporal Exploratory Models (STEM), in developing dynamic spatial distribution models for waterfowl species of importance to highly pathogenic avian influenza (HPAI). This method would allow for building multiple distribution models across the breeding, wintering, and migratory seasons, leading to more temporally detailed disease risk models. For example, instead of a single risk map showing areas of high transmission potential between wild and domestic birds, we could potentially have monthly maps showing differences in areas of transmission potential at this interface.

The Future: The temporally dynamic spatial distribution models for waterfowl developed from this STEM modeling will serve as inputs to avian influenza disease transmission models. If the methodology proves to be successful, then high-resolution temporal models (either daily or monthly distribution predictions) can be conducted for the suite of waterfowl species in the USA. Further, although this and future work concentrates on waterfowl, other studies could potentially focus on other animal vectors important in disease transmission.