Ya Yellow-Bellied Chicken!

Where to Be Afraid of the Next Avian Influenza Outbreak

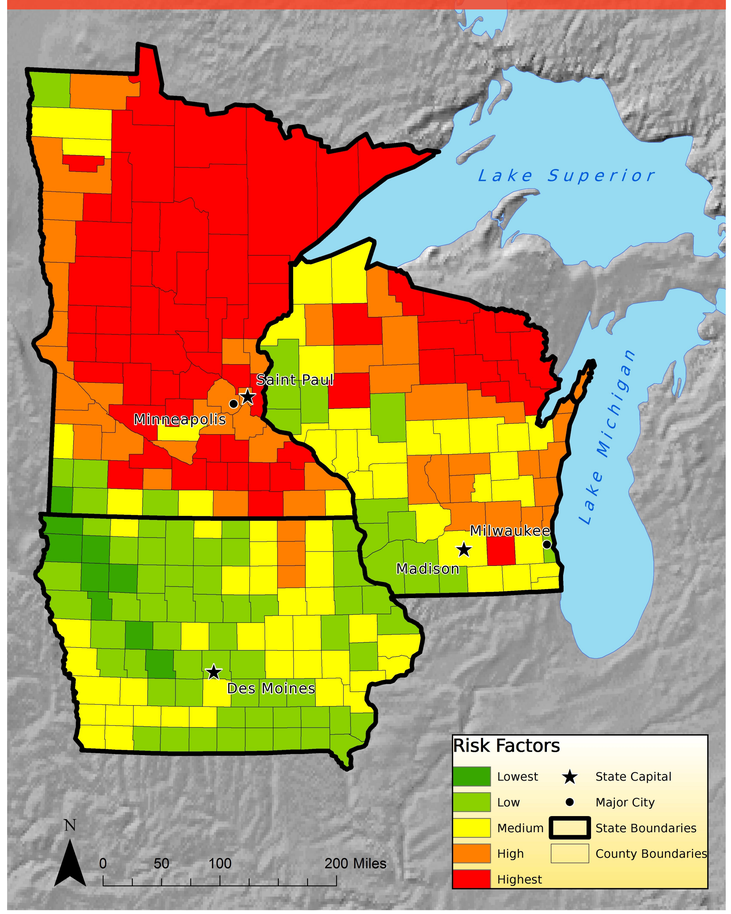
Introduction

Severely Affected States During AI Outbreak in 2015.

Avian Influenza (AI) is a highly fatal and contagious disease that mostly affects poultry birds, such as chickens and turkeys. H5N2 is one of the strains of the Influenza A virus that has caused outbreaks around the world in the past. In 2015, the United States experienced the worst AI outbreak in history with H5N2 as one of the primary strains responsible. 21 states and 211 commercial farms were affected. Somehow, the virus has breached these very secure facilities, causing an estimated loss of $3.3 billion to the total economy. These losses were due to the efforts to control the outbreak through humanely depopulating millions of poultry birds in affected areas. Also, trading bans were imposed by countries that would normally import birds, meat, and/or eggs, leading to further economic loss. The virus circulates in wild waterfowl and the breakdown of biosecurity in poultry facilities caused the individual outbreaks. It is important to know where are the risky areas for AI entering into an area as this virus can cause devastating loss to the economy and bird lives.

This project predicts the risk of an H5N2 AI outbreak affecting counties in Minnesota, Iowa, and Wisconsin. During March—June 2015, these states were severely affected by this outbreak due to their large commercial poultry facilities. Biosecurity is a hard factor to map accurately. A risk analysis was based on risk factors mapped below and the history of affected counties during March—June 2015.

Combined Risk Analysis of H5N2 Avian Influenza Outbreaks in MI, WI, & IA



Conclusions

The combined risk analysis was created through doing a mean zonal statistic across all the risk factors mapped below per county. This combined risk analysis indicates that northern Minnesota and Wisconsin were at the highest risk of H5N2 AI. The highest risk area is most likely due to the high freezing temperatures and wetlands in the area. This analysis appears to be robust in analyzing risky areas due to Minnesota being known as the "Land of 10,000 Lakes" and the state was the most severely affected state of the three examined. This highest risk area, when examined individually through the risk factors mapped below, show that this area has at least a medium risk across all risk factors, with the exception of wind and the history of outbreaks.

Avian Influenza is a Worldwide Issue, Not Just a US One.

Limitations of this analysis are apparent in the Iowa had some counties with medium to large amounts of outbreaks but they were ranked as having a low risk. There are many reasons as to why this happened. When calculating the risk analysis, counties within waterfowl flyways were scored as a high risk and those not within were calculated as a no risk. This may have caused some right sided skewness and therefore caused some lower ranked risky areas than what would be represented in reality. All factors were weighted evenly, except for areas in or not within flyways. This is another potential cause of misrepresenting risk.

Cartographer: Chris Mantell
Date: 5/10/16
Course: MCM1009—GIS for Conservation Medicine
Professor: Carolyn Talmadge
Projection: NAD 1983 UTM Zone 15N
Data Sources: US Census, NaturalEarth, ESRI Data Maps, HealthMap.org, weathercollector.com, usclimatedata.com, weathersource.com, NREL, NLCD, 2011.

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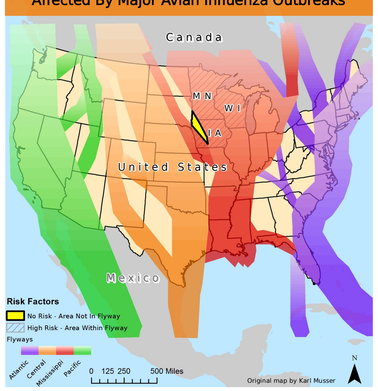
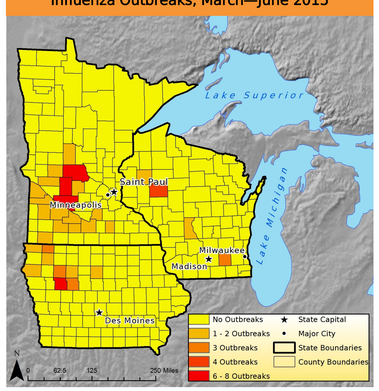
Waterfowl Flyways in US & Midwestern States Affected By Major Avian Influenza Outbreaks



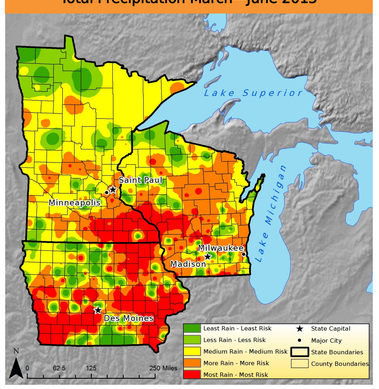
A map of waterfowl flyways was used to determine risk. This map was georeferenced, created in the editor tool, reclassified, and included in the raster calculation. If the areas were in the Mississippi flyway, it was considered high risk.

Counties in Midwestern States with H5N2 Avian Influenza Outbreaks, March—June 2015



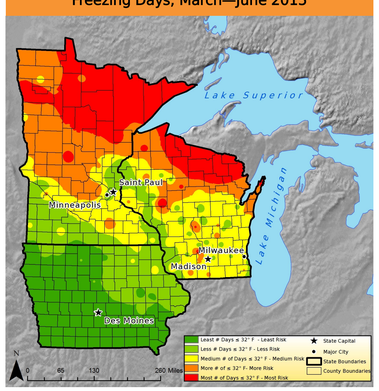
H5N2 AI geocoded data from HealthMap.org was imported into the mapped area. It was then merged with county layers, turned into raster data, reclassified based on number of outbreaks, and included in the raster calculation.

H5N2 Avian Influenza Risk Factors Based On Total Precipitation March—June 2015



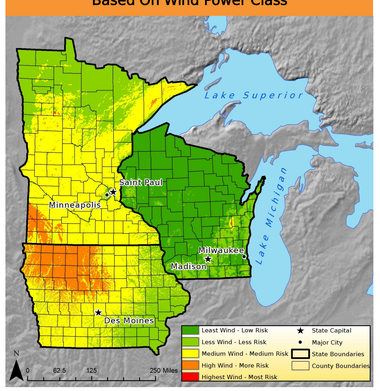
Total precipitation data was taken from weather station data from weathercollector.com. This data was used to interpolate total precipitation by IDW to the rest of the study area, reclassified, and included in the raster calculation.

H5N2 Avian Influenza Risk Factors Based On Freezing Days, March—June 2015



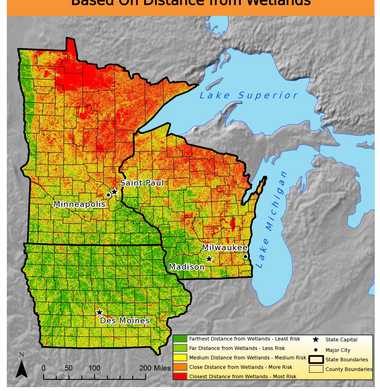
Average mean daily temperatures data was taken from usclimatedata.com and weathersource.com. The total number of freezing days was counted, used to interpolate, reclassified, and included in the raster calculation.

H5N2 Avian Influenza Risk Factors Based On Wind Power Class



Wind Power Class data was taken from National Renewable Energy Laboratory, reclassified, and included in the raster calculation.

H5N2 Avian Influenza Risk Factors Based On Distance from Wetlands



Wetlands was extracted from National Land Cover Database, 2011. Euclidean was determined from the wetlands, reclassified, and included in the raster calculation.