Entering the Digital Side of the Lab:

Avian Influenza Data Predictions for the Pacific Rim and beyond

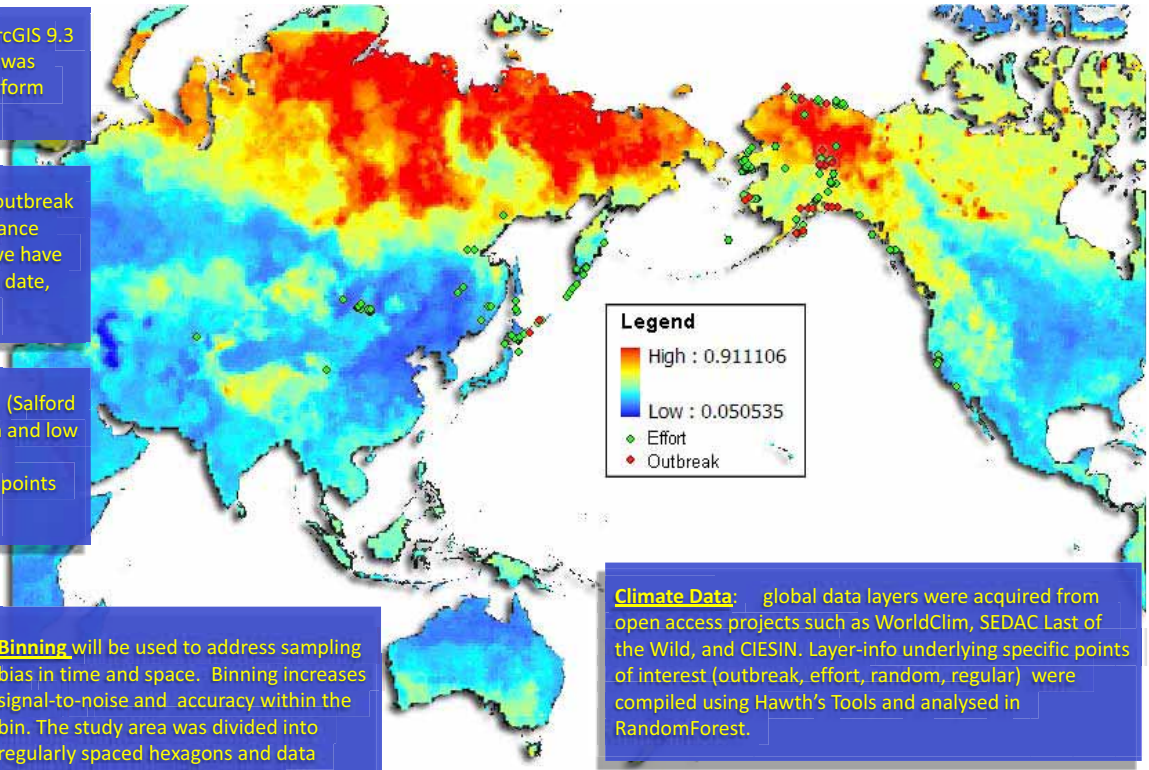
Keiko Akasofu[1], Falk Huettmann[2], George Happ, Jon Runstadler
Department of Biology & Wildlife, University of Alaska Fairbanks
[1]fnka@uaf.edu, [2]fffh@uaf.edu

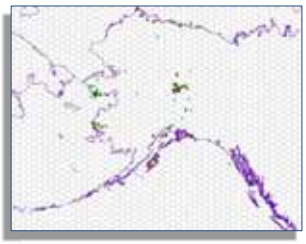
The purpose of this project is to visualize known outbreaks of avian influenza and to develop a predictive niche model based on ecological and geographic features.

Map: The map was developed in ArcGIS 9.3 (ESRI). The Hawth's Tools extension was used to generate databases and perform spatial analyses.

Virus Data: collection effort and outbreak data come from an ongoing surveillance project (CRISAR). For each sample we have GPS coordinates, species, collection date, viral screening results, etc.

Analysis: we used RandomForest (Salford Systems) to determine areas of high and low probability. Climatic and ecological characteristics underlying outbreak points were ranked by predictive power.

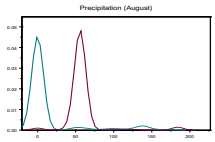


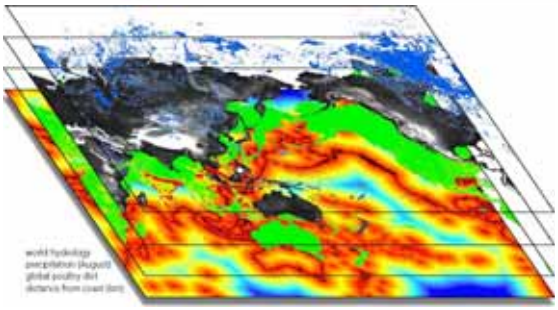


Binning will be used to address sampling bias in time and space. Binning increases signal-to-noise and accuracy within the bin. The study area was divided into regularly spaced hexagons and data within the bins were averaged.

Climate Data: global data layers were acquired from open access projects such as WorldClim, SEDAC Last of the Wild, and CIESIN. Layer-info underlying specific points of interest (outbreak, effort, random, regular) were compiled using Hawth's Tools and analysed in RandomForest.

Frequency distribution: histograms were generated for each predictor variable in order to visualize survey effort (blue) vs. landscape (red).





Data layers include

- Altitude
- Precipitation (August)
- Global human footprint
- Human influence
- Last of the wild
- Population density
- Global hydrology
- Global poultry distribution
- Global pig distribution
- Annual mean temperature
- Mean diurnal range
- Isothermality
- Temperature seasonality
- Maximum temperature of warmest month
- Minimum temperature of coldest month
- Temperature annual range
- Mean temperature of wettest quarter
- Mean temperature of driest quarter
- Mean temperature of warmest quarter
- Mean temperature of coldest quarter
- Annual precipitation
- Precipitation of wettest month
- Precipitation of driest month
- Precipitation of seasonality
- Precipitation of driest quarter
- Precipitation of warmest quarter
- Precipitation of coldest quarter

What's next?

This is phase I of this project. We plan to improve it and increase accuracy by:

- Applying binning
- Adding infrastructure data for human health implications
- Expanding the data set
- Improving upon landscape ecology
- Running accuracy tests and occupancy models
- Testing specific hypotheses, and forecasting
- **Involving the global AI community & sharing info**

Department of Biology & Wildlife
University of Alaska Fairbanks
Fairbanks, AK 99775

Acknowledgements:
EWHALE Lab; Happ Lab, Runstadler Lab & CRISAR for surveillance data