

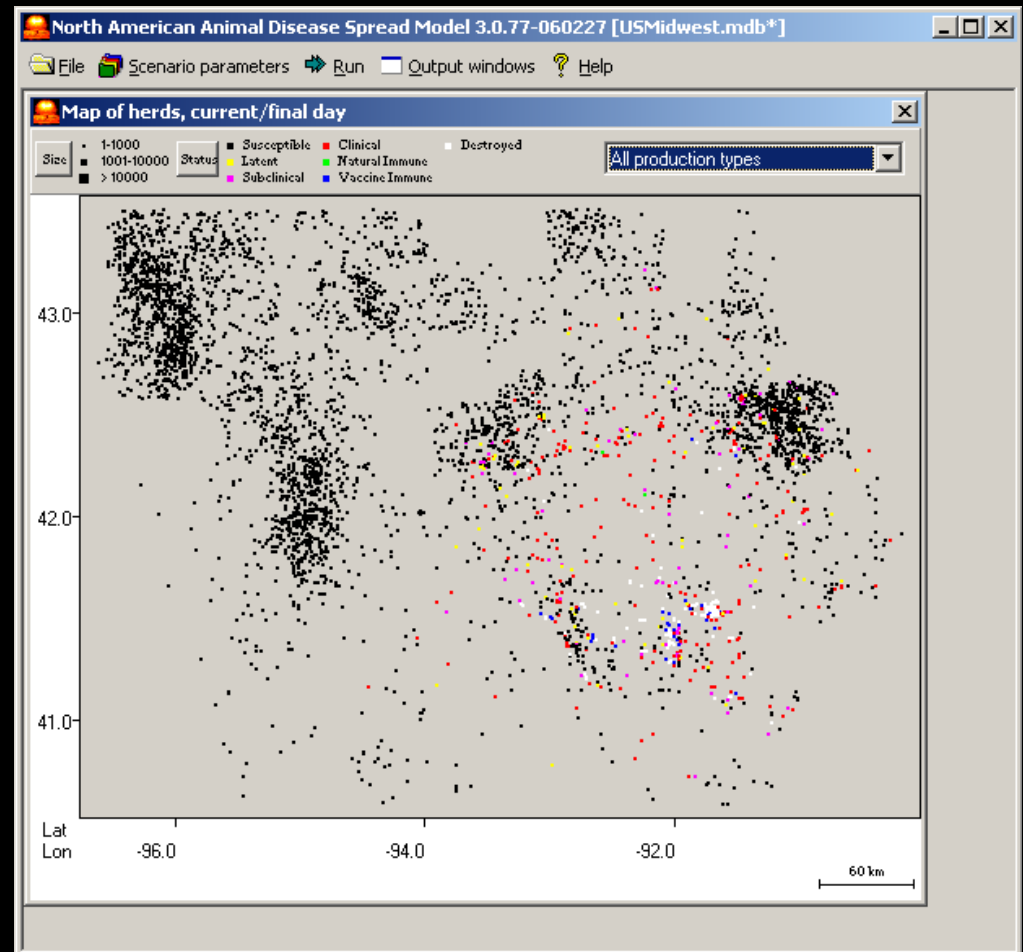
Developing a population for *NAADSM*

Aaron Reeves, [Animal Population Health Institute](#)
[College of Veterinary Medicine and Biomedical Sciences](#)
[Colorado State University, Fort Collins, Colorado](#)



Some key characteristics of *NAADSM*

- *NAADSM* is a herd-based, spatial model
- Consequently, *NAADSM* relies on information about a population of herds



How accurate does a population for *NAADSM* need to be? (I)

- It depends on the questions being asked of the model
- For some questions, it should be as accurate as possible
 - e.g., attempts to predict spatial disease spread during an outbreak
- (Is it appropriate to ask questions of this type of *NAADSM*, or for that matter, any disease model?)

How accurate does a population for *NAADSM* need to be? (II)

- For some broad questions, a completely artificial population may be adequate
 - e.g., what might the relative epidemiologic and economic consequences of different disease control strategies be?¹
- For many questions that will be asked of a realistic simulation model, it should be feasible to use a realistic, if not real, population

Population characteristics in order of relative importance for *NAADSM*

1. Does a herd/flock/unit/premises exist at all?
 - How many units are in the region of interest?
2. What are the spatial relationships of a unit relative to others in the population?
3. What is the size (number of animals) on the premises?

Characteristics of populations not currently considered by *NAADSM*

- Is a farm immediately adjacent to another farm?
- How are animals on a farm housed?

Obtaining actual farm data

- Is data regarding individual farm locations generally available?
 - In the US, the answer is no
- If the region of interest is small enough, this data could be collected “manually”
 - Obtaining GPS coordinates
 - Using satellite imagery
 - Geocoding street addresses

Using geocoding and satellite imagery



- Here you can see a poultry house that was geocoded from street address data

Actual farm location found by visual identification

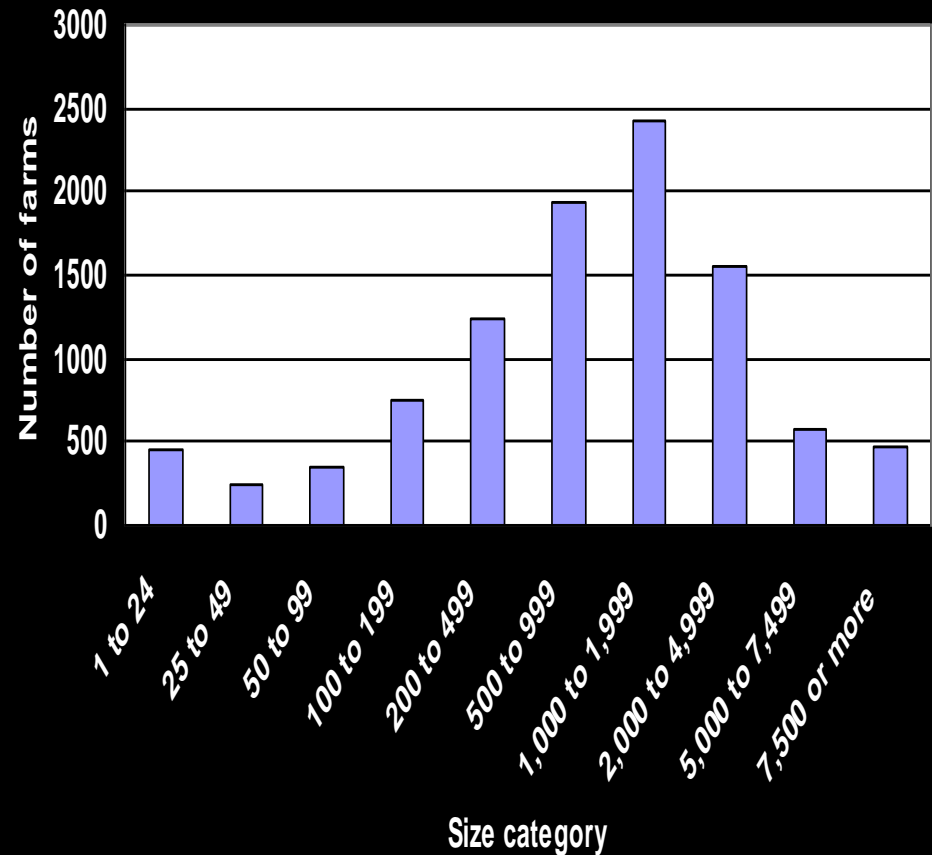
Location found by geocoding street addresses

Creating artificial but realistic population maps: Swine operations in Iowa

- A prerequisite for an ongoing investigation by CEAH and APHI (K. Portacci *et al.*)
- The primary questions being addressed: should vaccine for pseudorabies be stockpiled, and if so, how much?

Available data for farm locations (I)

- Number of swine operations in the state of Iowa, classified by number of animals and production type¹



¹Original data from USDA National Agricultural Statistics Service
2002 Census of Agriculture

Available data for farm locations (II)

- Number of swine operations per county in Iowa, without information regarding number of animals or production type

Building the artificial population: Determining farm locations

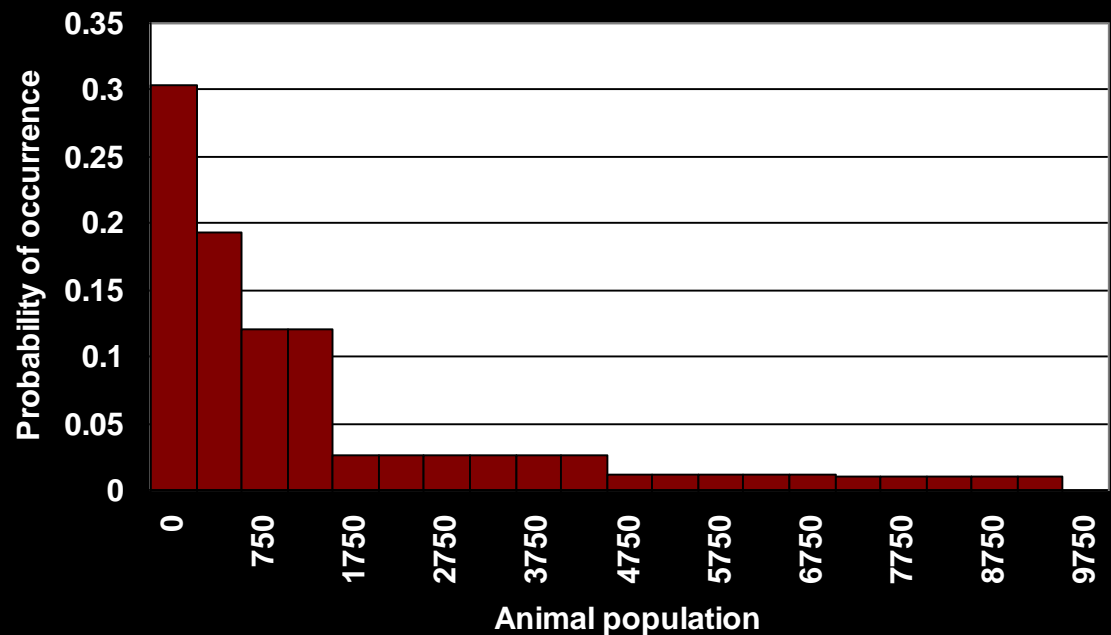
- ArcGIS and Hawth's Analysis Tools were used to place point locations on a map of Iowa
- The number of point locations per county was based on NASS data for the number of farms per county
- Points were placed strictly at random
- Urban areas, public lands, and bodies of water were excluded

Building the artificial population: Determining production types

- Production type data was available only at the state level
- One of five production types was assigned to each point location at random, such that the total number of farms of each type for the entire state corresponded to available data

Building the artificial population: Determining operation sizes (I)

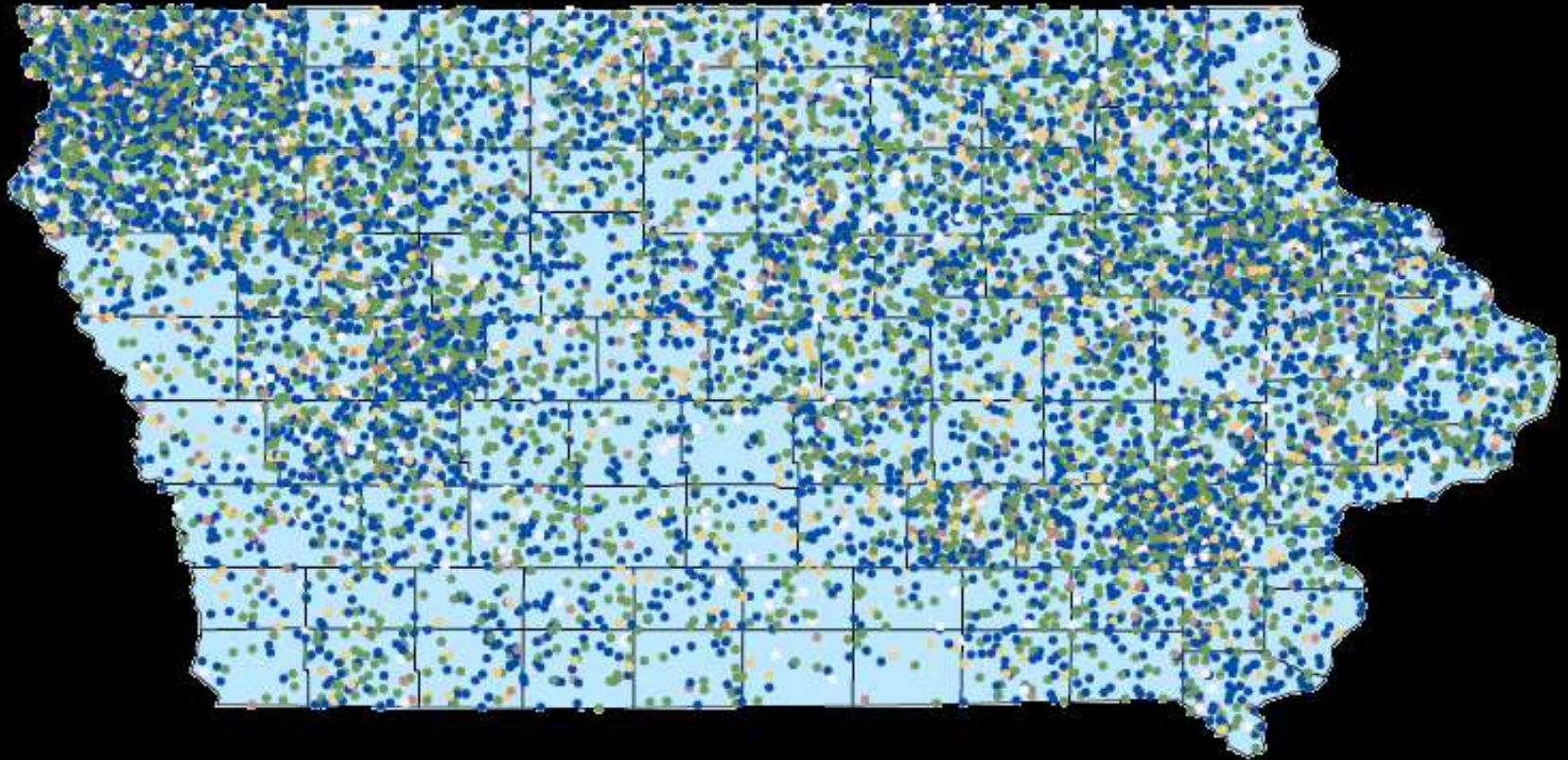
- An empirical probability density function describing the number of animals per farm was constructed based on state-level data for each of the five production types
- A maximum possible number of animals was estimated based on expert opinion



Building the artificial population: Determining operation sizes (II)

- For each point location, number of animals was determined by sampling from the probability density function for the appropriate production type

Building the artificial population: The result



Assessing the adequacy of artificial population maps

- Several studies (by members of the NAADSM team and other modelers) are currently under way, which will help to address the adequacy artificial versus “real” population maps