

Determining Animal Count Using Structure Attributes through Image Digitization

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Introduction

- Phosphorus is necessary for life on Earth, but in excess is associated with negative environmental consequences. For instance, extra phosphorus in water sources can lead to algal blooms which can upset aquatic ecosystems (figure 1).
- Manure from livestock animals is a major contributor to excess phosphorus in the environment. That manure can end up as run-off and ultimately find its way into a water source.
- To be able to improve the cycle of phosphorus, more needs to be known about this big contributor. Unfortunately, there is little information available on livestock farm locations, let alone livestock inventories.
- The goal of this research was to quantify the relationship between the size of livestock structures and animal counts.**



Figure 1 displays an example of harmful algal bloom in a lake in Iowa.

Methods

- Used ground-truthed animal feeding operation (AFO) sites from two livestock-dense counties in North Carolina and California (figure 2 and 3).
- Each operation was manually digitized in ArcGIS Pro to measure the structural square footage of AFO operations (figure 4).
- These total structural area were compared with permitted animal counts to explore the relationship between size of structures and livestock inventories.

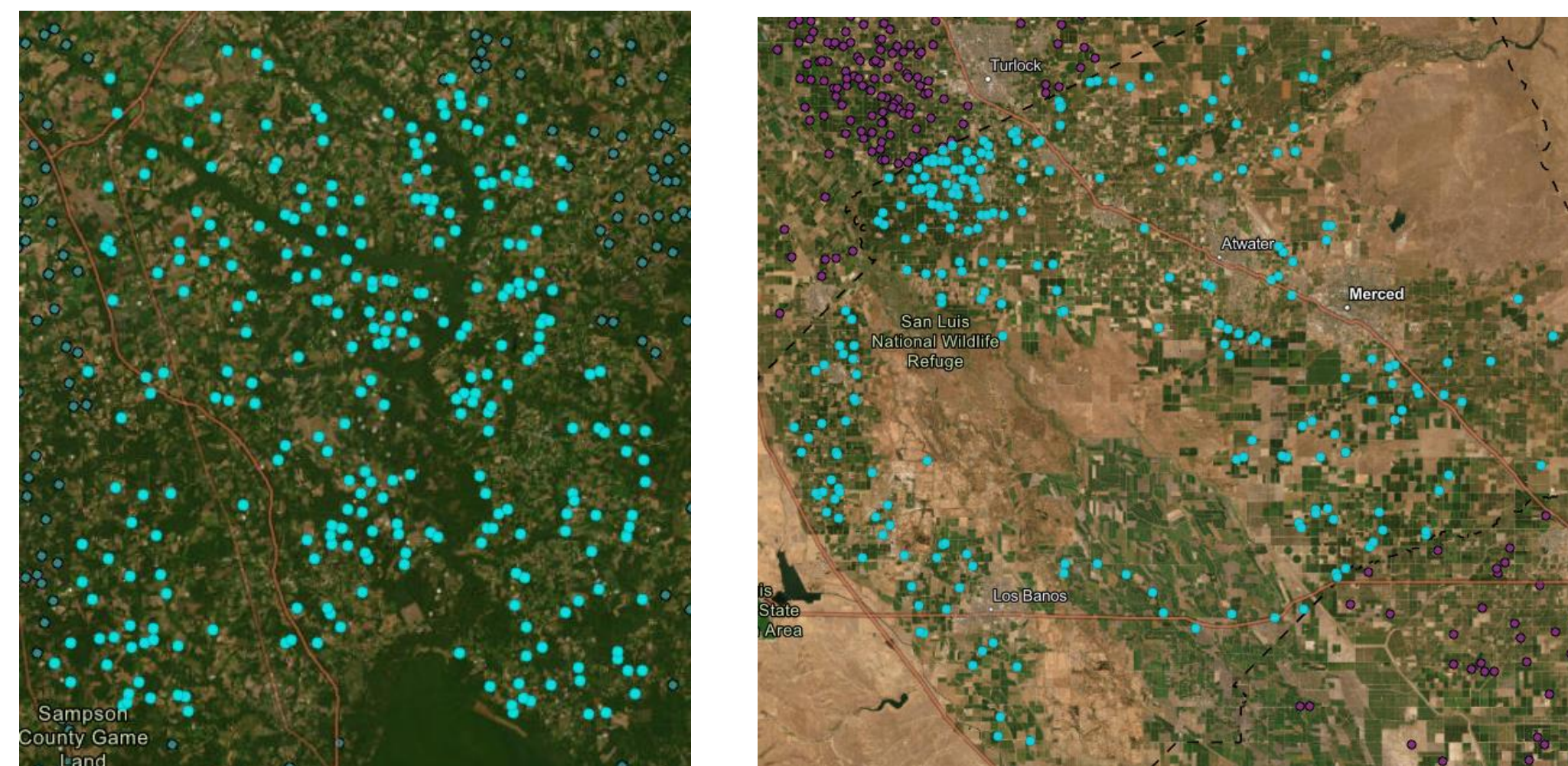
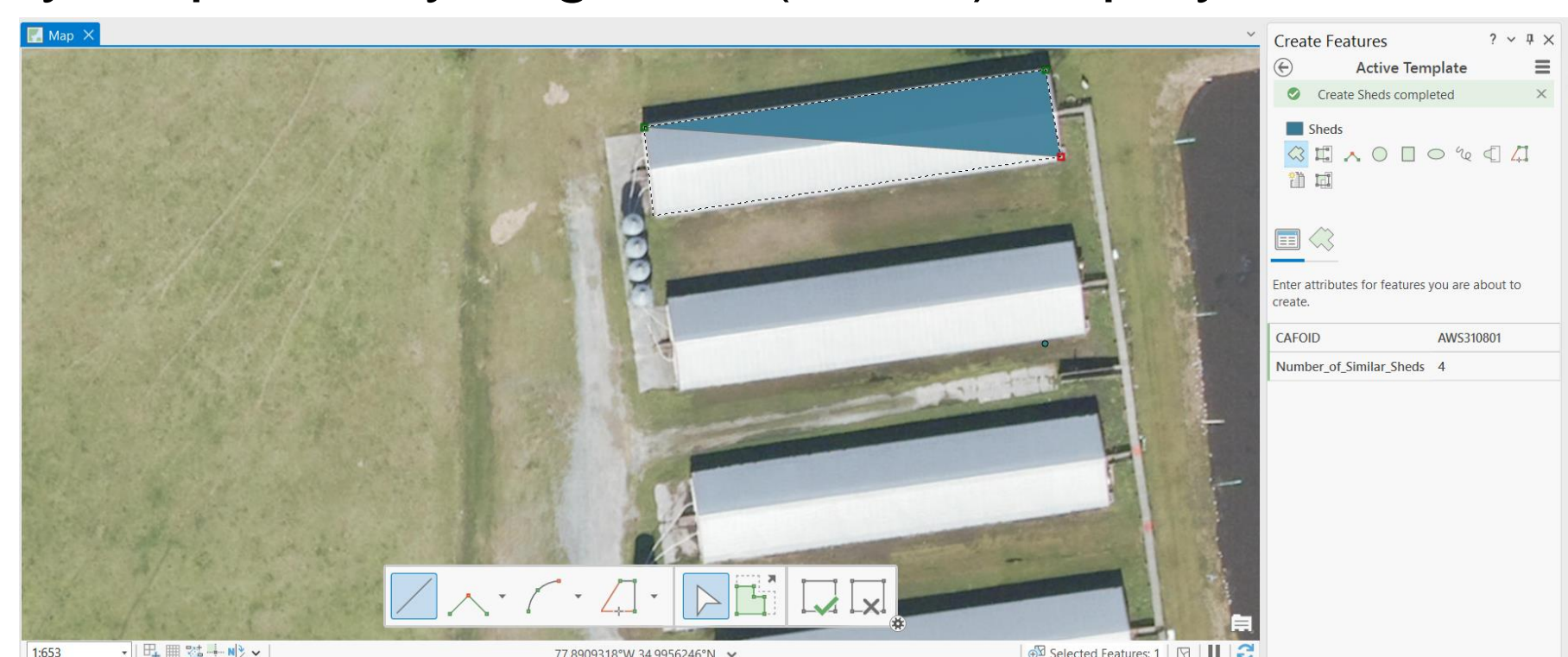


Figure 2 and Figure 3 (above) display the selected AFO sites in Duplin County and Merced County respectively. Figure 4 (below) displays the feature class tool.



Results

Note: Total Structure Area is the sum of all structure areas within a specific AFO operation

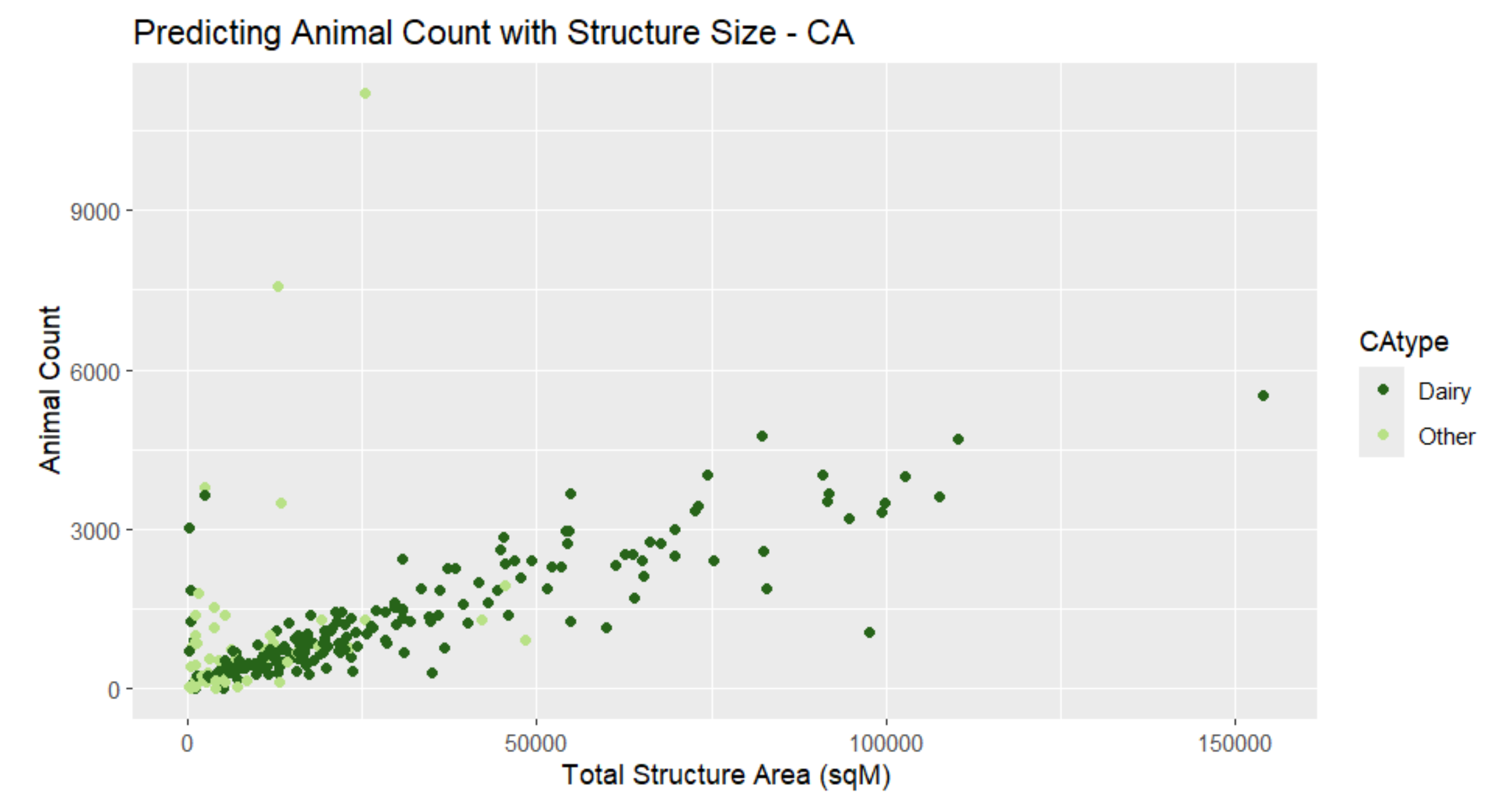


Figure 5

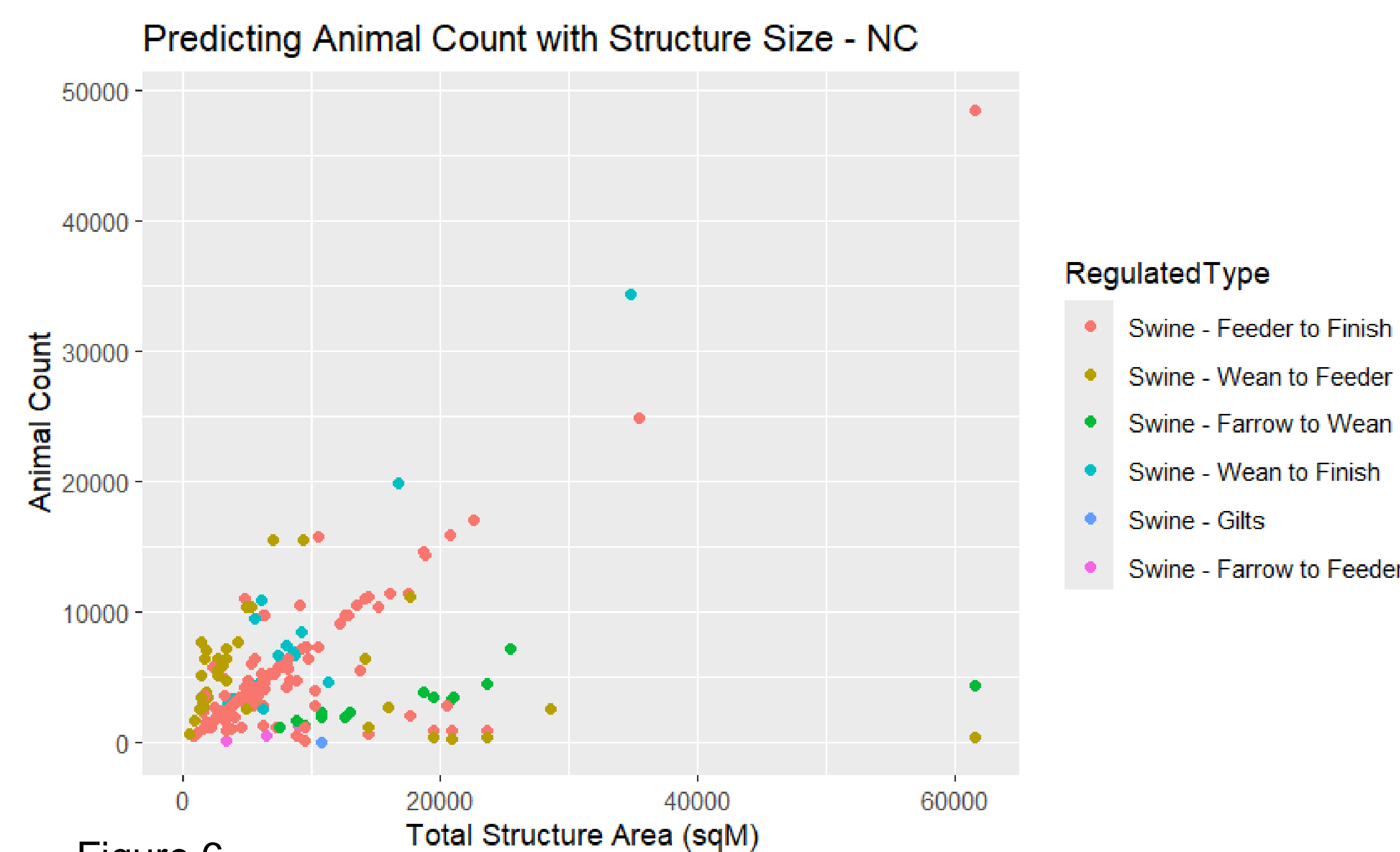


Figure 6

- The Merced County data (figure 5) shows there's a positive correlation with dairy barns opposed to the other barns.
- The Duplin County data (figure 6) also shows that different stages of feeding operations can be used as a possible predictor, since wean to feeder has a noticeably steeper slope than feeder to finish.
- The overall positive trend in all the graphs (figures 5-7) is indication that there is indeed a relationship between the number of animals and the size of barns.

Predicting Animal Count with Structure Size

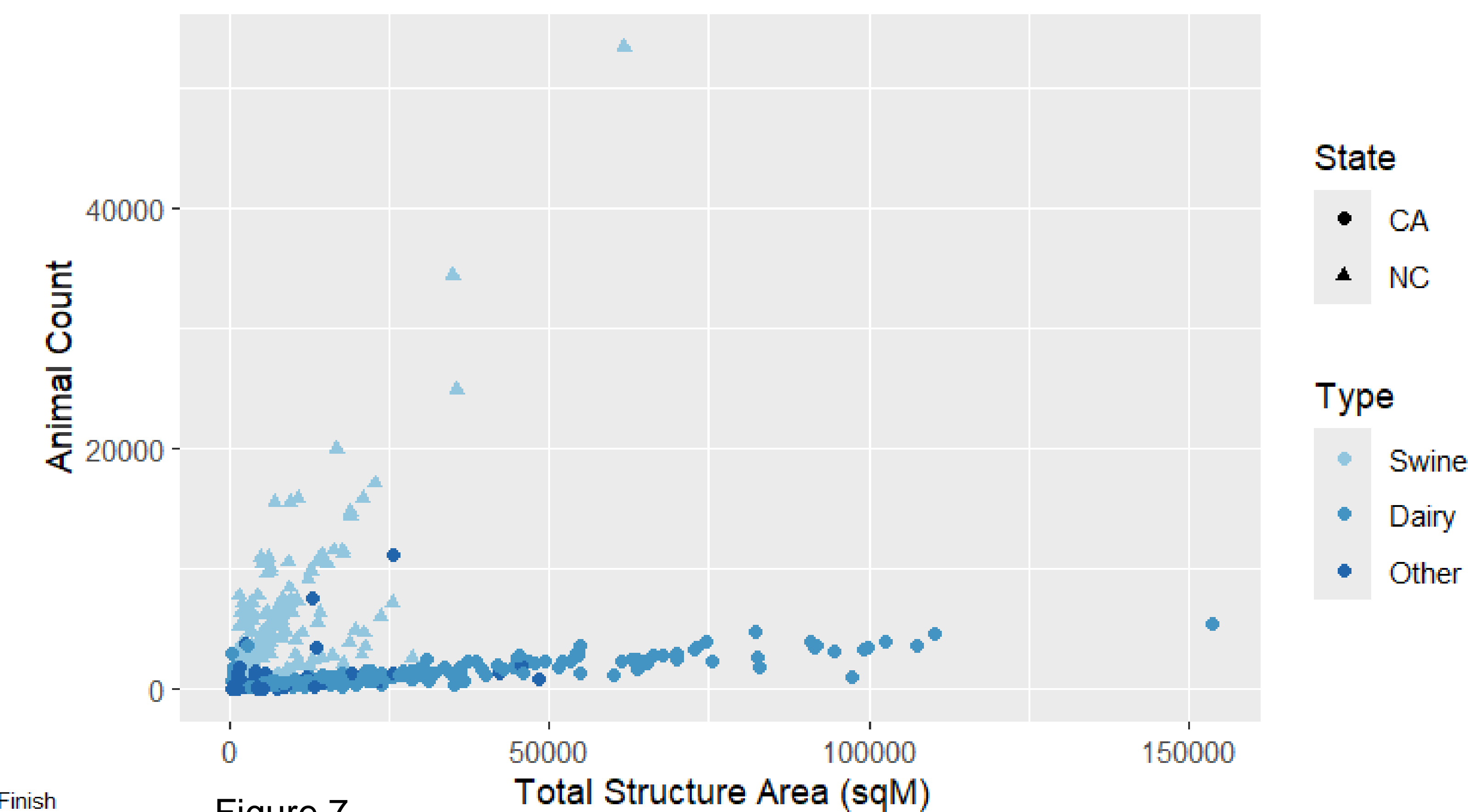


Figure 7

Acknowledgements

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References



Future Work

- This data collected can be used to train a classification algorithm to predict the amount of animals on an AFO farm when given attributes of the farm such as barn area, land cover data, the type of animals being housed, and other variables