

Spring 2015

# Prevalence of six viral and bacterial diseases in wild hogs in South Carolina (2007-2013)

S R. Sullivan  
*Clemson University*

W C. Bridges  
*Clemson University*

K W. McFadden  
*Clemson University*

J J. Mayer  
*Clemson University*

P.G.R. Jodice  
*Clemson University*

*See next page for additional authors*

Follow this and additional works at: [https://tigerprints.clemson.edu/grads\\_symposium](https://tigerprints.clemson.edu/grads_symposium)

---

## Recommended Citation

Sullivan, S R.; Bridges, W C.; McFadden, K W.; Mayer, J J.; Jodice, P.G.R.; and Yarrow, G K., "Prevalence of six viral and bacterial diseases in wild hogs in South Carolina (2007-2013)" (2015). *Graduate Research and Discovery Symposium (GRADS)*. 172.  
[https://tigerprints.clemson.edu/grads\\_symposium/172](https://tigerprints.clemson.edu/grads_symposium/172)

This Poster is brought to you for free and open access by the Research and Innovation Month at TigerPrints. It has been accepted for inclusion in Graduate Research and Discovery Symposium (GRADS) by an authorized administrator of TigerPrints. For more information, please contact [kokeefe@clemson.edu](mailto:kokeefe@clemson.edu).

---

**Authors**

S R. Sullivan, W C. Bridges, K W. McFadden, J J. Mayer, P.G.R. Jodice, and G K. Yarrow

# Prevalence of six viral and bacterial diseases in wild hogs in South Carolina (2007-2013)

Susan R. Sullivan<sup>1</sup>, William C. Bridges Jr.<sup>2</sup>, Katherine W. McFadden<sup>3</sup>, John J. Mayer<sup>4</sup>, Patrick G.R. Jodice<sup>3</sup>, and Greg K. Yarrow<sup>1</sup>

<sup>1</sup>Department of Forestry and Environmental Conservation, Clemson University, Clemson, SC 29634, USA, <sup>2</sup>College of Engineering and Science, Clemson University, Clemson, SC 29634, USA, <sup>3</sup>U.S. Geological Survey, South Carolina Cooperative Fish & Wildlife Research Unit, Clemson University, Clemson, SC 29634, USA, <sup>4</sup>Savannah River National Laboratory, Aiken, SC 29808, USA

## Introduction

Domestic swine were brought to South Carolina by Spanish settlers likely during the 16<sup>th</sup> century (Mayer and Brisbin 2008). The wild hog populations presently found in the state have descended from free-ranging members of these original colonial domestic swine as well as subsequent releases, both accidental and deliberate, of modern domestic swine and Eurasian wild boar (Mayer and Brisbin 2008). As of 2014, there were an estimated 160,000 wild hogs in South Carolina, which pose a serious threat to ecosystems and native species as well as humans and domestic livestock in the state (Mayer 2014). It is estimated that wild hog damage in the United States amounts to roughly \$1.5 billion each year; however, this estimate could substantially increase if wild hogs transmitted a viral or bacterial infection to the domestic livestock industry in the United States (Pimentel 2007).

## Objectives

- 1) Quantify the prevalence of 6 wild hog diseases in South Carolina over a period of 7 years
- 2) Examine the relationship between disease prevalence and wild hog age class, sex, and geographic location



Figure 1. A USDA Wildlife Services biologist collects a blood sample from a dispatched wild hog by using a needle and syringe to directly puncture the heart.

## Methods

- Study period: 2007-2013
- USDA Wildlife Services biologists collected blood and nasal swab samples from 629 dispatched wild hogs (Fig. 1)
- The date, geographic coordinates, site, county, sex, and age class of each wild hog were recorded
- Blood and nasal swab samples were sent to laboratories to test for 6 selected diseases (Table 1)
- The relationship between disease prevalence and geographic location was analyzed with ArcGIS®

Table 1. From 2007-2013, the laboratory tests used to detect the antibodies of 6 selected diseases and the statistical analysis techniques used to quantify the prevalence of those diseases as well as determine any relationships between prevalence and wild hog age class, sex, or geographic location in South Carolina.

Disease	Laboratory test	Statistical analysis
Classical swine fever (CSF)	Enzyme-linked immunosorbent assay	-
Swine brucellosis (SB)	Fluorescent polarization assay	Logistic regression model
Pseudorabies virus (PRV)	Enzyme-linked immunosorbent assay	Logistic regression model
Porcine circovirus (CIRCO)	Indirect immunofluorescence assay	Logistic regression model
Porcine reproductive and respiratory syndrome (PRRS)	Enzyme-linked immunosorbent assay	Generalized linear model with Firth biased-adjusted estimates
Swine influenza virus (SIV)	Reverse transcription-polymerase chain reaction & enzyme-linked immunosorbent assay	Linear least squares model

## Results

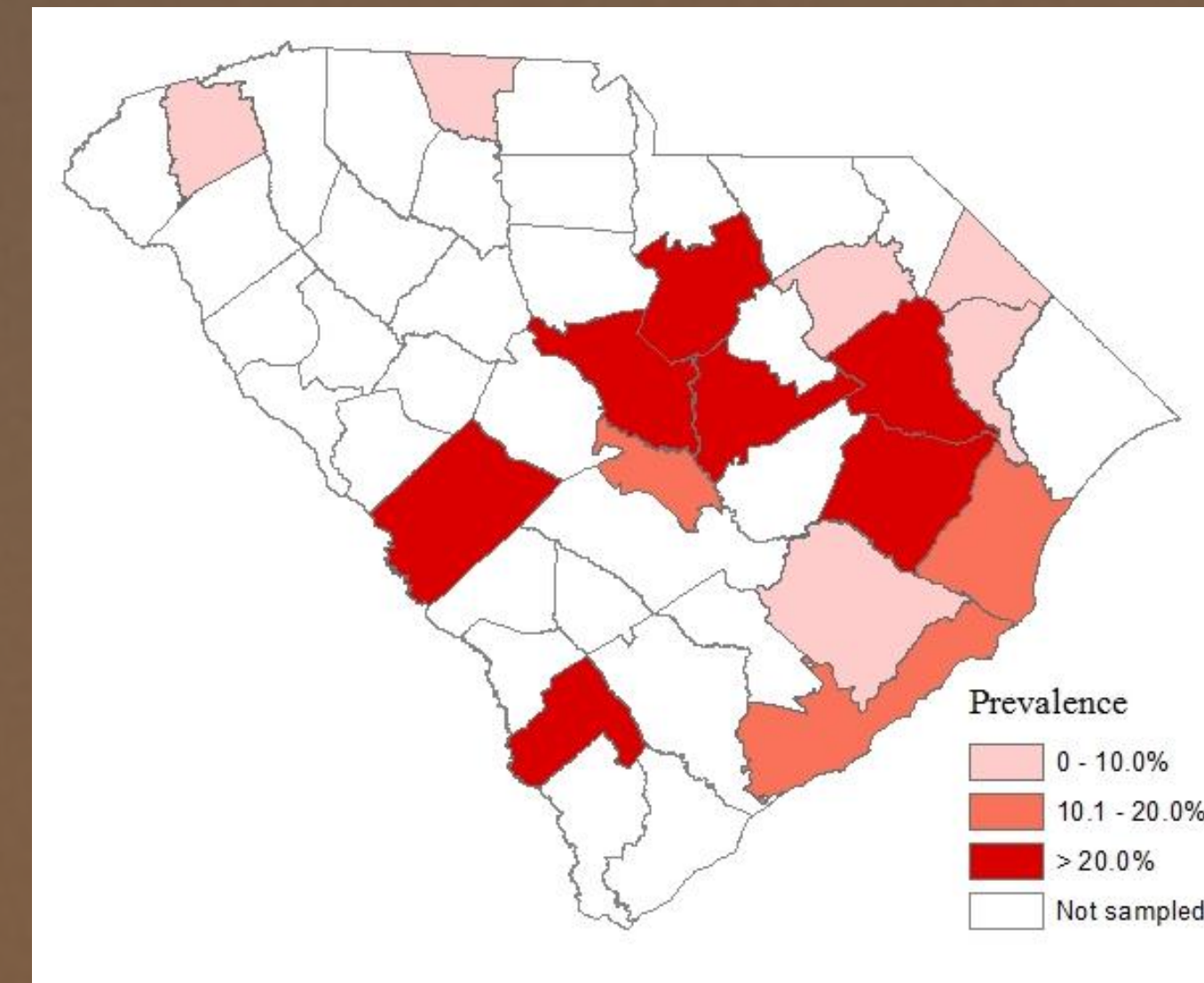


Figure 2. The prevalence of swine brucellosis (SB) in South Carolina counties, 2007-2013.

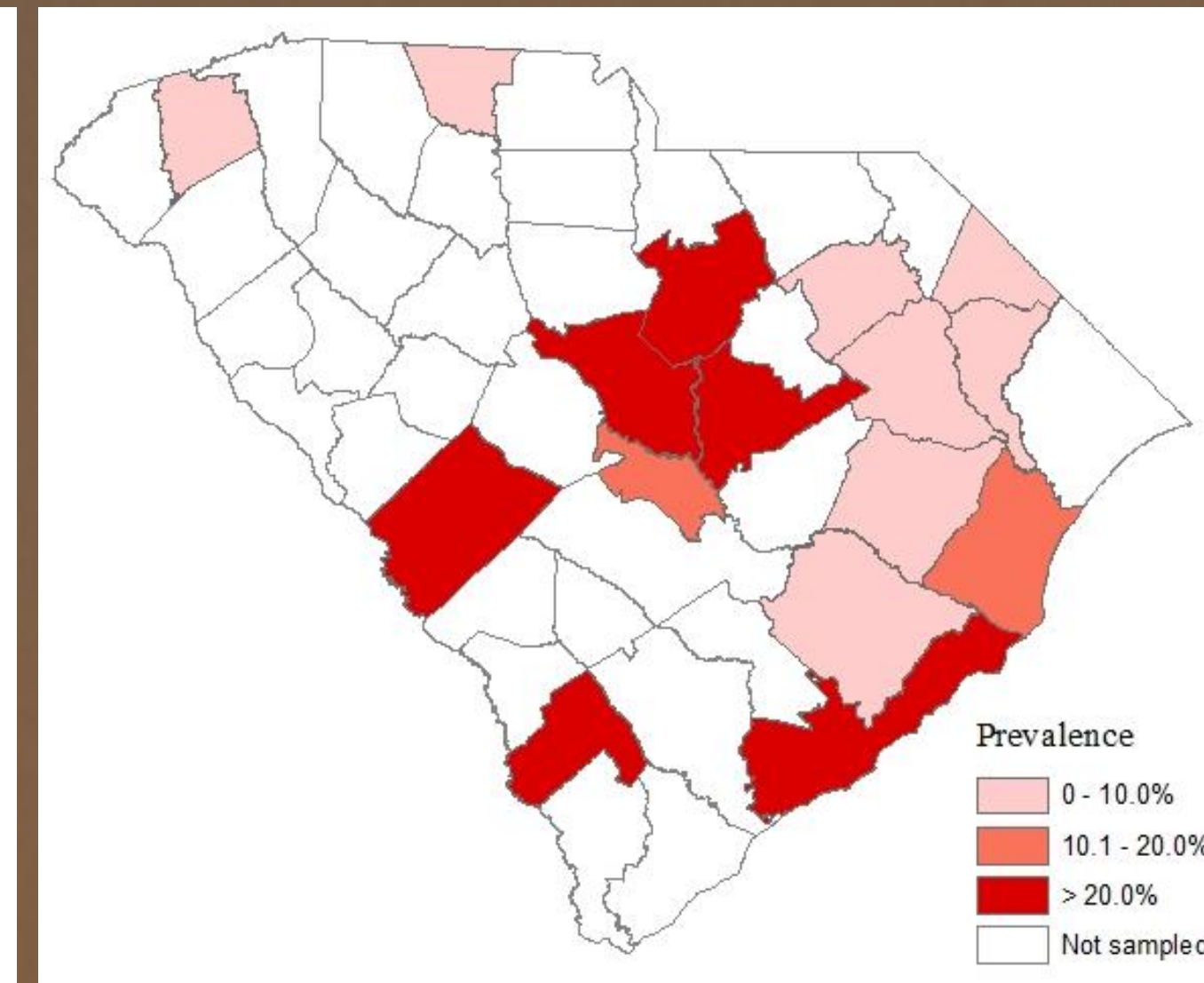


Figure 3. The prevalence of pseudorabies virus (PRV) in South Carolina counties, 2007-2013.

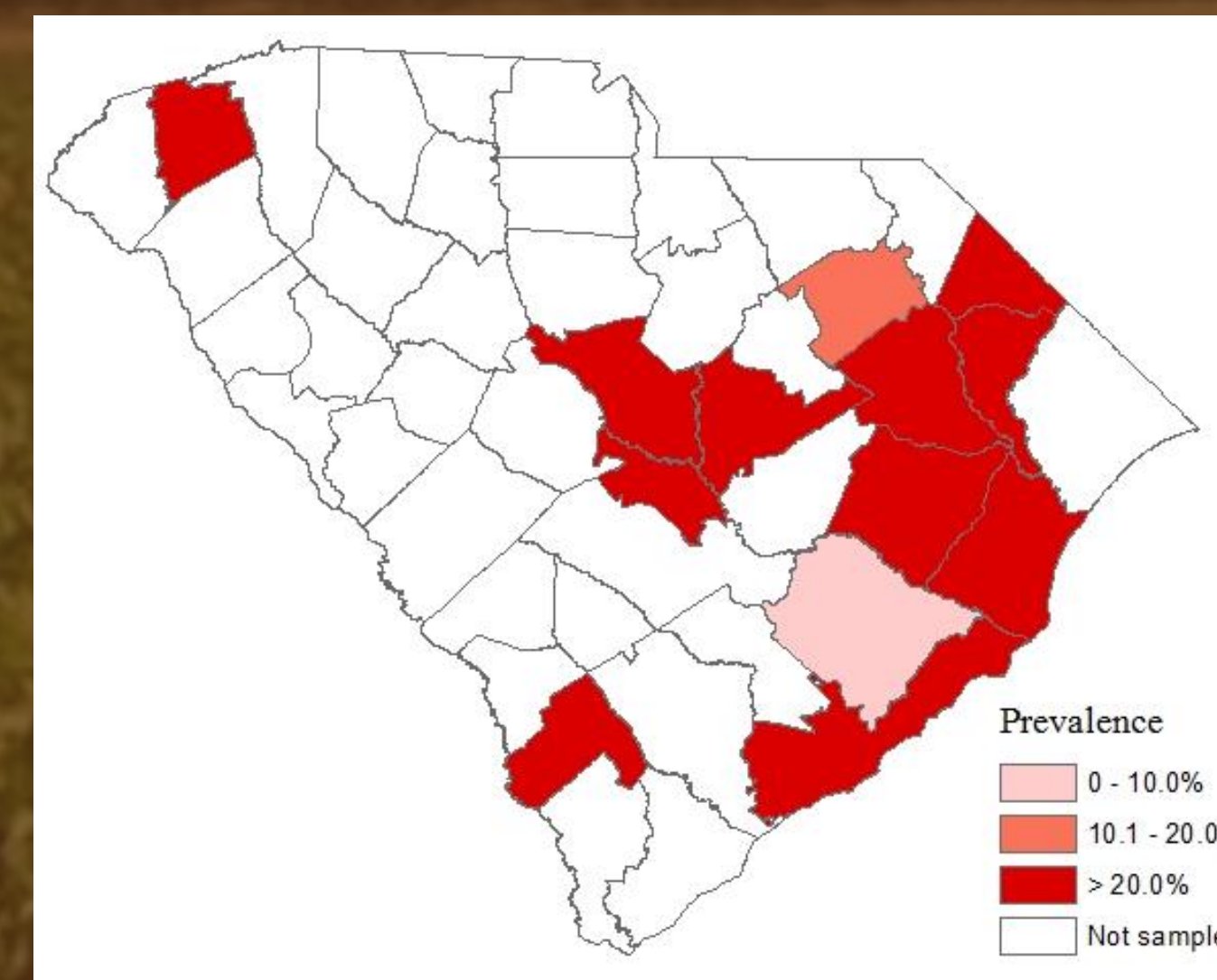


Figure 4. The prevalence of porcine circovirus (CIRCO) in South Carolina counties, 2007-2013.

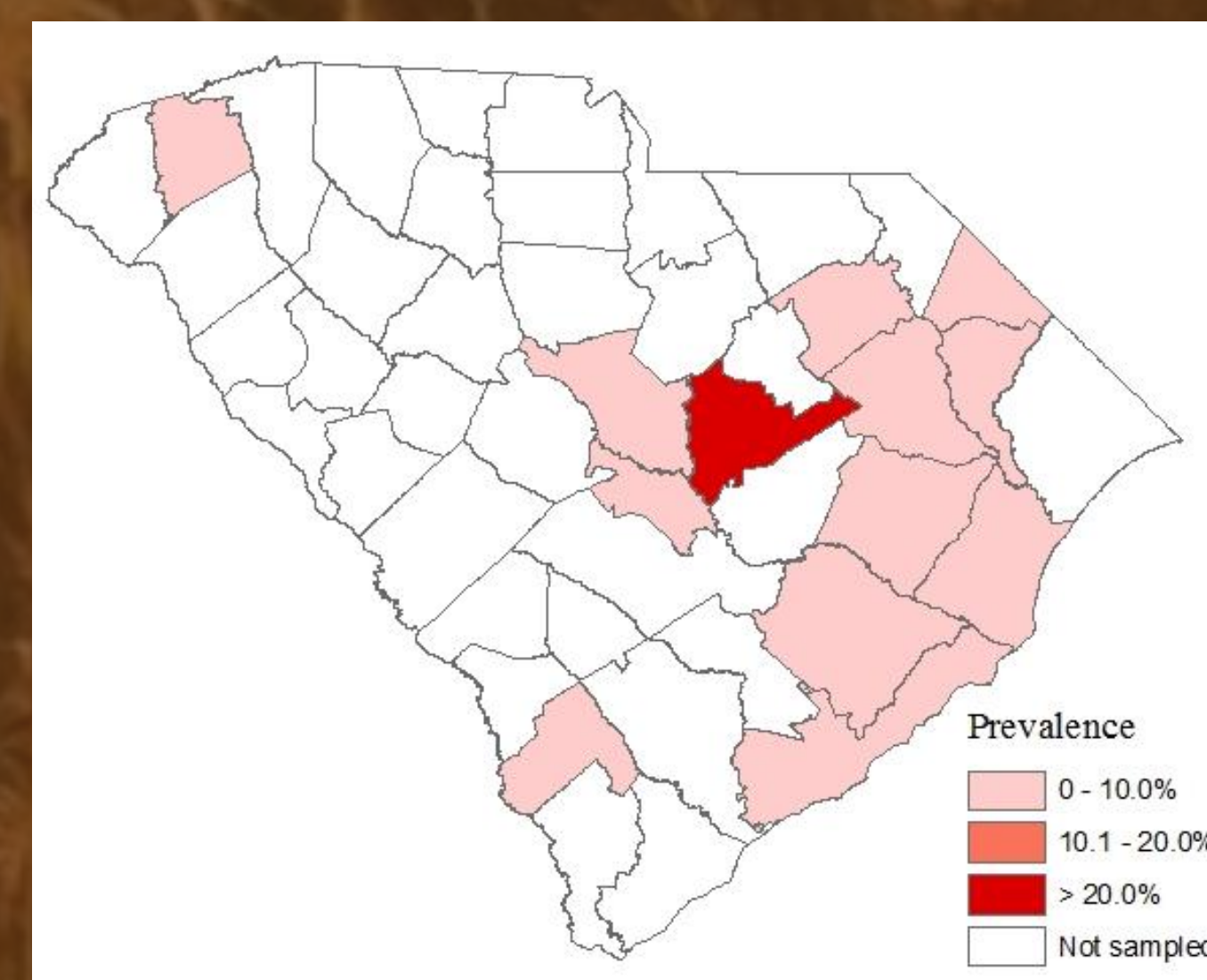


Figure 5. The prevalence of porcine reproductive and respiratory syndrome (PRRS) in South Carolina counties, 2007-2013.

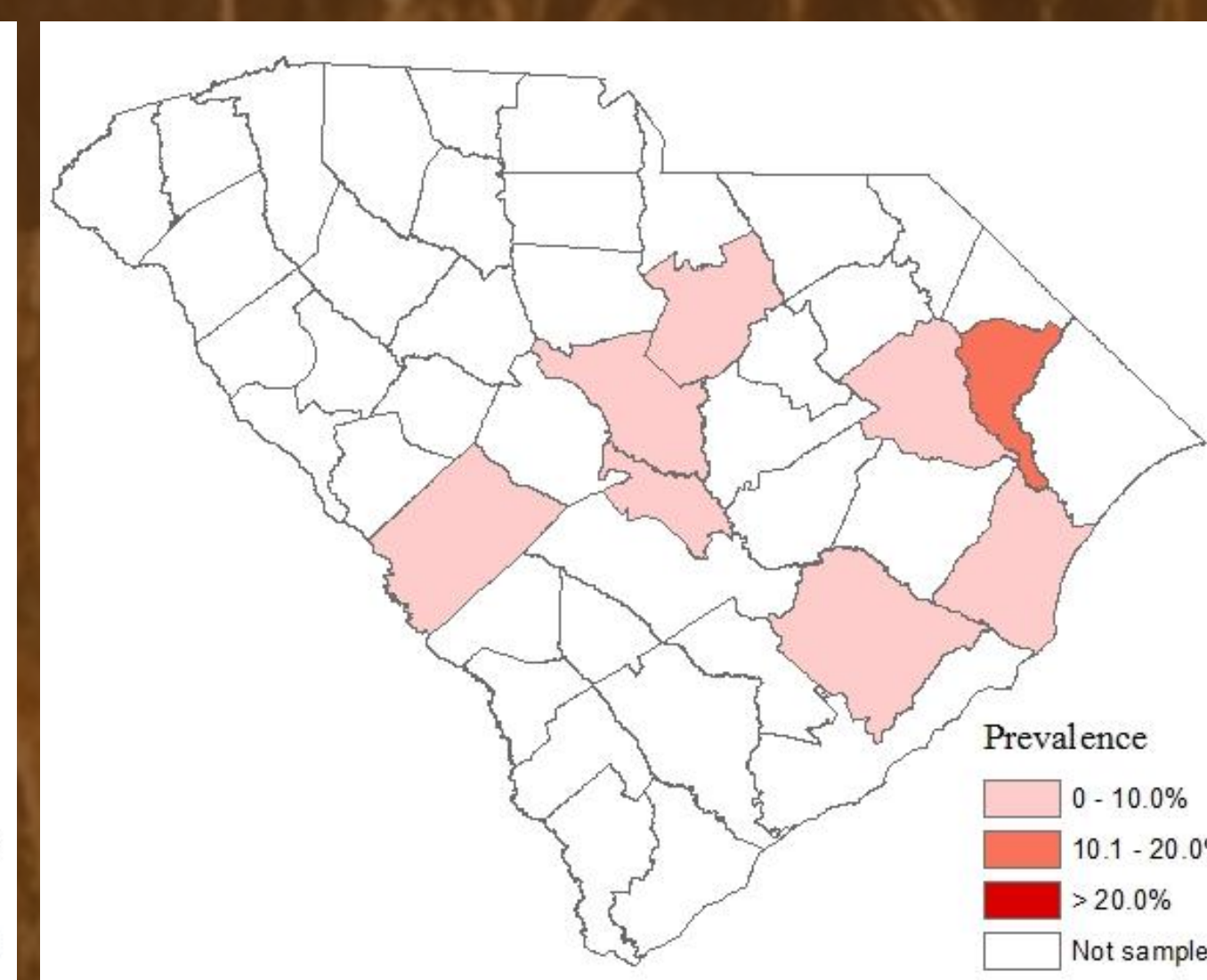


Figure 6. The prevalence of swine influenza virus (SIV) in South Carolina counties, 2007-2013.

## Results

- No wild hogs tested positive for CSF during any year of the study period
- Age class was significantly associated with SB prevalence ( $p < 0.001$ ), PRV prevalence ( $p < 0.001$ ), and CIRCO prevalence ( $p = 0.04$ )
  - Adults were 3.9 (95% C.L. = 1.9 to 7.9) times as likely to test positive for SB relative to sub-adults
  - Adults were 4.9 (95% C.L. = 2.4 to 10.1) times as likely to test positive for PRV relative to sub-adults
  - Adults were 2.7 (95% C.L. = 1.3 to 5.9) times as likely to test positive for CIRCO relative to sub-adults
- Sex was significantly associated with CIRCO prevalence ( $p = 0.006$ )
  - Females were 2.3 (95% C.L. = 1.3 to 4.2) times as likely to test positive for CIRCO relative to males
- Neither age class nor sex was significantly associated with PRRS or SIV prevalence ( $p > 0.05$  for each)
- Positive SB, PRV, and CIRCO samples were found in 50.0 - 92.3% of counties sampled (Figs. 2 - 4)
- Positive PRRS and SIV samples were found in 25.0 - 38.5% of counties sampled (Figs. 5 - 6)

## Discussion

- An age-based effect is relevant because adult wild hogs have had a longer time to come into contact with an individual infected with a disease compared to that of sub-adults
  - Additionally, SB is a sexually transmitted disease and adults are more likely to be reproductively active than sub-adults
- A sex-based effect is relevant because male wild hogs disperse from their family unit, which generally consists of one or more females and their collective young, once they reach maturity which could make males less likely to become infected with a disease transmitted through animal-to-animal contact
- All domestic swine operations in the United States are currently free of SB and PRV
  - However, wild hogs are reservoirs of these diseases and thus have the potential to infect domestic swine herds
- The relationship between disease prevalence and geographic location provides important information about disease hotspots in the state and allows information to be shared with at-risk individuals, such as hunters or farmers, in affected counties
- Future disease monitoring efforts need to target counties in the state that have not yet been sampled
- Expansion of this project will include mapping the proximity of infected wild hogs to the domestic livestock operations in South Carolina



Figure 7. Wild hogs in Hampton County in South Carolina (2014).

## Acknowledgements & Literature Cited

We thank the USDA Natural Resources Conservation Service for funding support and USDA Wildlife Services for collecting and providing access to the data. We also thank Noel Myers and Jim Edens who have contributed to this project.

Mayer, J.J. 2014. Estimation of the number of wild pigs found in the United States. Savannah River National Laboratory, Aiken, SC. STI-2014-00292: 1-8.  
 Mayer, J. J., and I. L. Brisbin, Jr. 2008. Wild Pigs in the United States: Their History, Comparative Morphology, and Current Status. 2nd Edition. The University of Georgia Press, Athens. 313 pp.  
 Pimentel, D. 2007. Environmental and economic costs of vertebrate species invasions into the United States. Pp. 2-8. In G. W. Wimer, W. C. Pitt, and K. A. Fagerstone (eds). Managing Vertebrate Invasive Species: Proceedings of an International Symposium. USDA/APHIS Wildlife Services, National Wildlife Research Center, Fort Collins, Colorado. 481 pp.

