

Distribution, Pest Status, and Research Programs for the Brown Marmorated Stink Bug in the Southeastern US

Jim Walgenbach

NC State University

Mt Hort Crops Res & Ext Ctr

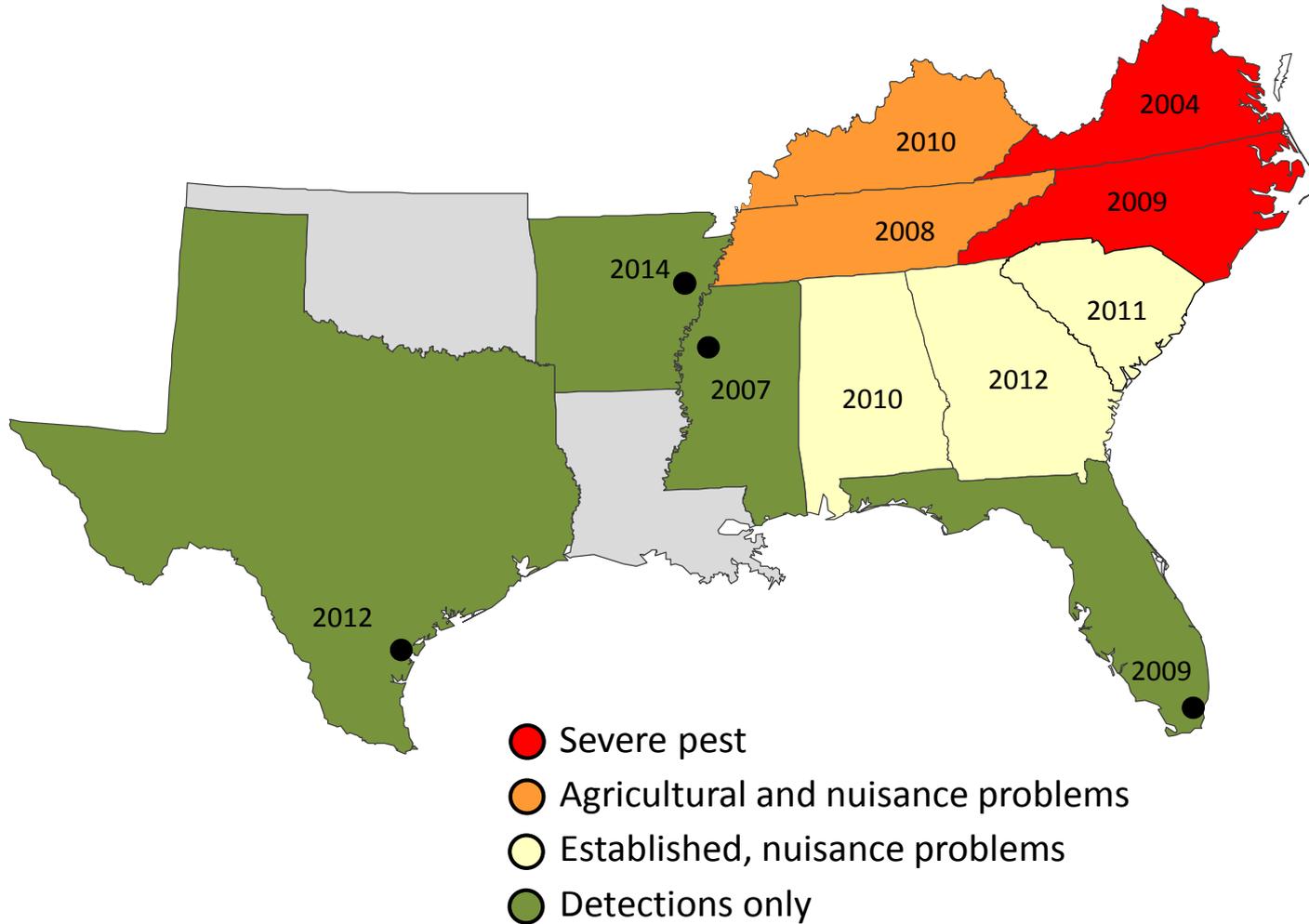
Mills River, NC

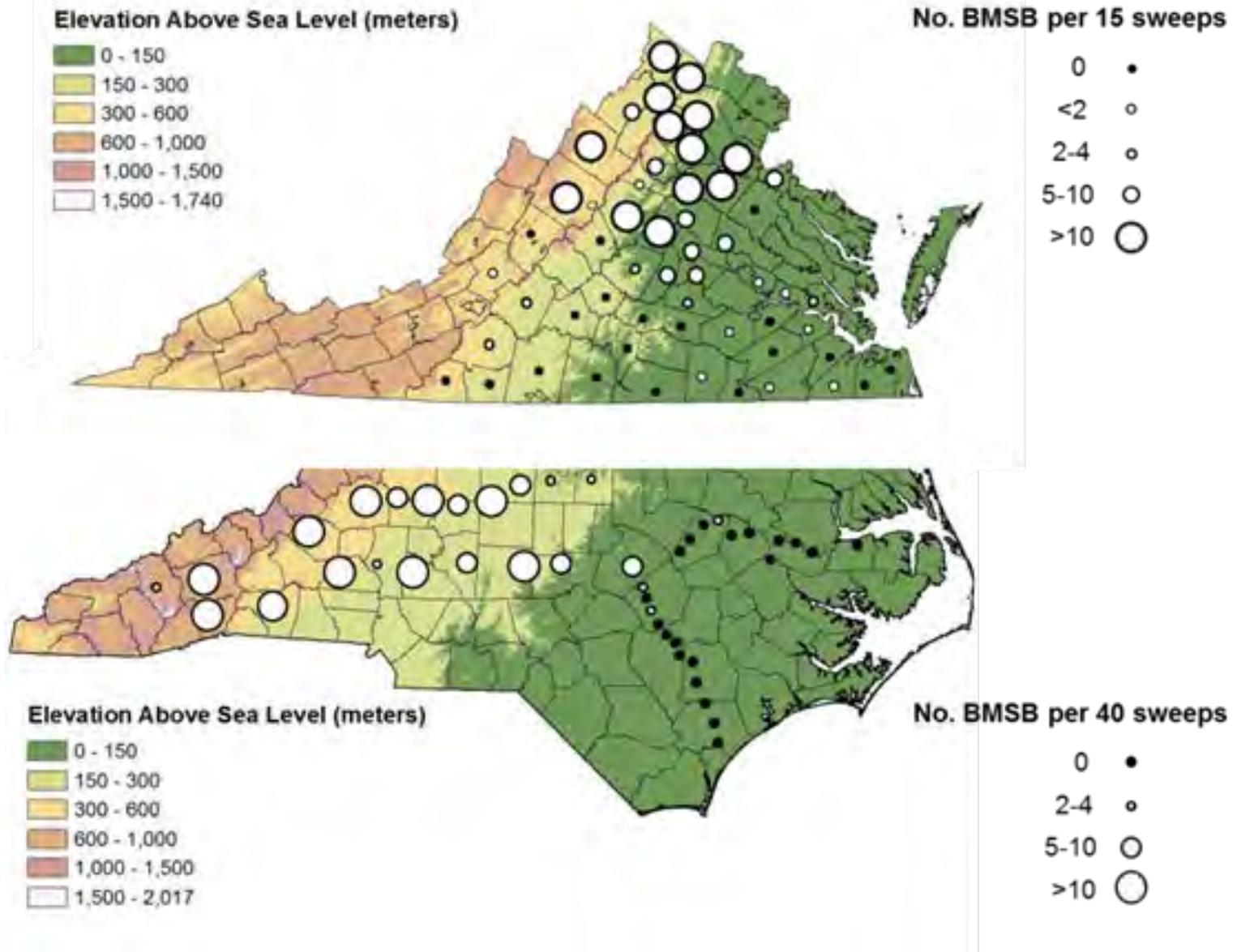
NC STATE UNIVERSITY

Additional Contributors

- Kathy Flanders, Auburn University
- Savannah Duke, Auburn University
- Ron Smith, Auburn University
- Scott Stewart, University of Tennessee
- Frank Hale, University of Tennessee
- Blake Layton, Mississippi State University
- Powell Smith, Clemson University
- Ric Bessin, University of Kentucky
- Mike Merchant, Texas A&M
- Mike Toews, University Georgia
- Dominic Reissig, NC State University
- Tom Kuhar, Virginia Tech
- Ames Herbert, Virginia Tech
- Kim Sam, Arkansas State Plant Board
- Amanda Hodges, University of Florida

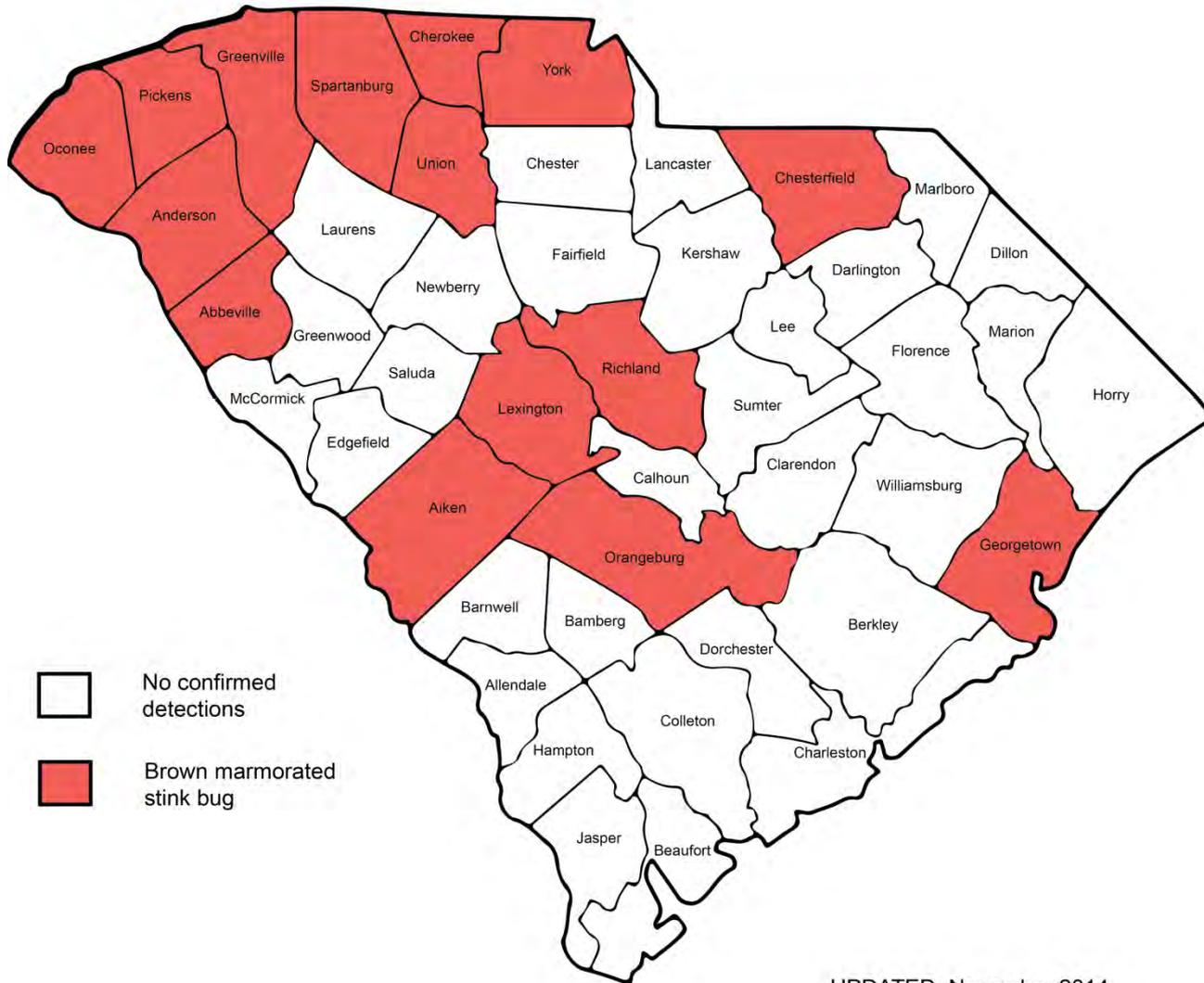
Occurrence and Distribution of BMSB in the Southeast





Bakken et al. 2015. Occurrence of BMSB on wild hosts in non-managed woodlands and soybeans in NC and VA. *Environ. Entomol.* 44: 1011-1021.

PEST DETECTIONS BY COUNTY

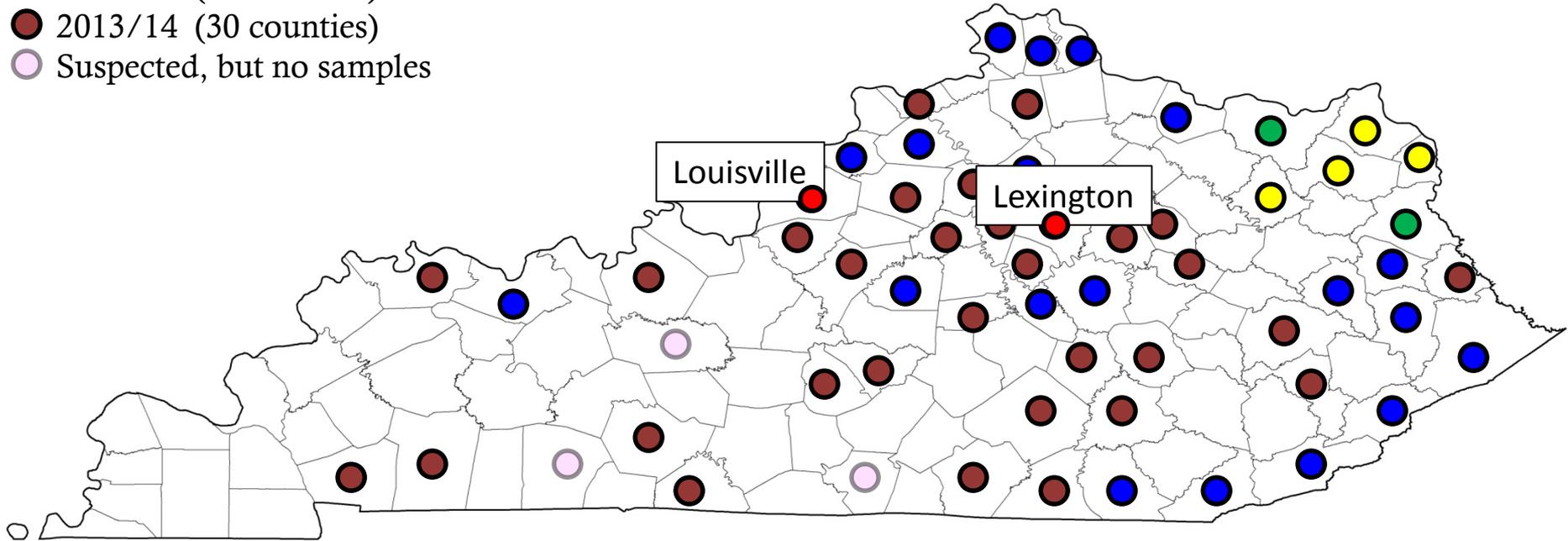


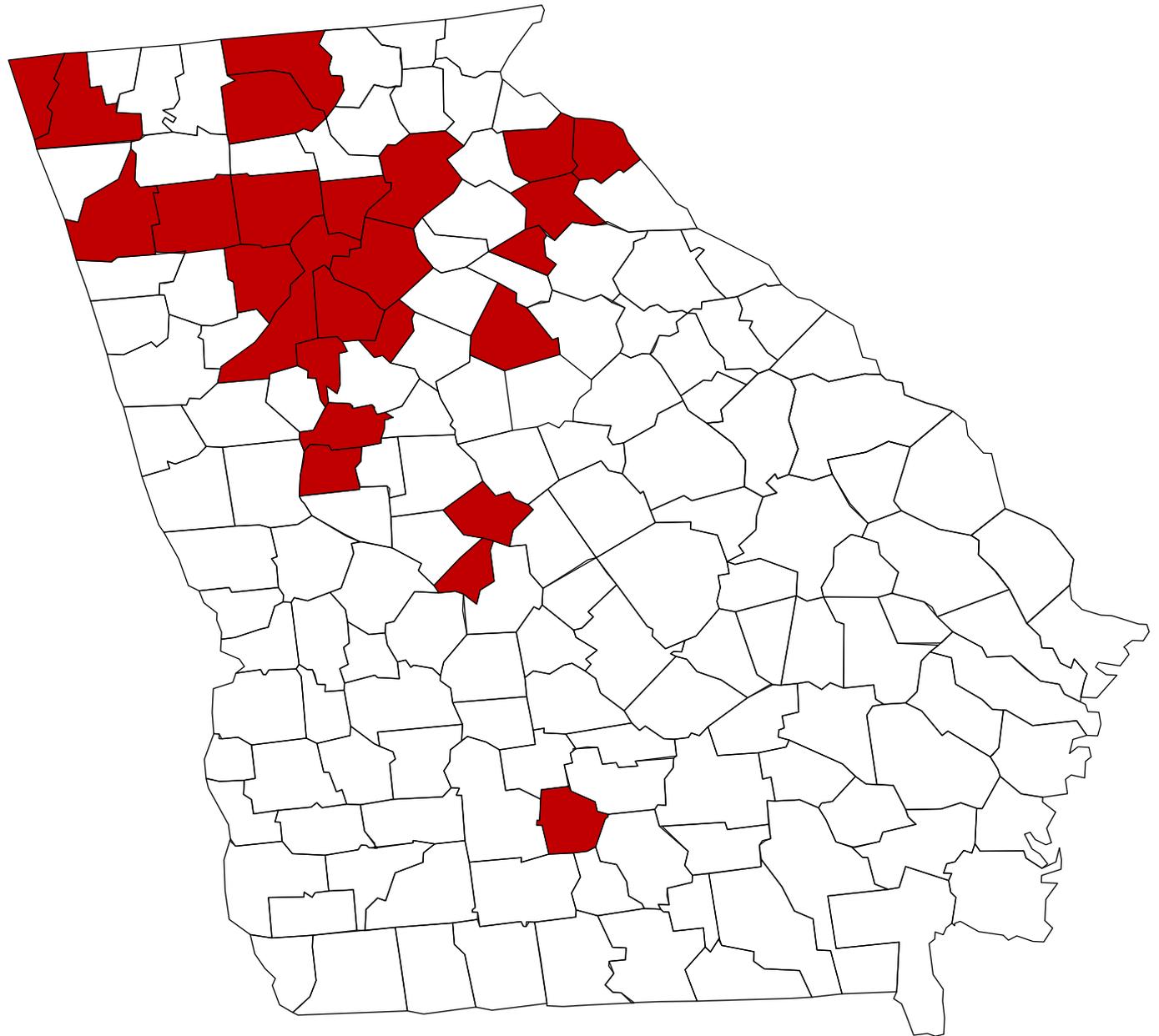
UPDATED: November 2014

Brown Marmorated Stink Bug Timeline

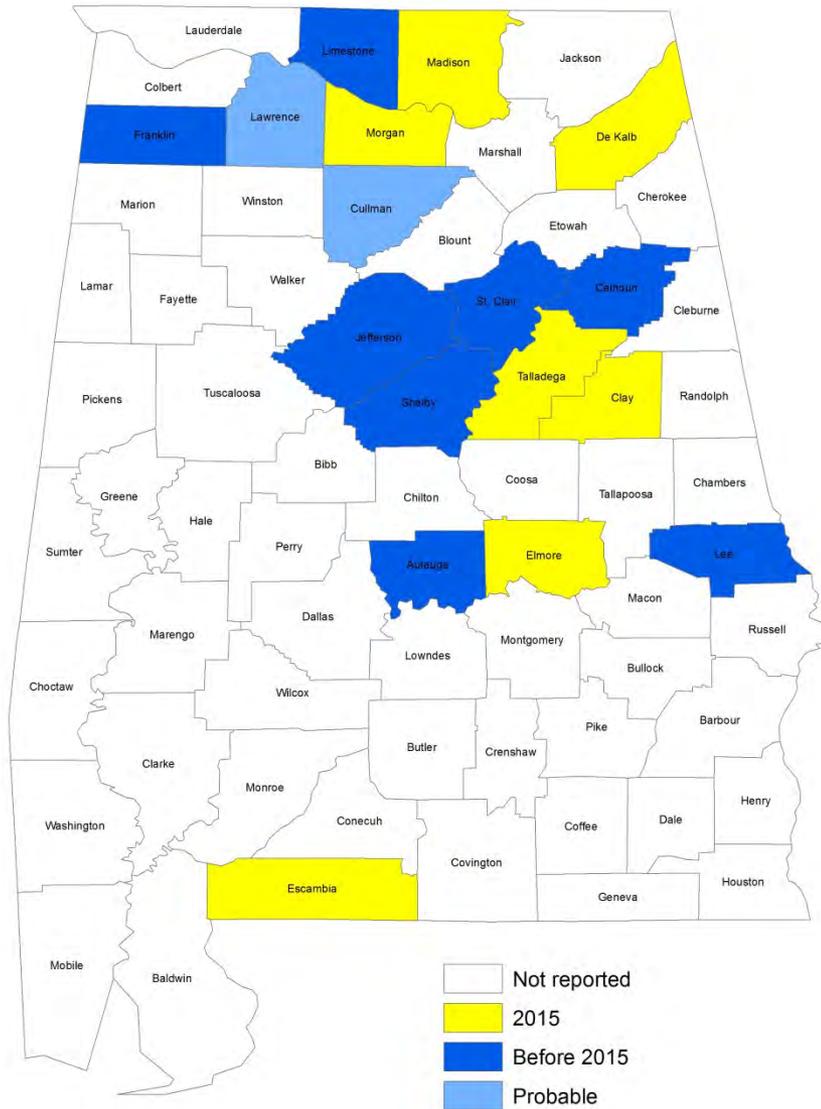
57/120 counties

- 2010/11 (6 counties)
- 2011/12 (2 counties)
- 2012/13 (19 counties)
- 2013/14 (30 counties)
- Suspected, but no samples

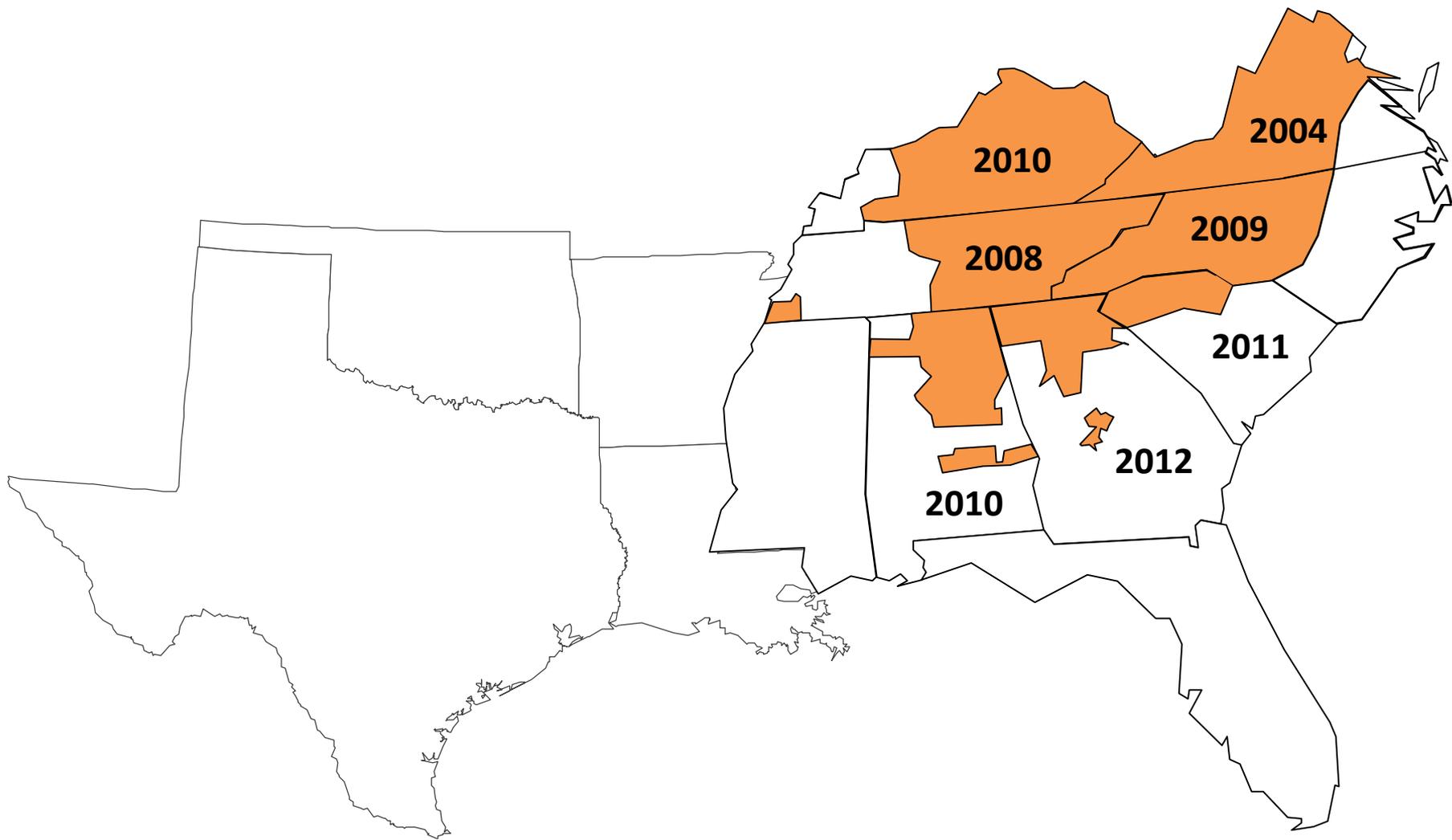




Mike Toews, University of Georgia



Kathy Flanders, Auburn University



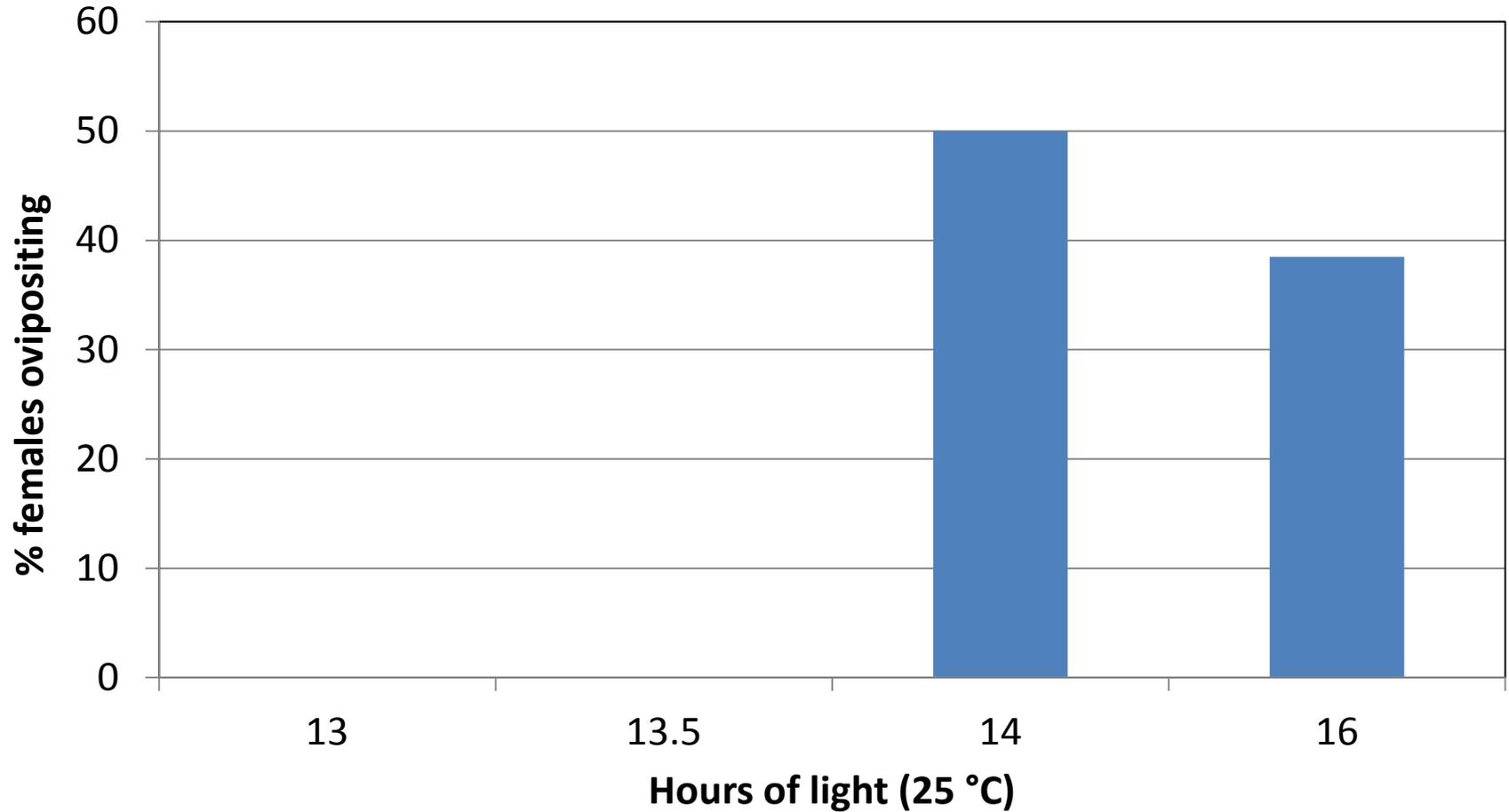
Factors Limiting BMSB Distribution in Southeastern US.

- Photoperiod
- Overwintering Ecology
- Summer temperatures
- Host plant availability

BMSB Life History

- Origin of Eastern US BMSB – Beijing, China
 - Xu et al. 2014. *Biol. Invasions* 16: 153-166.
- Critical day length for ovarian development and diapause induction
 - 13.5 – 14 hours day length
 - Fujiya et al. 1979
 - Watanabe, M. 1979. *Ann. Rep. Toyama Inst. Health* 11: 33-37.
 - 14.5 – 15 hour day length
 - Tanagi & Hagihara. 1980. *Plant Protection* 34: 31-42
- Temperature affects rate of ovarian development
 - Watanabe, M. 1980. *Funo Med Journal* 12: 168-173.
- Development in relation to temperature
 - 15°C, 33°C, 538 DD from egg-Adult
 - Nielsen et al. 2008. *Environ. Entomol.* 37: 348-355.

Photoperiod Effect on Reproduction of Overwintered Adults



Reproductive Stages of Brown Marmorated Stink Bug*

- 1: Immature oocytes,
Spermatheca clear
- 2: Defined oocytes, still immature
- 3: Mated, maturing oocytes,
Spermatheca evident
- 4: Mature oocyte in common duct,
Sclerotized spermatheca
- 5: Distended appearance,
Oocytes degrading

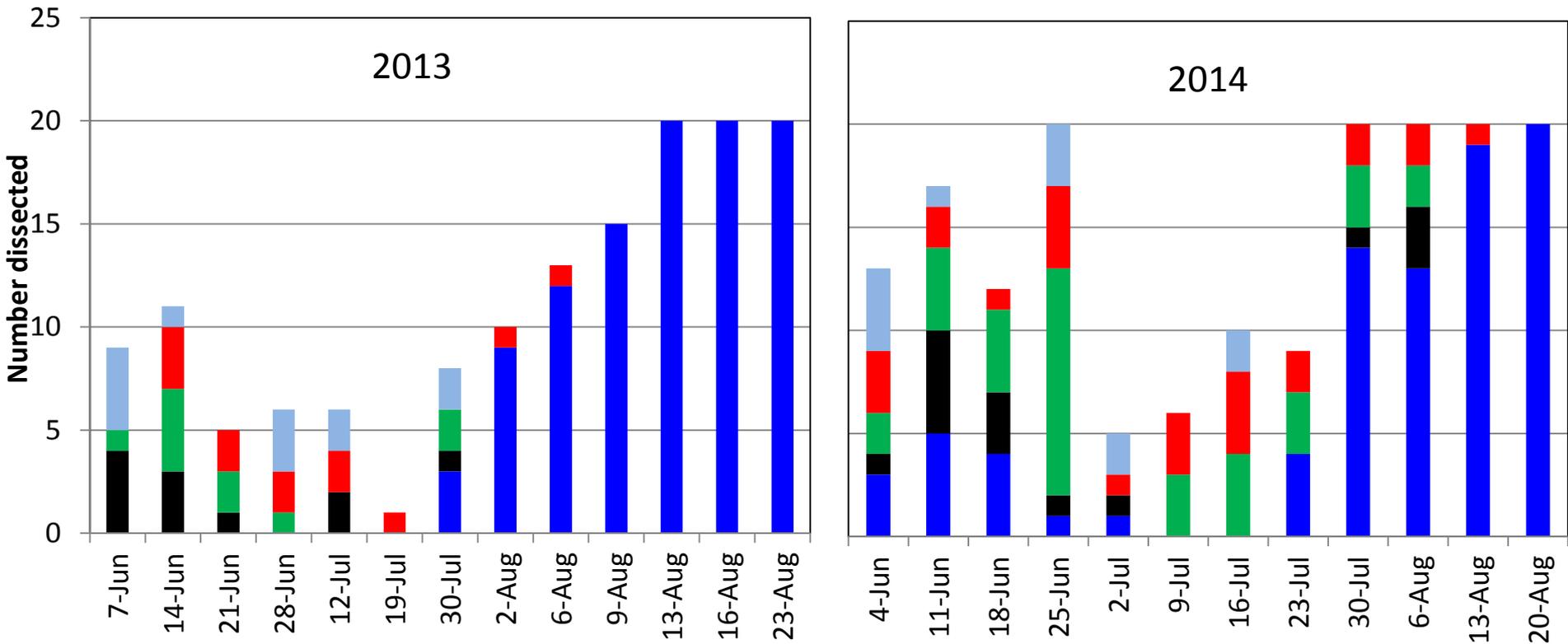


*Nielsen rating system, modified after Katayama et al. 1993

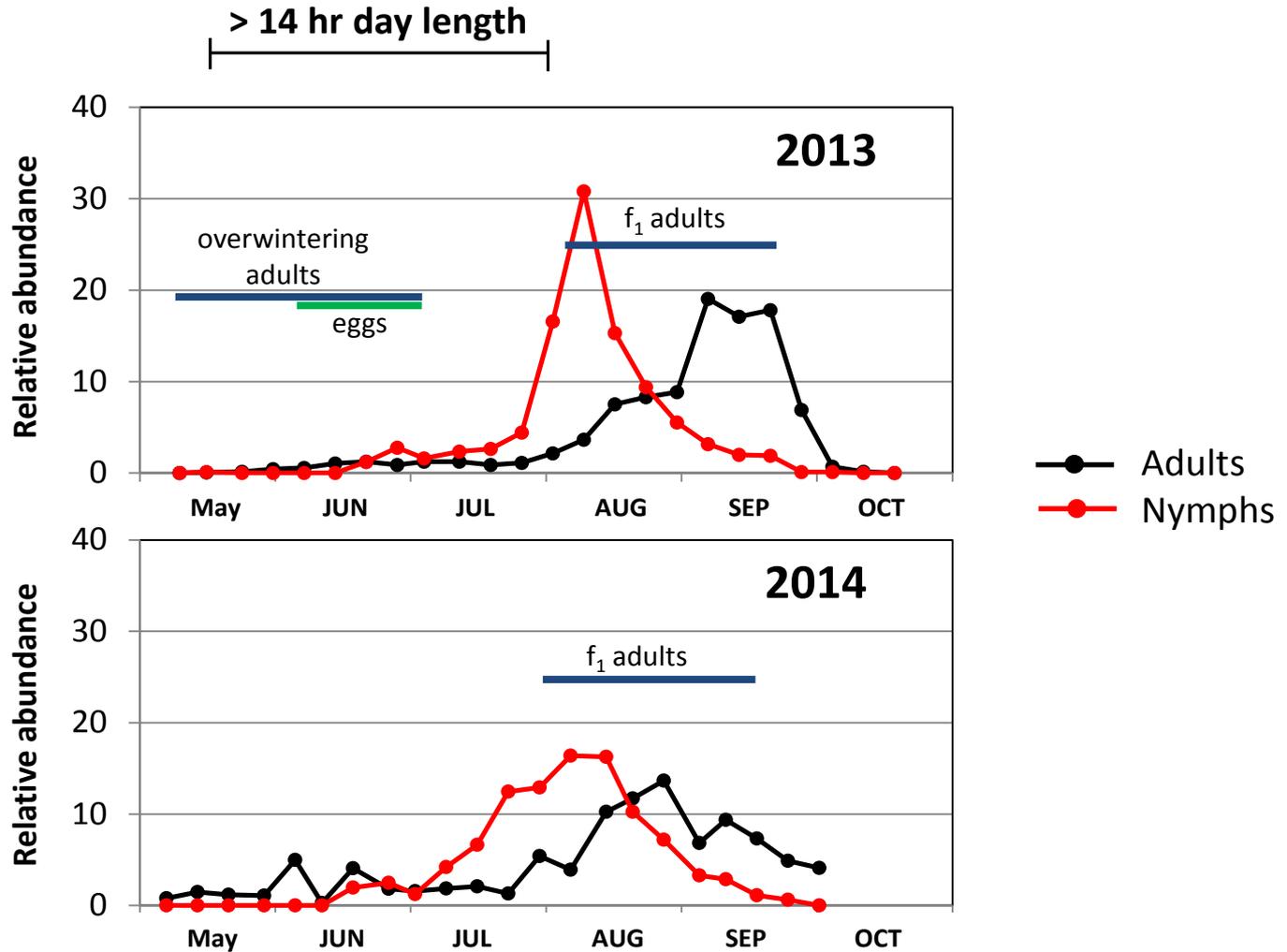
2013 –BMSB Female Reproductive Rank

Asheville, NC

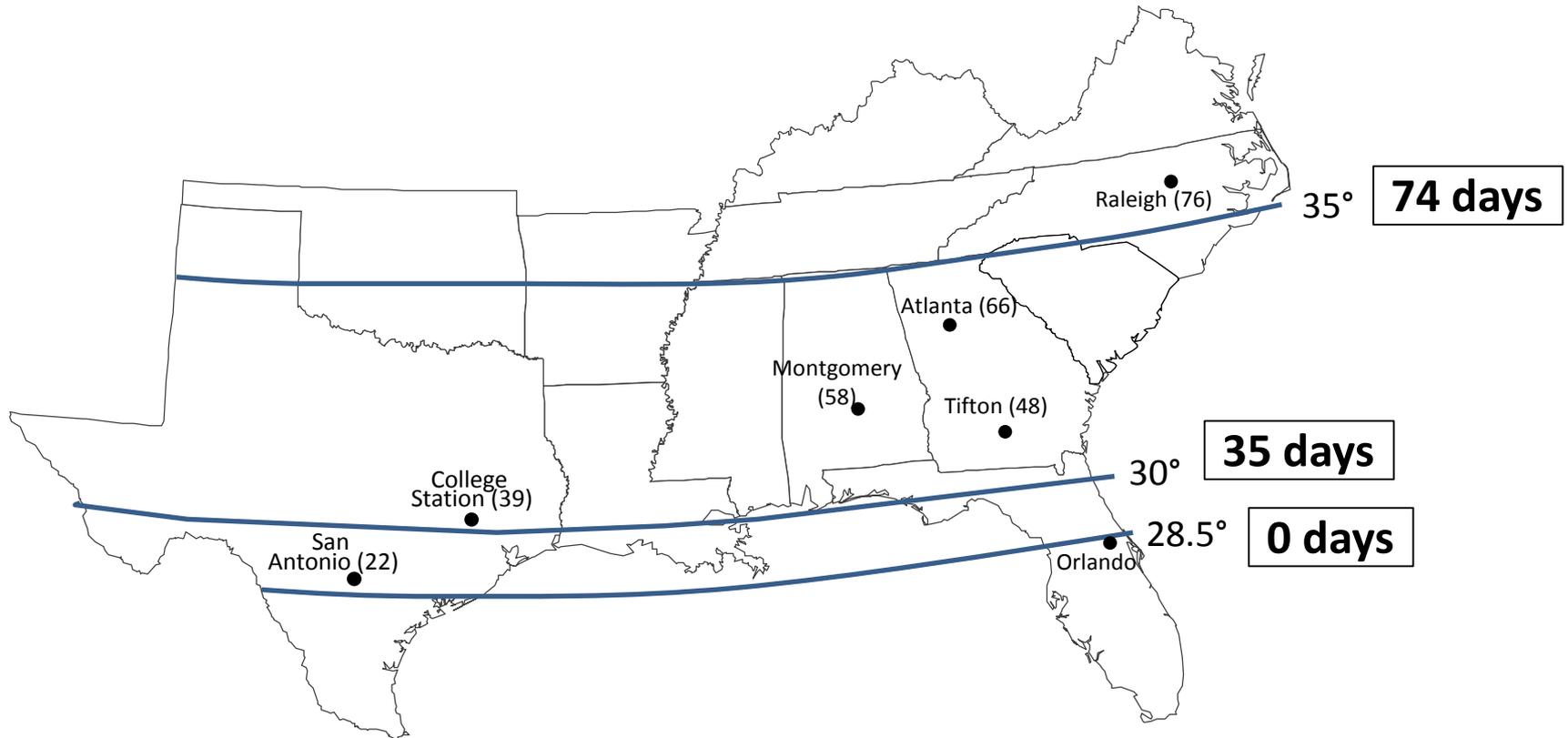
Reproductive Rank



BMSB Phenology – Asheville, NC



Day Length >14 Hrs in the Southeast

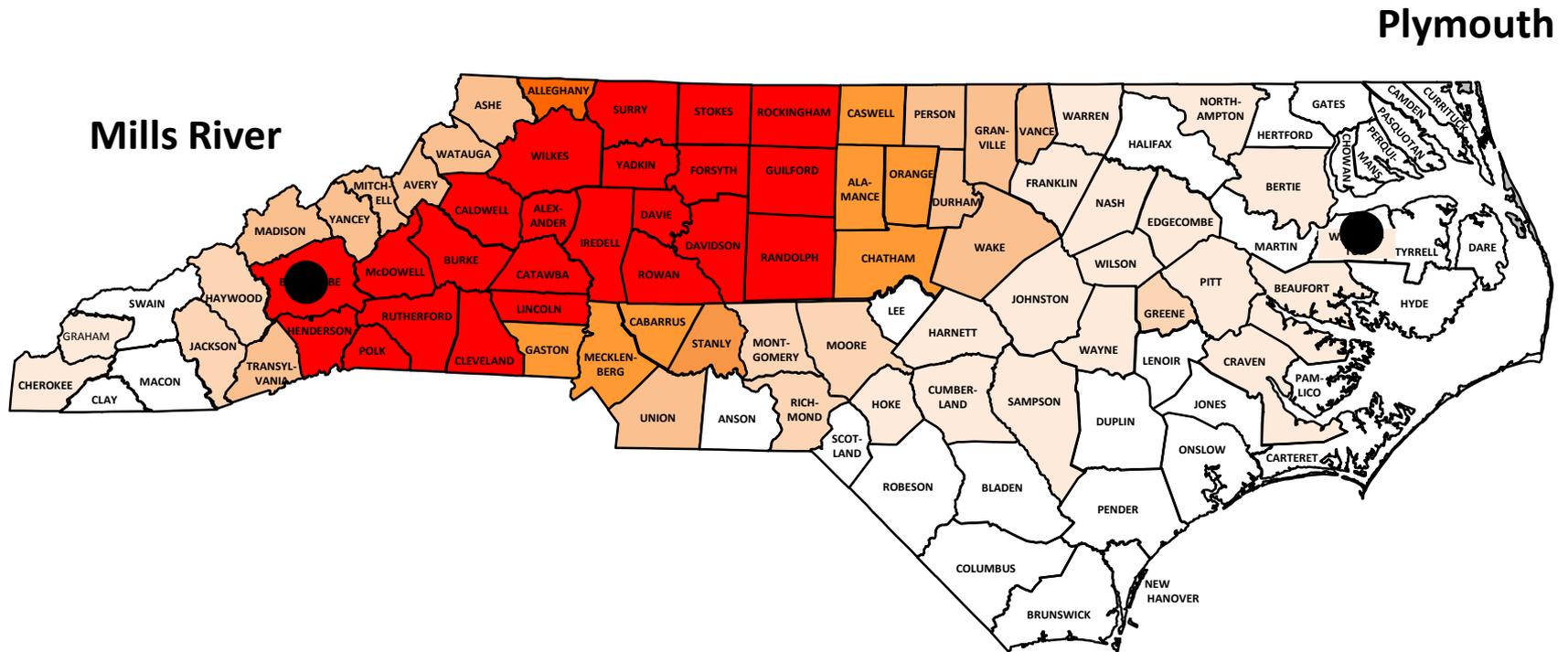


BMSB Overwintering/Spring Emergence Study

- Diapausing adults collected in October in overwintering shelters.
- Shelters placed apple crates and covered with chloroplast.
- Mortality and emergence recorded in the following spring.



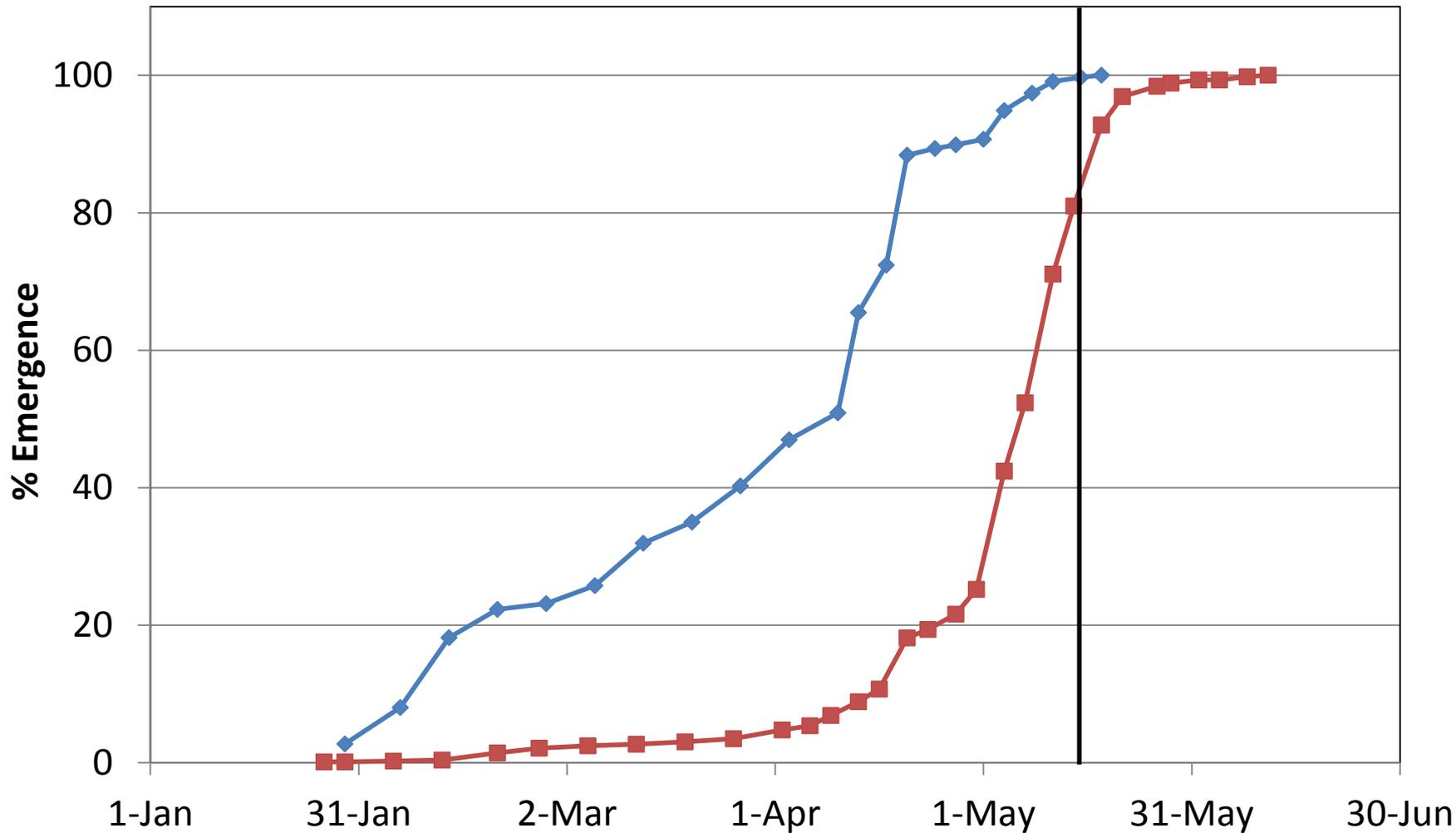
Intensity of Brown Marmorated Stink Bug Populations in NC



-  Widespread agricultural and nuisance pest.
-  Locally intense agricultural and nuisance pest.
-  Local hotspots in residential areas.
-  Low level populations in isolated areas.

Cumulative Emergence of Overwintered BMSB in North Carolina

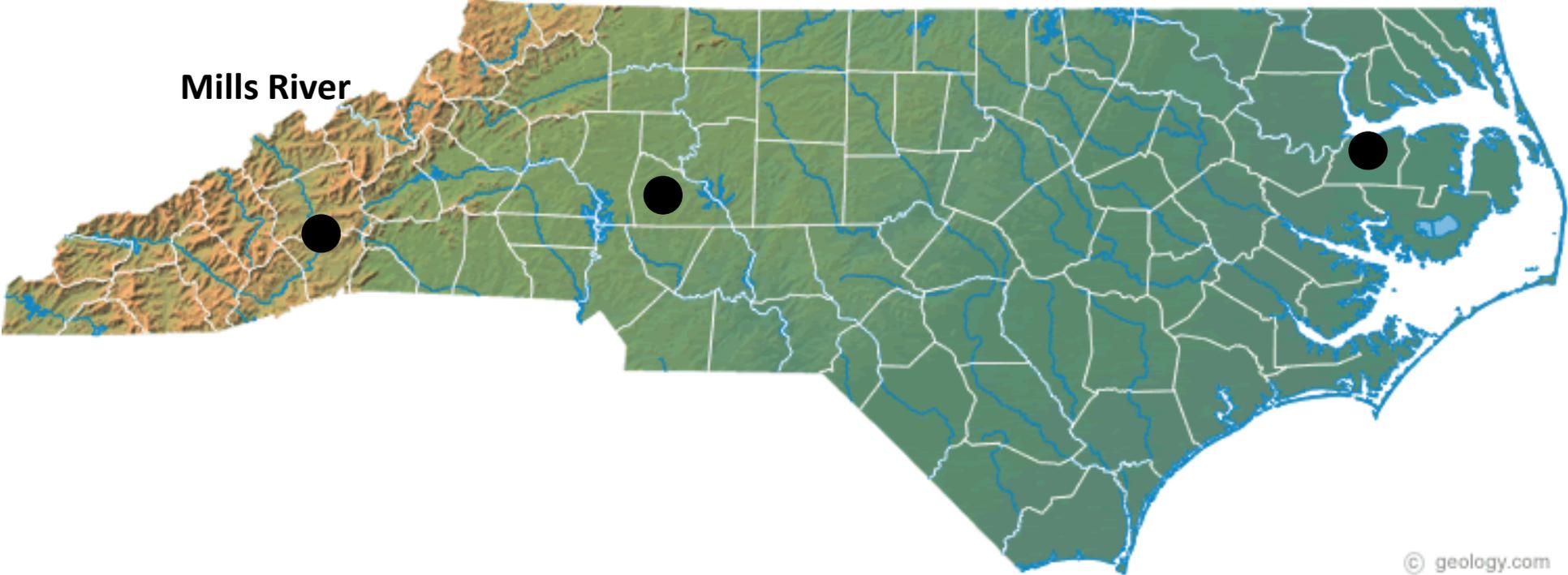
◆ Raleigh ■ Mills River



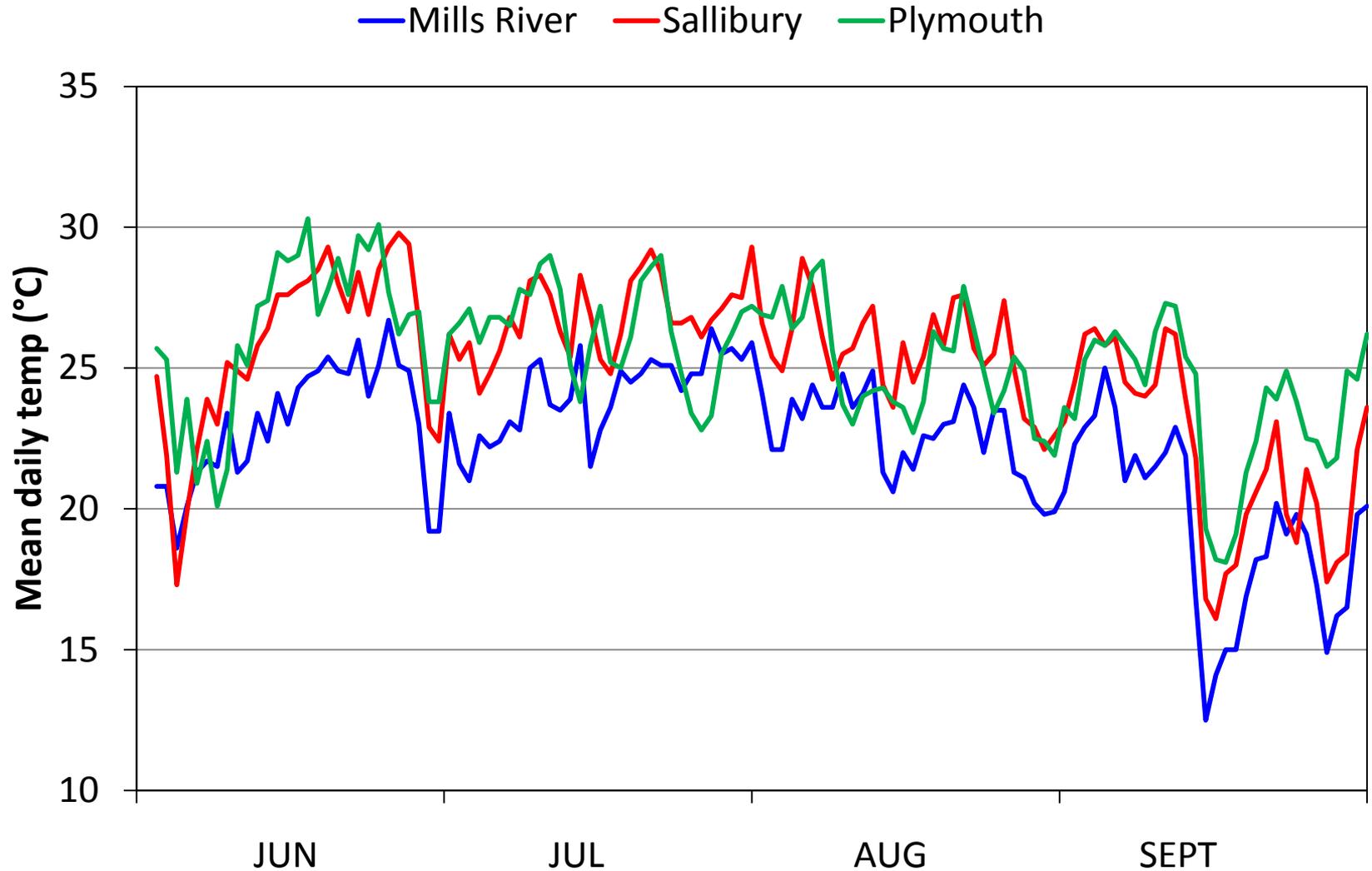
Mills River

Salisbury

Plymouth



Mean Daily Temperature



BMSB Pest Status in Southeast

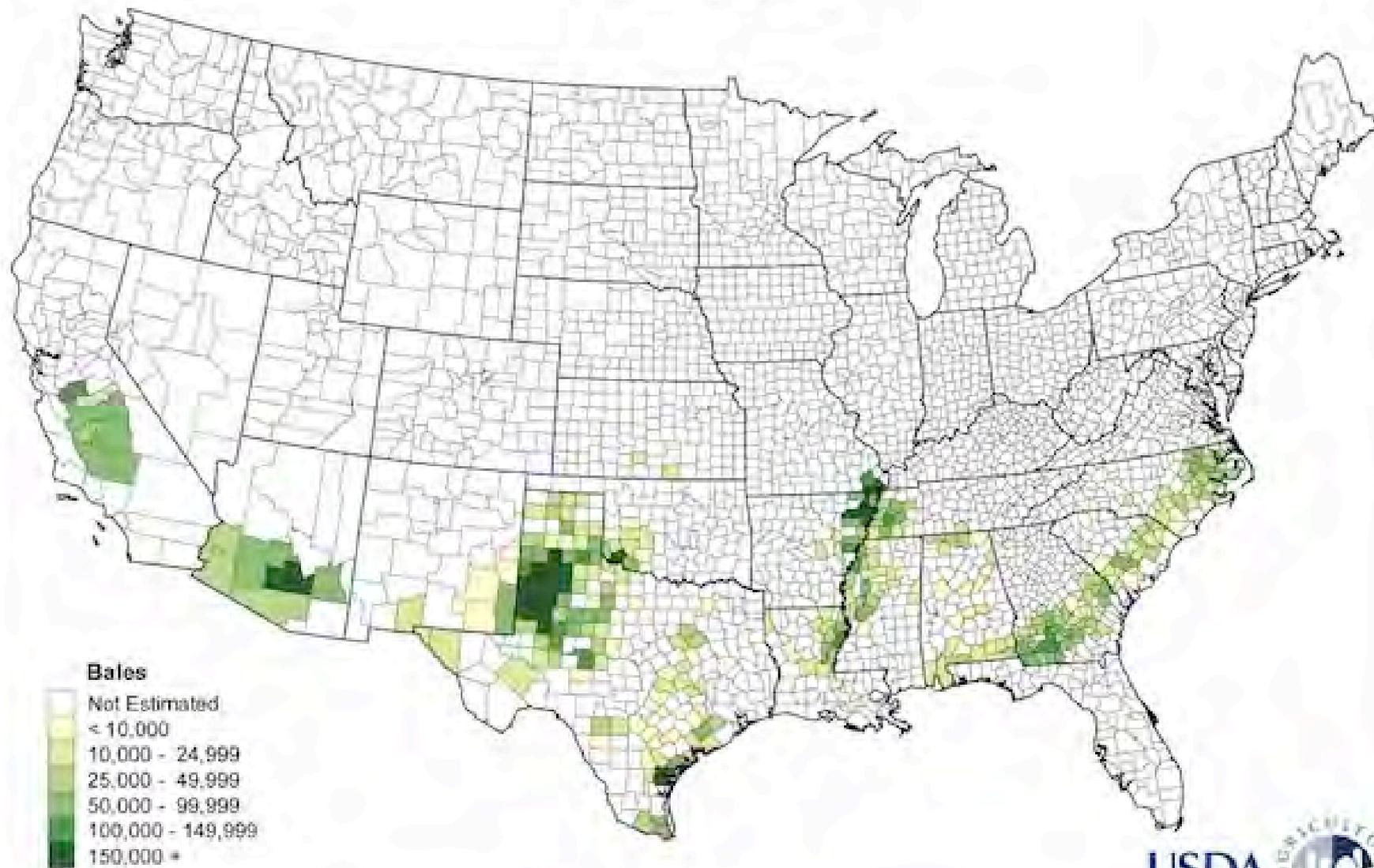


Pest Status of BMSB in the Southeast

State	Apple	Peach	Veget*	Corn	Cotton	Soybean
KY	X	X	X	X		X
VA	X	X	X	X		X
NC	X	X	X	X	X	X
SC	X	X		X		X
TN	X	X		X		X
AL				X		X
GA						

*BMSB as a pest of vegetables is much greater on organic vs conventional production.

Upland Cotton 2010 Production by County for Selected States



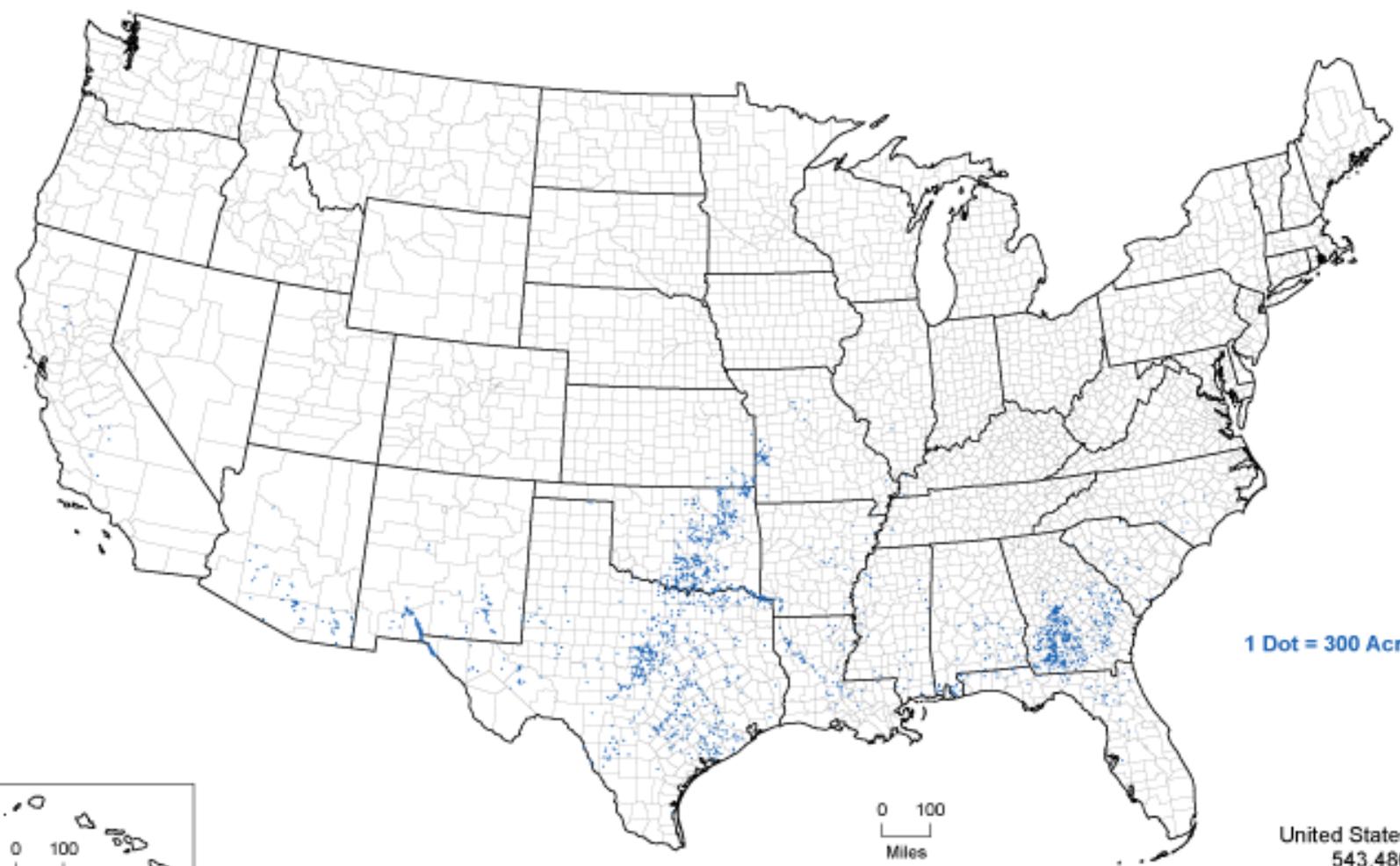
Bales



0 200
Miles



Total Acres of All Pecans: 2012



1 Dot = 300 Acres

0 100
Miles

United States Total
543,486



0 100
Miles

BMSB Research Activities in the Southeast

Kentucky (Bessin, Hardwood, Palli)

- Exclusion netting for organic control
- Stink bug communities in soybean
- Impact of biological control, including gut content analysis
- Development of BMSB RNAi tools.

- Tennessee (Jenny Moore)

- Exclusion netting for organic control
- Impact of biological control agents

BMSB Research Activities in the Southeast

- Virginia (C. Bergh, A. Herbert, T. Kuhar, D. Pfeiffer)
 - Monitoring tools and management strategies on tree fruit, vegetables, grapes and field crops
 - Seasonal movement patterns among habitats
 - Overwintering biology and ecology
 - Factors affecting colonization of new habitats
 - Development on different hosts
 - Impact on soybeans, corn and cotton
 - Organic management on vegetables
 - Structural and household pest control approaches
 - Development of climate models for predicting spread

BMSB Research Activities in the Southeast

- North Carolina (J. Walgenbach, D. Reissig, G. Kennedy)
 - Management on fruits, vegetables and field crops
 - Trap crops in organic systems
 - Impact of biologic control agents in managed and non-managed habitats
 - Overwintering biology and ecology
 - Biotic and abiotic factors affecting colonization of different regions

BMSB Research Activities in the Southeast

- Georgia (M. Toews, G. Tillman, T. Cottrell)
 - Distribution in southern cotton-corn-soybean systems
 - Bacterial and fungal pathogen load in BMSB (G. Medrano, USDA-ARS College Station)
 - Trapping and distribution studies

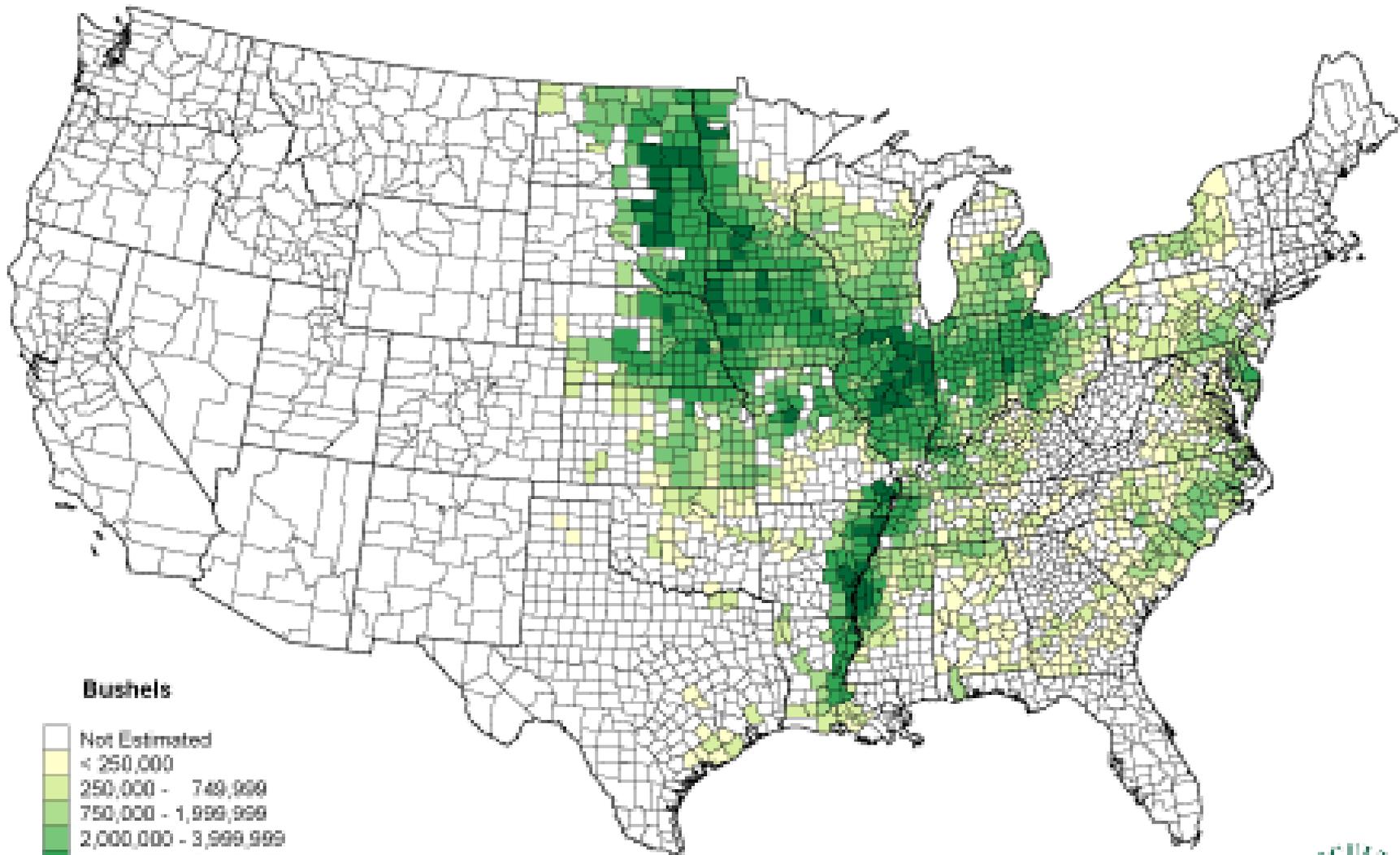
BMSB Research Activities in the Southeast

- Alabama (K. Flanders)
 - Distribution and spread of established populations throughout state.
 - Impact of southern climates on development and reproduction.

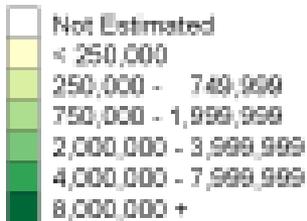
Summary

- BMSB has become firmly established in several areas of the southeast, principally in mountain and piedmont areas.
- BMSB population dynamics in southeast is likely to be much different than mid-Atlantic states due to climatic.
- Establishment in coastal plain ecoregions appears to be hampered by climatic factors, including summer and winter temperatures, day length, and possibly host plant availability.

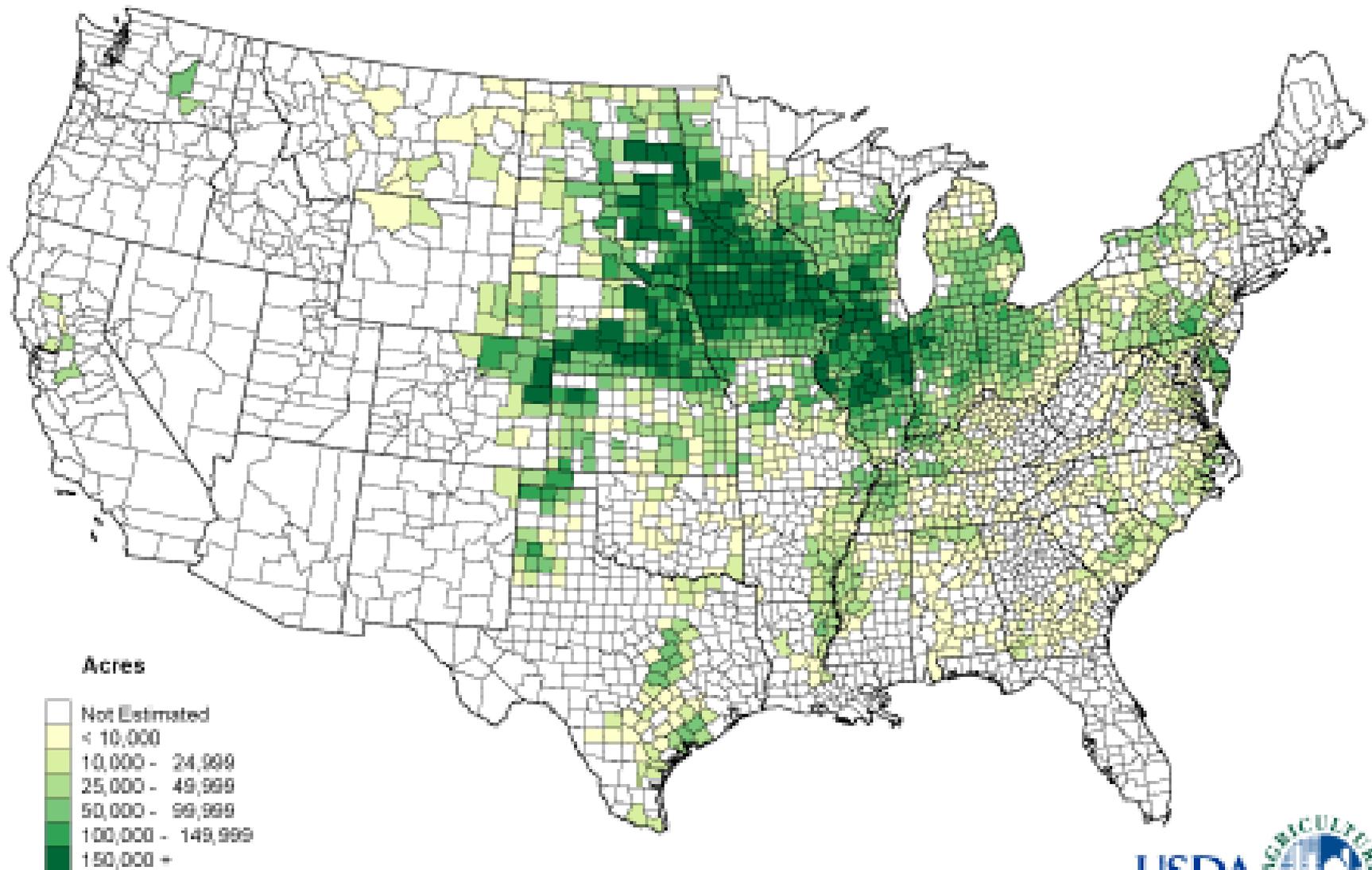
Soybeans 2014 Production by County for Selected States



Bushels



Corn for All Purposes 2014 Planted Acres by County for Selected States



Acres

