Modeling the relationship between southern highbush blueberry flower density and flower thrips abundance

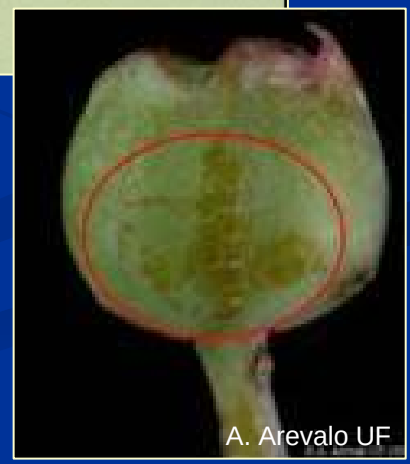
Elena M. Rhodes
Entomology and Nematology Department, UF

Southern Highbush Blueberries in Florida

- 2009 (USDA, 2010)
  - 6.4 million kg (14.1 million lbs)
  - 1,295 ha (3,200 acres)
  - Average of $11.89 per kg ($5.40 per lb)

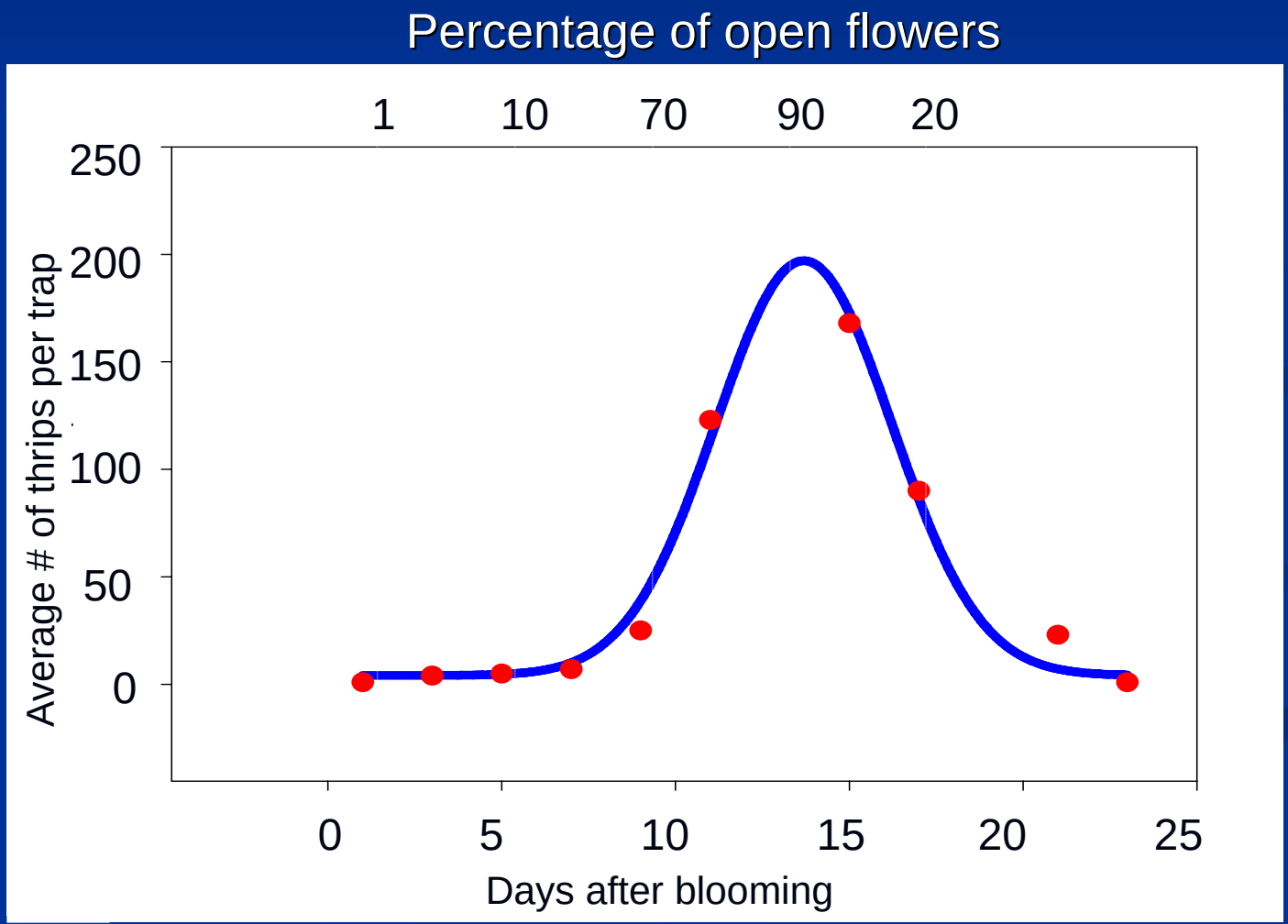
Flower Thrips

- ~90% of thrips captured in FL blueberries are *Frankliniella bispinosa* (Morgan) (Arévalo, 2006)
- ~1 mm in length
- Bristle-like wings and “punch and suck” mouthparts
- Injury caused by feeding and oviposition



Size of Thrips Populations in Relation to Flower Phenology

Arévalo and Liburd, 2007, J. Econ. Entomol. 100: 1622-1632



Relevance to Thrips Management

- Thrips populations form ‘hot spots’ (Arévalo and Liburd 2007)
- Goal: predict ‘hot spot’ locations for targeted insecticide applications
  - Reduce negative environmental effects
  - Reduce non-target effects
  - Reduce grower expenses

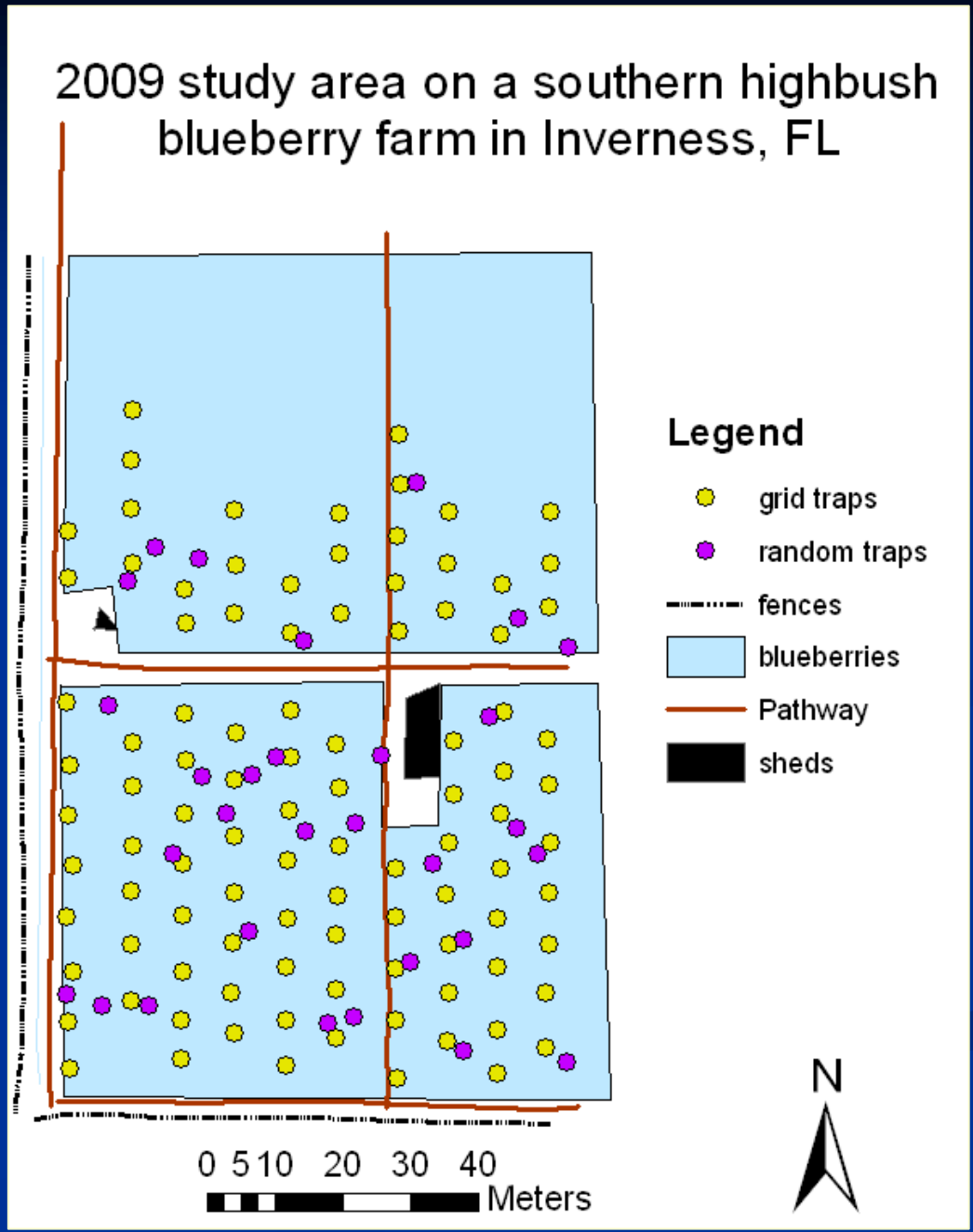
Objective

- To determine if ‘hot spots’ are correlated with flower density in space

Hypothesis: There is a positive linear relationship between thrips per trap and flower density in space

Methods 2009

- White sticky traps
  - Jan. 23 – Feb. 26
  - 7.62 m grid
  - Traps replaced once per week
- Percent open flowers
  - Per row each week



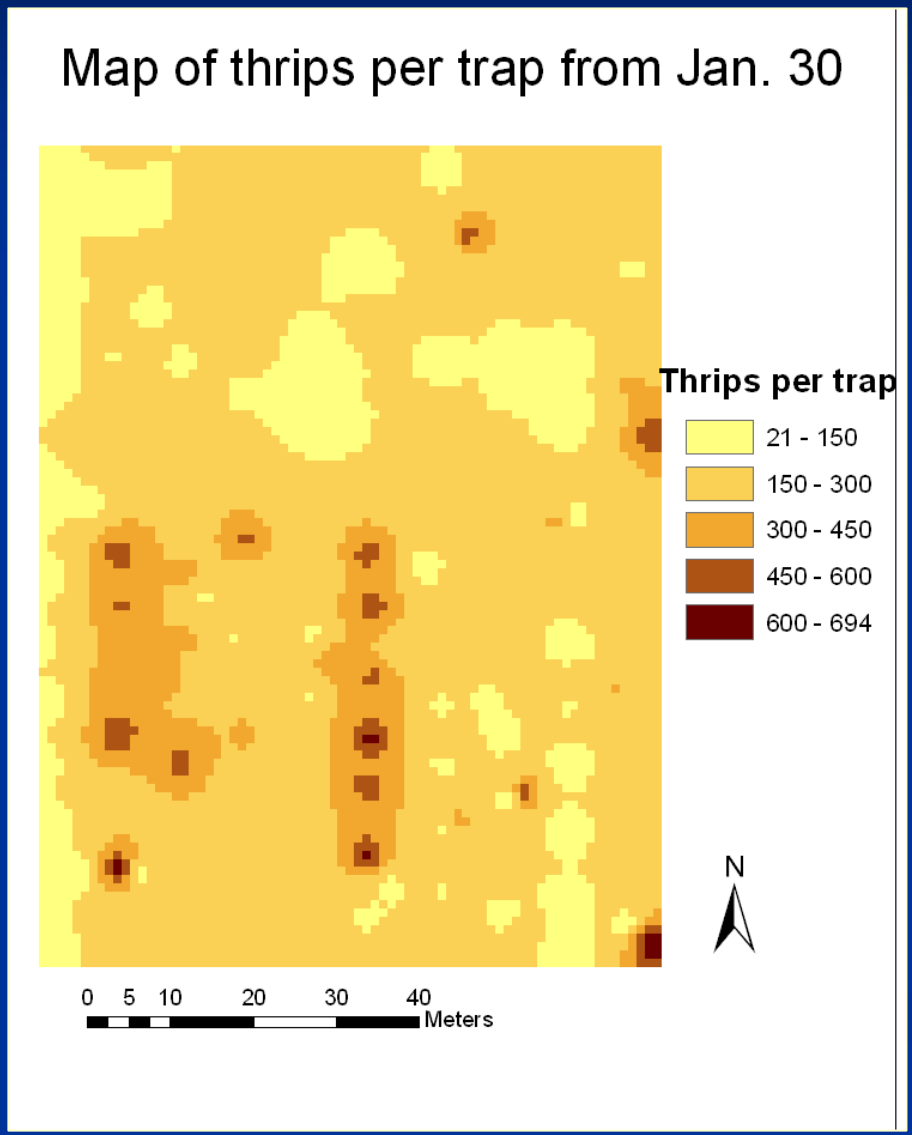
Methods: Regression and Correlation

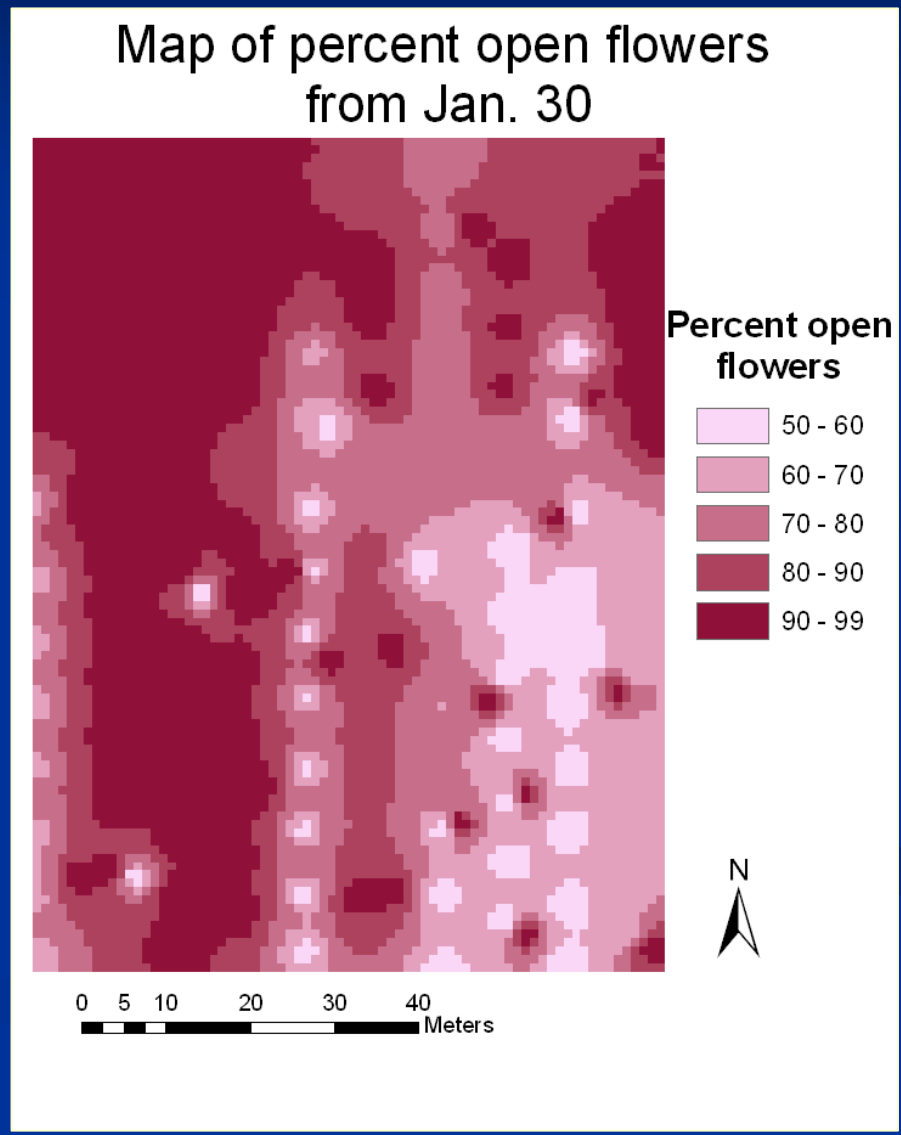
- Theil regression
  - Percent of open flowers vs. thrips per trap each week
- Kendall's τ

Methods: ArcGIS

- Created maps of thrips per trap and percent of open flowers
  - Inverse Distance Weighting (IDW)
- Classify thrips in classes of 150 per trap and flowers using equal interval
- Reclassify so lowest class were set to 1 and highest to 3 (week 2), 5 (week1), or 8 (weeks 3-5)
- Subtract reclassified flowers from reclassified thrips

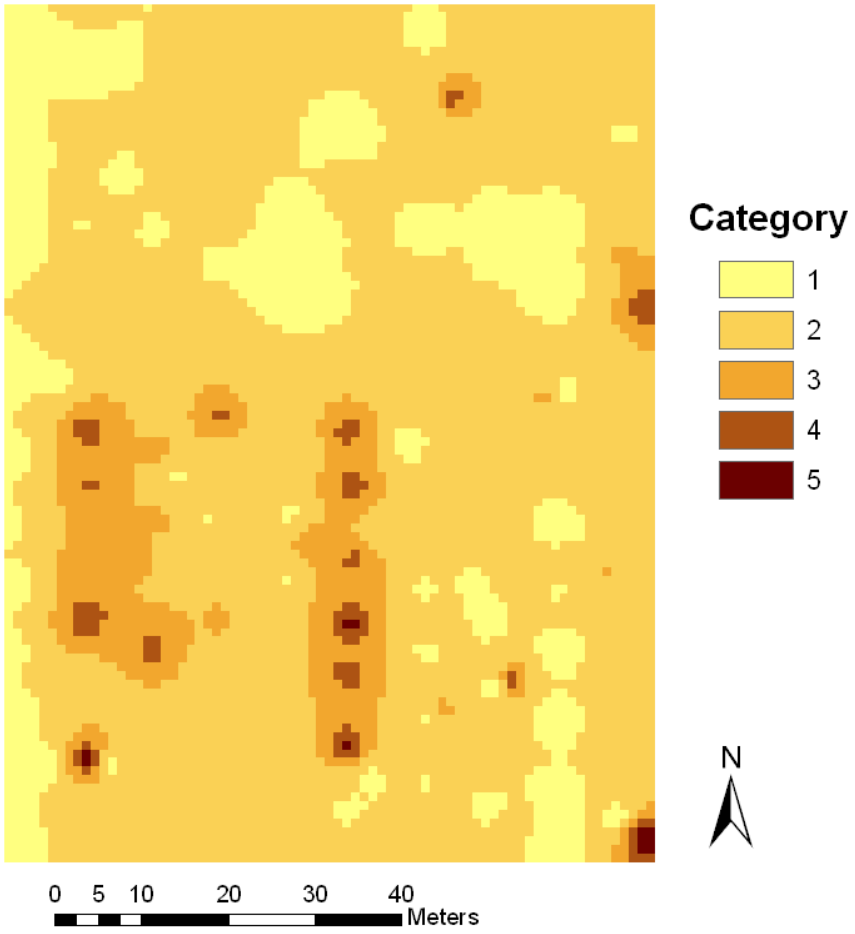
Methods: ArcGIS - Classify



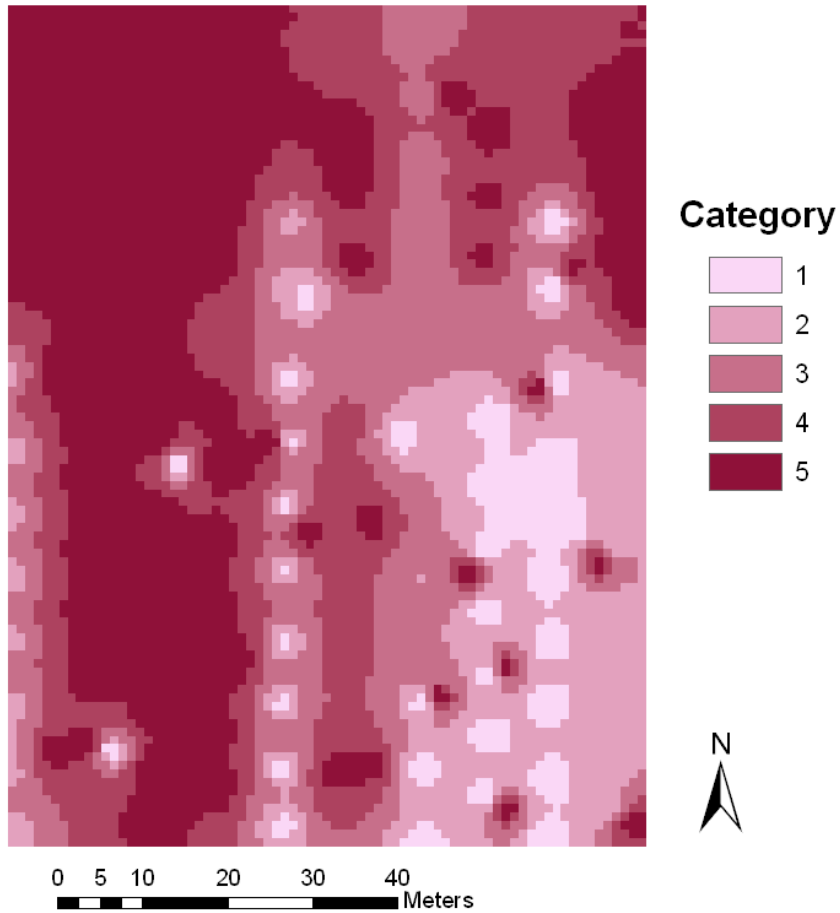


Methods: ArcGIS - Reclassify

Map of thrips per trap from Jan. 30



Map of percent open flowers from Jan. 30



Results: Regression and Correlation

Date	Equation	*P*	τ
1/30/2009	y = 2.600x - 32.00	< 0.0001	0.36
2/5/2009	y = 0.100x + 1.000	0.0002	0.24
2/13/2009	y = 1.505x + 380.725	0.25	0.07
2/20/2009	y = 1.500x + 481.500	0.31	0.06
2/26/2009	y = 1.467x + 497.500	0.67	0.03

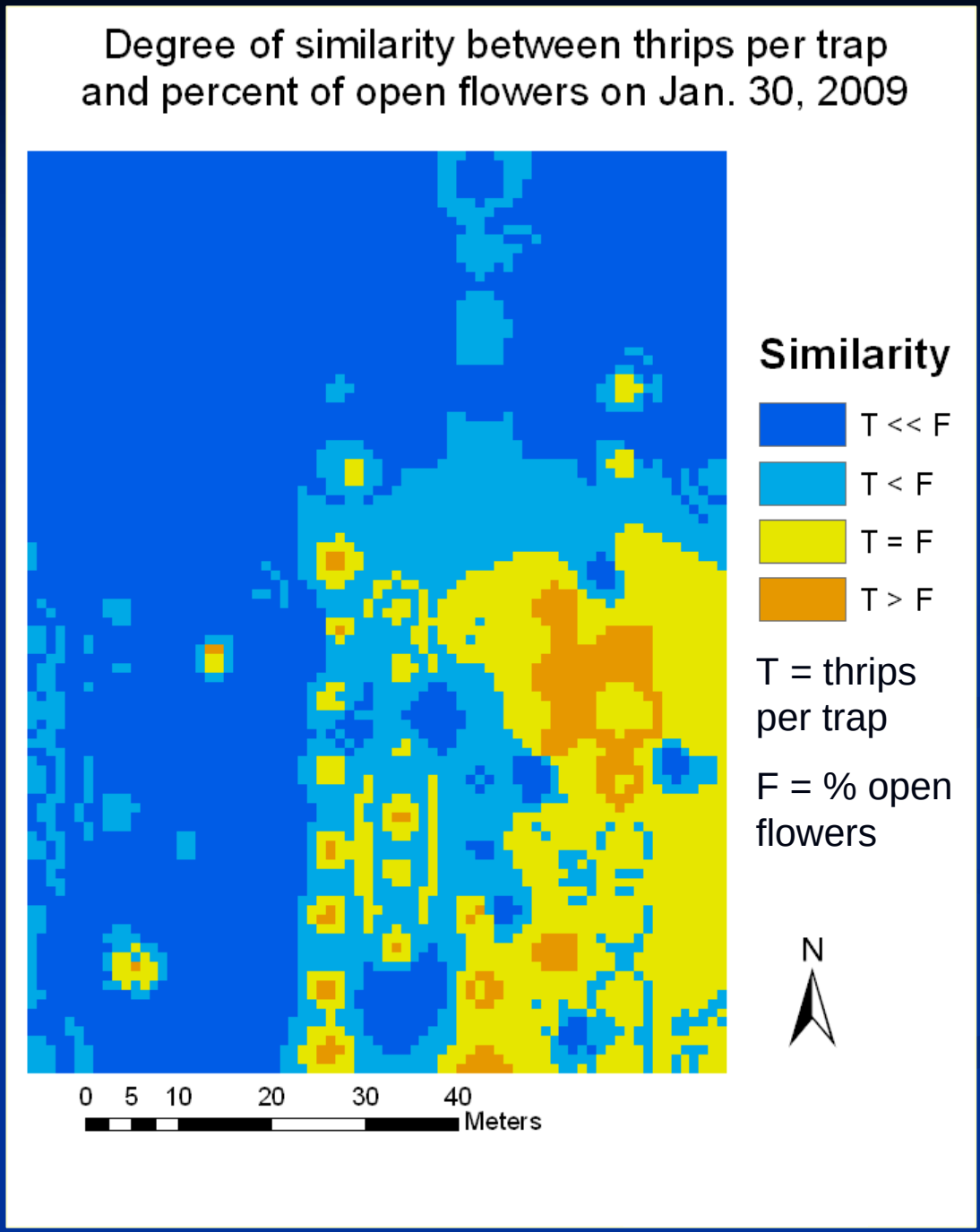
Results: Similarity Maps

Jan. 30

80% open flowers

$\tau = 0.36$

$P < 0.0001$

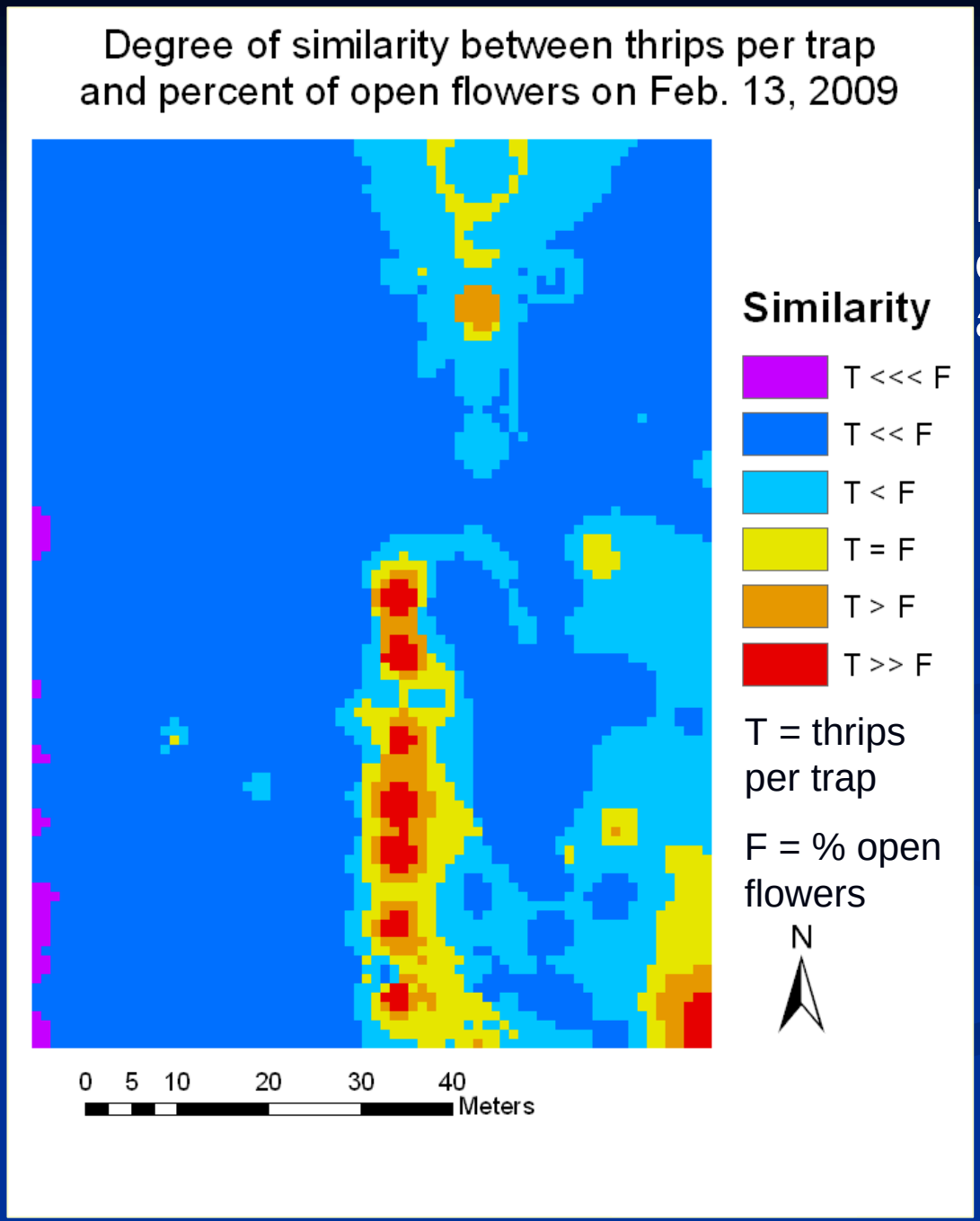


Feb. 13

80% open flowers

$\tau = 0.07$

$P = 0.25$



Percent of total area

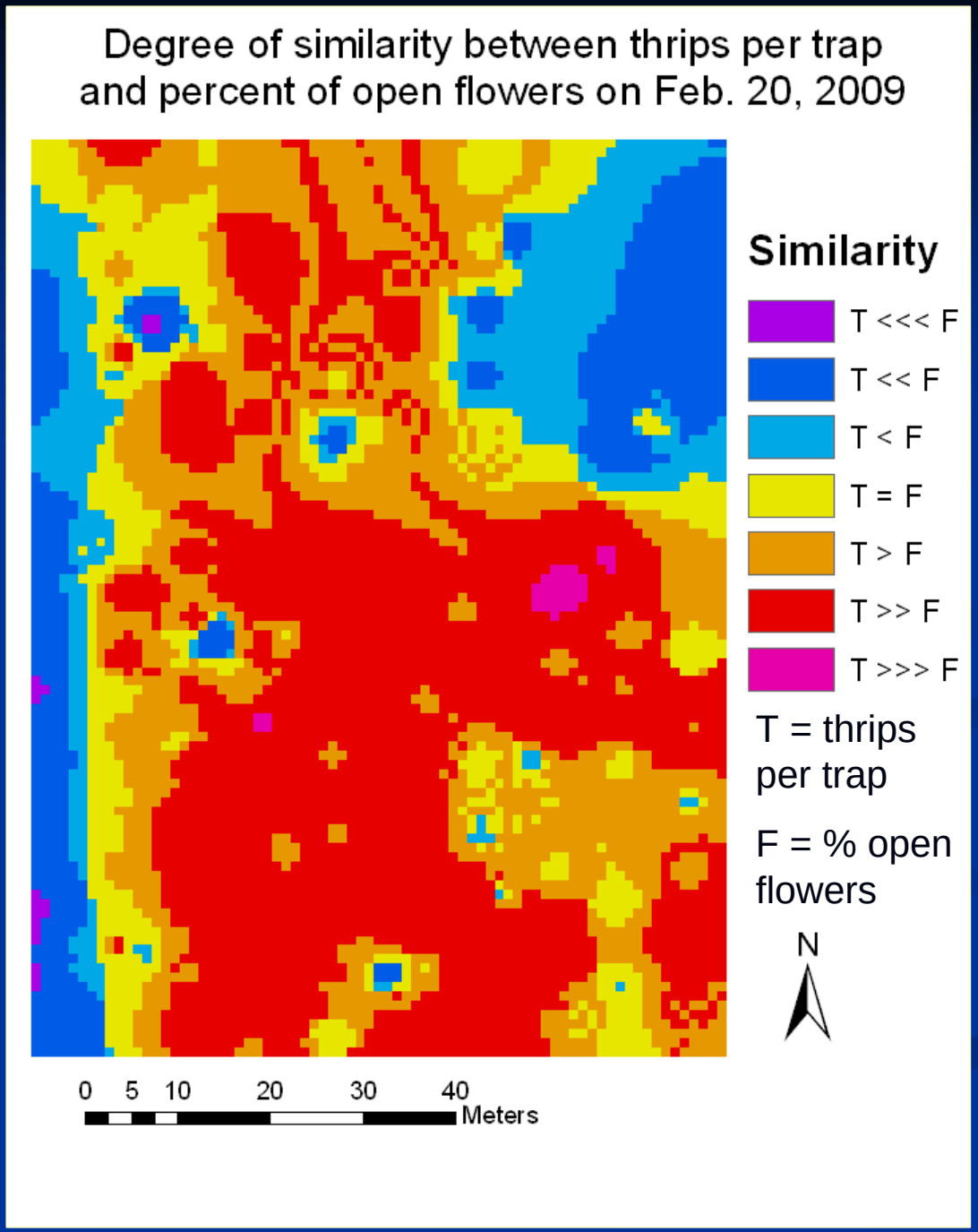
1%
71%
19%
6%
2%
1%

Feb. 20

31% open flowers

$\tau = 0.06$

$P = 0.31$

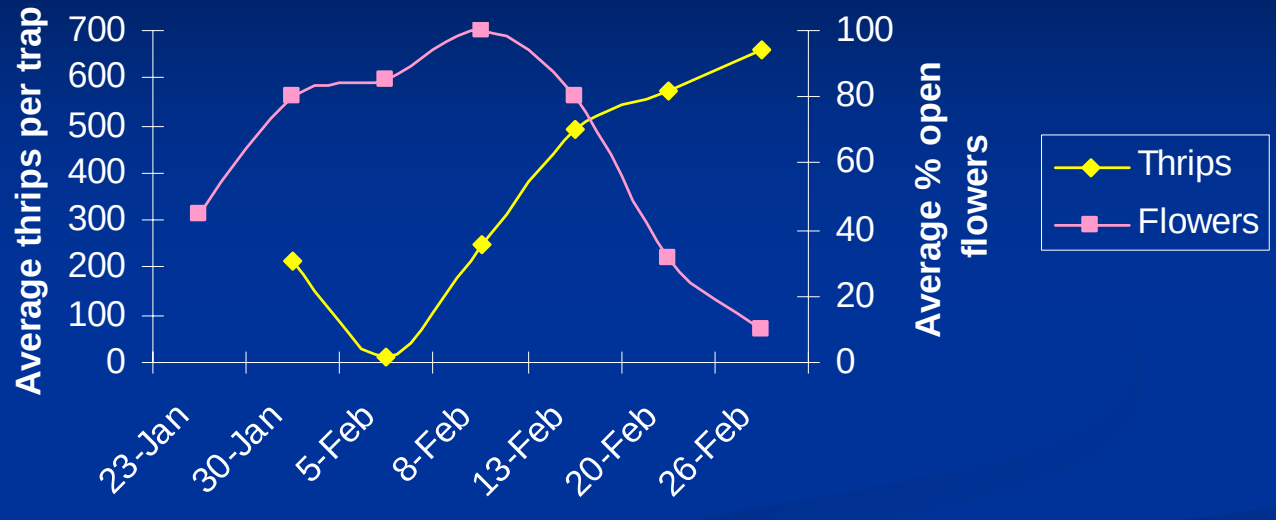


Percent of total area

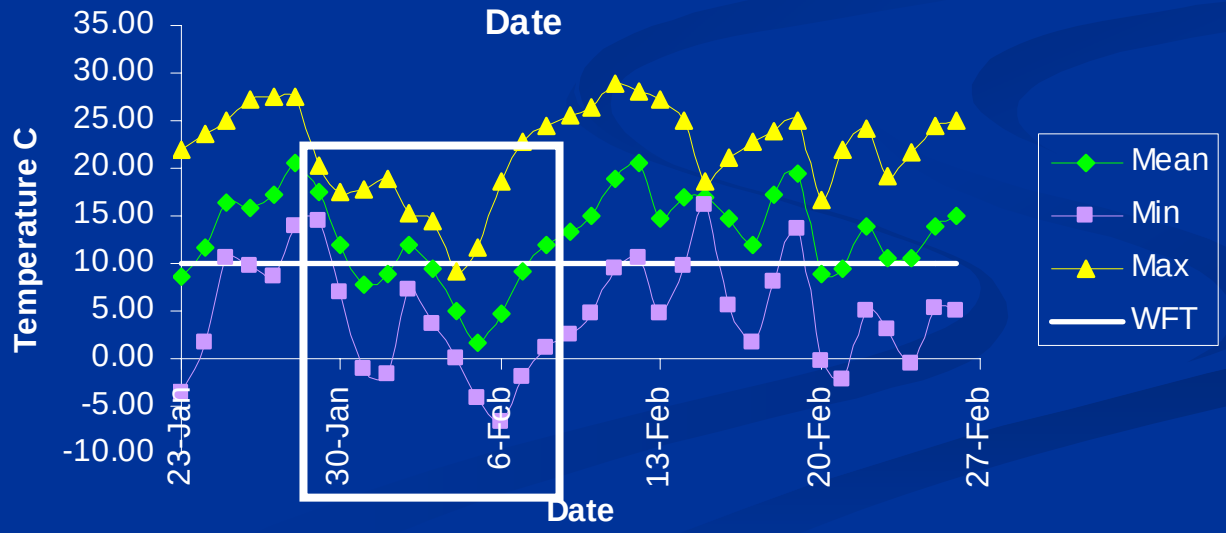
<1%
11%
10%
13%
26%
39%
<1%

Results: Temperature Effects?

Study area averages over time



Temperature Data



WFT = development threshold for western flower thrips

Discussion

- There appears to be a positive linear relationship between percent of open flowers and thrips per trap in space
- This relationship is not evident during peak flowering or when thrips populations remain high when fruit set begins

Conclusions

- Flower density is an important factor for modeling ‘hot spots’
  - More accurate measure of flower density needed
- Temperature data needs to be considered

Acknowledgements

- Dr. Oscar Liburd
- Dr. Joseph Funderburk
- Dr. Robert McSorley
- Dr. Sabine Grunwald

- Florida Blueberry Growers Association

- Small Fruit and Vegetable lab staff and students

Questions?