Geospatial Analysis of *Melanaphis sacchari* in South Texas: 2014-2015

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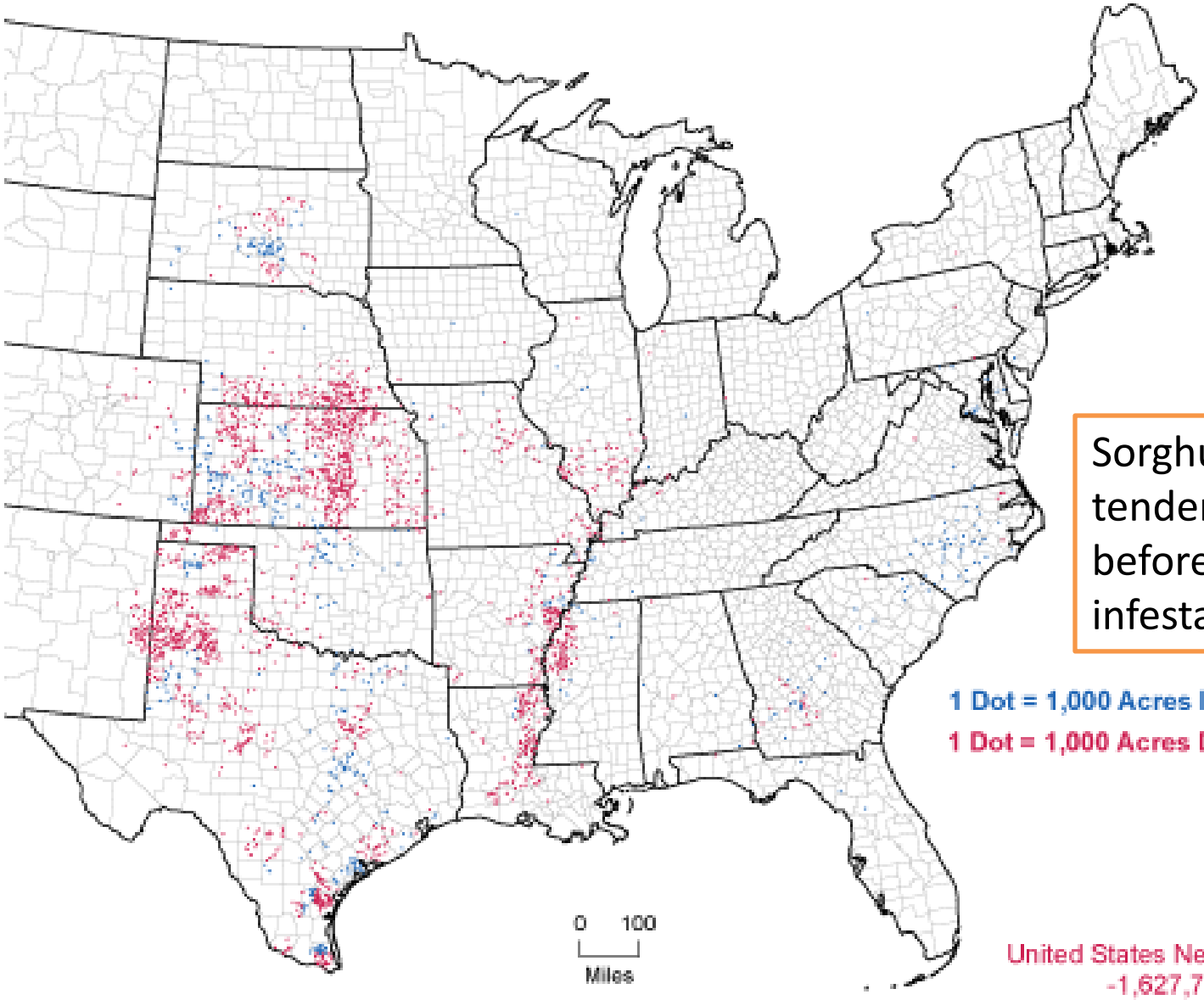
Sugarcane Aphid Informative Meeting
AgriLife, Weslaco TX, April 12, 2016

Grain Sorghum Change in Acreage: 2007 to 2012



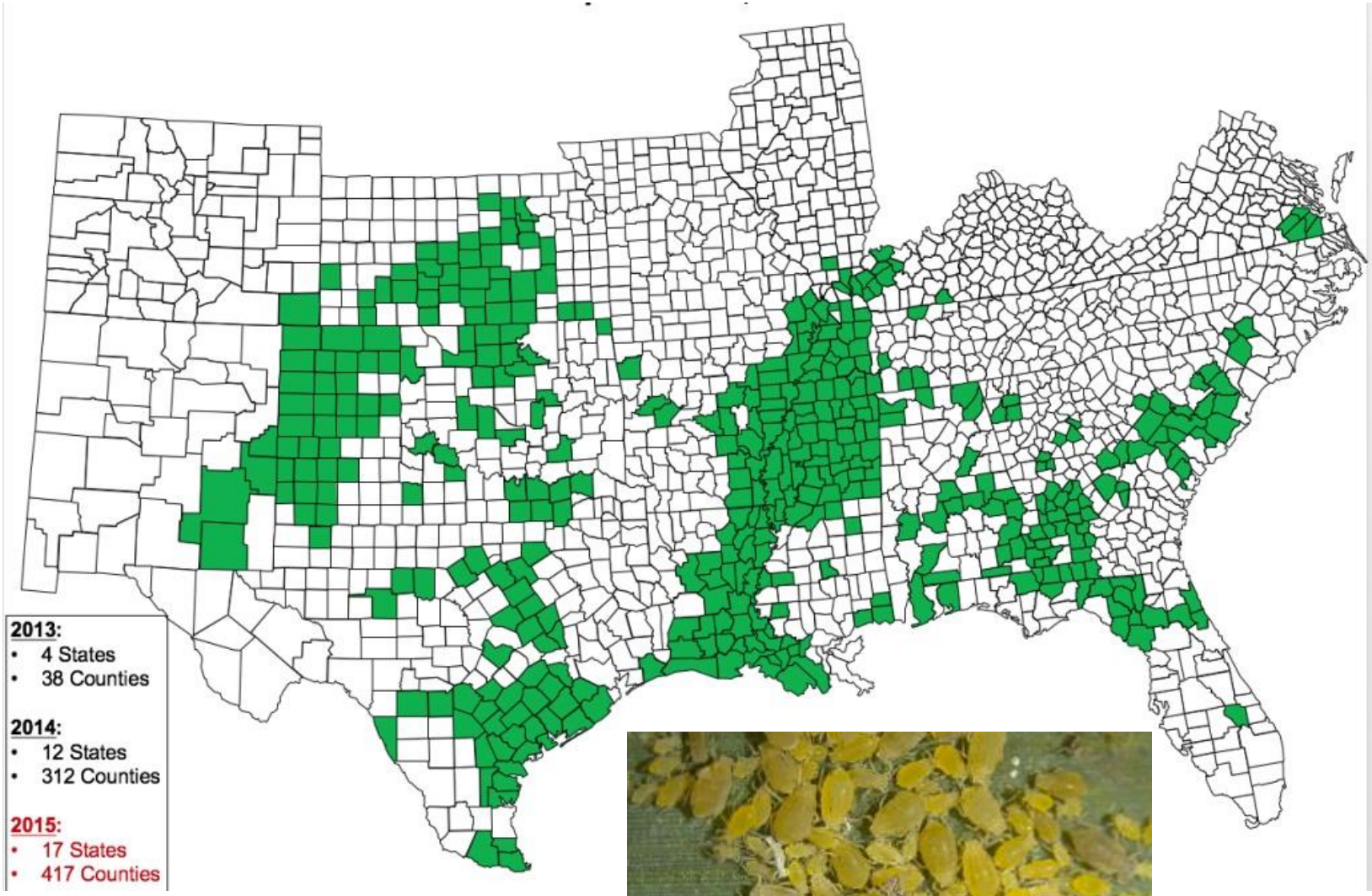
Sorghum in RGV had tendency to decrease before the SCA infestation on 2013-2015

1 Dot = 1,000 Acres Increase

1 Dot = 1,000 Acres Decrease

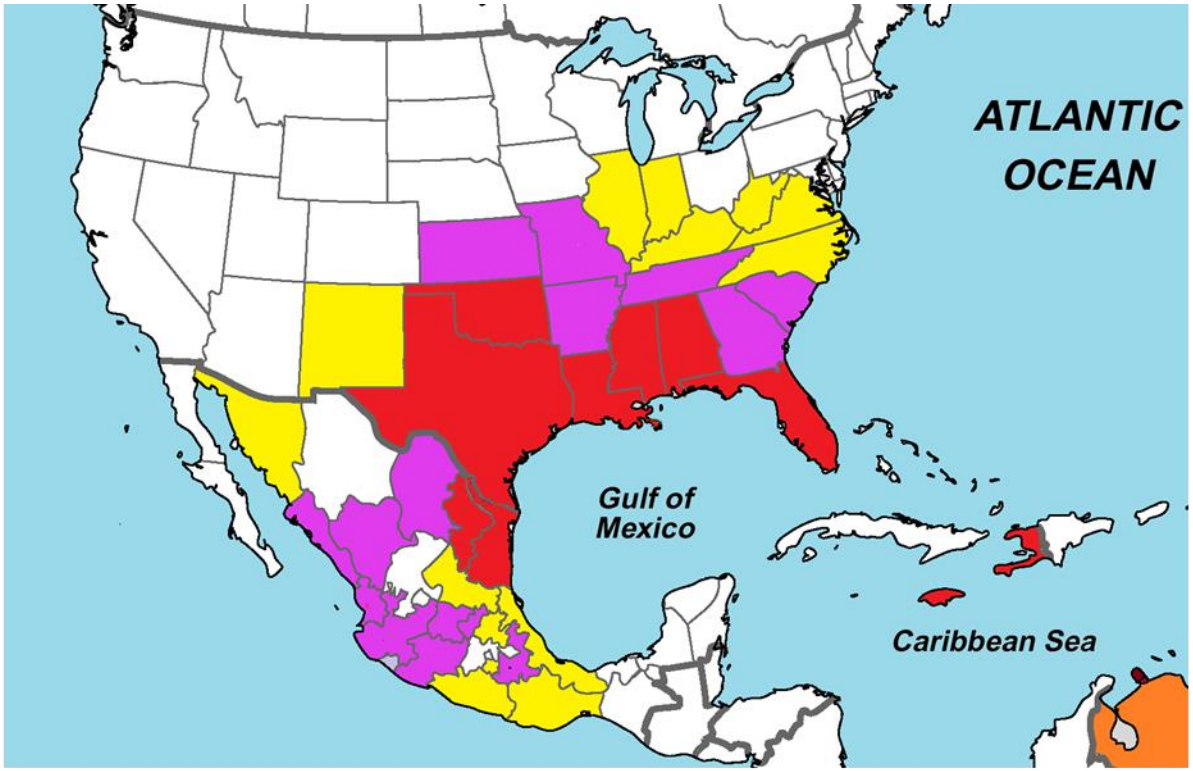
United States Net Decrease
-1,627,735

Sugarcane Aphid, occurrence on Sorghum September 30, 2015



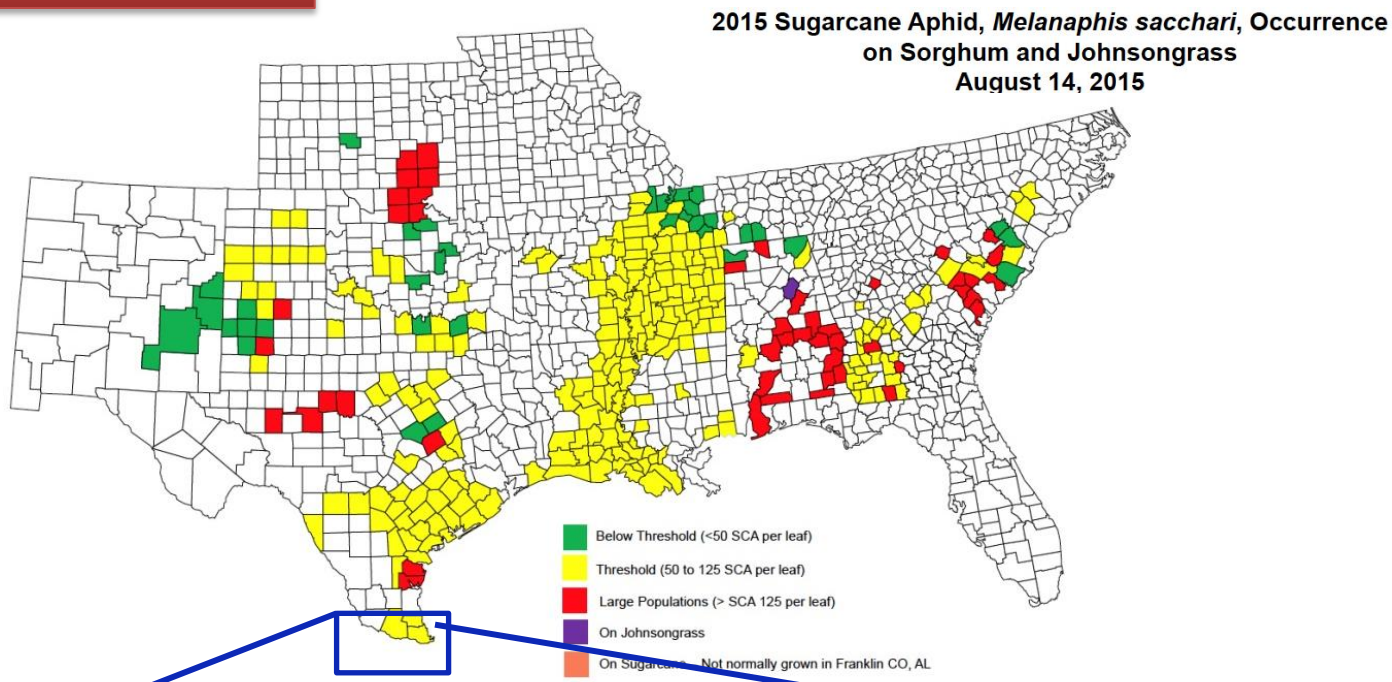
Robert Bowling

Geographic expansion of SCA in USA and Mexico



	2013	2014	2015
U.S.A.	6	12	18
Mexico	2	11	22

Materials and Method

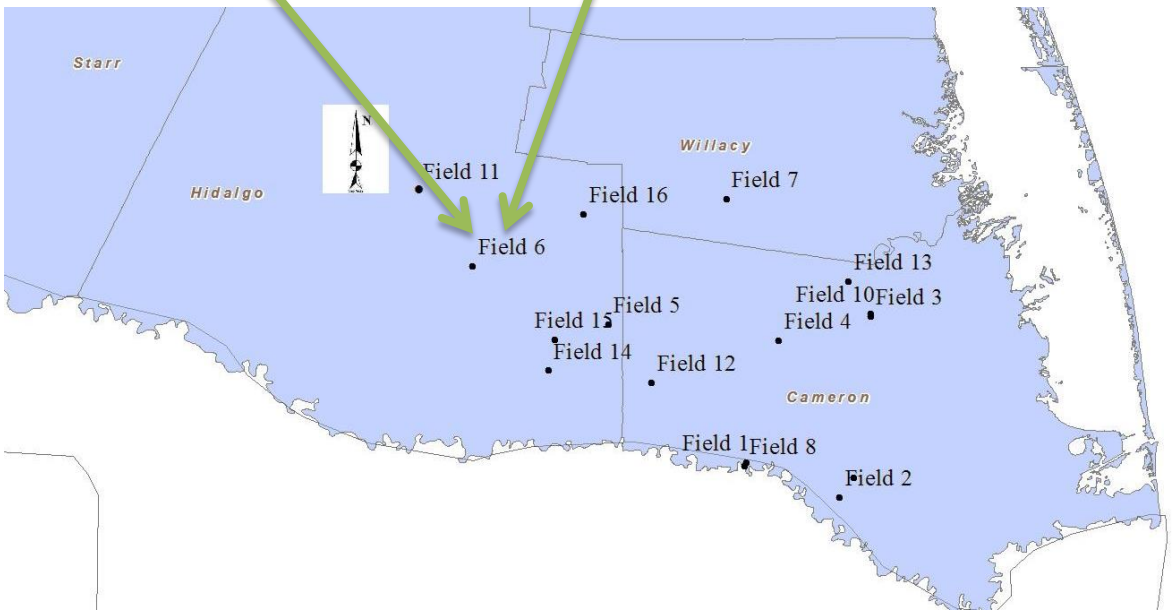


Geographic area

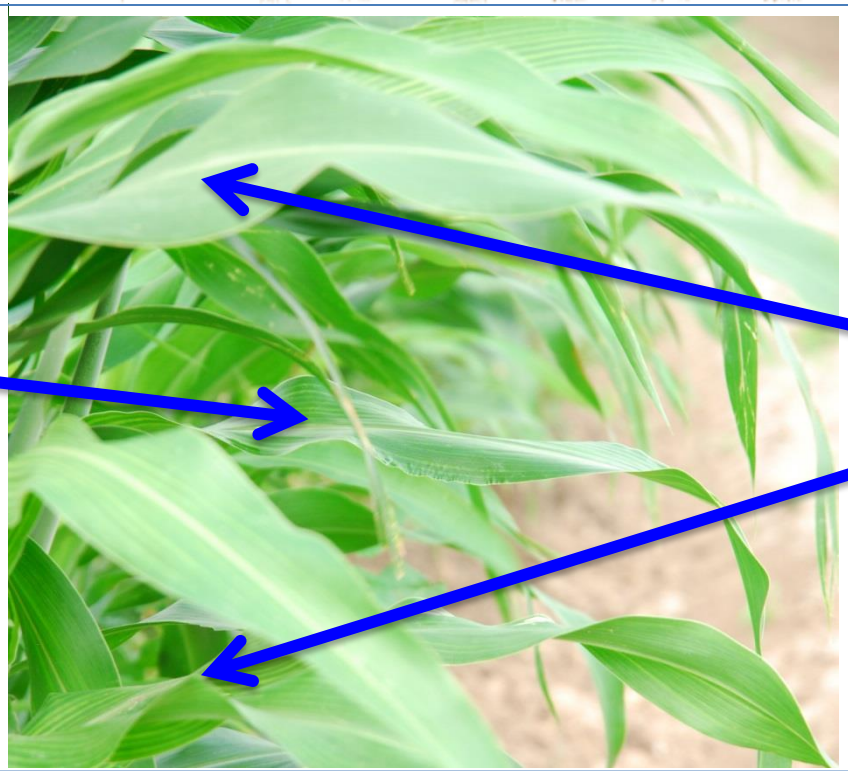
Geolocation of each field

GPS

Geographic Coordinate System: GCS_WGS_1984
Datum: D_WGS_1984
Prime Meridian: Greenwich
Angular Unit: Degree



Tallies of SCA on mature leaf



2014

1 leaf per plant

20 plants per field

2015

2 leaf per plant:

1 upper leaf

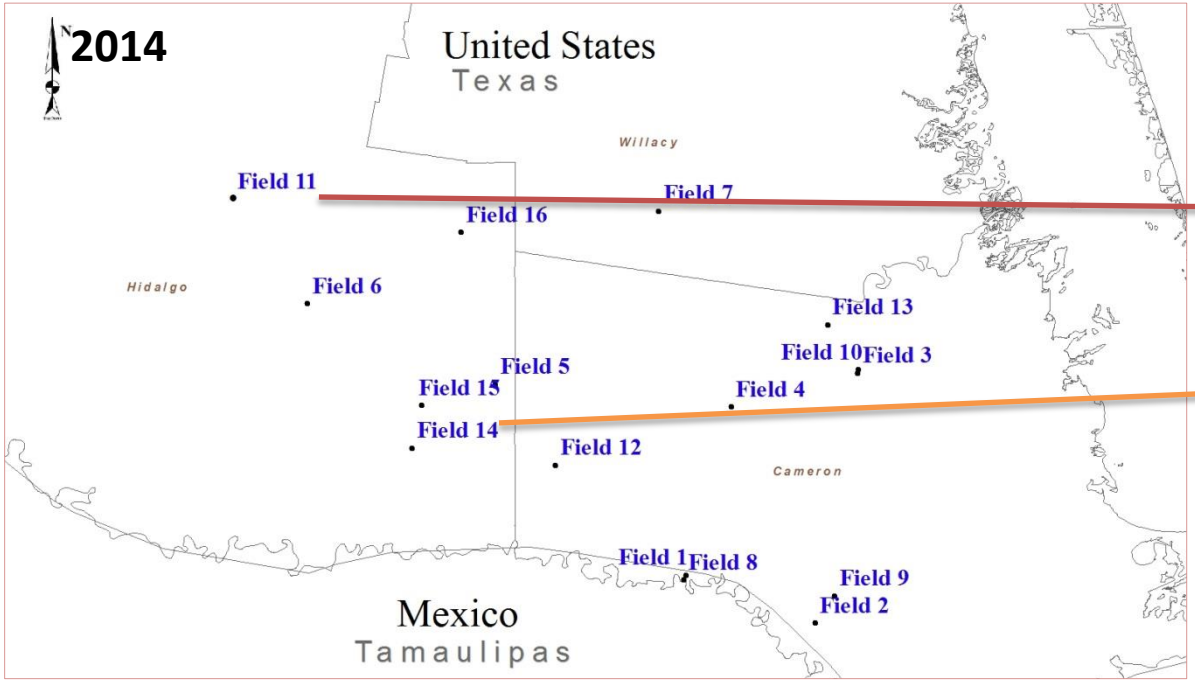
1 lower leaf

20 plants per field

Population SCA

wingless per leaf

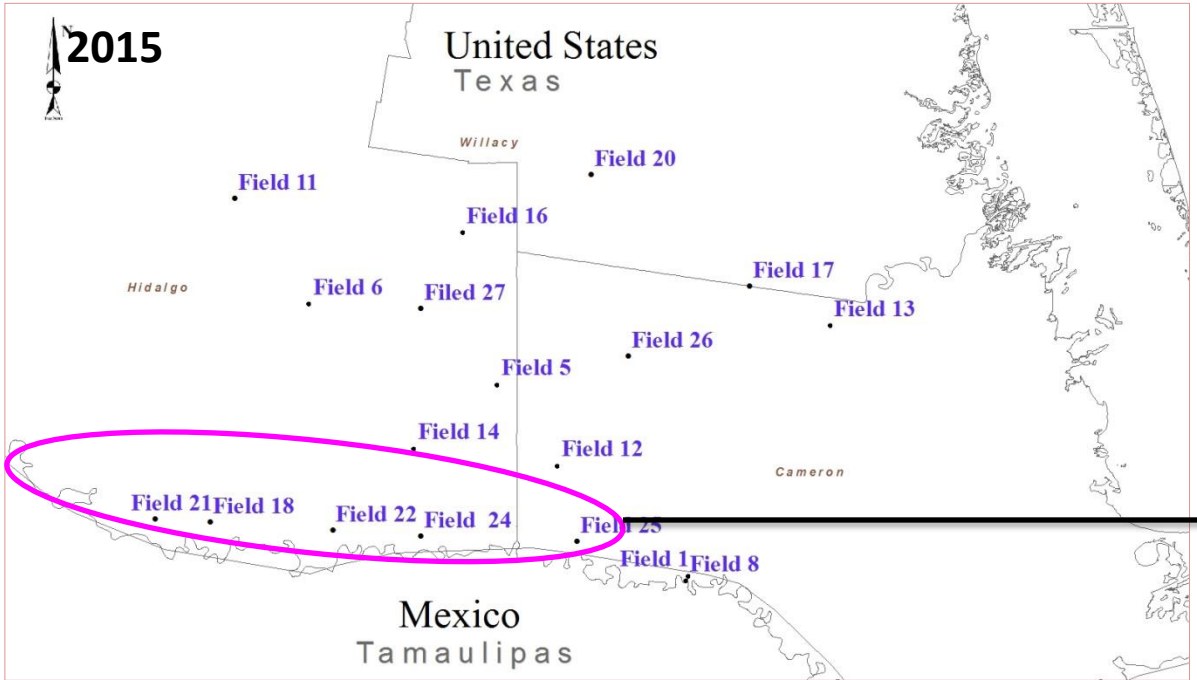
Winded per leaf



Organic

Experimental

10 conventional fields
1 organic field
controls untreated in experimental field



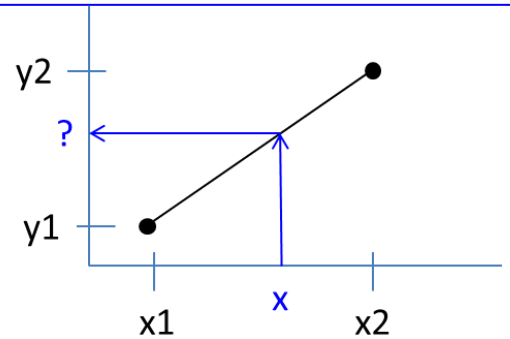
16 conventional fields
1 organic field
controls untreated in experimental field

Fields along near to the border with Mexico

Interpolation

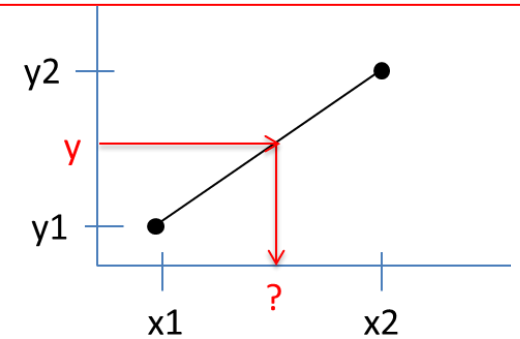
The linear interpolation formula gives value of y at specified point **x**:

$y = y1 + x\,(y2 - y1)$

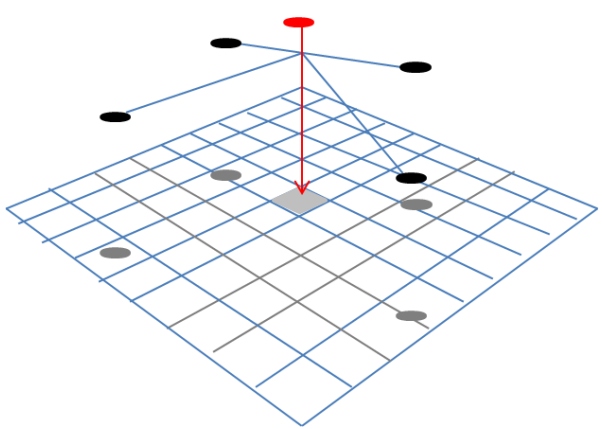


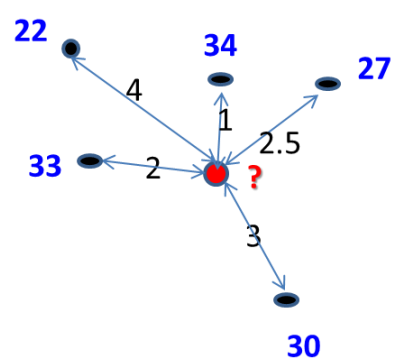
Inverse linear interpolation gives value of x at which y takes a specified value

$x = (y - y1)/\,(y2 - y1)$



Process to geospatial analysis ➡ Interpolating values using the linear algorithm described by **Dewey (1988)**





$$Zij = \frac{\sum_{k=1}^{n} \frac{z_k}{\left[(x_i - x_k)^2 + (y_i - y_k)^2\right]^w}}{\sum_{k=1}^{n} \frac{1}{\left[(x_i - x_k)^2 + (y_i - y_k)^2\right]^w}}$$

$$Zij = \frac{\frac{34}{1^2} + \frac{33}{2^2} + \frac{27}{2.5^2} + \frac{30}{3^2} + \frac{22}{4^2}}{\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{2.5^2} + \frac{1}{3^2} + \frac{1}{4^2}}$$

$Zij =$ **32.38**

Statistical analysis of SCA population

Date (MM-DD-YYYY) expressed as the week number of the year.

Mean of SCA/leaf per week number (Statistica 12 StatSoft inc., Tulsa, USA).

Geospatial analysis

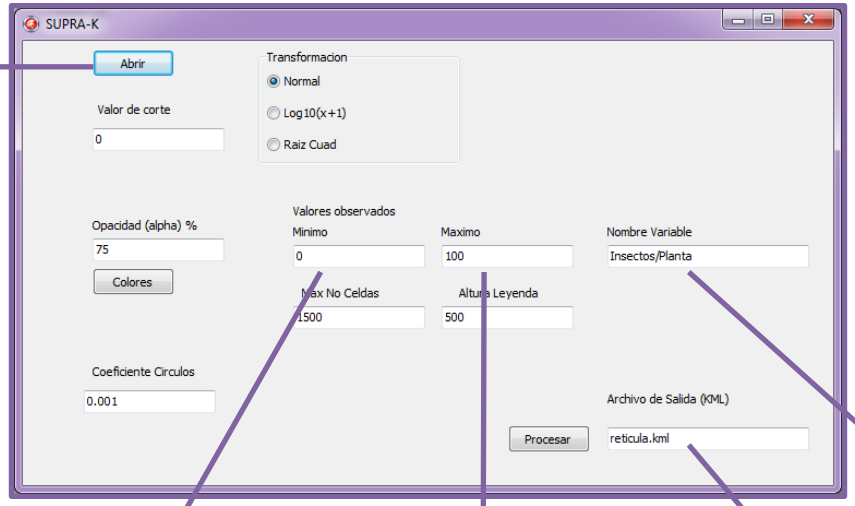
SUPRA https://sites.google.com/site/efialto/supra Dr. Jose Lopez-Collado

SUPRA (**SUP**erficie de **R**epuest**A**) is a PC-based program that creates 2D maps based either on a math function Z=*f*(x,y) or point data.

File

Extension txt

- Latitude
- Longitude
- SCA/ leaf



1600 values for x Per map

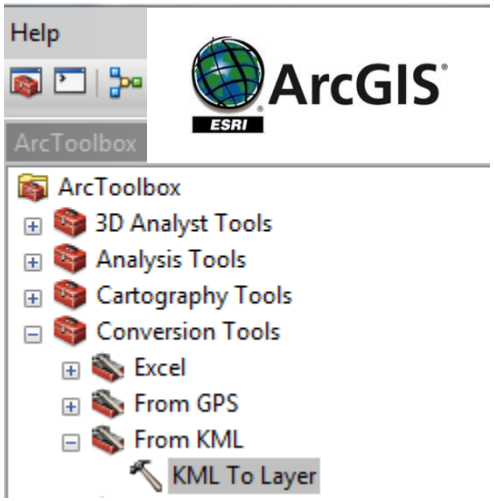
Variable name

Minimum data

Maximum data

File pack
kml extension with same projection of origin file

SCA 2014 mean.ft	10/26/2015 2:18 PM	CSV File	411 KB
SCA 2014 mean	10/26/2015 2:18 PM	KML	649 KB
SCA 2014 mean.stats	10/26/2015 2:18 PM	STATS File	1 KB
SCA 2014 mean.sup.asc	10/26/2015 2:18 PM	ASC File	24 KB
SCA 2014 mean	10/26/2015 2:17 PM	Text Document	1 KB



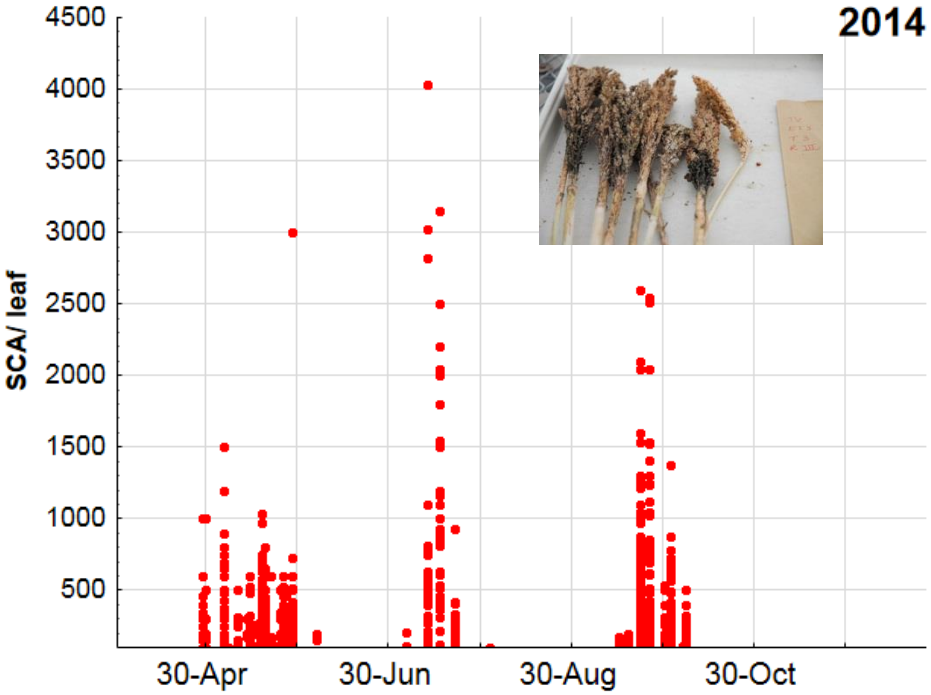
Integration of geospatial analysis

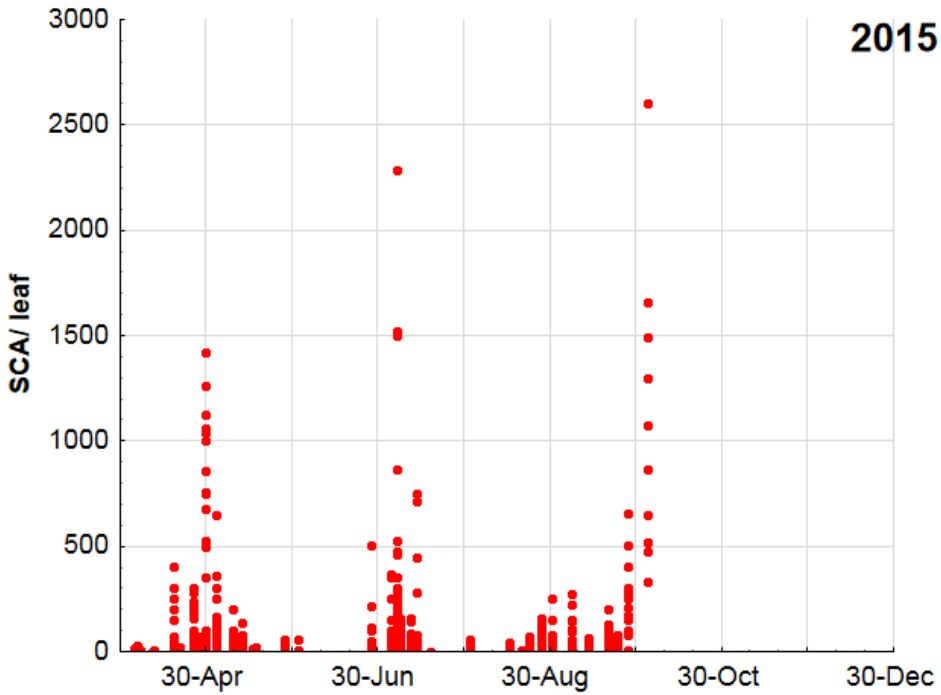
Add layers

- US counties
- Fields points
- States of Mexico

Results

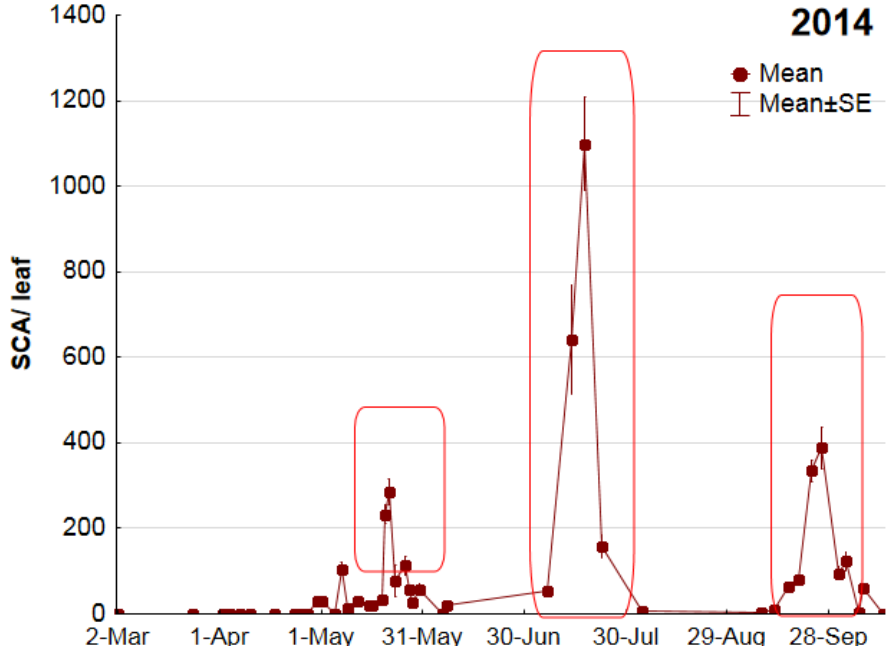
Data

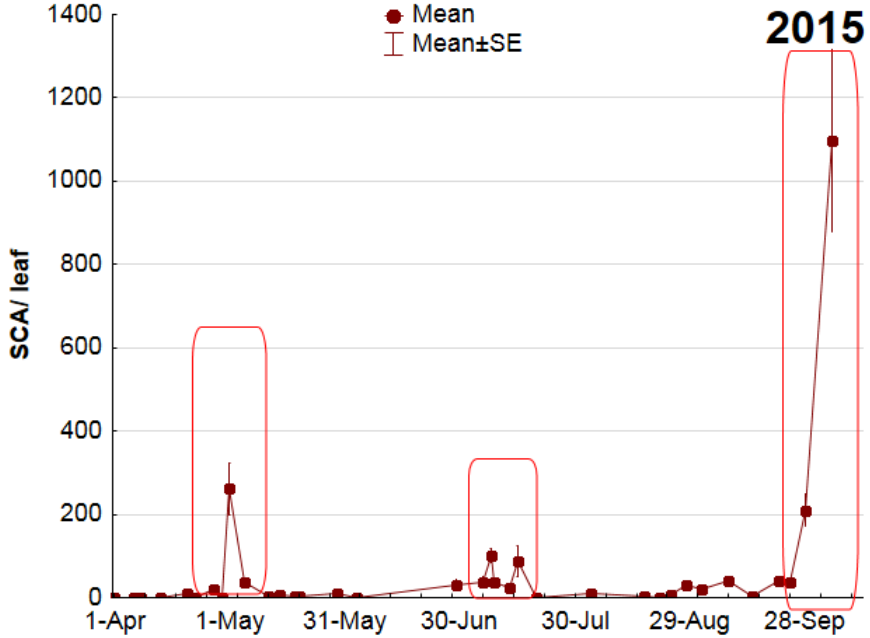


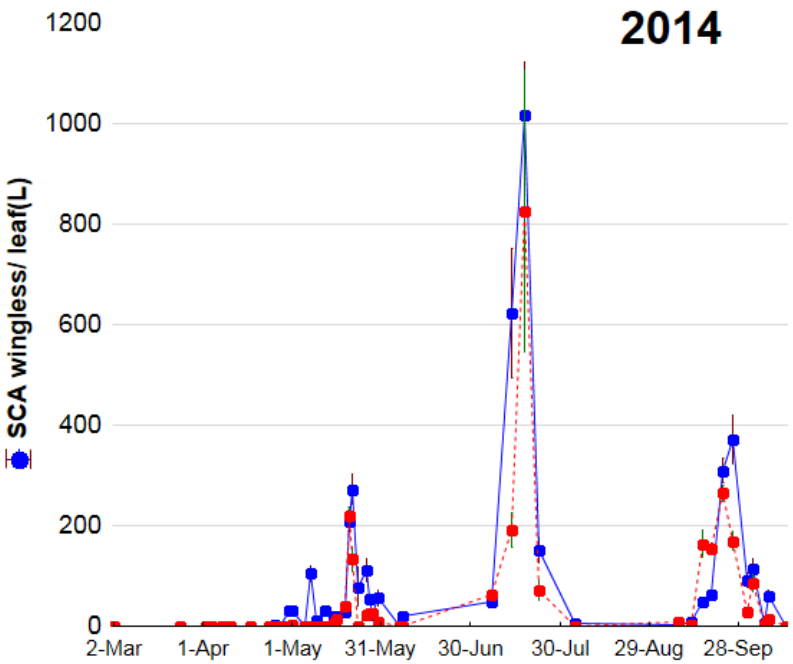


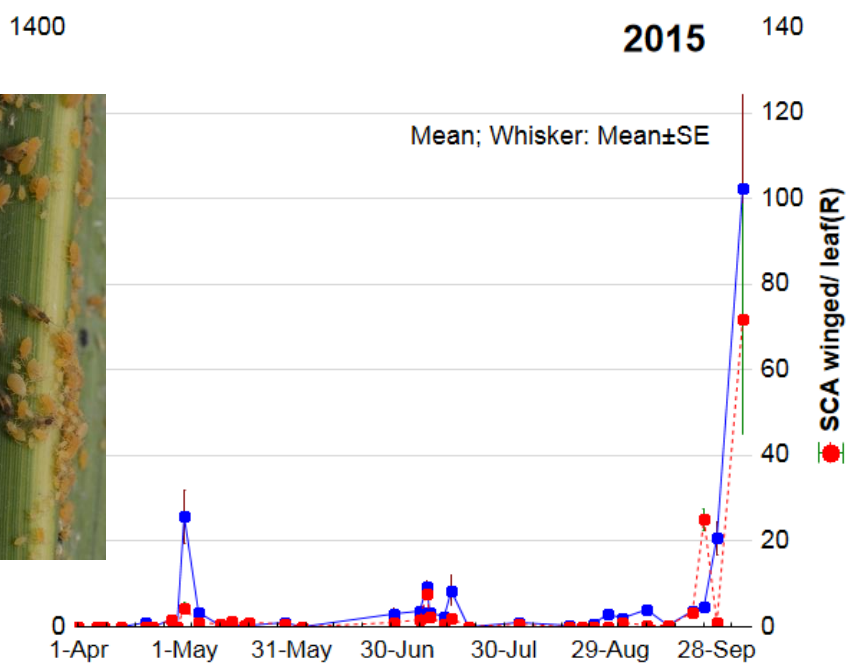
a) 8,600 plants
b) 354,950 wingless aphids
c) 21,791 winged aphids
d) Since 3 March to 4 Oct., 2014

a) 6,813 plants
b) 158,633 wingless aphids
c) 11,318 winged aphids
d) Since 1 Apr. to 4 Oct., 2015







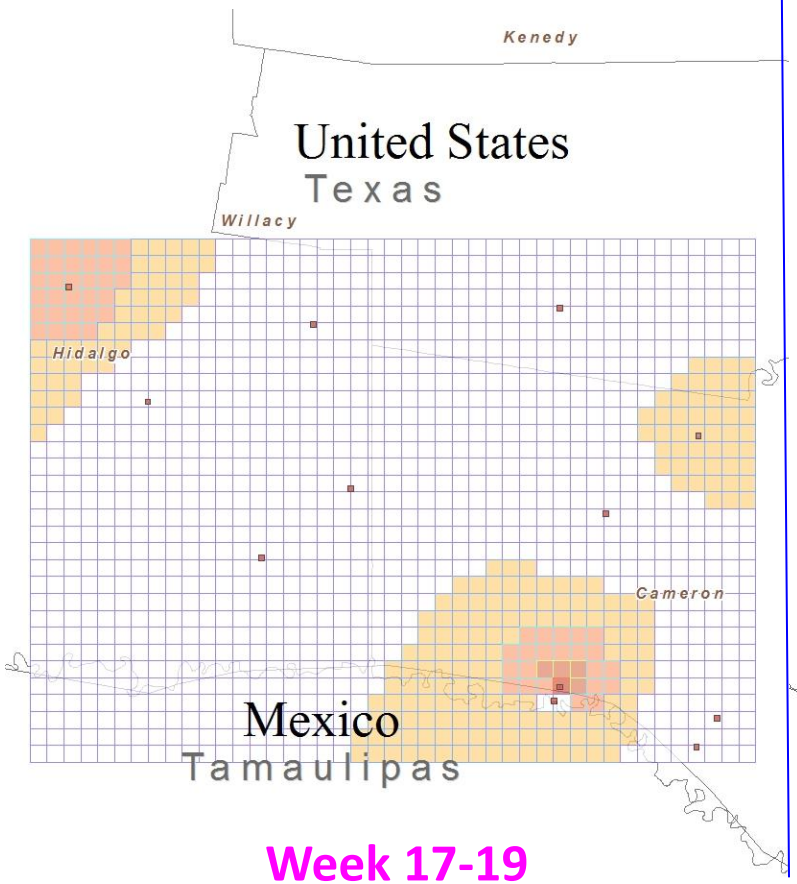


Wingless/ winged ratio = 15.82 ± 0.86

Wingless/ winged ratio = 14.5 ± 1.91

Initial infestation

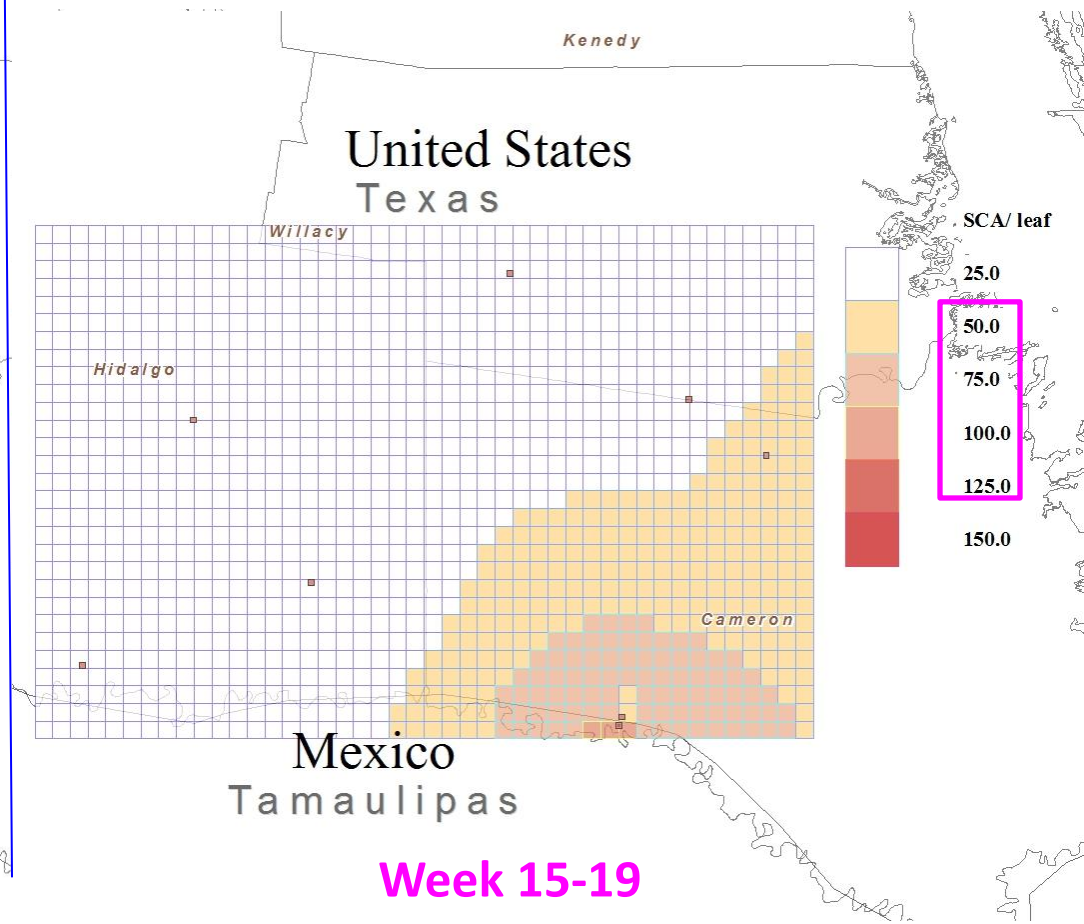
2014



Week 17-19

1st to 3rd week of May

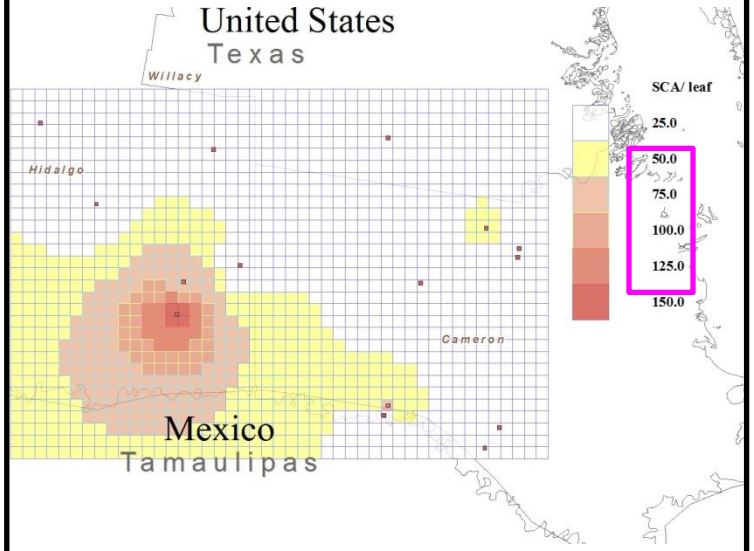
2015



Week 15-19

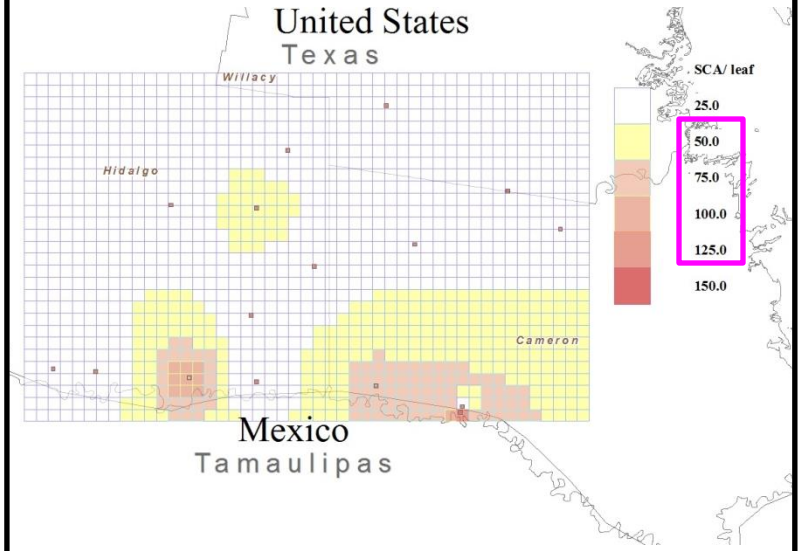
3rd week of April to 3rd week of May

2014

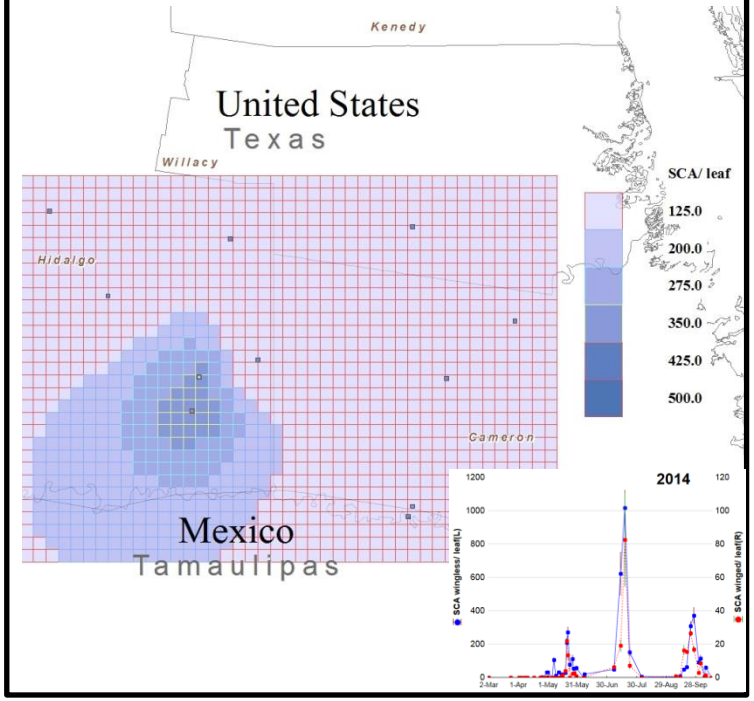


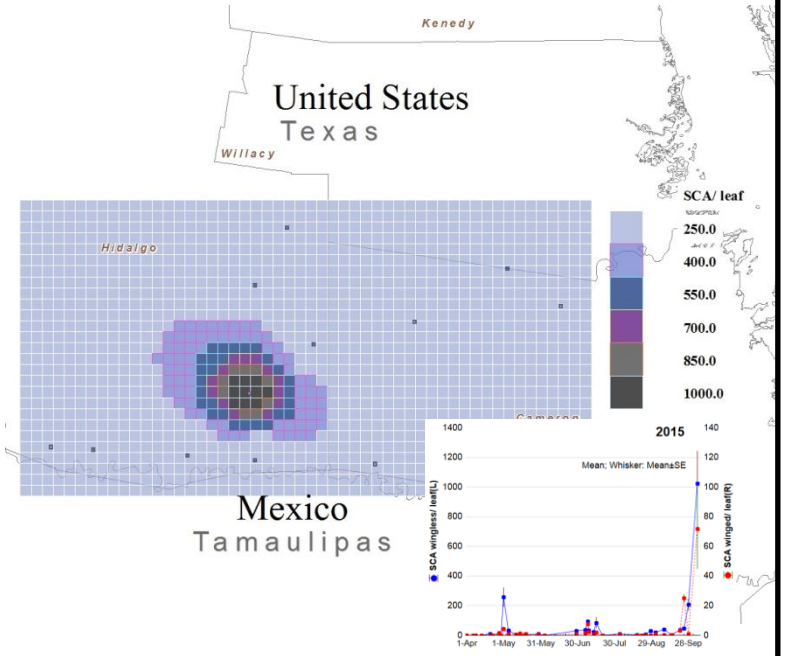
Mean population

2015

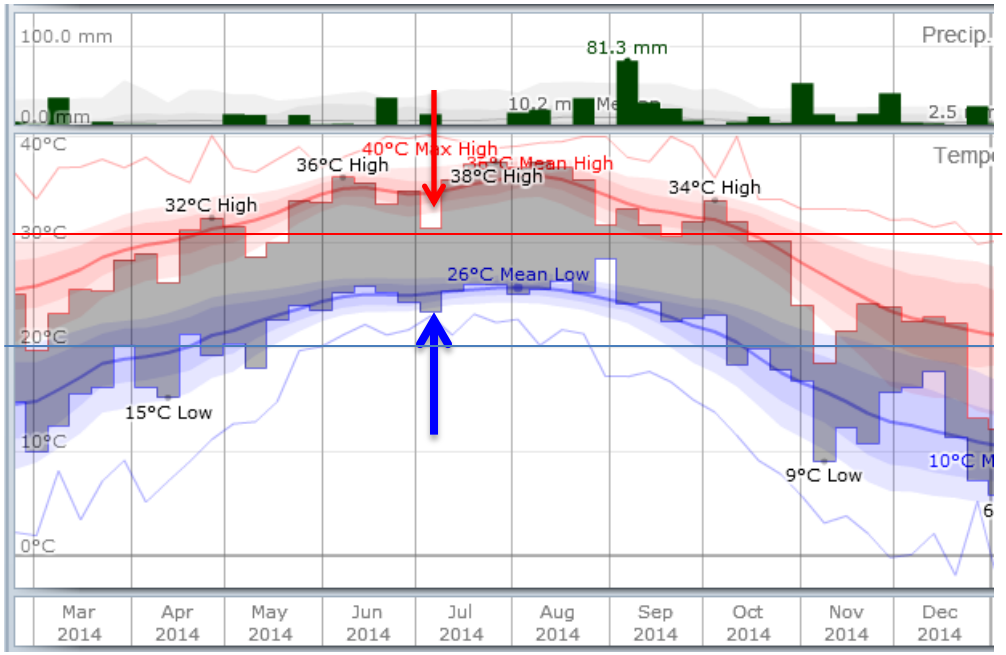


Hot spot



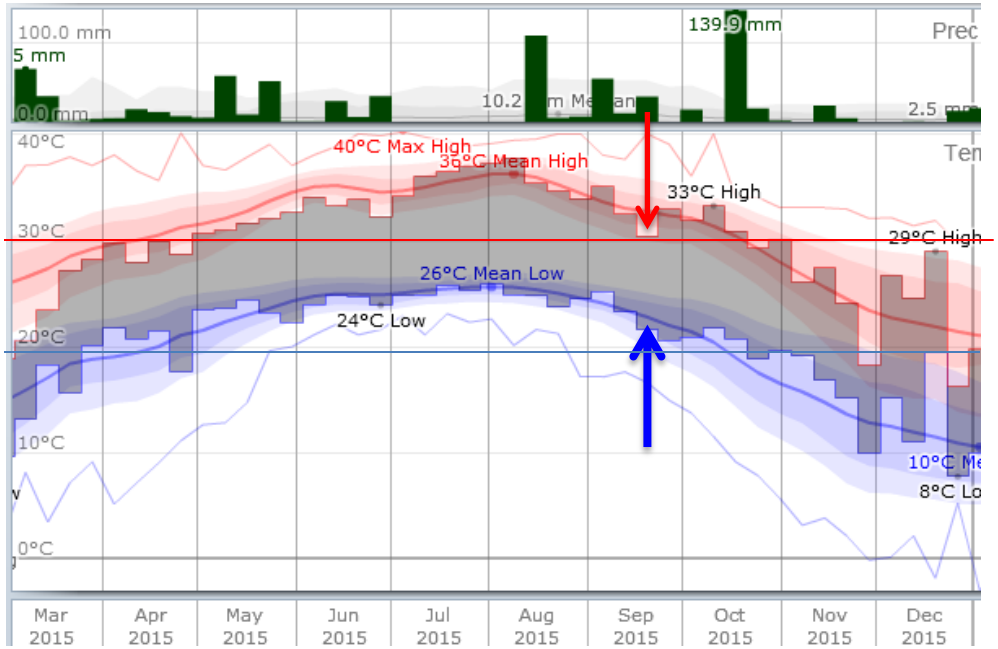


2014



86 F

2015



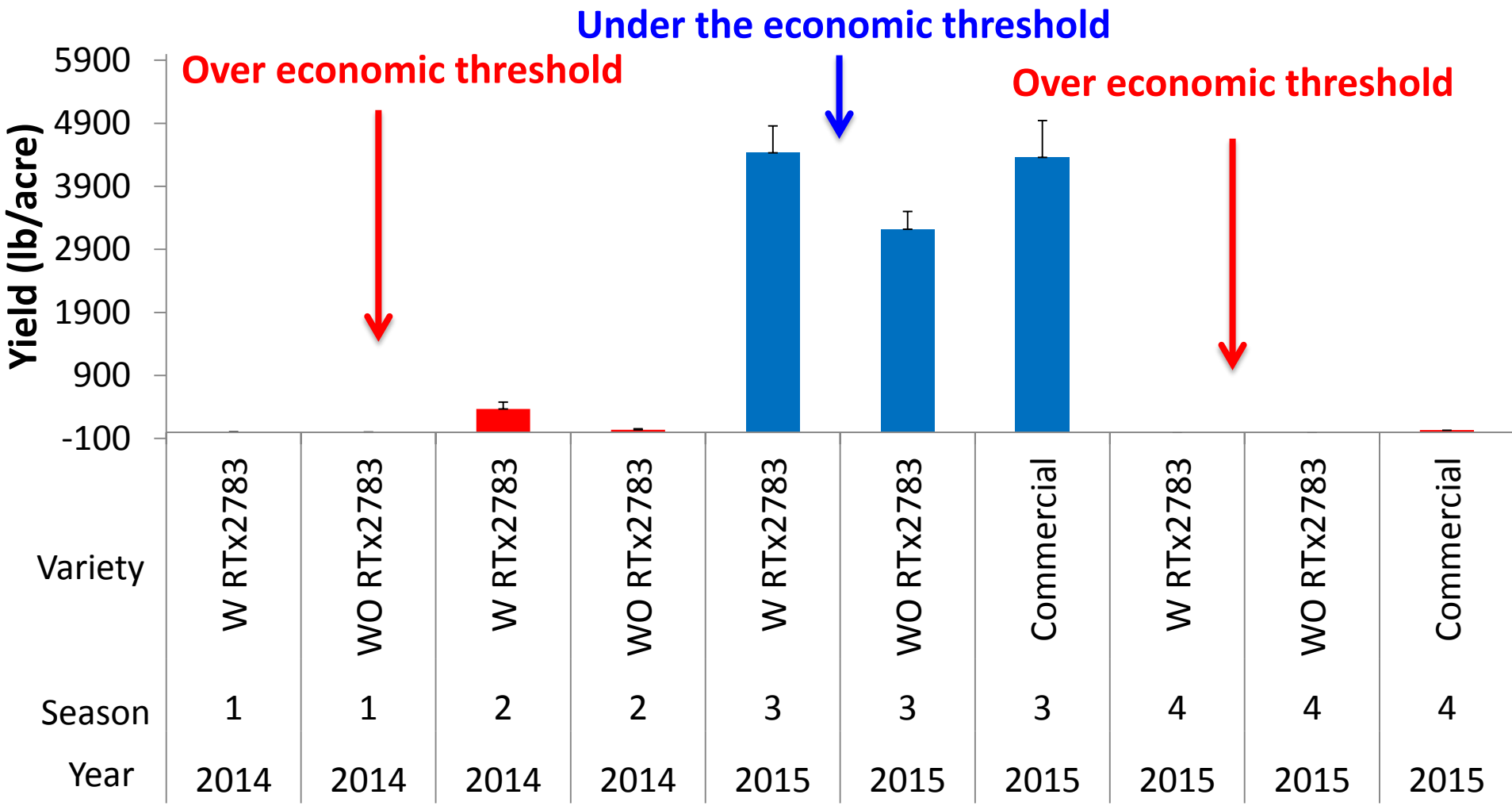
86 F

Sorghum after seed protection period

Yield of untreated controls

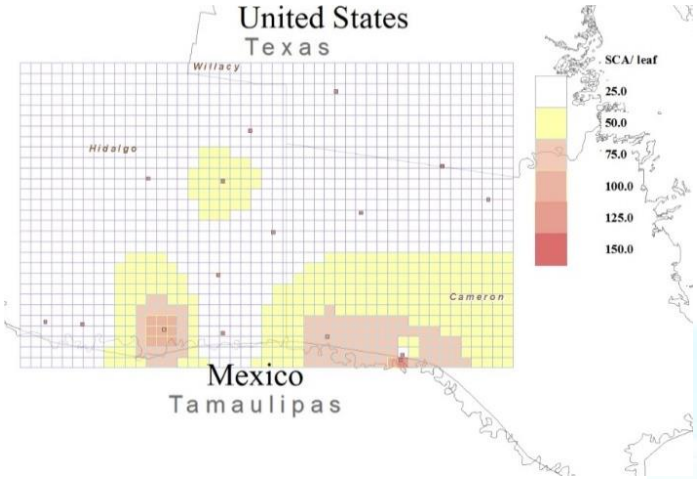
Experimental field
n=80
Limited irrigation
Single row
4 rows, 20 ft

ET: 50-125



Conclusion

- The geospatial analysis of the SCA shows three population peaks in the RGV in S. Texas
- For the RGV only a maximum of 2 of these population peak require sprays
- Geospatial analysis showed highest SCA populations near the border with Mexico



Acknowledgments

- Sorghum farmers of the LRGV
- **Beto Garza, and Texas A&M Agrilife Research.**
- Organic Transition Program-NIFA-USDA, grant No. 2010-51106-21803**.**
- **Our entomology technicians.**

United States Department of Agriculture
National Institute of Food and Agriculture

Questions?

Thanks for your attention!

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