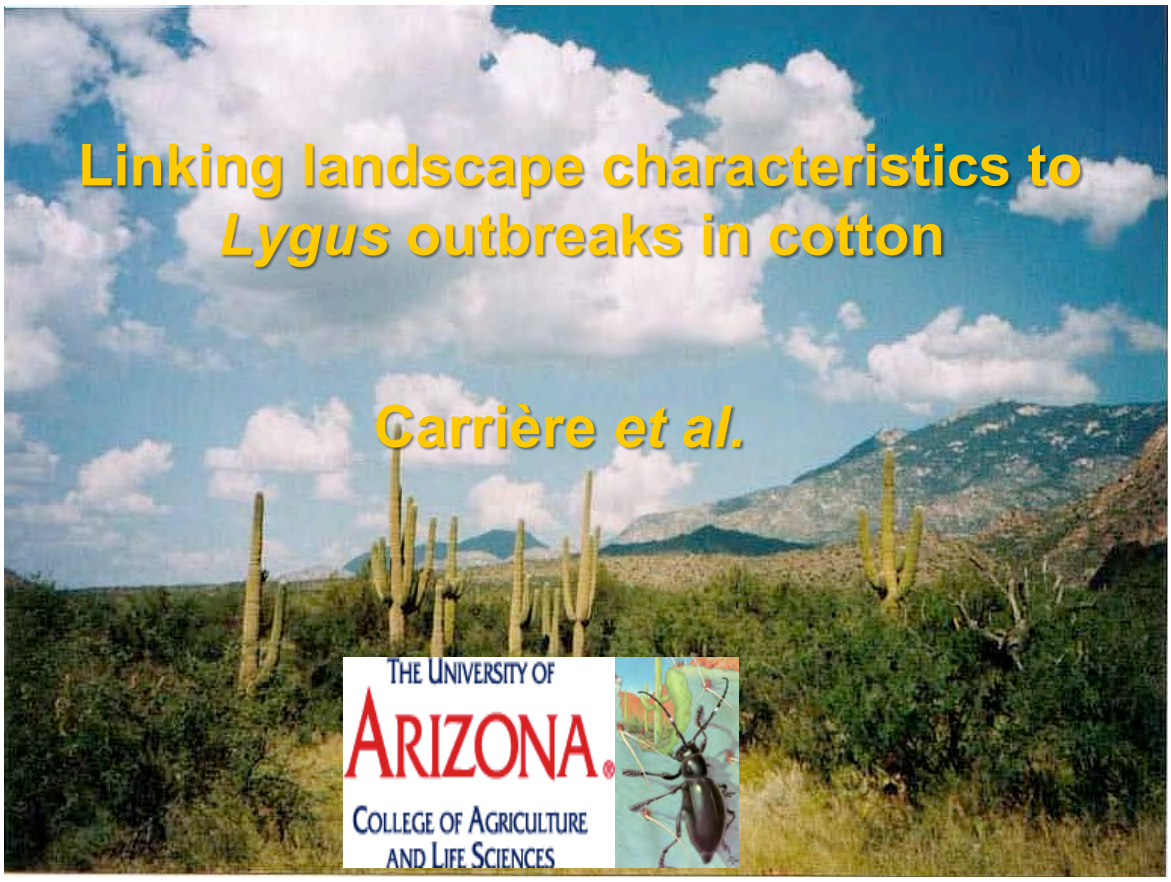


Goals:

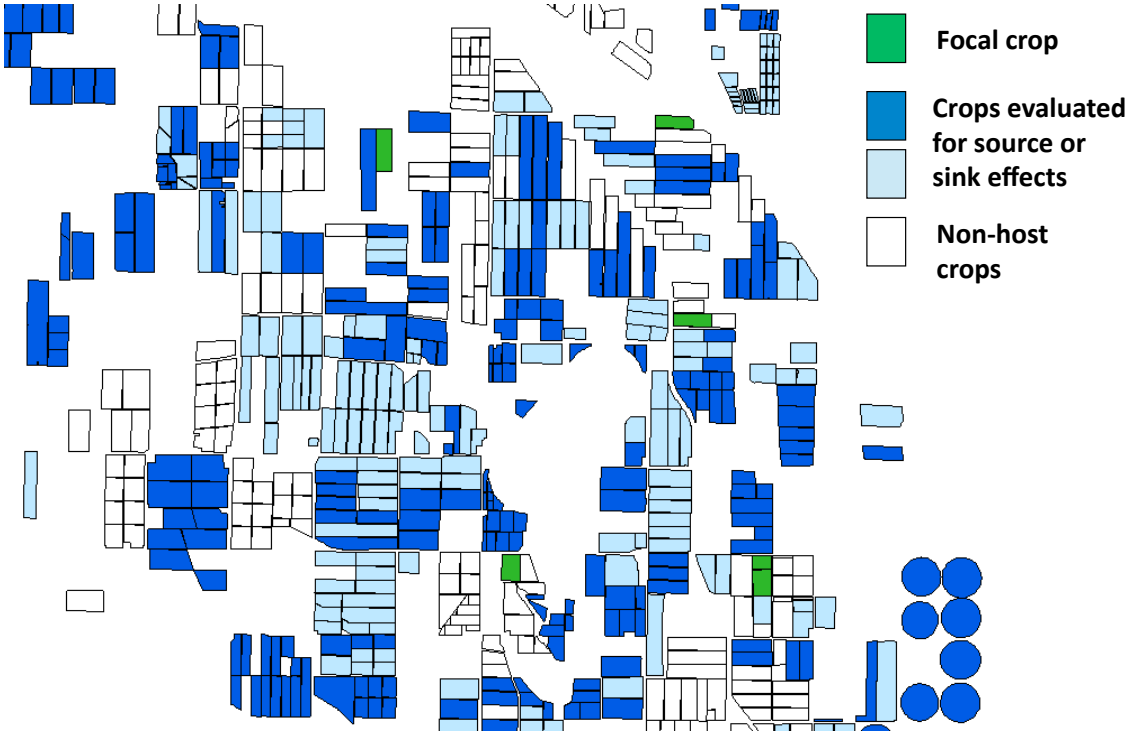
1. Determine the association between *Lygus* abundance in cotton fields and distribution / abundance of crops and non-cultivated vegetation

2. Determine constancy of these associations

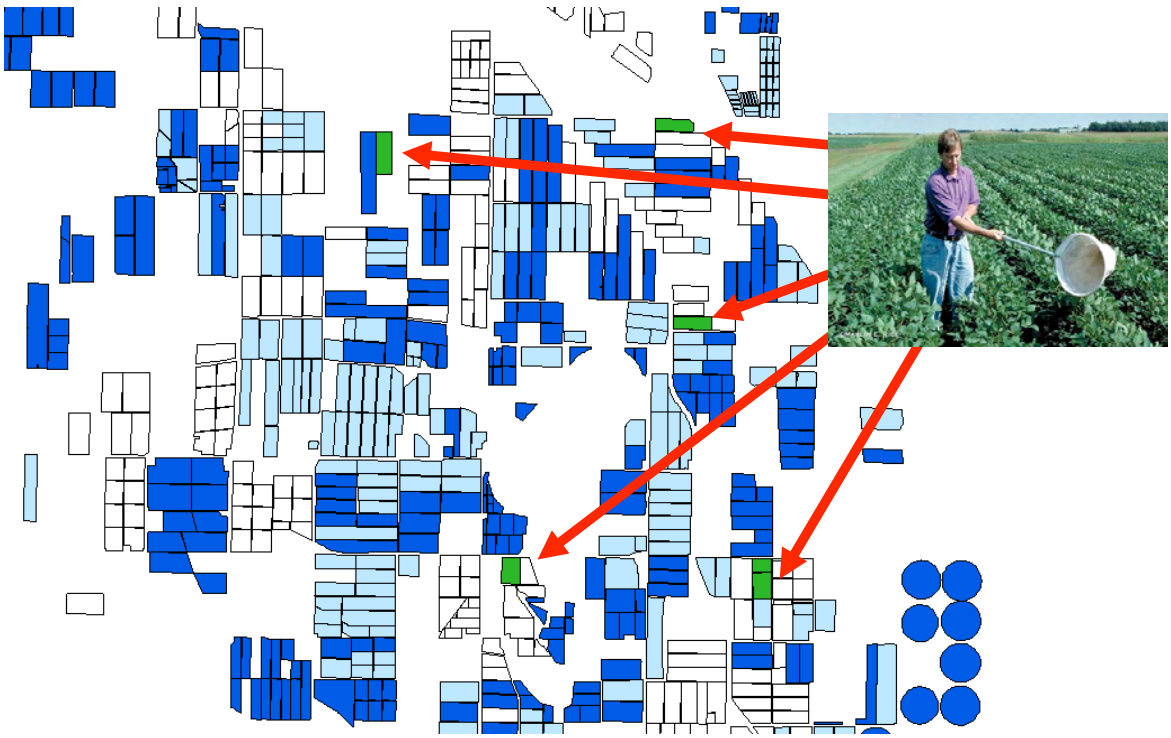
    a) Between years in same region (2007 and 2008)
    b) Across regions (AZ, CA, TX)

4. Predict *Lygus* density in cotton fields in 2009 with statistical models developed from 2007 and 2008 data

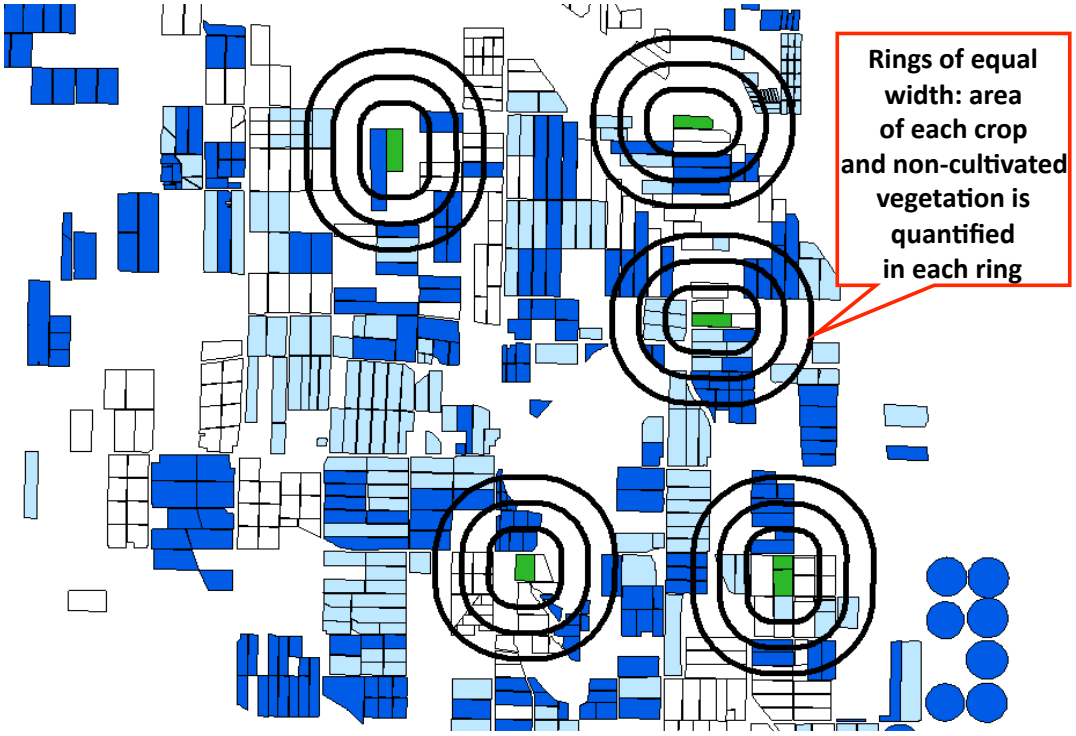
STEP 1: Produce Geographic Information System (GIS) map of crops



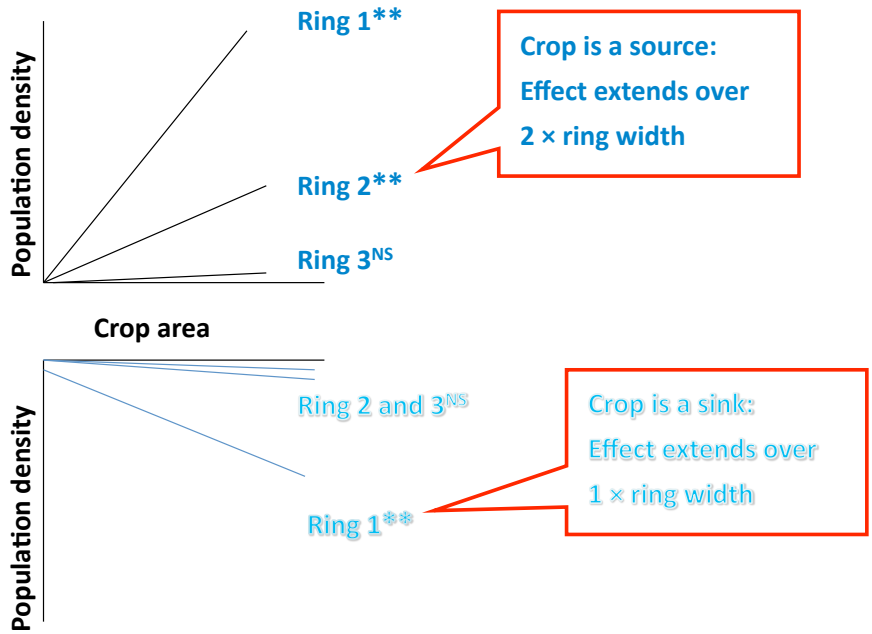
STEP 2: Measure population density in focal fields (N > 40)



STEP 3: Quantify distribution of crops and non-cultivated vegetation near focal crop



STEP 4: Evaluate association between area of crops / non-cultivated vegetation in each ring and population density in focal crop



$$\text{Density}_{\text{focal field}} = \text{intercept} + \text{cropRing 1} + \text{crop Ring2} + \text{cropRing3} + \text{cropRing 1} + \text{cropRing 2} + \text{cropRing3} + \text{error}$$

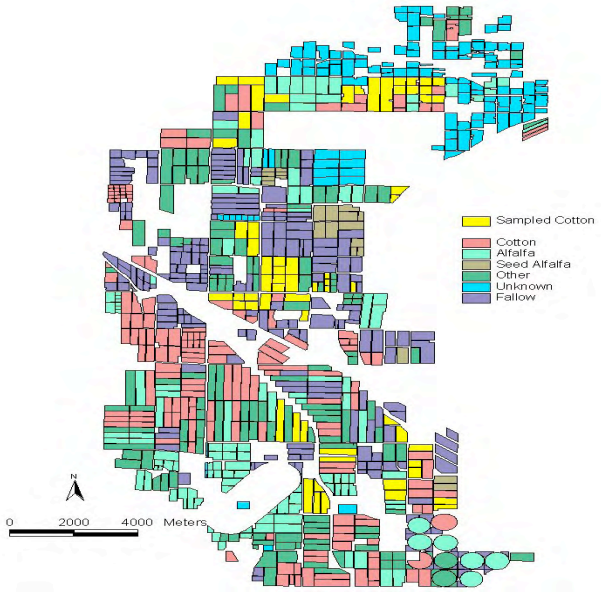
Effect of field type on *Lygus hesperus* density in cotton

Field Type	Effect	Scale (meters)
Cotton	Sink	750
Fallow fields with weeds	Source	500
Forage Alfalfa	Source	375
Seed Alfalfa	Source	1500

Carrière et al. 2006

Progress:

We produced and analyzed GIS maps of *Lygus* crops and non-cultivated vegetation around focal cotton fields for AZ 2007, CA 2007 and 2008, and TX 2007 and 2008



Progress:

1. Produced software to conduct parametric and non-parametric analyses:

   a) Multiple regression / partial correlation for separate rings as in Carrière et al. 2004, 2006

   b) Multiple regression / partial correlation analyses on all rings

   c) Stepwise regression / partial correlation

   d) Path analyses

2. Programs and associated documentation will be posted on the Web

3. A manuscript is planned to explain how method a to d can be used to analyze landscape data

Progress:

1. Several strategies for data analyses have been evaluated. We have made significant progress but have not yet developed a final strategy…

3. Two of the main statistical problems encountered:

   A) Statistical power is low when many crops are considered and data are spatially autocorrelated

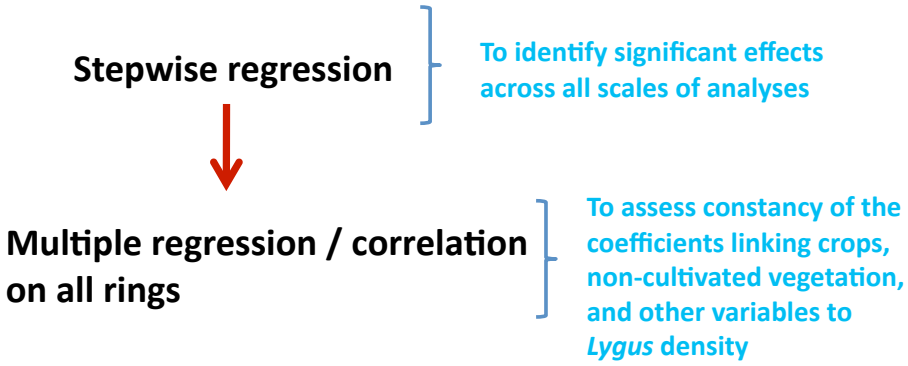
   → Stepwise regression is used to reduce number of explanatory variables considered

   B) The sign of the coefficients of the associations between crops and *Lygus* density can change in the same analysis

   → There are statistical reasons for this instability and we have not yet solved this problem entirely

Last strategy evaluated to analyze Total *Lygus*, Adults and Nymphs:

California data sets: four analyses conducted with 2 rings of a width of 750, 1000, 1250 or 1500 m



Pairwise correlation between Adults, Nymphs, and Total *Lygus*

Year	Effect	r *
2007	Total vs. Adults	0.93
	Total vs. Nymphs	0.82
	Adults vs. Nymphs	0.59
2008	Total vs. Adults	0.99
	Total vs. Nymphs	0.63
	Adults vs. Nymphs	0.55

* All correlation coefficients are significant at $P < 0.0001$

Significant factors retained in stepwise analyses with two rings at four scales (ring width of 750, 1000, 1250, or 1500 m)

Nymphs		Adults		Total	
2007	2008	2007	2008	2007	2008
	cotton	cotton		cotton	
	Hay alfalfa	Hay alfalfa	Hay alfalfa	Hay alfalfa	Hay alfalfa
Safflower		Safflower	Safflower	Safflower	Safflower
	Seed alfalfa	Seed alfalfa	Seed alfalfa	Seed alfalfa	Seed alfalfa
Sugar beet	Sugar beet				
		Tomato	Tomato	Tomato	Tomato
			Non-cultivated		Non-cultivated
			First Bloom	First bloom	First bloom

Coefficient of determination (R^2) for models fit at four different scales. Models only contained variables retained in stepwise process.

Scale		2007			2008	
	Adults	Nymphs	Total	Adults	Nymphs	Total
2 X 750	0.53	0.39	0.63	0.59	0.35	0.40
2 X 1000	0.60	0.42	0.72	0.41	0.37	0.49
2 X 1250	0.67	0.39	0.69	0.47	0.22	0.54
2 X 1500	0.62	0.08	0.64	0.42	0.32	0.46

Qualitative results for non-parametric, multiple regression analyses of Total *Lygus*. Four analyses were performed with two rings, using widths of 750, 1000, 1250, and 1500 m. Sign of all significant associations are shown.

	2007			2008	
Effect	Association	Maximum scale	Effect	Association	Maximum scale
Cotton	- +	3000			
Hay alfalfa	+ -	2500	Hay alfalfa	+ + +	3000
Safflower	+ +	1250	Safflower	+ + +	1500
Seed alfalfa	-	1500	Seed alfalfa		
Tomato	+	2000	Tomato	+	3000
			Non-cultivated	-	1500
			Sugar beet	-	750
First bloom	+				

Stability of coefficients was similar in analyses of Nymphs; but stability was less for Adults

Future strategies of analyses:

A

Non-parametric stepwise regression (Total *Lygus*, Adults and Nymphs)

Non-parametric partial correlation (Total *Lygus*)

Non-parametric path analyses (Adults and Nymphs)

B

Non-parametric stepwise regression (Total *Lygus*, Adults and Nymphs)

Non-parametric partial correlation using only one ring. (Total *Lygus*, Adults and Nymphs)