Plant/Pest/Pesticide Interactions

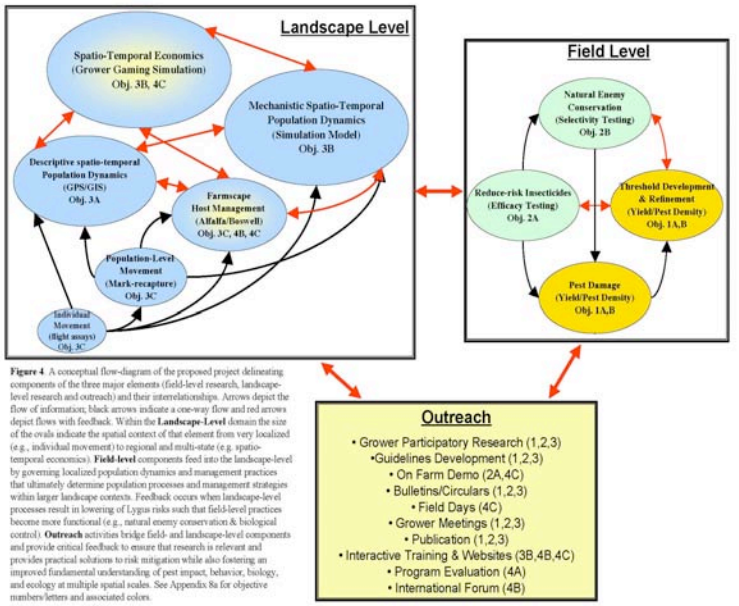
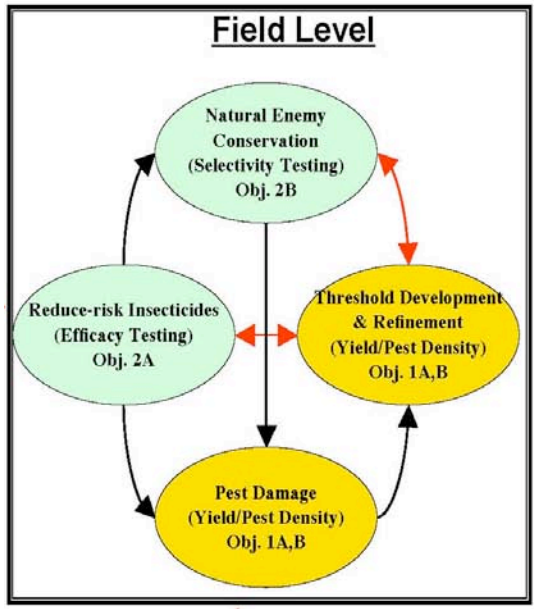


Figure 4. A conceptual flow-diagram of the proposed project delineating components of the three major elements (field-level research, landscape-level research and outreach) and their interrelationships. Arrows depict the flow of information; black arrows indicate a one-way flow and red arrows depict flows with feedback. Within the **Landscape-Level** domain the size of the ovals indicate the spatial context of that element from very localized (e.g., individual movement) to regional and multi-state (e.g. spatio-temporal economics). **Field-level** components feed into the landscape-level by governing localized population dynamics and management practices that ultimately determine population processes and management strategies within larger landscape contexts. Feedback occurs when landscape-level processes result in lowering of Lygus risks such that field-level practices become more functional (e.g., natural enemy conservation & biological control). **Outreach** activities bridge field- and landscape-level components and provide critical feedback to ensure that research is relevant and provides practical solutions to risk mitigation while also fostering an improved fundamental understanding of pest impact, behavior, biology, and ecology at multiple spatial scales. See Appendix 8a for objective numbers/letters and associated colors.



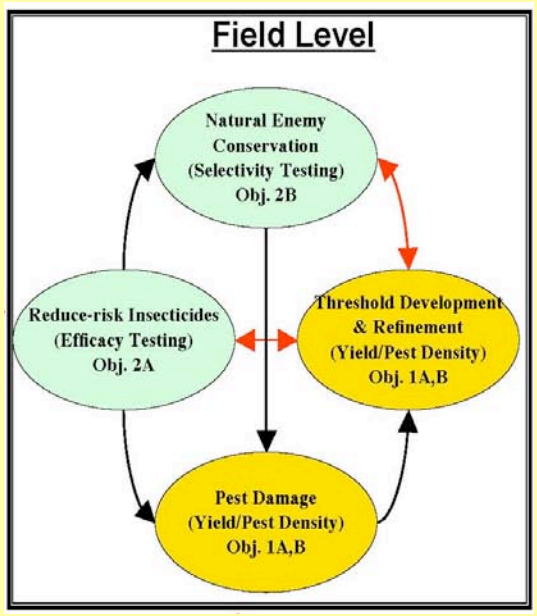
Field Level Experimental: Yield/Damage/Thresholds

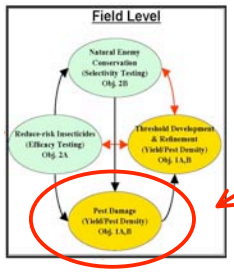
PI	Project
Bundy	(1) Economic injury evalu ations in cotton (2) Injury to chile peppers
Ellsworth	Development of dynamic yi eld/density relationship for cotton
Godfrey	Refining pest management guidelines in dry beans
Goodell /Molinar /Jimenez	Developing pest management guidelines for eggplant
Goodell /Hutmach er/Godfrey	Strengthening rese arch and extension for Pima cotton
Naranjo /Ellsworth	(1) Yield/ damage/density relationships in lesquerella (2) Yield/ damage/density relationships in guayule
Palumbo	Economic status in vegetable and vegetable seed production
Parajulee	(1) Boll susceptibility window in cotton (2) Compensat ion for induced fr uit loss in cotton
Rosenheim /Ellsworth	Incorporating *Geocoris* into thresholds for cotton

Field Level Experimental: Insecticide Efficacy/Selectivity

PI	Project
Ellsworth	Deployment options fo r reduced -risk and other insecticides in AZ cotton
Godfrey /Parajulee	Evaluating efficacy of registered and experimental insecticides in CA & TX cotton
Godfrey	Evaluating efficacy of registered and experimental insecticides in dry beans
McGuire	Developmen t of selective biopesticides
Naranjo /Ellsworth	Evaluation of selectivity of reduced -risk insecticides in AZ cotton

- 3 year study on economic thresholds for *Lygus* in cotton
- Preliminary analyses show 4-6 adults and 2-4 nymphs per plant before significant economic damage occurs
- Baseline data on potential injury to chile fruiting structures of various ages developed
- Lygus potentially problematic but field studies suggest peppers may not be a preferred host

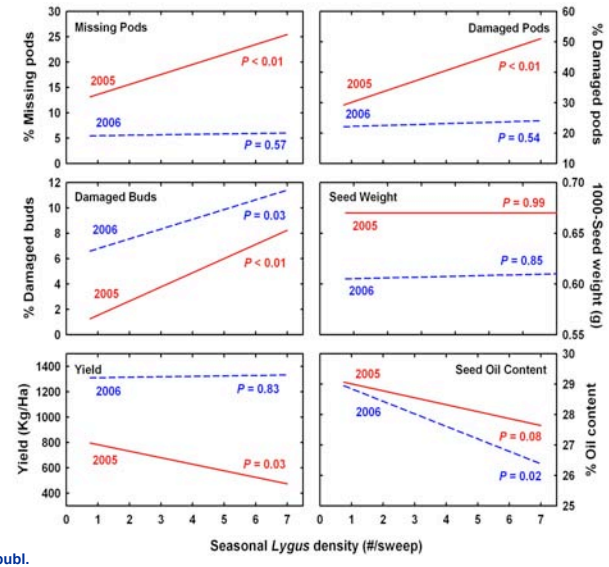




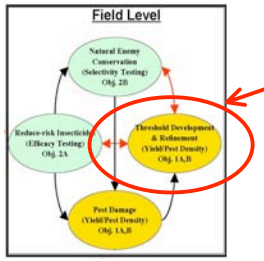
Pest Damage

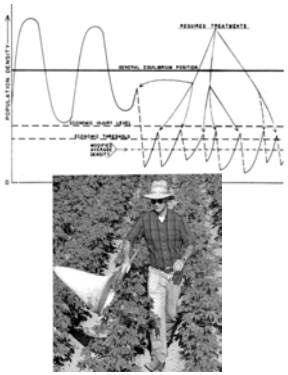
- Conducted at least 18 field and lab experiments related to field-level Lygus damage to crops(cotton, seed broccoli, dry beans, chiles, eggplant, lesquerella, guayule) in CA, AZ, NM and TX.
  - Pima appears less able to compensate for fruit loss
  - Upland cotton able to compensate for ≈1/3 early fruit loss – modified by irrigation
  - New variety of lima bean is more tolerant
  - Lygus effects on lesquerella inconsistent

Lygus spp. Impact on Lesquerella



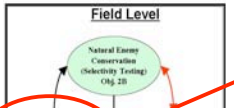
Naranjo et al., unpubl.





Threshold Development/Refinement

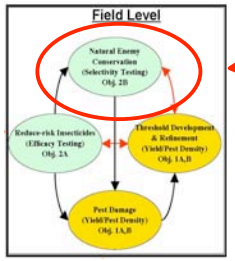
- Threshold of 15:4 verified in AZ cotton; planting date, irrigation termination & maturity class all affect economic outcomes
- NM studies appear to point to much higher threshold levels
- Insufficient data/analyses for chile peppers, lima beans, lesquerella, guayule, Pima cotton, eggplant
- *Geocoris* and *Zelus* impact Lygus suppression
- Calibration of sweep net sampling
- Instructional video of sweep sampling



Reduced-Risk Insecticides

- Eight series of field experiments related to determining insecticide efficacy, timing, and effect on natural enemies in cotton and dry beans in AZ, CA and TX.
- Large number of compounds & combinations tested in cotton
  - flonicamid/metaflumizone -very good
  - orthene and oxamyl - good
  - pyrethroids – marginal with resistance issues
- Compounds & combinations examined in dry bean
  - pyrethroids - very good

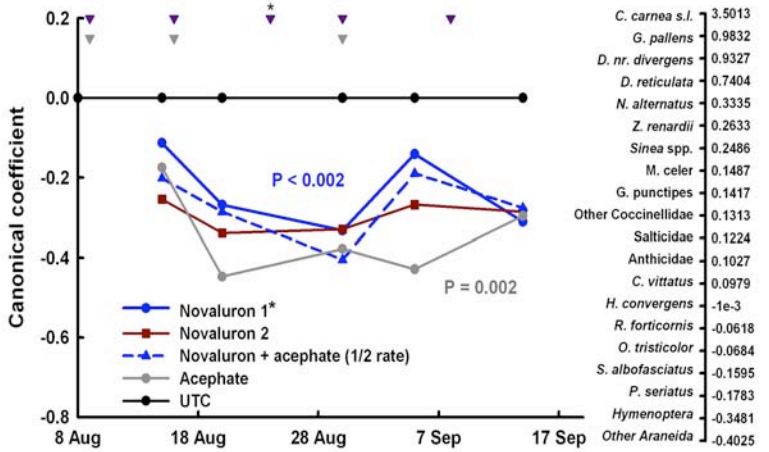
Compatibility?



Natural Enemy Conservation

- Selectivity of insecticides examined in cotton trials in CA and AZ
- AZ studies clearly show high selectivity of flonicamid and metaflumizone, but not novaluron
  - flonicamid is being widely adopted by AZ growers
- Cotton growers now have selective options for all three key pests in western US

Selectivity of WF/Lygus Insecticides (Novaluron)



Ellsworth & Naranjo, unpubl.

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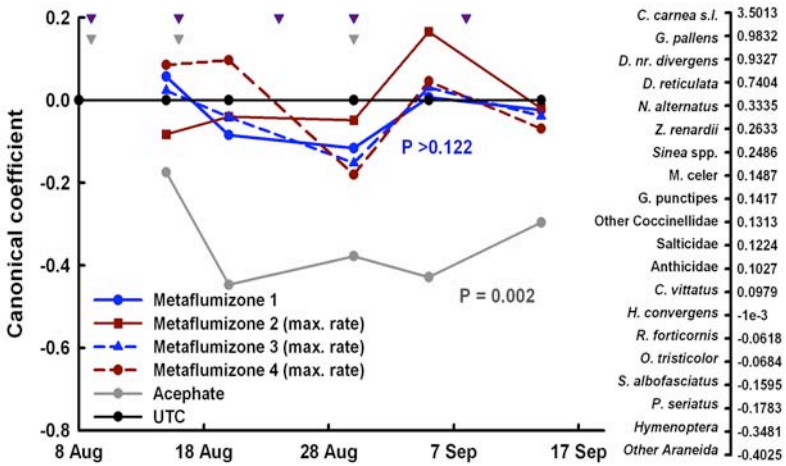
Selectivity of Lygus Insecticides (Metaflumizone)



Ellsworth & Naranjo, unpubl.

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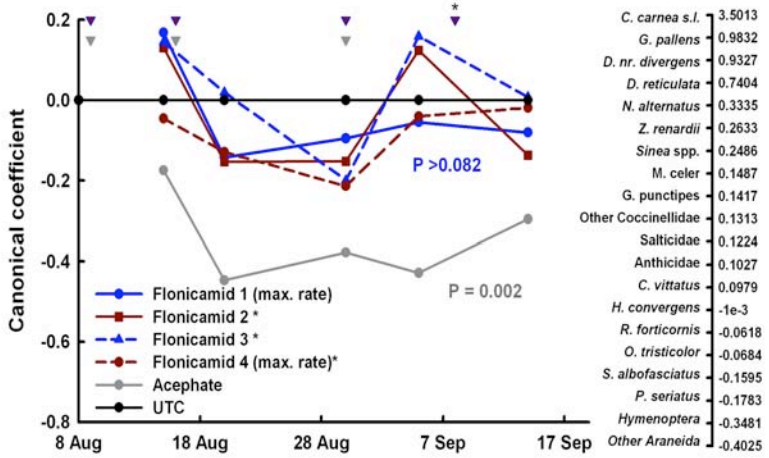
Selectivity of Lygus Insecticides (Flonicamid)



Ellsworth & Naranjo, unpubl.

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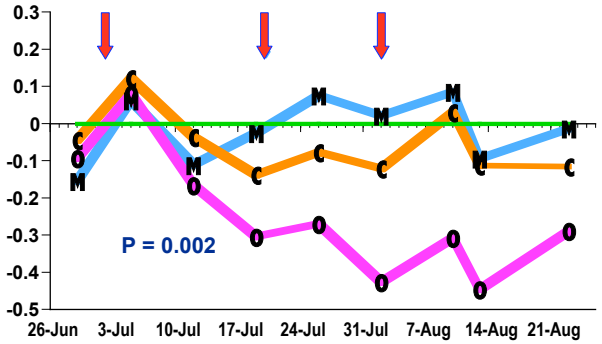
Principal Response Curve

Natural Enemies to Orthene v. Carbine or Metaflumizone



Ellsworth & Naranjo, unpubl.

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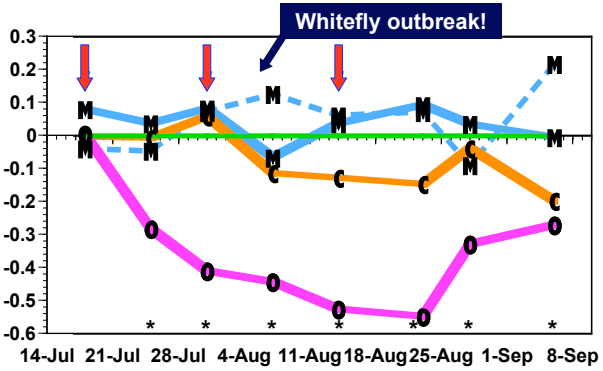
Principal Response Curve

Natural Enemies to Orthene v. Carbine or Metaflumizone



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Ellsworth & Naranjo, unpubl.