

- USDA-CSREES, Risk Avoidance & Mitigation Program (RAMP)
- \$2,500,000 over 4 years
- Developing and implementing field and landscape level reduced-risk management strategies for Lygus in Western cropping systems

- Scope
 - 4 Western States, AZ (Lead), CA, NM, TX
 - 7 Institutions, UA, UC-Davis, UC-IPM, NMSU, TX A&M, USDA-ARS, McGill University
 - 13 PI's, many collaborators
 - Upland & Pima cottons, seed alfalfa, vegetable & vegetable seed crops, eggplant, chiles, guayule, lesquerella, dry beans

Ellsworth/UA

This is the project team for the \$2.5M grant rec'd from USDA-CSREES Risk Avoidance & Mitigation Program. Ellsworth is lead PI and UA the lead institution for this 4-year 4-state project. There are 13 PIs cooperating and a number of public and private cooperators.

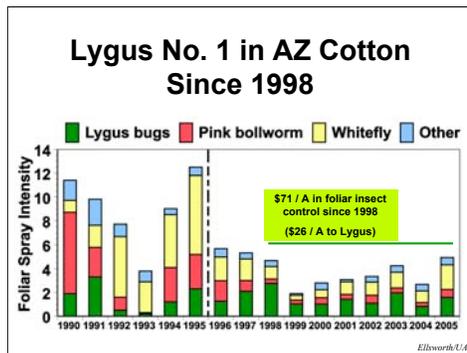
The particulars.

The goal is to develop a comprehensive research and outreach approach that will allow us to develop areawide suppression of Lygus bugs through improved field practices and landscape manipulation. This requires a gamut of fundamental and applied investigations into the movement potential and control of Lygus in at least 10 crops.

Potential Impact

- Other affected crops (not in RAMP)
 - Clover seed, sugarbeets, celery, strawberry, peach, nectarine, pulses, plum, pear, lettuce
- AZ no. 1 producers of broccoli & cauliflower seed
 - 1-2 sprays each year; 10% loss in seed quality
- Eggplant losses 3-10% in CA & ca. 1.5 sprays
- 1M A of alfalfa grown in CA/AZ
- Guayule could increase to as much as 200,000 A
- Cotton = \$1 billion crop in RAMP states, half of all U.S. production
- Old controls: dimethoate (1962), dicrotophos (1964), aldicarb (1970), methamidophos (1972), acephate (1973), oxamyl (1974), pyrethroid (1979)

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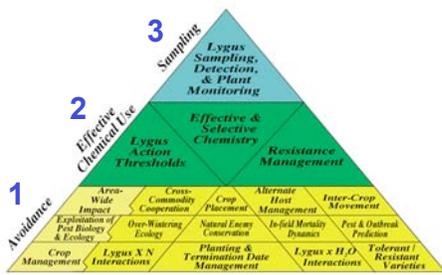
Lygus bugs are a complex of ca. 3 species in the West, with *Lygus hesperus* doing the majority of damage to our crops. It is an indigenous, polyphagous mirid with seed or floral-feeding habits that make it particularly damaging to a wide array of fruit, vegetable, and field crops in the West and beyond.

Lygus has been our number one insect pest of cotton since 1998. Lygus has gained in importance simply because it occupies a greater proportion of our spray requirements and budgets since the introduction of selective technologies for other pests in 1996 (Bt cotton for PBW and IGRs for whitefly control). In fact, it is the largest yield threat to AZ cotton.

Losses to and control costs for Lygus are extremely large. [Next slide shows specific information for AZ cotton.] Huge advances have been made in IPM overall in the last decade; however, Lygus and other mirids remain or have become key pests that tend to only have very broadly toxic insecticides as their primary control options.

Over 200,000 A are grown in AZ. Over half of the U.S. production of Upland cotton and ALL Pima cotton production is made in the 4 RAMP states.

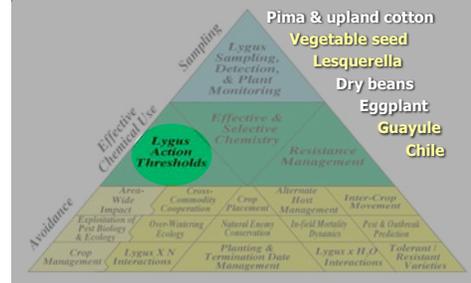
Lygus IPM



Integrated Pest Management (IPM) developed for Lygus or any pest depends on a set of prevention or avoidance practices, where possible, and remedial controls. In its simplest form, IPM can be described as having three basic keys, Sampling and Effective Chemical Use, resting on a foundation of Avoidance practices.

To be fully functional, IPM depends on information for all its building blocks, some of which are pictured here.

Yield : Density Relationships

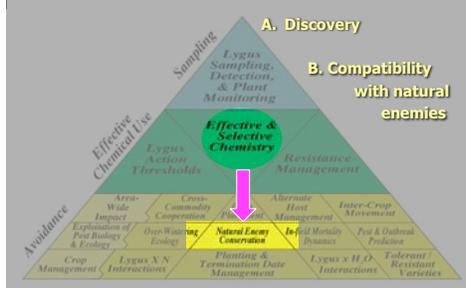


Thresholds (and other economic information) are a major building block of any IPM program.

Our RAMP Team will address specific yield : Lygus density relationships and other economic information to develop action thresholds and other information needed to better deploy chemical controls in all the crops lists (those highlighted in yellow are crops without any defined economic relationship for Lygus, but are known hosts for this pest group).

Guayule and Lesquerella are new crops, the former being planted on thousands of acres in AZ. They are being developed for arid Western conditions, but harbor Lygus of unknown consequence to the crop itself or local or regional dynamics of this pest.

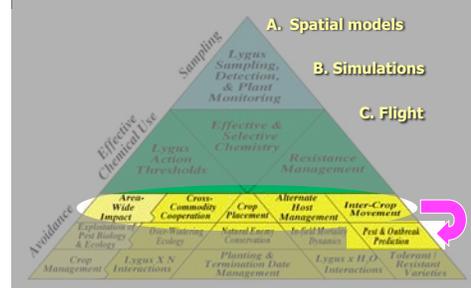
Expand Reduced-Risk Technologies



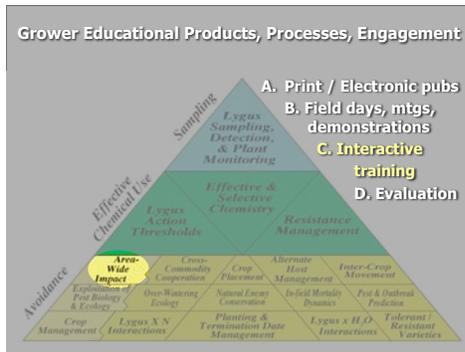
Central to remedial tactics is an effective chemical arsenal. In AZ, we have shown that when selective options are available and effective, huge gains in both target and collateral control can be achieved due to much better natural enemy conservation.

Our RAMP team will be working to expand "reduced-risk" technologies for Lygus control in an array of crops. Our goal will be to replace or minimize the impact of the broadly toxic insecticides that growers of certain crops currently depend, and achieve better compatibility with natural enemy conservation.

Source-Sink Relationships & Movement



Our ultimate goal is to broadly improve the management of Lygus through field-specific and landscape-level practices and understanding. This requires a detailed, theoretical and empirical understanding of crop source-sink relationships for lygus bugs. We will do this through the development of empirical data on Lygus abundance across landscapes in three states and the development of spatially-explicit models, as well as mechanistic simulations of Lygus movement through a system based in part on field-marking and laboratory study of Lygus flight characteristics. All this should lead to opportunities for advances in strategic planting and coordinated crop and pest management for optimizing Lygus IPM across commodities.



Our project does not depend on passive dissemination of information & tech. transfer. We have significant investments in a comprehensive Extension program: numerous printed and electronic publications; various field days, meetings and demonstrations; and significant grower engagement including grower-participatory research, on-farm demonstrations, detailed program evaluation, and a novel interactive model for grower training.

This interactive training will be developed from empirical data, & movement models generated from the RAMP together with key economic information to teach growers about risk management, group adoption, allocation, and re-allocation of land uses to minimize Lygus losses and maximize areawide returns.



Securing the RAMP Grant required significant endorsement and promise of leveraging support from numerous individuals and organizations. Only a few are listed here, but special thanks are due to Cotton Incorporated, various commodity boards in the 4 states, USDA, UC-IPM, and Yulex Corporation (developer and processor of guayule). Coordination and support of this project are done through the Arizona Pest Management Center.

Photo credit: J. Silvertooth