

Research-Based Integrated Pest Management (IPM) Programs Impact People, Communities and the Economy of Arizona

Pests in homes, schools, parks, landscapes and other community settings threaten human health and impact local economies. **Pests can vector diseases (mosquitoes), contribute to allergies and asthma problems (rodents, cockroaches); reduce quality of life (bed bugs); and damage structures (termites) and landscapes (insect, weed and disease pests of plants), reducing the value of homes and parks.** The UA Arizona Pest Management Center delivers research-based Integrated Pest Management (IPM) solutions to communities through our multidisciplinary Community IPM Team.

Job Support and Economic Impact in Arizona

- 1,241 pest management companies in Arizona represent 5.8% of businesses nationally, which in 2012 were estimated to **generate \$11.4B in revenue**
- We estimate that Arizona schools practicing IPM could each save, on average, \$10,500 each year
- Arizona is recognized as the #1 golf destination in North America, with more than 787,300 annual golfers playing 12 million rounds of golf at over 300 courses, impacting a **\$3 billion dollar leisure / recreational industry**; in Scottsdale alone, 26 golf facilities account for an estimated 1,800 full time jobs and 960 part time jobs
- Our Extension IPM programs provide research based information and continuing education units (CEUs) to help professionals maintain licenses and high standards of pest control. **What clientele say:**
 - “A minimum of 10% growth (nearly \$100,000) in 2012 was directly related to what we learned from UA Extension IPM programs, which has increased our sustainability and improved our ability to compete with larger companies.” – owner of a local pest management company
 - “We have had such a positive growth in our business using IPM strategies that I have been able to take them [beyond schools] into other market places.” – Arizona District Manager for global pest management company
 - “UA Extension programs helped us sustain our operation and maintain jobs” - Medical Director at a health facility for veterans

Improving Quality of Life

- IPM in schools has been shown to **reduce pest incidence by 78% and pesticide use by 71%**. **Arizona IPM programs impact over 303,600 students statewide**
- 374 units at a large public housing site were renovated in 2011 according to our IPM guidelines, eliminating ongoing problems with German cockroaches and bed bugs. Families were returned to pest-free homes, **enjoying a greatly increased quality of life** while breaking the cycle of pest re-infestation
- **What clientele say:**
 - “Education provided by UA faculty helped us safely reduce pest pressures and the need for pesticides in schools. Public safety and environmental safety are the largest benefits and these have no measuring tool. **It is a priceless thing to know that we have been given the knowledge and tools to keep our customers safe while having a positive impact on our environment.**” – Arizona District Manager for global pest management company
 - “After working with UA and implementing a bed bug policy, we reduced classroom bed bug incidents by about 70% at one of the largest high school districts in the country, affecting 16 schools, over 27,000 students, and approximately 3,000 employees.” - Quality Assurance and Sustainability Specialist at large urban school district
 - “With the help of the Extension program the city has reduced environment risks to our employees and visitors, has increased knowledge and awareness of employees and improved environmental health.” - Public Works employee for large city

Integrated Pest Management Helps Arizona's Economy, Environment & Quality of Life

*Measuring and communicating environmental, economic and social impacts of IPM are key to recruiting and leveraging support for our IPM programs, and to **maximizing future impacts**.* Our IPM programs are planned, developed and implemented by interdisciplinary teams organized under the Arizona Pest Management Center (APMC) and address agricultural, natural and urban settings.

*Our programs are **highly leveraged to maximize impacts**.* For FY 2010 we secured about \$1.1 million in grants (>\$900K federal) and other resources to support IPM research and outreach.

*Our investments in IPM assessment are **paying dividends in increased capacity to document program impacts*** (Fig. 1). Dedicated faculty develop evaluation data that document IPM outcomes and impacts for all program areas, showing dramatic impacts that **save growers money, protect human and environmental health, & save/create jobs in Arizona** (Figs. 2–4).

Impacts from Arizona's Cotton IPM program:

- Arizona leads the world in cotton yield per acre (>1550 lbs.), nearly twice the U.S. average, **contributing 9,000 jobs and \$700 million to Arizona's economy in 2011**
- Reductions in control costs & yield losses to arthropods have **saved cotton growers more than \$388,000,000 since 1996**
- **All-Time Record Gains: growers reduced their need to spray by 88%** (only 1.5 times / season), **their costs by 81%, and the amount of insecticides used by 77%**, equivalent to **applying less than a can of soda on an entire football field in one year**
- By 2011, 76% of all cotton insecticides used were selective, meaning they are **safer to use and help preserve beneficial insects** in the cotton system
- Arizona cotton growers have reduced broadly toxic insecticides by 74% compared to pre-2005 levels
- Growers used to spray 100% of their acreage multiple times for insect pests. Now on average, about 25% of all cotton acres are **never sprayed for insects**
- Our cotton IPM program, including adoption of Bt cotton and whitefly-specific insect growth regulators since 1996 and a selective Lygus feeding inhibitor since 2006, has reduced risks to human health and the environment by **eliminating over 1.16 million pounds of insecticide active ingredient annually**, down 90% compared to 1995
- The cotton IPM plans developed in Arizona have been exported for use in California, Texas, Australia, Latin America and northern Mexico
- In the border region of Mexico (pop. 1M), 30,000 ha of cotton has often been subject to broadly toxic pesticide use, affecting over 15,000 agricultural workers; implementation of the Arizona IPM program resulted in a 51%, 30–40%, and 34% reduction in broadly toxic insecticides, all insecticides, and their costs, respectively, saving over \$1.6M in 2012 alone

Selected Highlights of IPM Impacts in Arizona's Vegetable Systems

- Arizona growers are one of the leading producers of fresh-market vegetables in the U.S., producing fresh vegetables and melons at an **estimated farm gate value of over \$900M annually creating \$2.5 billion of economic output**; this includes over 90% of all fresh lettuce consumed in the U.S. in the winter, valued at over 3.2M in the 2009–2010 season
- **Broad-spectrum insecticide use in lettuce has declined 72%** from a high of over 10 sprays (1995) to less than 2.4 sprays over recent years (2009–2011)
- Use of safer, reduced-risk insecticides have increased 14-fold over the same period
- **Safety to aquatic & other organisms has been progressively and significantly improved** by other 80% over the last 21 years (Fig. 4)

Arizona Pest Management Center – Impacts

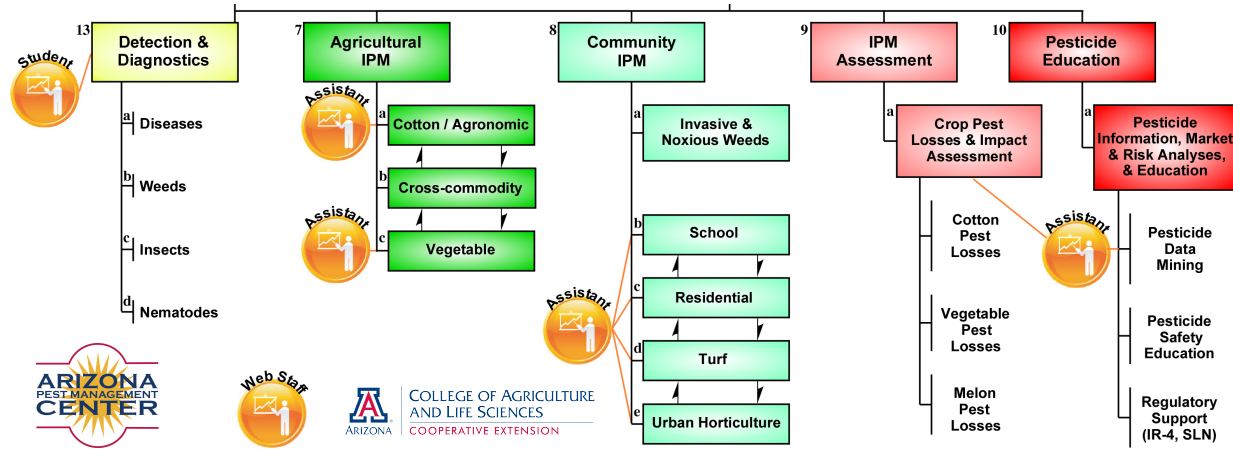


Figure 1. The Arizona Pest Management Center deploys IPM teams that conduct research and outreach to support implementation of IPM in agricultural and community settings. Faculty dedicated to IPM Assessment help teams develop quantitative and qualitative measurements of stakeholder behaviors and IPM impacts. Orange assets are 50% leveraged through a federally funded institutional grant (USDA-National Institute of Food and Agriculture).

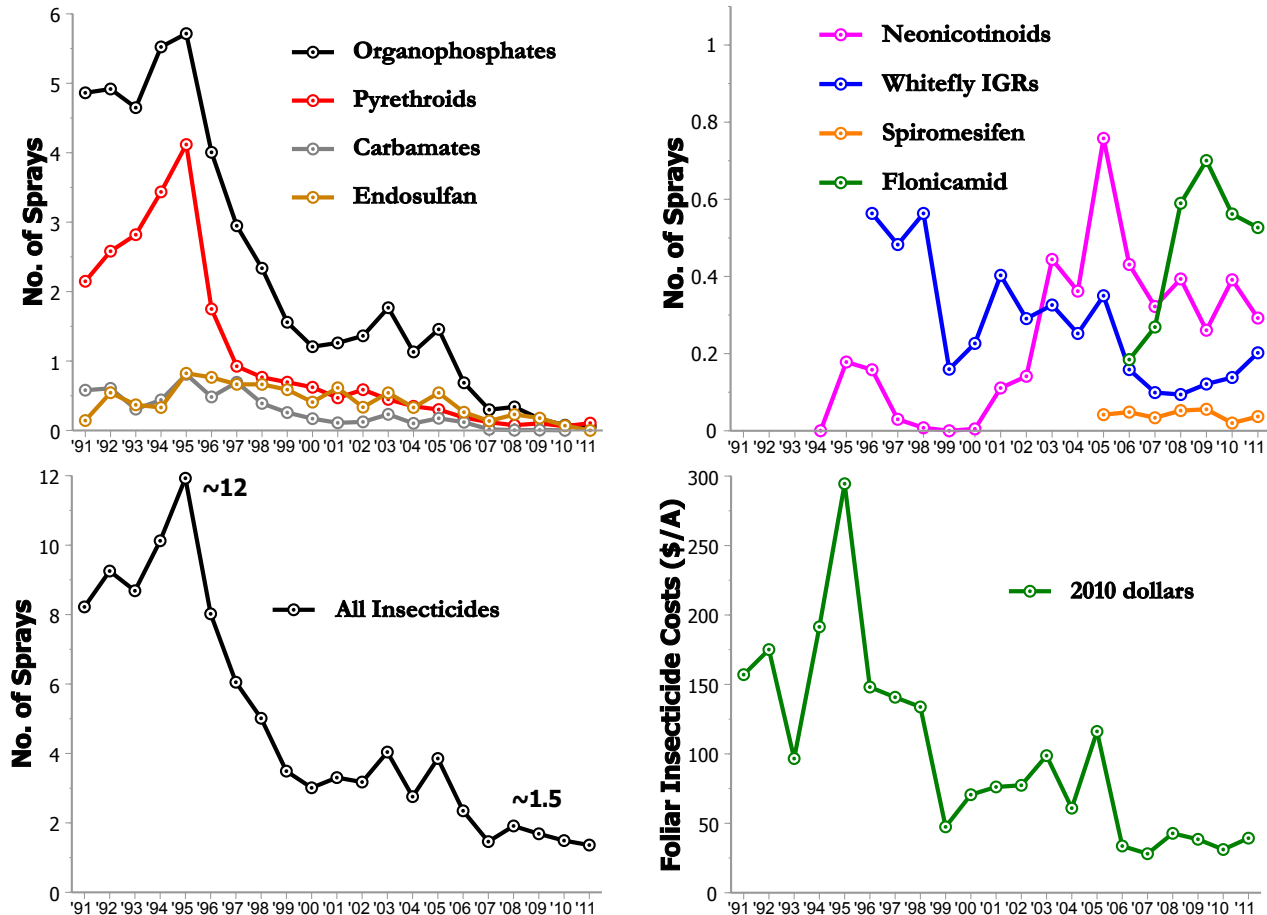


Figure 2. Statewide average cotton insecticide use patterns in Arizona, 1991–2011. Broad spectrum & reduced-risk insecticides (upper left & right) in use during this period. All insecticides & their costs (including application costs) (lower left & right) reached a 33-yr low over the last 6 years. Comparing the last 6 yrs to 1995 (an all-time high), pyrethroids have been reduced by 97%, organophosphates by 92%, carbamates by 97%, and endosulfan by 82% with an overall reduction of cotton insecticide use of 85%. By 2011, 76% of all cotton insecticides were either fully (55%) or partially (21%) selective, safer for natural enemies. *Source: APMC Pesticide Use Database & Cotton Insect Losses Database, Arizona Pest Management Center, Ellsworth & Fournier, unpubl.*

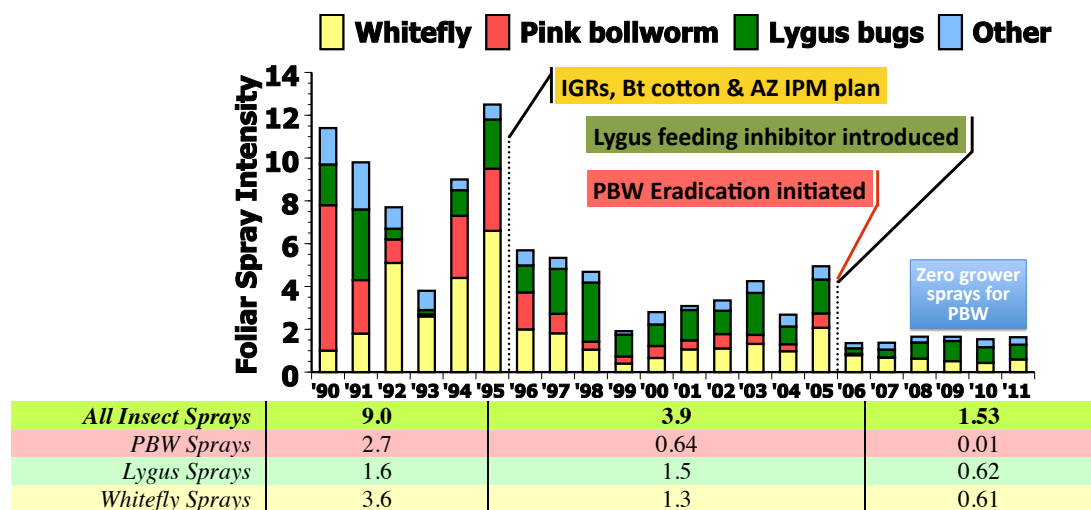


Figure 3. Statewide average cotton insecticide use patterns in Arizona, 1990–2011, by key pest. Over 1.6 million lbs a.i. annual reduction in the last 6 yrs compared to the 34-yr high in 1995; est. cumulative savings in control costs & yield in excess of \$388M. Source: Cotton Insect Losses Database, Arizona Pest Management Center, Ellsworth, unpubl.

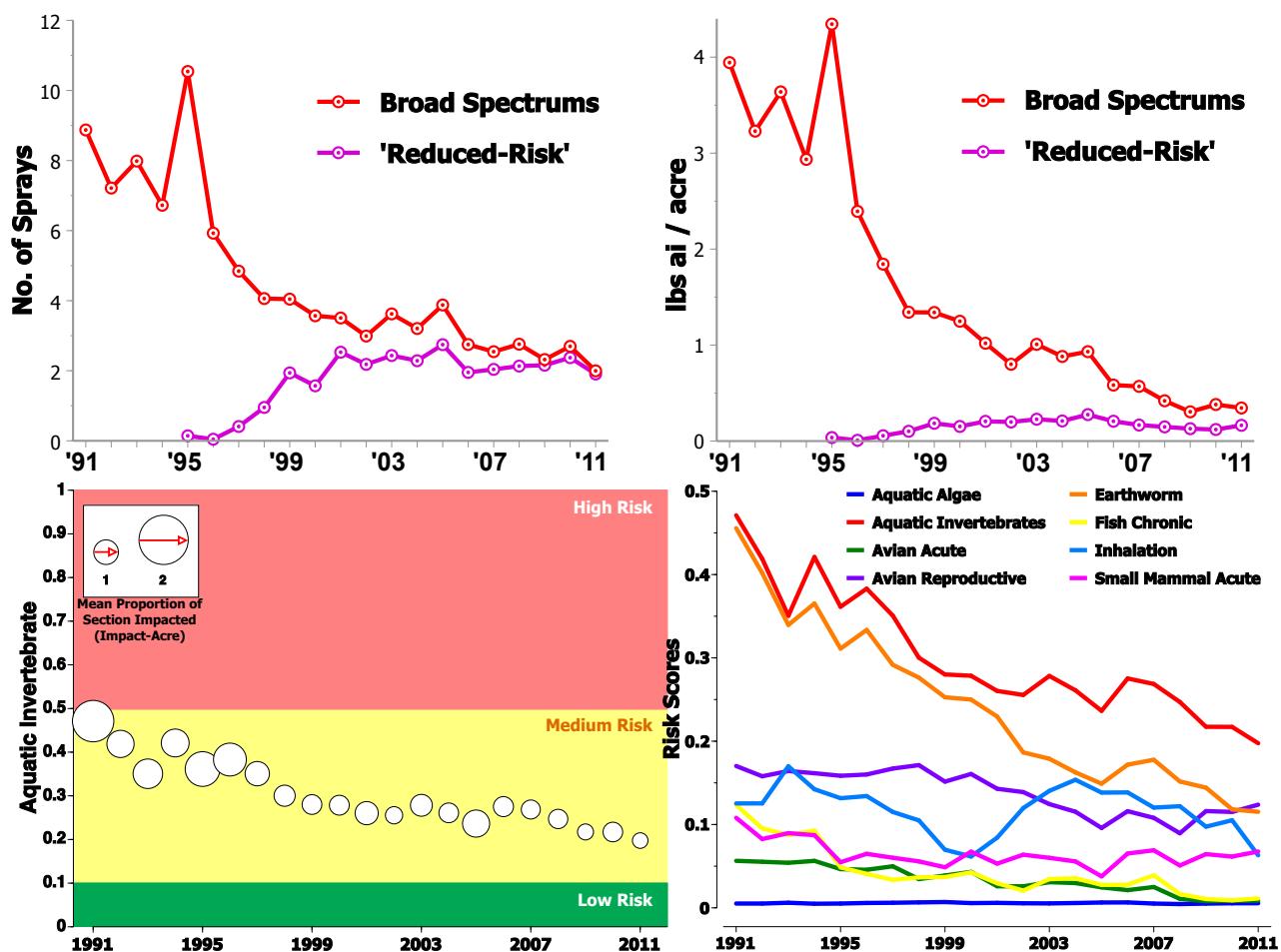


Figure 4. Statewide lettuce pesticide use patterns in Arizona, 1991–2011. Broad-spectrum insecticide use has declined 72% from a high of over 10 sprays (1995) to less than 2.4 sprays over recent years (2009–2011); reduced-risk insecticides have increased 14-fold over this same period (upper left). Large declines in key broad-spectrum insecticides (upper left & right) include reductions in organophosphates (-95%), endosulfan (-96%), carbamates (-91%), and pyrethroids (-67%). Over the same period, IPM-PRiME risk scores (lower left & right) and impacted area (lower left) have shown significant improvements for environmental safety and conditions for fish (by up to 89%), birds (by up to 86%) and other organisms (by 24–89%), despite increased lettuce acreages over this two decade period. Sources: Arizona Pest Management Center, Palumbo et al., unpubl., Guzy, Fournier, Dixon, Jepson, Palumbo, Ellsworth, unpubl.