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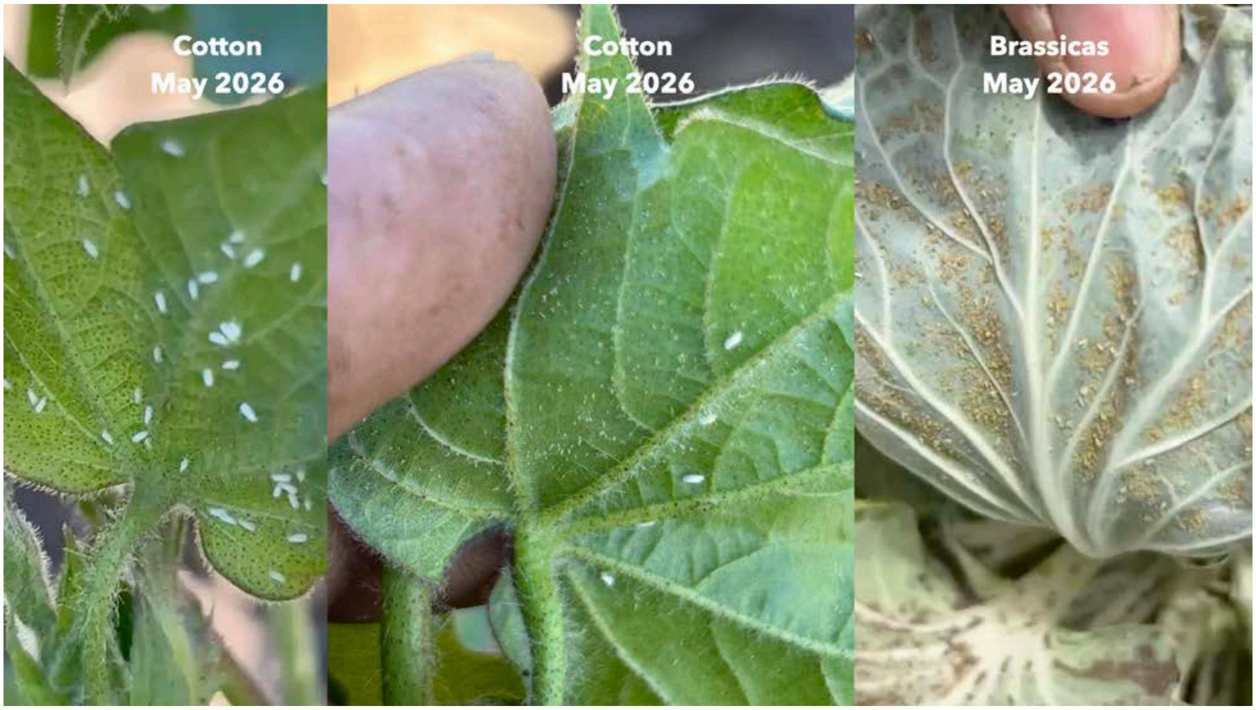
Prepared for the Annual Cultivating Solutions Dinner,
Yuma Center for Excellence in Desert Agriculture

The University of Arizona
College of Agriculture and Life Sciences
Cooperative Extension
Arizona Pest Management Center

Whiteflies, Stewardship, and Proactive Resistance Management

This document was adapted from a 10-minute invited presentation delivered at the 2026 Cultivating Solutions Dinner. Speaker notes have been expanded to provide additional context and interpretation for readers. Presented in Yuma, Arizona, on 27 May 2026 to an audience of approximately 40 growers, agricultural professionals, students, and community stakeholders.

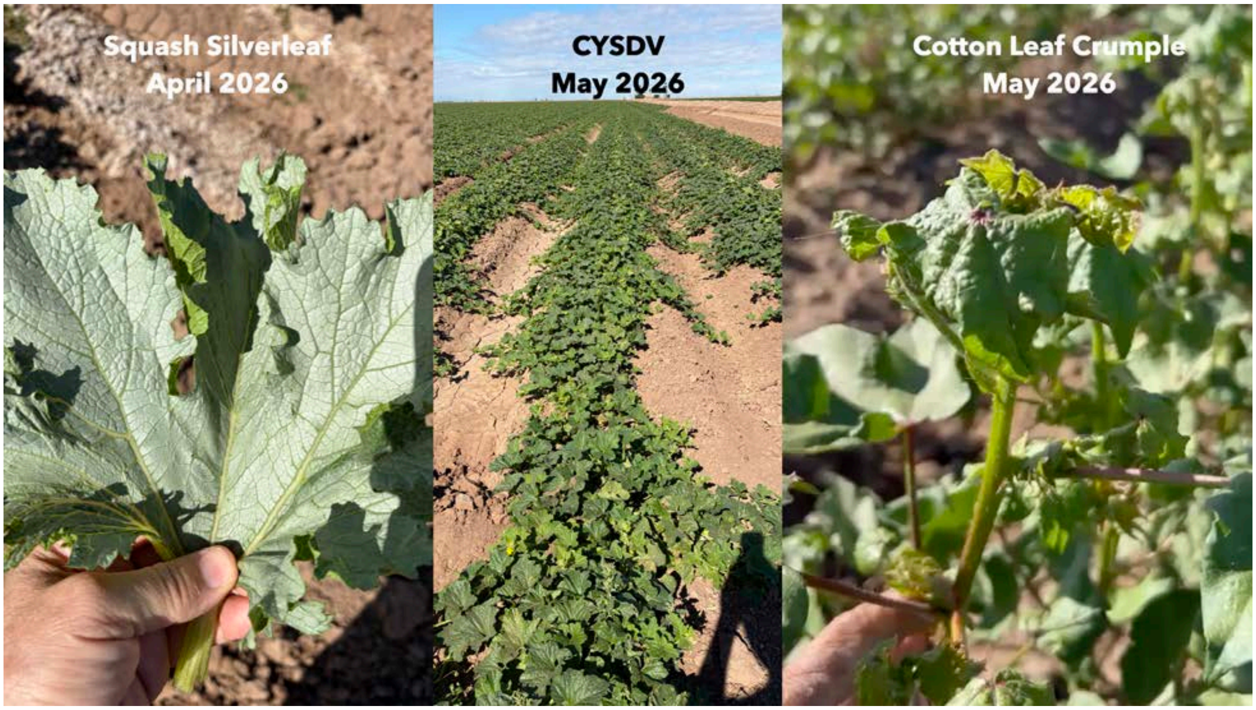
This material is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2024-70006-43563 and by the Arizona Specialty Crops Block Grant program. Any recommendations, products, services, or organizations mentioned in this publication do not imply endorsement by the USDA or the University of Arizona.



For most of the winter, everyone was talking about diamondback moth. By May 2026, whiteflies had become the bigger story. The photographs shown here were collected in Yuma-area cotton and brassica fields during May 2026 and reflect unusually high whitefly activity across multiple crops.

While whiteflies are a familiar pest in desert agriculture, the intensity and timing of infestations observed during spring 2026 raised concerns among growers, PCAs (Pest Control Advisors), and researchers alike. These observations provided the backdrop for a broader discussion about how pest management systems function across crops and landscapes, and why stewardship, biological control, and resistance management remain essential to sustaining agricultural productivity in the desert Southwest.

Visual: Photographs from May 2026 showing adult whiteflies and immature stages on cotton and brassica leaves. The images illustrate unusually abundant whitefly populations occurring simultaneously in multiple crop systems across the Yuma and surrounding agricultural region.

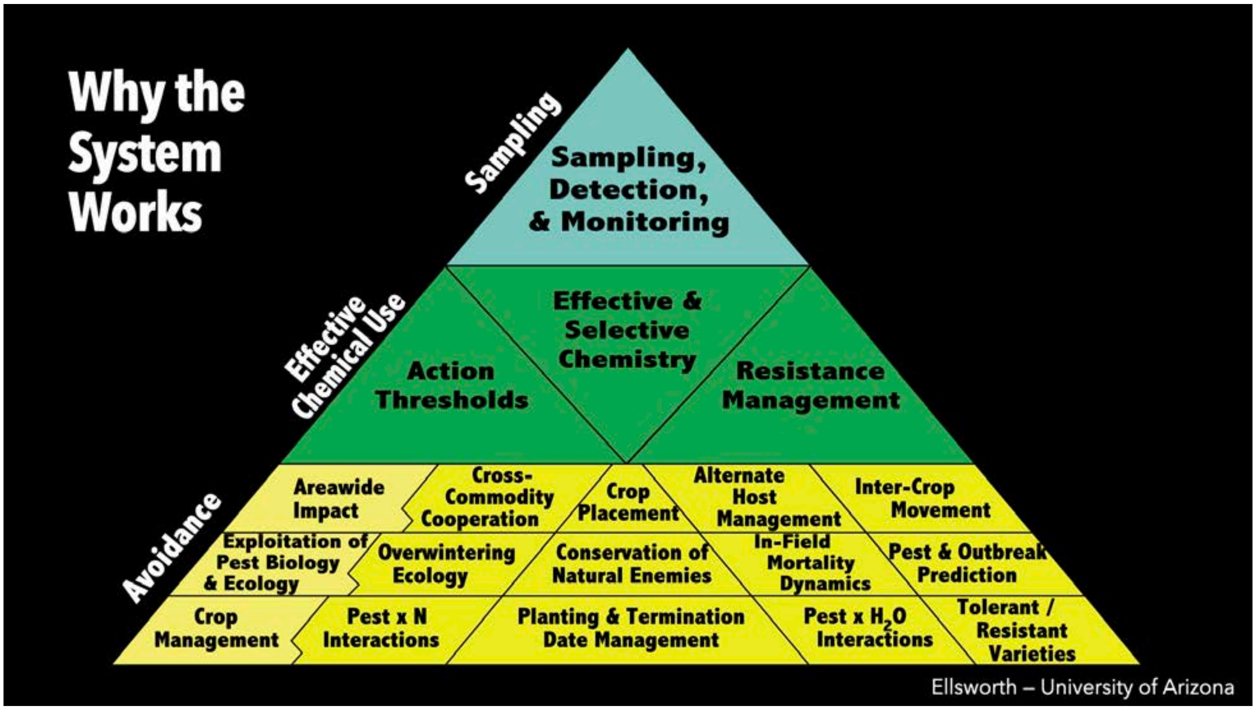


That may sound like a narrow insect issue, but it is actually a reminder of how interconnected agriculture is across this desert landscape. Whiteflies do not simply cause direct feeding damage. They also transmit important plant viruses and induce physiological disorders that can significantly affect crop quality and yield. During spring 2026, several unusual indicators appeared simultaneously across the Yuma production region.

The photograph on the left shows squash silverleaf, a physiological disorder caused by whitefly feeding. This was the first time I had observed the disorder at economically meaningful levels in a commercial field in nearly 30 years. The center image shows severe symptoms of Cucurbit Yellows Stunting Disorder Virus (CYSDV) in spring cantaloupe. Although CYSDV is a chronic concern in desert melon production, it is typically less important in spring melons than in fall production systems. The widespread expression observed in 2026 raised concerns about significant production losses. The image on the right shows cotton leaf crumple virus, another whitefly-vectored disease. While commonly present at low levels, it rarely develops early enough to cause substantial economic injury. In 2026, however, unusually early infestations increased the potential for meaningful impacts on cotton growth and yield.

Taken together, these observations suggested that whitefly pressure was influencing multiple crops simultaneously and had the potential to affect production throughout the remainder of the growing season, including cotton, fall melons, and winter vegetable systems.

Visual: Three photographs illustrating whitefly-associated crop impacts during spring 2026. Left: squash silverleaf symptoms causing abnormal silver coloration of squash leaves. Center: a melon field exhibiting widespread symptoms of Cucurbit Yellows Stunting Disorder Virus (CYSDV). Right: cotton leaf crumple symptoms visible on young cotton foliage. Together, the images illustrate the broad impacts of whiteflies across multiple crops.



The challenges described in the previous slides are serious, but they also serve as a reminder that Arizona agriculture has spent decades building one of the most sophisticated integrated pest management (IPM) systems in the world. Whiteflies remain an important pest, yet today we manage them within a much broader framework of biology, ecology, economics, and stewardship.

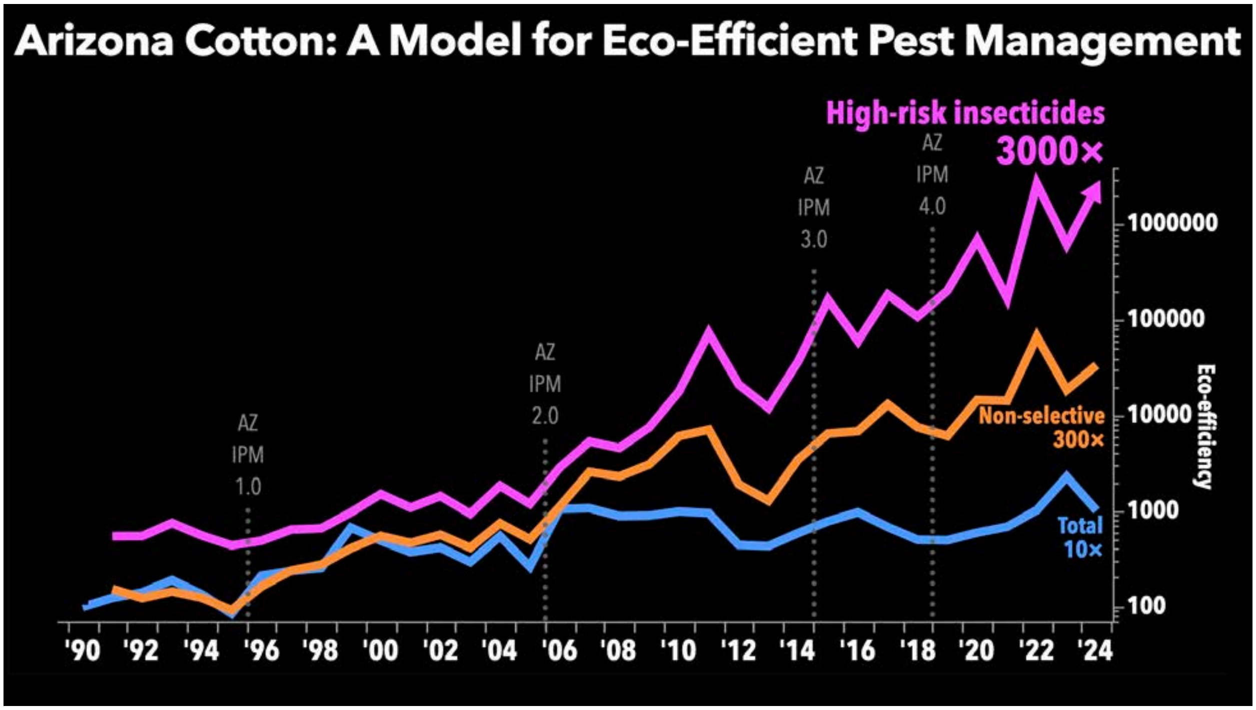
This figure illustrates the many interconnected components of Arizona's IPM system. Effective pest management depends on far more than insecticides alone. It includes:

- understanding pest biology and overwintering ecology,
- conserving natural enemies,
- using action thresholds and monitoring programs,
- coordinating management across crops
- managing crop placement and alternate hosts, and
- maintaining effective resistance management programs.

These components work together to reduce pest pressure, preserve beneficial organisms, and sustain the effectiveness of available technologies.

One of the most important lessons learned over the past three decades is that resistance management is not simply a field-level issue. It depends on cooperation among growers, PCAs, researchers, industry, and regulators across crops and across the broader agricultural landscape. The ability of Arizona agriculture to respond to whiteflies today is largely a product of these long-term investments in science, stewardship, and collaboration.

Visual: Pyramid diagram illustrating the major components of Arizona's integrated pest management system. The two base layers of this foundation include crop management, pest ecology, planting and termination practices, conservation of natural enemies, and other biological and agronomic factors. The third level emphasizes areawide impact, cross-commodity cooperation, crop placement, and alternate host management. The top of the pyramid highlights sampling, detection, monitoring, action thresholds, selective chemistry and resistance management. The figure conveys that successful pest management depends on many interconnected practices working together rather than any single tactic.



The systems-based approach described in the previous slide has produced measurable outcomes. One way to quantify those outcomes is through eco-efficiency, a measure that in this case relates agricultural production to the amount and type of pesticide inputs required to achieve that production.

The figure illustrates long-term changes in Arizona cotton pest management over more than three decades. During this period, growers and PCAs reduced reliance on insecticides while maintaining highly productive cotton systems. Particularly noteworthy is the dramatic reduction in the use of high-risk insecticides, resulting in an approximately 3,000× improvement in eco-efficiency relative to the early 1990s.

These improvements did not result from a single technology or product. Rather, they emerged from the combined effects of better monitoring, action thresholds, selective chemistries, conservation of natural enemies, resistance management, and coordinated implementation of IPM practices across the industry. The result is a production system that achieves effective pest control with substantially lower ecological disruption than was possible a generation ago.

Visual: Line graph showing changes in eco-efficiency of Arizona cotton pest management from approximately 1990 through 2024. Three curves represent total insecticide use, non-selective insecticides, and high-risk insecticides. All show increasing eco-efficiency over time, with the greatest improvement occurring in high-risk insecticides, which increased by roughly 3,000×. The figure illustrates long-term reductions in pesticide hazard relative to agricultural production.

A major reason Arizona has been able to reduce insecticide use while maintaining effective pest control is the conservation of natural enemies. The photographs shown here were taken in side-by-side cotton plots managed differently early in the season. In one plot, broad-spectrum insecticides disrupted predator populations. In the other, no disruptive sprays were made and predators were preserved.

The result is visible. Where predators were eliminated, whitefly populations increased to damaging levels (left). Where predators were conserved, biological control suppressed whiteflies and delayed the need for insecticide intervention (right). The difference was not the result of a whitefly spray program; rather, it was the result of preserving the biological control already present in the field.

This illustrates one of the central principles of modern Arizona IPM: selectivity matters. Product selection influences not only the target pest, but also the beneficial organisms that help regulate pest populations.

By preserving these natural enemies, growers and PCAs can reduce pest outbreaks, avoid unnecessary applications, and improve the overall stability of the production system.

Visual: Side-by-side comparison of two cotton plots. The left image ("Predators Eliminated") shows a pan trap surface densely covered with whiteflies following disruption of natural enemies. The right image ("Predators Conserved") shows dramatically fewer whiteflies where predator populations were preserved. The comparison illustrates the importance of biological control and selective insecticide use.

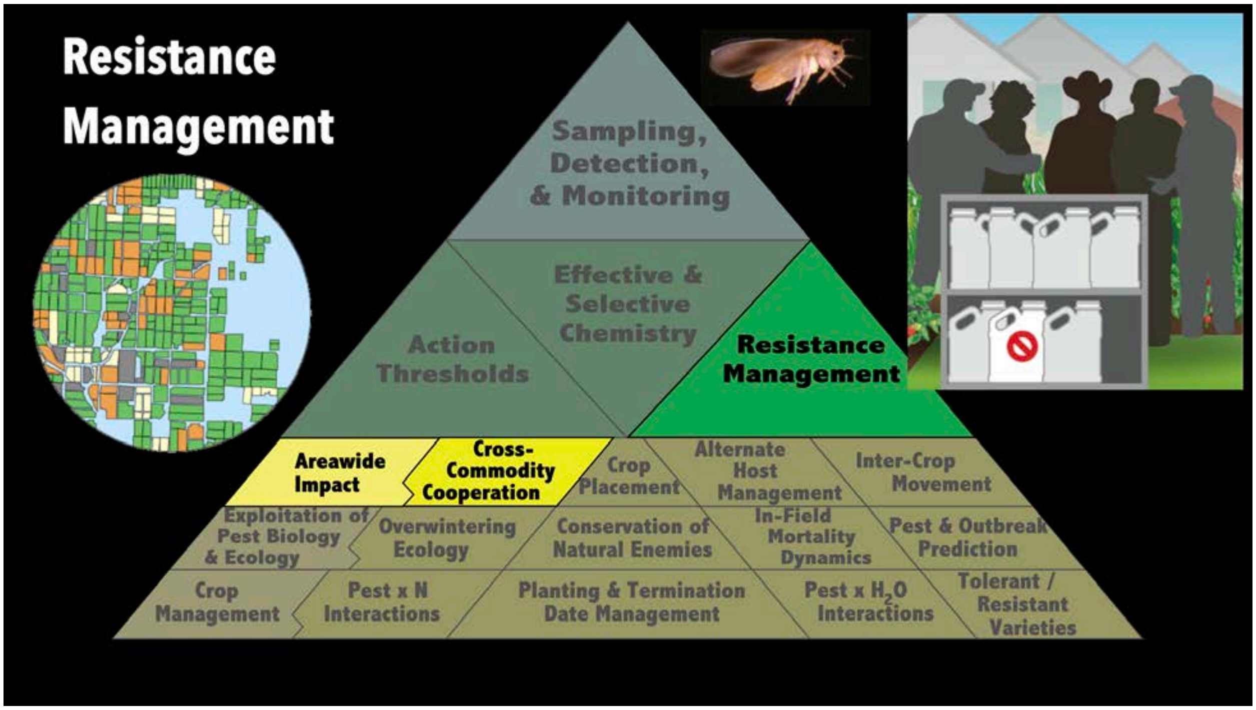
This is where much of modern Arizona insect management began. The introduction and rapid expansion of the silverleaf whitefly (Bemisia tabaci MEAM1) during the early 1990s created one of the most severe pest crises in the history of desert agriculture. Whiteflies reached extraordinary densities, affecting crops throughout the region and creating production challenges unlike anything most growers had previously experienced.

For many of us, this period coincided with the beginning of our careers. It certainly did for John Palumbo and me. The crisis demanded new approaches. People wore masks in those days—not because of human disease, but because whiteflies were so abundant that it could be difficult to breathe comfortably outdoors during peak infestations. The scale of the problem was unlike anything most of us had seen before.

Growers, PCAs, industry scientists, and university researchers worked together to develop and deploy new management tools and strategies. These efforts included the discovery and registration of selective insecticides, improved sampling and action-threshold systems, the identification and quantification of bio-residual control, advances in Lygus management, and the development of resistance-management programs supported through cross-commodity cooperation.

Many of the practices that define Arizona IPM today were born from the lessons learned during this period. The systems highlighted in the previous slides did not emerge overnight; they were developed in direct response to the challenges posed by whiteflies and continue to evolve today.

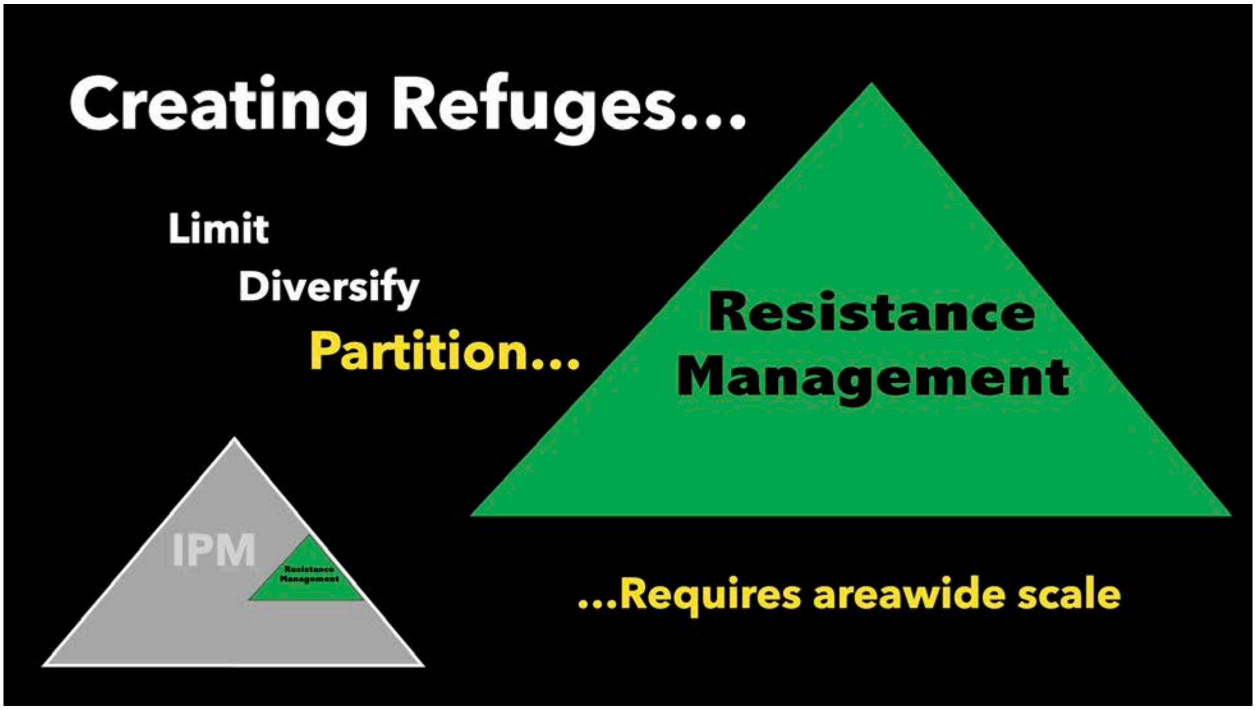
Visual: Historical photographs from the early 1990s showing extremely dense whitefly infestations in Arizona agriculture. Large numbers of whiteflies are visible in the air, illustrating the severity of the silverleaf whitefly outbreak that affected multiple crops throughout the region and prompted major advances in integrated pest management and resistance management.



One of the most important lessons learned from the whitefly crisis was that resistance management could not be approached as a field-level problem. We learned quickly that resistance is a landscape-scale phenomenon driven by the collective effects of management decisions made across crops, seasons, and communities.

As whiteflies move among cotton, melons, vegetables, and other hosts, they are exposed to insecticides applied in many different production systems. The selection pressure created by those applications accumulates across the landscape. As a result, preserving the effectiveness of insecticides requires more than individual stewardship—it requires coordination.

This realization led to the development of resistance-management programs built around cross-commodity cooperation and areawide impact. Growers, PCAs, industry representatives, regulators, and researchers worked together to encourage the partitioning of insecticide modes of action and the preservation of refuge opportunities across agricultural landscapes. These cooperative efforts became a defining feature of Arizona's approach to resistance management and remain essential today.

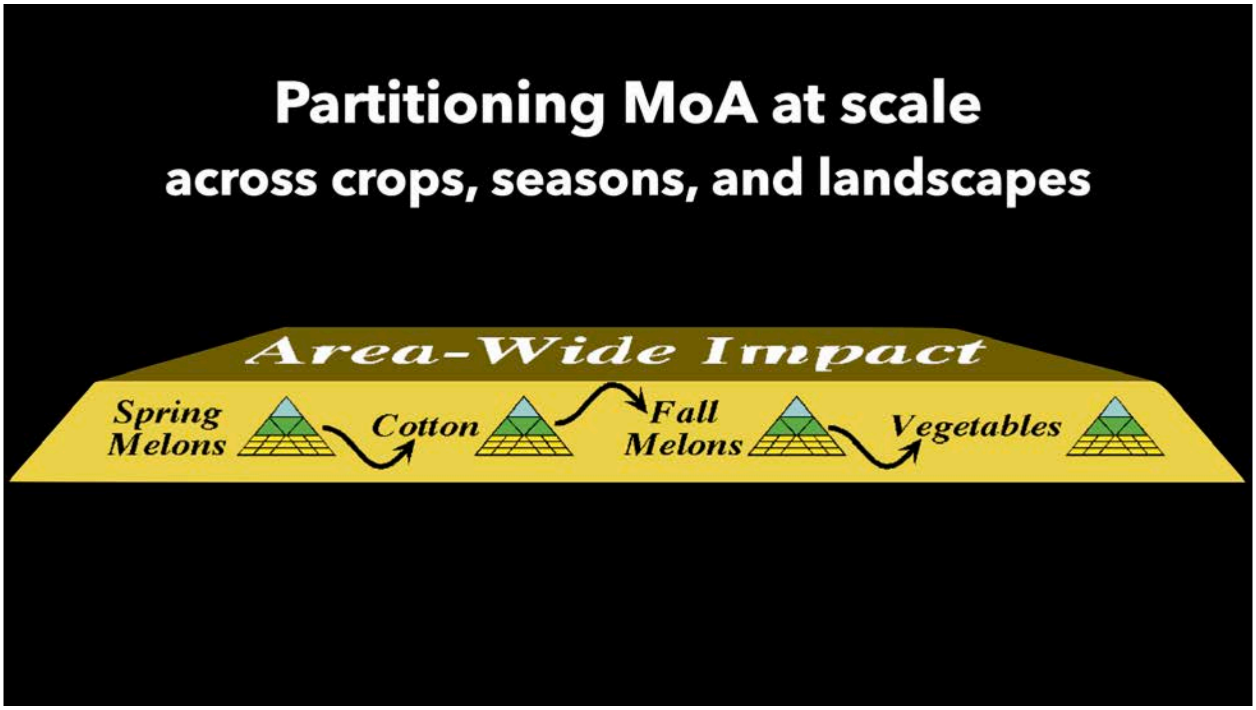


Once resistance management was recognized as a landscape-scale challenge, the next question became how to reduce selection pressure while preserving effective pest control. The answer was not simply to use fewer insecticides, but to use them more strategically.

One of the central concepts in resistance management is the preservation of refuges—areas or periods in which susceptible insects can survive without exposure to the same selection pressures. These susceptible populations help dilute resistance genes and slow the development of resistant pest populations over time.

Creating and maintaining refuges does not occur automatically in modern agricultural systems. It requires intentional management decisions, coordination among crops, and stewardship across large production areas. Likewise, partitioning insecticide modes of action across the landscape helps prevent repeated exposure of pest populations to the same selection pressures.

For these reasons, effective resistance management extends beyond individual fields and individual growers. It depends on collective actions that create refuge opportunities and diversify selection pressures across agricultural landscapes.



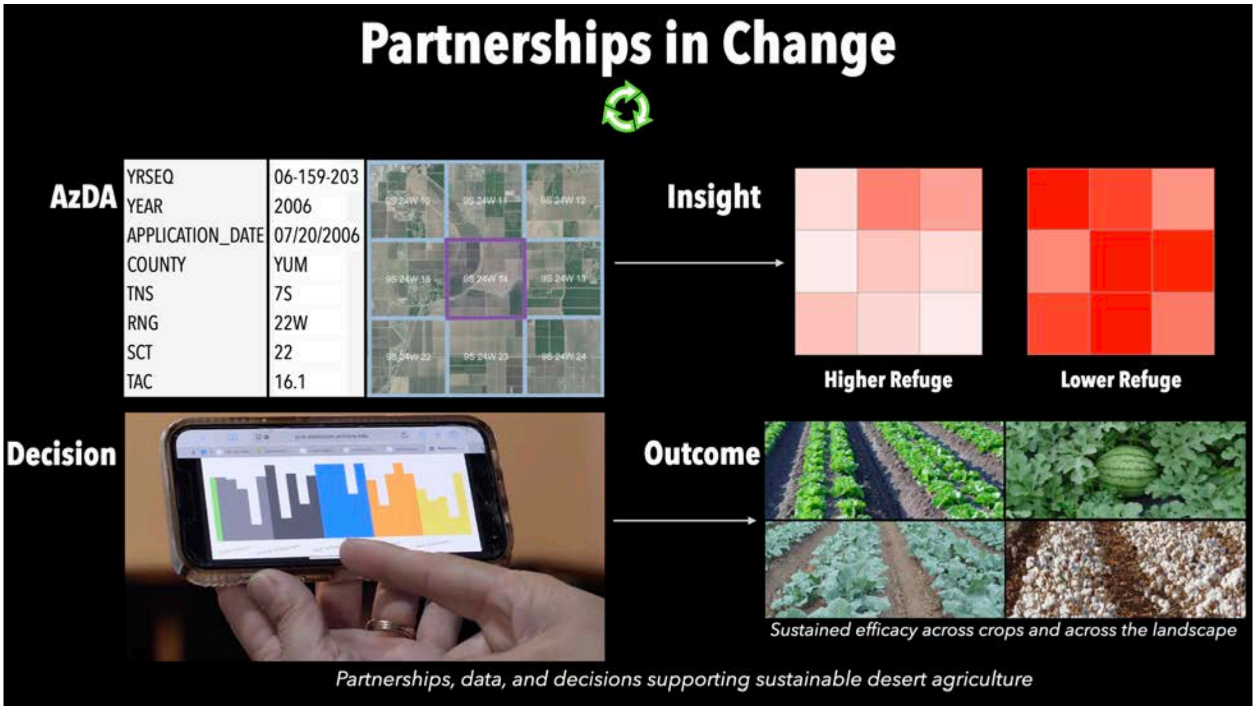
The need for landscape-scale resistance management becomes clear when viewed through the lens of Arizona's agricultural production system. Whiteflies are highly mobile and move among a wide range of crop hosts. As a result, they move among crops, fields, and production seasons, experiencing the cumulative effects of management decisions made throughout the region.

In Arizona, there is substantial temporal and spatial overlap among spring melons, cotton, fall melons, and winter vegetable crops. Each production system can serve as a source of whiteflies for the crops that follow. This continuity creates opportunities for whitefly population growth, movement, and selection for resistance across much of the year.

Resistance management cannot be achieved solely within a single crop or production sector. For this reason, partitioning insecticide modes of action across crops, seasons, and landscapes is critical.

Instead, resistance management depends on coordinated stewardship that recognizes the interconnected nature of our agricultural landscape. Without such coordination, resistance risks increase and pest outbreaks become more difficult and costly to manage.

Visual: Diagram illustrating the seasonal and landscape connections among major Arizona host crops for whiteflies, including spring melons, cotton, fall melons, and winter vegetables. Arrows and crop groupings emphasize how whitefly populations can move among crops across seasons, creating continuous opportunities for selection pressure and highlighting the need to partition insecticide modes of action across the agricultural landscape.



The concepts discussed in the previous slides—cross-commodity cooperation, refuges, partitioning of modes of action, and landscape-scale stewardship—have guided resistance-management thinking in Arizona for decades. The challenge has always been translating those concepts into practical decision-support tools that can be used by growers and PCAs.

This is why I am especially pleased to highlight the partnerships that made the Proactive Resistance Management (PRM) platform possible. John Palumbo and I first discussed many of these ideas more than 25 years ago, but only recently have the necessary data resources, computing capacity, and collaborative partnerships come together to make such a system feasible.

The PRM platform uses Arizona Department of Agriculture pesticide-use reporting data, combined with landscape-level analyses, to generate insights about insecticide-use patterns and refuge availability across agricultural communities. The goal is not to replace the expertise of growers and PCAs, but to provide additional context that supports informed resistance-management decisions.

Ultimately, the objective remains the same as it was during the whitefly crisis of the 1990s: to preserve the effectiveness of our pest-management tools, sustain agricultural productivity, and support long-term stewardship across crops and across the landscape.

Visual: Flow diagram illustrating how the Proactive Resistance Management (PRM) platform transforms pesticide-use data into decision support. Arizona Department of Agriculture use-reporting data are combined with landscape analyses to generate insights regarding insecticide-use patterns and refuge availability. These insights inform grower and PCA decisions, with the goal of sustaining insecticide efficacy across crops and across the agricultural landscape.