

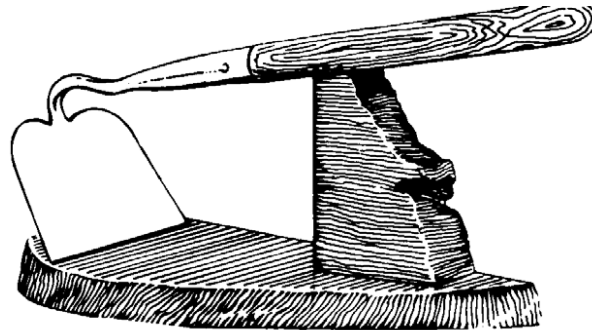
Proceedings

78th ANNUAL CONFERENCE OF THE

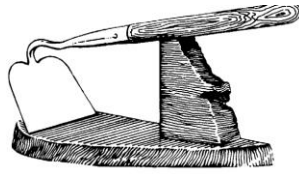
CALIFORNIA WEED SCIENCE SOCIETY

“Back to Basics”

January 28-30, 2026
Santa Barbara, California



CWSS 1948-2026



2026 Proceedings of the California Weed Science Society

Volume 78

**Papers Presented at the Annual Conference
January 28-30, 2026**

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Preface

The proceedings contain contributed summaries of papers and posters presented at the annual conference, award winners, and sponsors.

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2026 Student Awards

Graduate Poster Contest Winners

First Place: Kekoa Nelson (University of California, Davis) – title not provided

Second Place: Tong Zhen – Evaluation of Electrical Weed Control in California Organic Blueberries (University of California, Davis)

Undergraduate Poster Contest Winner

First Place: Robinson Johnson (University of California, Davis) – title not provided

Graduate Paper/Oral Winners

First Place (tie): Consuelo B. Baez Vega – Herbicide Screening for California Wild Rice – Weed Efficacy and Crop Phytotoxicity (California State University, Chico)

First Place (tie): Tong Zhen – Evaluation of Branched Broomrape (*Phelipanche ramosa*) Seed Responses to Nitrogen Fertilizers and Flooding (University of California, Davis)

Note: presentation titles for Kekoa Nelson and Robinson Johnson had not yet been provided at the time this draft was assembled.

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Important Considerations to Optimize Herbicide Performance

Mandeep Singh*, University of California Cooperative Extension, Sacramento, Solano, and Yolo Counties, CA, USA. *Corresponding author (mdpsingh@ucanr.edu)

Herbicide efficacy is influenced by multiple interacting factors rather than a single variable. These may include weed characteristics, adjuvants, spray water quality, and environmental conditions, among others. Weed characteristics, such as species, life cycle, and growth stage, are critical for herbicide selection and application timing. Small and actively growing weeds are generally more susceptible to postemergence herbicides, whereas leaf features like cuticle thickness, waxes, and trichomes can influence spray retention and herbicide absorption. This presentation discusses the role of adjuvants (surfactants, oils, and fertilizers) and the impact of water quality (turbidity, hardness, and pH) on spray solution and herbicide activity. Additionally, herbicide antagonism and physical incompatibility issues in tank mixtures are briefly reviewed. Overall, this presentation highlights the importance of understanding and integrating multiple factors in decision-making prior to herbicide application to maximize weed control.

Weather and Climate Impacts on Herbicide Performance

Brad Hanson*, UC Cooperative Extension Specialist, University of California, Davis, CA, USA.

*Corresponding author (bhanson@ucdavis.edu)

The CWSS Weed School Session is usually a great session with several speakers reminding and refreshing us on a core topic area of weed control. When considering chemical weed control approaches, we spend a lot of time discussing various herbicidal modes of action, application rates and timing, weed spectrum control and species selectivity, tank mix partners, and similar factors. This year, with the session focused on factors affecting herbicide performance, I wanted to spend some time thinking about weather- and climate-related factors that can affect herbicide performance. First off, I thought it would be useful to describe how I am thinking about climate versus weather. In this context, weather is the short-term atmospheric conditions like temperature, rain, and wind occurring over the span of hours and days, while climate is a summation of the average of those conditions over a longer period of time. A quote I ran across summed it up as “Climate is what you expect and weather is what you get.” So, in this presentation, I will be thinking about climate as the longer-term conditions that affect weed presence and growth parameters, whereas weather is the short- and immediate-term conditions that affect herbicide performance and plant health. To a large extent, most of the impact of weather and climate on herbicide performance relates to getting the herbicide to the target weed and then getting the herbicide into the plant. Although weather and climate factors can affect the rate of plant metabolic function, which can indirectly affect herbicide efficacy, those factors have relatively little direct impact on how a herbicide functions (i.e., its mode of action) once in the plant. Weed-related factors: Climate and weather can impact weed presence and health, which affects herbicide performance. Longer-term conditions can greatly impact when weeds emerge and the composition of weeds at the site, which obviously affects ideal herbicide application timing and product choices. Application-related factors: Many factors affect the success of getting the herbicide from the spray tank into the plant, where it can have its biochemical action. Most of these are weather factors, particularly temperature, wind, and humidity at and around the herbicide application timing, which can affect herbicide deposition on target. Many spray adjuvants function to slow drying and maintain droplets on the leaf to increase retention time and improve absorption and, thus, efficacy. Absorption-related factors: Herbicide absorption is affected by both climate and weather factors, particularly conditions that affect cuticle thickness, density, and wax composition. Herbicide action: The mode of action of a particular herbicide does not really change in response to either climate or weather; however, weather conditions can affect plant growth rate, stress, and general health, which does affect the rate of herbicide action. Herbicide fate and action in soil: Climate conditions, particularly soil moisture and temperature, can directly affect the half-life of herbicides in soil due to how that affects both chemical and microbial degradation. Both weather and climate factors can affect herbicide performance. Longer-term climate factors probably have the greatest impact on which weeds are present and when they emerge, so field scouting to identify and treat weeds with appropriate products at the ideal timing is the main action. To address weather-related factors on herbicide deposition and absorption, consider application timing to avoid hot, dry, and windy periods, treat target weeds when young and rapidly growing, and consider appropriate adjuvant technologies, herbicide rate adjustments, increased carrier volume, and herbicide formulations and mixes selected to overcome application and absorption challenges.

The Importance of Sprayer Calibration and Weed Control

James M. Schaeffer, Helena Agri Enterprises, Fresno, CA, USA.

Understanding and addressing the limitations of equipment used to apply chemical herbicides will positively impact seasonal weed control. Proper calibration and maintenance of spray equipment mitigate issues associated with herbicide delivery methods. Damaged or clogged nozzles, inaccurate pressure gauges, inaccurate tachometers or speedometers, and calibration calculation errors will result in poor weed control. Delivering the desired spray volume in gallons per acre can be done with an accurate calibration measure of application speed, spray nozzle output in gallons per minute, and total swath width. Adjustments in speed, air pressure, and nozzle size can be made to reach the applicable spray volume. Acceptable weed control is determined by the right combination of herbicide mode of action, spray volume and coverage, and overall mortality of the weed species treated.

Biological Factors Affecting Herbicide Performance

Jorge Angeles*, University of California Cooperative Extension, Tulare, Kings, and Fresno Counties, CA, USA. *Corresponding author (jaangeles@ucanr.edu)

The biological factors of plants can affect the weed control efficacy of herbicides. Some of the most important factors are weed identification and understanding the life cycle of weeds. Weed species consist of both annual and perennial species that emerge in either winter or summer. Annual weeds only reproduce by seeds, whereas perennial weeds reproduce by both seed and vegetative structures such as stolons, rhizomes, and tubers. Perennial weeds are often more difficult to control once established, as they can use stored energy to resprout from their root systems. Mechanical control methods such as tillage can be ineffective for managing perennial weeds, as they may spread underground structures and increase infestations. Weed morphology can also affect the efficacy of herbicides, including leaf angle, surface texture, waxy cuticle, and overall leaf area. Weed species with thick or waxy cuticles can reduce spray retention and absorption, which results in reduced uptake of postemergence herbicides. The use of spray adjuvants can improve the uptake of herbicides by reducing leaf surface tension and improving spray coverage and absorption. Environmental and physiological conditions that affect the biochemical processes of a plant can also affect the efficacy of herbicides. Postemergence herbicides that are systemic are most effective when applied to weeds that are actively growing and not stressed. Stress conditions such as drought, extreme temperatures, disease, or nutrient deficiencies can reduce the uptake and translocation of herbicides. Weed stage, size, and density are also important biological factors that can affect herbicide efficacy; smaller weeds are more susceptible while larger weeds have established root systems and often require higher application rates. Dense weed populations can reduce spray coverage and increase competition. Herbicide resistance is a major constraint on herbicide efficacy, often defined as the evolved ability of a weed population to survive a herbicide at a dose that was previously effective, through either target site or non-target site resistance mechanisms. Overall, it is important to take into account all biological factors to use herbicides more effectively, and rotating and tank-mixing herbicides with different modes of action can help reduce the risk of weeds developing resistance.

ALS Herbicide Resistance in Shepherd's Purse in California's Central Valley Small Grain Crops

Manasvi Singh, California State University, Fresno, CA, USA.

Capsella bursa-pastoris (Shepherd's purse) is an allotetraploid, winter annual broadleaf weed. It is distributed worldwide and has become a troublesome weed that presents a significant challenge to the agriculture industry due to its highly adaptable nature and suspected resistance to frequently overused herbicides. In California's Central Valley, small grain crop growers have reported a decline in the effectiveness of common ALS (acetolactate synthase)-inhibiting herbicides, such as pyroxsulam (Simplicity) and tribenuron-methyl (Express), for control of shepherd's purse specifically in small grain crops like wheat, rye, and triticale. However, confirmation of resistance to these ALS inhibitors and knowledge of the genetic mechanisms responsible in these weed populations are lacking. This study aims to address this gap in knowledge by (i) conducting herbicide dose-response assays on collected seed samples from susceptible and suspected resistant fields, and (ii) performing molecular genetic analyses to identify possible resistance-causing point mutations within the ALS gene and evaluate their likely effects on the efficacy of such herbicides. Thus far, our sequencing efforts have confirmed the presence of a Trp574Leu mutation, a substitution known to confer resistance to ALS-inhibiting herbicides, in certain Central Valley populations. This represents the first experimental confirmation of ALS resistance in shepherd's purse populations from the United States. The combined findings of this study, from both phenotypic and genotypic evaluations, aim to inform the development of alternative weed management strategies for controlling this problematic weed in small-grain cropping systems. The results will also enhance understanding of weed science, particularly concerning polyploidy in weed species and its role in herbicide resistance evolution. Keywords: *Capsella bursa-pastoris*, herbicide resistance, acetolactate synthase (ALS) gene

Evaluation of Branched Broomrape (*Phelipanche ramosa*) Seed Responses to Nitrogen Fertilizers and Flooding

Tong Zhen*¹, Pershang Hosseini¹, Bradley D. Hanson¹. ¹Department of Plant Sciences, University of California, Davis, Davis, California, USA. *Corresponding author (tzhen@ucdavis.edu)

Reports of branched broomrape [*Phelipanche ramosa* (L.) Pomel] in California represent a reemerged threat to the processing tomato industry following its presumed eradication in the 1980s. Although chemical control programs for branched broomrape suppression have been developed in the past few years as an emergency response, limited research has been conducted on cultural practices that could be incorporated into integrated pest management programs. Three lab-scale studies were conducted in 2024 and 2025 to evaluate the responses of branched broomrape seeds to nitrogen fertilization and flooding. The fertilizer study evaluated the effects of diammonium hydrogen phosphate, calcium nitrate tetrahydrate, potassium chloride, potassium nitrate, ammonium nitrate, ammonium sulfate, and urea on branched broomrape seed germination and radicle elongation at various concentrations (0, 1.56, 3.125, 6.25, 12.5, 25, 50 mM) and at various seed germination stages (preconditioning, germination stimulation, and radicle elongation). The flooding studies evaluated the effects of flooding duration (3, 7, 14, 28, 42, and 56 days) and temperature (10°C and 28°C) on branched broomrape seed germination and the number of seed attachments to the tomato host plant. Results from the fertilizer study showed that fertilizers containing ammonium salts and urea inhibited branched broomrape seed germination and radicle elongation, and this effect was observed when fertilizers were applied during the germination-stimulation stage. For flooding studies, the branched broomrape seed germination rate dropped to 20% after 14 days of flooding at 28°C. Flooding at both 10°C and 28°C reduced broomrape seed attachment to tomato plants by 50% within 7 days. These lab-scale data suggest that fertilization management and flooding have the potential to control branched broomrape infestation as cultural management strategies, but the results should be validated at the field scale in future experiments.

Herbicide Screening for California Wild Rice – Weed Efficacy and Crop Phytotoxicity

Consuelo B. Baez Vega*¹, Alex Ceseski², Taiyu Guan², Rohith Vulchi³, Roger Batts⁴, Kari Arnold⁵, Whitney Brim-DeForest². ¹California State University, Chico, CA, USA, ²University of California Division of Agricultural and Natural Resources, Cooperative Extension, CA, USA, ³University of California, Davis, CA, USA, ⁴IR-4 Project, North Carolina State University, NC, USA, ⁵IR-4 Western Region, University of California, Davis, CA, USA. *Corresponding author (cbbaezvega@csuchico.edu)

Wild rice is a highly valued and nutritious North American native specialty crop that is grown in flooded conditions until maturity. Weeds have been a major issue for California wild rice growers since production began in the 1970s. Deep flooding has been the primary tool to reduce weed competition. For chemical control, only one herbicide option is available for use in California. Due to only having one product, herbicide resistance potential increases, which is of concern since the weed spectra in rice fields (a crop with similar growing conditions and the same weeds as wild rice) have herbicide resistance. In order to provide additional herbicide tools, field studies were conducted to evaluate established rice herbicides for wild rice crop safety and weed efficacy with intent to register via the Interregional Research Project No. 4 (IR-4). In 2020, a pre-screening greenhouse study was conducted to test the phytotoxic effects of California rice registered herbicides on wild rice. Several of the herbicides were eliminated for a field study evaluation. In 2021 and 2022, three herbicide field studies were conducted (year 1: Shasta County, year 2: Shasta and Yolo Counties) to test phytotoxicity on wild rice and efficacy on weeds. The field studies were set up as randomized complete block designs (RCBDs), with four replications per herbicide treatment on 3 × 6 m plots. The treatments, tested at two application rates, were cyhalofop-butyl (0.31 and 0.63 kg ai ha⁻¹), florypyrauxifen-benzyl (0.04 and 0.08 kg ai ha⁻¹), penoxsulam (0.05 and 0.1 kg ai ha⁻¹), triclopyr (0.42 and 0.84 kg ai ha⁻¹), and propanil (3.37 and 6.73 kg ai ha⁻¹). Additionally, florypyrauxifen-benzyl and triclopyr were applied sequentially at the same rate as the first application, 14 and 20 days apart, respectively. Carfentrazone was included as a positive control applied at one rate of 0.53 kg ai ha⁻¹. Two untreated plots per trial were also used as negative controls. Treatments were applied using a CO₂-pressurized backpack sprayer. Evaluations consisted of weed control efficacy and crop phytotoxicity (stunting, stand loss, leaf burn, leaf deformation, chlorosis, lodging, dead) conducted 7, 14, 21, 28, and 35 days after treatment (DAT). Percent heading was evaluated at 39 DAT. Yield data, when possible, were collected by hand harvesting wild rice from 1 × 3 m quadrants and threshing with a portable thresher. Overall, treatments showed varying degrees of weed control, but they were generally good to excellent. Most of the herbicides led to low crop phytotoxicity symptoms with the exception of penoxsulam and triclopyr, where symptoms were more severe at the higher application rate; as a result, yields were also heavily reduced. Findings determined cyhalofop-butyl, florypyrauxifen-benzyl, and propanil as possible contenders to be registered for use in California wild rice. Florypyrauxifen-benzyl has since been registered for cultivated California wild rice under a Section 24(c) registration in 2025.

Herbicide Use and Choices on Utility Rights-of-Way Across Ecotypes

Bob Brenton, PCA.

Vegetation management on utility rights-of-way requires balancing effective weed control with environmental stewardship and regulatory compliance across a wide range of ecological settings. Herbicide selection and application strategies vary depending on vegetation type, site characteristics, land ownership, and management objectives. This presentation will examine considerations for herbicide use in forested, grassland, desert, riparian, wetland, and alpine ecotypes, with an emphasis on selecting appropriate products and application methods for each environment. The presentation will also review the federal and state regulatory framework governing herbicide use on utility rights-of-way, including coordination with federal land management agencies during project planning and implementation. Topics will include herbicide mode of action, environmental fate, application methods, public and environmental safety, agency-approved herbicide lists, and monitoring requirements. A case study will illustrate how integrated vegetation management principles are applied to develop effective, site-specific treatment programs while meeting regulatory and environmental objectives.

Invasive Species Management in Complex Aquatic Systems: Past, Present, Future

Jens Beets, USDA.

Invasive aquatic plants present significant ecological, economic, and operational challenges in California's waterways. This presentation examines the evolution of invasive species management in complex aquatic systems, highlighting the ecological and economic impacts these species have on water delivery, navigation, recreation, sedimentation, flood risk, and the spread of invasive pests and weeds. Using the Sacramento-San Joaquin River Delta as a case study, attendees will explore the complexities of managing invasive aquatic vegetation in a highly interconnected ecosystem characterized by diverse plant communities, competing water use priorities, and the continual threat of new invasive species. The presentation will review historical management approaches and compare them with current integrated pest management strategies, including herbicide applications, biological control, and mechanical harvesting. Discussion will focus on the increasing role of herbicides due to their cost-effectiveness, selectivity, and ability to provide rapid response to new infestations while minimizing impacts to surrounding resources. The session will conclude with a look at emerging technologies and future management approaches that may improve the effectiveness and sustainability of aquatic weed control in California's complex aquatic ecosystems.

This abstract was generated from the presentation description submitted for DPR accreditation.

Herbicide Efficacy and Drift from Uncrewed Aerial Vehicle Application in Rice Cropping Systems

Kassim Al-Khatib*, University of California, Davis. *Corresponding author (kalkhatib@ucdavis.edu)

Uncrewed aerial vehicles (UAVs) are becoming an increasingly important application technology in California rice production, particularly in fields where conventional ground equipment is limited by water, terrain, or accessibility. This presentation examines the efficacy of herbicide applications made by UAVs while evaluating the potential for off-target herbicide movement under field conditions. The benefits of UAV applications, including improved efficiency, reduced spray volumes, rapid field coverage, and enhanced precision, will be discussed in the context of water-seeded rice production. Field studies compared herbicide applications made by UAVs at multiple spray heights with conventional ground applications to evaluate weed control, crop response, and grain yield. Additional research investigated off-target herbicide drift using a glufosinate treatment as a drift marker under typical application conditions. Results demonstrated comparable weed control and rice yield between UAV and ground applications across the evaluated spray heights, while also highlighting the potential for herbicide movement beyond treated areas under certain environmental conditions. The presentation will discuss the practical advantages and limitations of UAV technology, factors influencing herbicide drift, and management practices that can improve application efficacy while minimizing off-target impacts in rice production systems.

Sustained Harmful Algal Bloom Mitigation in a Complex Watershed: One Year of Success at Lake Elsinore Using the Shock N' Lock Method

Rene Sandoval, American Lady Vet Services Inc., InSync Management Solutions.

Lake Elsinore, Southern California's largest natural freshwater recreational lake, has experienced recurring harmful cyanobacterial blooms for decades, resulting in public health advisories, fish kills, and recreational closures. Management of the lake is complicated by its status as a terminal basin and the continuous inflow of approximately five million gallons of highly treated recycled water each day, which contributes an ongoing external nutrient load. This presentation reviews the implementation of a phased "Shock and Lock" treatment strategy designed to reduce harmful algal blooms while improving long-term water quality. The initial treatment phase utilized sodium carbonate peroxyhydrate to rapidly reduce cyanobacterial biomass and associated toxins. A subsequent nutrient management phase incorporated applications of lanthanum-modified bentonite clay to bind bioavailable phosphorus within the water column, sediments, and recycled water inputs, limiting nutrient availability for future bloom development. One year after implementation, the program has resulted in sustained improvements in water quality, with Lake Elsinore avoiding Warning and Danger advisory levels for microcystin toxins for the first time in decades. The presentation will discuss treatment implementation, monitoring results, and the potential application of this integrated management approach for restoring nutrient-impaired aquatic systems.

Winged Water-Primrose (*Ludwigia decurrens*): Mapping and Identification

Vanessa Varela¹, Jens Beets², Luis Espino³, Sarah Marsh Janish¹, Whitney Brim-DeForest³. ¹California Division of Agriculture and Natural Resources, ²USDA-ARS, ³University of California Division of Agriculture and Natural Resources, Cooperative Extension.

Winged water-primrose (*Ludwigia decurrens*) is an invasive aquatic weed that threatens California rice production and irrigation infrastructure due to its rapid spread by both seed and vegetative propagation. Since its initial detection in a Butte County rice field in 2011, the species has been designated by the California Department of Food and Agriculture as both an “A”-rated noxious weed and a “P”-rated pest because of its potential to reduce certified rice production, spread throughout rice-growing regions, and impact agricultural exports. This presentation will review the biology, identification, and distribution of winged water-primrose, with an emphasis on its pathways of spread within rice fields, irrigation canals, and waterways. The presentation will also highlight recent collaborative survey efforts conducted by the Ludwigia Task Force, including partners from the University of California, USDA-ARS, county agricultural commissioners’ offices, the California Crop Improvement Association, the California Rice Experiment Station, and the California Rice Commission. Results from expanded surveys in 2025 documented the first confirmed occurrence in Placer County and continued expansion along the Cherokee Canal in Butte County, demonstrating the importance of coordinated monitoring and early detection. Attendees will gain an overview of current mapping efforts and identification techniques that support rapid response and long-term management of this emerging invasive species in California rice production systems.

Treatment of Invasive Mussels

Tom Moorhouse, Clean Lakes Inc.

Invasive freshwater mussels pose significant ecological and operational challenges for water infrastructure, aquatic ecosystems, and recreational waterways. Their rapid colonization of intake structures, irrigation systems, reservoirs, and water conveyance facilities can reduce operational efficiency, increase maintenance costs, and alter native aquatic communities. Effective management requires treatment strategies that provide reliable control while minimizing impacts to non-target organisms and water quality. This presentation will examine current approaches to invasive mussel treatment, including chemical, physical, and integrated management strategies used to control established populations and limit further spread. Topics will include factors influencing treatment selection, application methods, regulatory considerations, monitoring techniques, and evaluation of treatment effectiveness. Case studies will highlight practical implementation in managed water systems and discuss lessons learned from recent control efforts. The presentation will conclude with a review of emerging technologies and future directions for invasive mussel management to support long-term protection of California's aquatic resources.

This abstract was generated from the presentation description submitted for DPR accreditation.

An Overview of the New Pest Control Permit

Stephen Burkholder, Bowman Consulting Group, Ltd.

Recent changes to California's regulatory framework for pesticide applications have introduced a new Pest Control Permit intended to improve consistency, environmental protection, and regulatory oversight. This presentation provides an overview of the new permit requirements, including when a permit is required, the activities and applications it covers, and the responsibilities of permit holders and regulatory agencies. Attendees will learn about the permitting process, required documentation, reporting obligations, and compliance considerations for pesticide applications conducted under the new permit. The presentation will also discuss how the permit integrates with existing state and federal regulations, common implementation challenges, and best management practices for maintaining compliance. Practical examples will be used to illustrate how the new requirements affect pesticide applicators, land managers, and project planners, helping attendees understand how to successfully navigate the updated permitting process.

This abstract was generated from the presentation description submitted for DPR accreditation.

Evaluation of Electrical Weed Control in California Organic Almonds

Tong Zhen*¹, Bradley D. Hanson¹. ¹Department of Plant Sciences, University of California, Davis, Davis, California, USA. *Corresponding author (tzh@ucdavis.edu)

Electrical weed control (EWC) is an emerging non-chemical option that may expand weed management tools for organic almonds. An EWC trial with randomized complete block design was established in a young organic almond orchard planted in April 2023. Plots received one of four EWC treatments or a mowing treatment. EWC treatments combined two energy settings (86 or 16 MJ ha⁻¹) and one or two passes per application. EWC was applied four times in 2023, seven times in 2024, and six times in 2025. Crop safety was assessed using almond tree trunk diameter measured in June and October 2023, October 2024, and November 2025. Soil health was evaluated from 0–6 inches soil samples collected in November 2024 comparing the 86 MJ ha⁻¹ two-pass treatment with the mowing treatment, including physical/chemical and biological indicators. Weed control efficacy was quantified from 2 by 2 ft quadrat imagery analyzed for weed cover at the day before treatments, 7 days after treatment (DAT), and 30 DAT in 2025 growing season. Treatment effects were analyzed using ANOVA with Fisher's LSD ($\alpha = 0.05$). Across the first three years, EWC treatments showed no negative effects on young almond tree growth. Soil physical, chemical, and biological indicators did not show negative effects under the highest-energy EWC relative to the standard management. EWC reduced weed cover and maintained suppression for up to approximately 30 days under hot and dry summer conditions. These findings indicate EWC can be integrated as a viable in-row weed management tool for young organic almonds without compromising early tree growth or soil health, while providing effective weed suppression.

Management of Summer-Active Perennial Weeds Benefits from Utilization of Residual Herbicides

Ryan J. Hill, University of California Agriculture & Natural Resources.

Summer-active perennial weeds remain among the most difficult species to manage in California agricultural systems due to their extensive underground reproductive structures, persistent regrowth, and increasing concerns over herbicide resistance. Effective long-term management requires integrated strategies that not only control existing infestations but also suppress new emergence and reinfestation. This presentation will examine the role of residual herbicides as a component of integrated perennial weed management programs. The session will review recent research evaluating the benefits and limitations of residual herbicides for managing summer-active perennial weeds, including their ability to extend control between applications and reduce reliance on repeated postemergence treatments. Discussion will include application timing, soil persistence, crop safety, environmental considerations, and integration with systemic herbicides to improve long-term management outcomes. Attendees will gain practical guidance on incorporating residual herbicides into compliant, effective, and sustainable weed management programs for California cropping systems.

This abstract was generated from the presentation description submitted for DPR accreditation.

Managing Herbicide Carryover Challenges in Orchards and Vineyards

Alexandre T. Rosa, Bayer Crop Science.

Herbicide carryover can present significant challenges in orchards and vineyards, particularly where long-lived perennial crops and new plantings are sensitive to herbicide residues remaining in the soil. Understanding the factors that influence herbicide persistence is essential for minimizing crop injury while maintaining effective weed control. This presentation will examine the environmental and management factors that affect herbicide carryover, including soil characteristics, rainfall patterns, herbicide chemistry, application timing, and product selection. The session will discuss practical approaches for identifying and reducing the risk of herbicide carryover in tree nut orchards and vineyards, with an emphasis on protecting newly established plantings and maintaining long-term crop health. Strategies for integrating herbicide selection, application timing, and cultural practices into comprehensive weed management programs will be reviewed, along with considerations for preventing crop injury while sustaining effective weed control. Attendees will gain practical guidance for managing herbicide carryover and improving the long-term productivity of perennial cropping systems.

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Florpyrauxifen-benzyl: Performance and Crop Safety in California Perennial Crops

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Perennial tree and vine cropping systems in California rely on postemergence (POST) herbicides for weed management; however, control of herbicide-resistant hairy fleabane (*Conyza* spp.) and perennial weeds such as field bindweed (*Convolvulus arvensis*) remains challenging. Florpyrauxifen-benzyl (FPB), a Group 4 synthetic auxin herbicide, was registered in California in 2025 for use in perennial crops as HULK® CA. Prior to that registration, researchers across UC Davis and UC Cooperative Extension conducted field trials from 2022 through 2025 to evaluate FPB efficacy and crop safety and to compare winter versus spring POST application timings. Seven trials were conducted in grapes (2), walnuts (2), sweet cherries (1), and pomegranates (2) under in-crop and non-crop conditions. FPB was applied at 22 fl oz/A alone or in tank mixtures with glyphosate, glufosinate, PPO inhibitors, or ALS inhibitors, with appropriate adjuvants included. Weed control was visually evaluated 7 to 86 d after treatment, focusing on hairy fleabane, field bindweed, and yellow nutsedge (*Cyperus esculentus*), and crop injury was monitored throughout the season. In pomegranate, sequential FPB applications at 16, 22, and 44 fl oz/A were applied at approximately 30-d intervals for two consecutive years to the same area to assess cumulative crop safety. Standalone winter POST applications of FPB provided 85 to 100% control of hairy fleabane, compared with 70 to 100% control from spring applications. Tank mixtures containing FPB resulted in 90 to 98% control of hairy fleabane and provided improved suppression of field bindweed (70 to 85%) and yellow nutsedge (75 to 90%) compared with standard grower programs. Although directly-treated pomegranate suckers had some symptoms, no significant crop injury was observed in any crop, including in plots receiving up to five applications at twice the labeled rate over two years. These results demonstrate that florpyrauxifen-benzyl is an effective and safe POST herbicide option for California perennial cropping systems.

Herbicide Performance Screenings in California Agave (*Agave tequiliana*)

Matthew Fatino, Seth Watkins, Rohith Vulchi, and Brad Hanson.

Agave (*Agave tequiliana*) has emerged as a promising specialty crop in California due to its drought tolerance and growing demand for distilled spirits. Although commercial production has expanded to approximately 1,000 acres, weed management remains a significant challenge, particularly during crop establishment within the 5- to 7-year production cycle. Limited availability of registered herbicides has created a need for research evaluating effective and crop-safe weed control options. This presentation summarizes field trials conducted in commercial agave near Huron, California, to evaluate the crop safety and weed control efficacy of preemergence (PRE) and postemergence (POST) herbicide programs. Herbicide treatments were applied over two growing seasons, and crop response and weed control were assessed following each application. Results will provide insight into the relative performance of several herbicide options and their potential role in integrated weed management programs for California agave production. These findings will help support the development of effective weed management strategies for this emerging agricultural crop.

Whacking Weeds in Coastal Subtropical Trees

Ben Faber, University of California Cooperative Extension.

Weed management in small, steep, and water-limited orchards along California's Central Coast presents unique challenges due to diverse specialty crops, difficult terrain, and limited management options. This presentation examines integrated weed management strategies for subtropical tree crops including citrus, avocado, cherimoya, persimmon, pitahaya, coffee, and sapote, where orchard design, equipment limitations, and proximity to fire-prone wildlands influence weed control decisions. The session will review the advantages and limitations of herbicides, tillage, mulches, cover crops, weed whacking, and weed cloth as components of an integrated weed management program. Particular emphasis will be placed on the limited herbicide options available in specialty crops and the need to balance effective weed suppression with crop safety, soil conservation, water use efficiency, and regulatory compliance. Attendees will gain practical insights into developing integrated weed management strategies tailored to the unique production conditions of coastal subtropical orchards.

This abstract was generated from the presentation description submitted for DPR accreditation.

A Role for Steam in Specific Crops

Steve Fennimore, Emeritus, University of California, Davis.

Steam has emerged as a nonchemical option for managing weeds and soilborne pests in specialty crop production, particularly where conventional fumigants or herbicides are limited or undesirable. This presentation will introduce the regulatory definition of pest control devices and explain why steam qualifies as a pest control device under California regulations. The session will examine the use of steam for soil pest control, with an emphasis on weed management and suppression of soilborne pests through soil disinfestation. Attendees will learn how steam can be incorporated into integrated pest management programs, including its role in organic production systems, operational considerations, and practical limitations. The presentation will discuss factors influencing treatment effectiveness, equipment requirements, and situations where steam provides an effective alternative or complement to conventional pest management practices. Participants will gain an overview of the opportunities and challenges associated with integrating steam into weed and soil pest management programs for specialty crops.

This abstract was generated from the presentation description submitted for DPR accreditation.

You Can Manage Nutsedge

Milt McGiffen, University of California, Riverside.

Nutsedge is one of the most persistent and difficult-to-control weeds in California cropping systems due to its unique biology and ability to reproduce and spread through underground tubers. This presentation will examine the characteristics that distinguish nutsedge from other troublesome weeds and explain how these traits influence management decisions. Attendees will gain a better understanding of the plant's life cycle, reproductive strategies, and mechanisms that contribute to its long-term persistence in agricultural fields. The session will review practical management approaches that target nutsedge during vulnerable stages of its life cycle, including shading, solarization, and other fallow-season practices. Discussion will focus on integrating cultural and nonchemical techniques into broader weed management programs to improve long-term suppression and reduce reliance on individual control methods. Participants will leave with a greater understanding of effective, integrated strategies for managing nutsedge in California production systems.

This abstract was generated from the presentation description submitted for DPR accreditation.

Using WeedCUT to Help Improve IPM on Roadsides

Chris McDonald, University of California Agriculture & Natural Resources.

Roadside and rights-of-way vegetation management requires balancing multiple objectives, including wildfire ignition reduction, driver safety, aesthetics, water conservation, and invasive weed control. Selecting appropriate management practices can be challenging due to varying site conditions, maintenance goals, and available resources. This presentation introduces WeedCUT, a free online decision-support tool designed to help land managers develop integrated pest management (IPM) strategies for roadsides and rights-of-way. The session will demonstrate how WeedCUT can be used to identify and compare more than 50 vegetation management techniques based on site access, management objectives, and operational constraints. Participants will also learn how the tool can be used to develop management strategies for more than 200 invasive plant species by filtering recommendations according to site characteristics and target weeds. Attendees will gain practical guidance on using WeedCUT to improve decision-making, integrate multiple management approaches, and implement effective, site-specific roadside vegetation management programs.

Pest Control Recommendation Considerations

Robert Brenton, Owner, Brenton VMS, LLC.

Pest Control Recommendations (PCRs) are a critical component of pesticide use in California, providing the technical and regulatory foundation for safe, effective, and legally compliant applications. This presentation examines the development of PCRs for non-crop settings, emphasizing their role in integrated vegetation management (IVM), environmental stewardship, and compliance with California pesticide laws and regulations. Attendees will review the legal basis for PCRs, required documentation, and the essential elements necessary to prepare complete, site-specific recommendations. The session will discuss considerations unique to non-crop applications, including treatment objectives, site constraints, sensitive habitats, threatened and endangered species, fuels management, and noxious weed control. Additional topics will include compliance with the California Environmental Quality Act (CEQA), environmental mitigation measures, pollinator protection, herbicide selection, application timing, and the integration of biological, cultural, mechanical, and chemical control methods. Practical examples will illustrate the differences between site-specific and programmatic PCRs while highlighting best management practices that support effective vegetation management, regulatory compliance, and long-term environmental protection.

Managing Brush Regrowth Following Fuel Break Mastication

Scott Oneto, University of California Agriculture & Natural Resources.

Mechanical vegetation treatments such as mastication, tractor piling, lopping, and prescribed fire are widely used to reduce hazardous fuels and improve wildfire resilience. However, these treatments often stimulate vigorous brush regrowth that can rapidly diminish treatment effectiveness if not properly managed. This presentation examines strategies for controlling post-treatment brush regrowth to extend the benefits of fuel reduction projects and reduce long-term maintenance requirements. The session will summarize research evaluating 33 post-mastication treatment options, including mechanical methods such as targeted grazing and 30 chemical treatment programs. Treatment efficacy, cost considerations, and the advantages and limitations of each management approach will be discussed. Attendees will gain practical guidance on selecting integrated vegetation management strategies that effectively suppress brush regrowth while balancing operational costs, environmental considerations, and long-term fuel management objectives.

Value of Selective Herbicides for Fire Mitigation and ROW Management

Jerome Otto, Market Development Specialist, Corteva Agriscience.

Selective herbicides play an important role in integrated vegetation management programs by providing targeted control of undesirable vegetation while preserving desirable plant communities. In rights-of-way (ROW), selective herbicides can reduce maintenance costs, improve vegetation management outcomes, and support wildfire mitigation objectives by limiting the growth of invasive grasses, brush, and other hazardous fuels. This presentation will examine the use of selective herbicides for roadside and utility ROW management, including preemergence herbicides for annual grass control and selective products used for brush management and cut stump treatments. The session will review the ecological and economic benefits of selective herbicide programs, drawing on long-term research such as the Pennsylvania Gamelands Study, which evaluated impacts on non-target vegetation, and additional utility vegetation management studies that have demonstrated improved treatment efficiency and cost savings. Discussion will focus on integrating selective herbicides into comprehensive vegetation management programs that promote wildfire risk reduction, protect desirable vegetation, and improve long-term maintenance of transportation and utility corridors. Attendees will gain practical insight into selecting and implementing herbicide programs that balance effectiveness, environmental stewardship, and operational efficiency.

Counting the Cost of Weeds

Erick Valle, Norman's Nursery.

Weed management represents a significant production expense in nursery operations, yet the true economic impact of weeds is often underestimated. This presentation examines the direct and indirect costs associated with weed infestations and introduces practical methods for measuring the financial effects of weed management decisions. Attendees will learn the fundamental factors required for weed growth and how understanding these elements can improve the efficiency of weed control programs. The session will present a data-driven approach to calculating the cost of weeds, including methods for evaluating labor, sanitation, chemical treatments, ground covers, and hand weeding. Practical examples will demonstrate how measuring costs on a per-unit basis can identify operational inefficiencies and support more informed management decisions. The presentation will conclude with recommendations for improving weed management programs while balancing labor, material costs, and overall nursery profitability.

Improving Our Spraying Efficacy in Pesticide Applications

Don Frantz, Wilbur-Ellis.

Effective pesticide applications require more than selecting the appropriate product. Application success depends on understanding pesticide labels, proper equipment calibration, spray solution quality, adjuvant selection, and practices that maximize efficacy while minimizing off-target movement. This presentation will review the fundamental principles of effective pesticide application and provide practical guidance for improving application performance and applicator safety. Topics will include interpreting label directions, selecting and using adjuvants to enhance spray performance, improving spray water quality, reducing spray drift through application techniques and cultural practices, and proper mixing and loading procedures. The presentation will also discuss the importance of equipment calibration and how calibration, spray solution characteristics, and active ingredient interactions influence pesticide performance. Attendees will gain practical strategies and best management practices to improve application efficiency, maximize pesticide performance, and promote safe, effective, and environmentally responsible pesticide applications.

Insects in Managed Turf and Ornamentals

Jen Browning, PCA, BASF Professional & Specialty Solutions.

Managing insect pests in California's turf and ornamental systems requires adapting to changing pest pressures, evolving regulations, and an expanding range of management tools. This presentation will provide an overview of the most significant insect pests affecting managed turf and ornamental landscapes across California and the western United States, highlighting current challenges and emerging trends observed during the 2025 season. The session will discuss practical decision-making strategies for today's pest management environment, including integrated pest management principles, available control options, and factors that influence treatment selection. Updates on recent initiatives from the U.S. Environmental Protection Agency, the California Department of Pesticide Regulation, and CalPEST will be presented, along with their implications for pest management professionals. The presentation will conclude with a review of new insect management products and technologies currently under development, providing attendees with practical information to support effective, compliant, and sustainable insect management programs.

Watergrass in California Rice Systems: Identification and Control

Whitney Brim-DeForest, University of California Cooperative Extension.

Watergrass (*Echinochloa* spp.) is among the most economically important weed complexes in California rice production, with multiple species exhibiting differences in morphology, growth habits, and herbicide response. Accurate species identification is essential for selecting effective management strategies and maintaining long-term weed control. This presentation will review the history and distribution of watergrass species in California rice systems and discuss the distinguishing phenotypic characteristics used to identify each species. The session will summarize recent surveys of watergrass species distribution and evaluate current management practices, with an emphasis on postemergence herbicide control in field production. Discussion will include species-specific differences in control, factors influencing herbicide performance, and considerations for integrating chemical and cultural practices into comprehensive weed management programs. Attendees will gain practical knowledge to improve watergrass identification and implement effective, integrated control strategies in California rice systems.

Are Herbicide-Resistant Weeds or Herbicide-Resistant Seeds the Management Problem?

Anil Shrestha and Katherine Waselkov, California State University, Fresno.

Herbicide resistance continues to challenge weed management in annual agronomic cropping systems, requiring management strategies that extend beyond herbicide selection alone. This presentation will examine the ecological processes that influence the development and persistence of herbicide-resistant weed populations, with particular emphasis on the role of weed seedbanks and the selection pressure imposed by repeated herbicide use. Understanding the relationship between resistant plants, resistant seeds, and seedbank dynamics is essential for developing sustainable weed management programs. The session will review the current status of herbicide-resistant weeds, the mechanisms driving resistance evolution, and the importance of monitoring weed populations throughout the growing season. Discussion will focus on integrated weed management practices that reduce seed production, deplete the weed seedbank, and lessen selection pressure through the use of diverse cultural, mechanical, and chemical control strategies. Attendees will gain a better understanding of how season-long management and seedbank reduction can improve long-term control and slow the spread of herbicide-resistant weeds in annual agronomic crops.

New Herbicide Mode of Action for Preplant Use in Safflower

Nick Clark, University of California Cooperative Extension.

Weed management in California safflower production is challenged by a limited number of herbicide options and the increasing need for new modes of action to improve control and support resistance management. This presentation will examine current weed management challenges in safflower and discuss recent research evaluating epyrifenacil, a novel herbicide active ingredient, for preplant burndown applications with potential residual weed control activity. The session will review field research investigating the efficacy of epyrifenacil on key weed species, crop safety, and factors influencing herbicide performance under California growing conditions. Discussion will include the potential role of this new mode of action within integrated weed management programs, its contribution to herbicide resistance management, and practical considerations for incorporating preplant burndown treatments into safflower production systems. Attendees will gain insight into emerging weed control tools and their implications for improving weed management and long-term production sustainability.

Integrating Prescribed Fire and Grass-Specific Herbicides: A Strategy for Annual Wildflower Restoration

Chris Berry, UCSB Cheadle Center for Biodiversity and Ecological Restoration.

Native annual wildflower communities in coastal California have declined substantially due to competition from invasive annual grasses, yet they are rarely the focus of restoration efforts. This presentation describes a long-term restoration program at the UCSB Cheadle Center for Biodiversity and Ecological Restoration that integrates prescribed fire, grass-specific herbicides, hand weeding, and native wildflower seeding to restore non-native annual grasslands to diverse native wildflower habitat. Since 2008, prescribed burns have been used to control ripgut brome (*Bromus diandrus*) by generating high-intensity fires with supplemental woody fuels, heating the upper soil layer sufficiently to reduce the invasive grass seedbank by nearly 99%. While early efforts focused on restoring coastal sage scrub through planting and hand weeding, more recent projects have shifted toward recovering native annual wildflowers through direct seeding. The incorporation of the grass-selective herbicide clethodim has further improved restoration success by reducing competition from invasive grasses while minimizing disturbance to emerging native seedlings and decreasing the need for hand weeding. More than 20 native wildflower species have established persistent, resilient populations that continue to resist reinvasion. This presentation will review the restoration methods, treatment outcomes, and lessons learned from this integrated approach, demonstrating a successful strategy for restoring one of Southern California's most threatened native plant communities.

A Tale of Two Invasives, Black Mustard and Stinknet: Adapting Management Strategies

Chris McDonald, University of California Agriculture & Natural Resources.

Black mustard (*Brassica nigra*) and stinknet (*Oncosiphon pilulifer*) are invasive annual weeds that present different challenges for land managers due to differences in their biology, distribution, and management requirements. This presentation compares these two species to demonstrate how understanding an invasive plant's ecology can improve the success of weed management and habitat restoration efforts. Black mustard, which has been established in California for more than a century, has spread throughout much of the state and across the United States. In contrast, stinknet is a relatively recent invader whose distribution remains concentrated in Southern California and central Arizona. The presentation will review the biology, spread, and effective management strategies for both species, including chemical, mechanical, and cultural control methods. Particular emphasis will be placed on how treatment timing, plant life history, and patterns of invasion influence management decisions and restoration outcomes. By comparing a widespread, well-established invasive species with an emerging invader, attendees will gain practical insight into developing adaptive weed management strategies that improve control success and support long-term habitat restoration.

Use of Pre-emergent Herbicides for Site Preparation

Robert Freese, Program Manager, Restoration and Enhancement, Irvine Ranch Conservancy.

Successful seed-based habitat restoration depends on reducing the existing weed seedbank before native species are established. This presentation examines the use of the pre-emergent herbicide indaziflam (Esplanade®) as an alternative to glyphosate for site preparation in large-scale ecological restoration projects. The presentation will discuss how long-lasting pre-emergent weed control can improve restoration outcomes in highly degraded habitats with persistent invasive weed seedbanks. Drawing from restoration efforts on more than 40 acres at Bommer Canyon Preserve in Irvine, California, the session will review application techniques, treatment timing, residual activity, and considerations for native seed establishment following herbicide use. Discussion will include the benefits and limitations of indaziflam, including the need for precise application, extended soil residual activity, and potential impacts on sensitive native species. Attendees will gain practical insights into integrating pre-emergent herbicides into restoration programs to improve site preparation and increase the success of native habitat establishment.

Using Virtual Fence Technology and Grazing to Control Medusahead and Barbed Goatgrass

Brian Allen, University of California Agriculture & Natural Resources.

Invasive annual grasses such as medusahead (*Elymus caput-medusae*) and barbed goatgrass (*Aegilops triuncialis*) reduce forage production, degrade wildlife habitat, and alter ecosystem function throughout California's rangelands. Effective management depends on understanding the biology and growth patterns of these species and implementing control measures at the appropriate stage of development. This presentation examines the use of virtual fence technology to facilitate targeted, high-intensity, short-duration grazing as a tool for managing these invasive grasses. The session will review the biology of medusahead and barbed goatgrass, emphasizing the characteristics that influence grazing effectiveness and long-term population suppression. Attendees will learn how virtual fencing can improve livestock distribution, increase grazing precision, and enhance the effectiveness of targeted grazing programs without the need for traditional fencing infrastructure. The presentation will discuss key considerations for developing successful grazing strategies and highlight how integrating emerging technologies with ecological principles can improve invasive grass management in California rangelands.

Weed Control in Cilantro and Green Onions

O. Daugovish*, M. Valdes-Berriz, and Abigail R. Brondos. University of California Cooperative Extension, Ventura County, CA, USA. *Corresponding author (odaugovish@ucanr.edu)

Cilantro and onions are poor weed competitors. When uncontrolled, weeds can severely decrease crop yields and make harvesting not feasible. Linuron and prometryn have been essential in controlling broadleaf weeds in cilantro and oxyfluorfen, flumioxazin and pendimethalin in onions. However, none of these herbicides have satisfactory efficacy against yellow nutsedge. This perennial weed became increasingly troublesome in Southern California due to lack of cost-effective management and decreased availability of uninfested fields. In RCB designed studies we evaluated S-metolachlor (Dual Magnum, DM at 0-2.66 pint/A) for efficacy and safety in seeded barbecue onions and cilantro. All trials were drip-irrigated. All herbicide applications were made with hand-held CO₂-pressurized boom with 3 T-Jet nozzles at 150 Gal/A of spray volume. For cilantro, we applied the herbicide post-plant pre-emergence at Oxnard (sandy loam) and Camarillo (clay loam) and for onions we did it at 2-4 leaf stage at Fillmore (loamy sand) and post-plant pre-emergence at Camarillo (clay loam). Crop injury was scored on a scale from 0 (none) to 10 (dead plant). At Oxnard, cilantro appeared tolerant to DM at rates 0.33, 0.66 and 1 pint/A, and the herbicide did not affect injury scores or biomass of harvested crop when compared to untreated control. Nutsedge shoot germination decreased 53 to 67% at these DM rates compared to untreated control that had 2-2.5 nutsedge shoots/ft of bed. At Camarillo, rates up to 1.33 pint/A were not injurious to cilantro, but at 2.66 pint/A DM caused significant injury and stunting in cilantro. At 2.66 pint/A, DM reduced harvestable crop biomass 26% compared to untreated check while other rates did not cause significant yield reduction. All herbicide rates provided 90-96% broadleaf weed control, mostly lambsquarters, common purslane, little mallow and burning nettle. Nutsedge shoot germination was reduced 50-69% by all DM rates, and the 2.66 pint/A rate was more efficacious than the 0.67 pint/A rate. At Fillmore, onion growth in a warm interior valley was slower compared to yellow nutsedge, which was well-established and competed with 2-4 leaf onions at the time of the first application. These established nutsedge plants were not controlled by the herbicide, but the 1.33 pint/A rate of DM suppressed new shoot germination that continued in the onion beds in all other treatments until harvest. Due to partial nutsedge control at DM 1.33 pint/A, that treatment had 68% more bulbs and 85% greater crop biomass compared to all other treatments where nutsedge grew at 7-10 plants/ft of bed. At Camarillo, where we applied DM after planting onions pre-emergence, all rates up to 1.33 pints/A had similar stand and biomass at harvest as the untreated check, although they tended to decrease with increase in the herbicide rate. At 2.66 pint/A, plant number was reduced 60% and crop biomass at harvest 55% compared to untreated check. These results suggest that DM at rate 0.33-1.33 pints/A can be an excellent fit for cilantro for suppressing nutsedge and controlling broadleaf weeds when applied post-plant pre-emergence. In onions, DM rates <1.33 pint/A may be used post-plant pre-emergence and can help reduce competition from the initial cohorts of germinating nutsedge shoots. Since DM at all rates was safe at the 2-4 leaf stage and its efficacy was rate dependent, a repeated application of DM at 1.33 pints/A in established green onion may provide protection from continuously germinating nutsedge and secure harvestable crop in fields with low to moderate weed densities. In fields heavily infested with yellow nutsedge, planting onions during warm parts of the season may not be advisable unless other cost-effective management solutions are employed.

Vegetation Composition of Agricultural Drainage Ditches Influences Pest and Natural Enemy Communities

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Agricultural drainage ditches often maintain year-round vegetation which may include wind-dispersed weeds, invasive plants, and non-native plants that host insect pests for nearby agricultural areas. However, little research has explored vegetation composition in ditches in an agricultural, urban, and natural habitat matrix. In this study, we examined vegetation structure and composition in eight agricultural ditches in Ventura County between November 2023 and September 2024, as well as its relationship to the abundances of three key insect pests (*Plutella xylostella*, *Lygus hesperus*, and *Frankliniella occidentalis*) and a variety of beneficial arthropods. Vegetation surveys were conducted each season using 20m transects in 1m² quadrats to determine the plant species composition and percent coverage at each site. Arthropod samples collected by vacuuming of the most dominant plant species at each site were cleaned, sorted, and identified to lowest taxonomic level. In each season, non-native plant species number and percent cover were higher than native species, peaking in March 2024 at 93.5%. Moderately invasive non-native species such as mustards (*Brassica nigra* and *Hirschfeldia incana*), hemlock (*Conium maculatum*), and bermuda (*Cynodon dactylon*) were among the most common species. Weeds that utilize wind for seed dispersal such as sowthistle (*Sonchus oleraceus*) and horseweed (*Erigeron bonariensis*) were present at most sites and were a source of seed deposition into adjacent agricultural and disturbed areas. Additionally, invasive watercress (*Nasturtium officinale*) proliferated in most of the ditches with water, suggesting that these ditches can be sources of both invasive aquatic and terrestrial species. Furthermore, key insect pests and their natural enemies were quantified in association with these plant species. Abundance of diamondback moth (*P. xylostella*) and lygus bug (*L. hesperus*), insect pests causing millions of dollars' worth of damage to local agriculture, significantly increased on brassica species like watercress (*N. officinale*) and the mustards (*B. nigra* and *H. incana*). Western flower thrips (*F. occidentalis*), a known vector for Impatiens Necrotic Spot Virus, was observed using a wide variety of weedy non-native and native plants. The month of June recorded a peak in vegetation percent cover and overall arthropod abundance, indicating a relationship between available plant resources, pest and predator abundance, and temperature. These results can inform new, timely, and species-specific management guidelines to prevent ditches from acting as reservoirs for non-native plants and associated insect pests and facilitating their spread into adjacent agricultural and natural areas.

Response of Organic Herbicide Using Traditional Broadcast and Pinpoint Spray Technology and Influence of Adjuvants to Reduce Splashing

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The advent of hyper-precise pinpoint spray technologies is a highly effective way to reduce herbicide use and delivers unprecedented precision, ensuring that applications are precisely targeted as intended. It may enable the use of non-selective organic herbicides during the post-crop emergence timeframe. Greenhouse research trials were conducted to assess different dose-response (0.75, 1.5, 3, 6, and 9% v/v) of organic herbicide (Caprylic acid + Capric acid) with and without adjuvant (alcohol ethoxylate), for better coverage and application effectiveness. Large crabgrass (*Digitaria sanguinalis*) and palmer amaranth (*Amaranthus palmeri*) were submitted to the herbicide treatments at different weed growth stages (9, 18, and 27 days after germination - DAG). Results from these trials indicate a better organic herbicide effectiveness when applied in the initial weed growth stage (9 DAG). Weed control was greater than 90% with a rate of up to 1.5% v/v of the organic herbicide when sprayed at 9 DAG, while when sprayed at 18 DAG, at least a rate of up to 3% v/v was needed to provide similar control. For both weed growth stages (9 and 18 DAG), our results indicate that an added adjuvant in the organic herbicide solution increases the herbicide effectiveness. Additionally, our data suggest that hyper-precise pinpoint spray technologies provide high weed control effectiveness like the traditional broadcast foliar spray system and may enable the use of non-selective organic herbicides in systems post-crop emergence. Although pinpoint spray technology is highly effective at reducing herbicide use, off-target micro-drift and splashing may occur, potentially damaging non-target plants. To better understand this subject, research trials were conducted in controlled laboratory environments to quantify the off-target solution deposition area. For this study, we assess the response of different commercial spray adjuvant formulations to reduce micro-drift spray and splashing. Results from these trials indicate that the adjuvant containing pinene or polymer in the formulation showed better efficacy in minimizing micro-drift spray, splashing, and off-target deposition by increasing adherence of the solution to the leaf surface. Polymer-based drift control adjuvants are commonly used to decrease spray drift. Such adjuvants increase the viscosity of the solution, which induces the formation of coarse sprays by shifting the droplet size distribution to a larger size and can also reduce jet breakup and splash.

Exploring Electric Weed Control as a Cover Crop Termination Tool for No-Till Organic Vegetable Systems

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Cover crops are common cultural methods that are utilized for improving soil health and quality and weed management. In organic production, cover crop termination before planting is a challenge because of the lack of effective organically compliant tools available. Currently, cover crop termination is completed with mowing, roller crimping, or tillage. However, mowing and crimping may have reduced efficacy of certain plant species and tillage could have negative effects on soil health and quality goals. Electric weed control (EWC) technology utilizes electricity to kill plants it contacts near the soil surface and does not disturb the soil. Therefore, EWC may be effective in terminating cover crops and of value in no-till organic production systems. EWC was evaluated in terminating an oat and crimson clover cover crop mix compared to mowing and then prepared in tilled or no-till soil seedbeds before planting snap beans in 2025. The EWC treatment alone performed similarly to mowing in clover control from 50% to 80% and improved control of oats by 60% compared to mowing alone. When EWC followed mowing, cover crop control was up to 90%. After snap bean planting, the no-till treatments reduced bean biomass by 72% compared to tilled treatments. The weed species populations differed in the till and no-till systems; however, no clear effect on weed control from the termination method was observed this first year.

The Non-negotiables: Work Requirements, Handler Safety, and Avoiding Off-target Contamination

John Mikesell, Ventura County Agricultural Inspector.

Safe and compliant pesticide use depends on understanding and consistently following regulatory requirements that protect pesticide handlers, the public, and the environment. This presentation will review essential work requirements and handler safety responsibilities, emphasizing the regulatory standards and best management practices that every applicator should understand before, during, and after pesticide applications. The session will discuss pesticide handler safety requirements, personal protective equipment, employer and employee responsibilities, and practical measures to prevent off-target contamination. Participants will also learn techniques for minimizing drift, protecting sensitive sites and non-target organisms, and maintaining compliance with California pesticide regulations. Through practical examples and regulatory guidance, attendees will gain a better understanding of the non-negotiable practices that support safe, effective, and environmentally responsible pesticide applications in agricultural and landscape settings.

This abstract was generated from the presentation description submitted for DPR accreditation.

Regulatory Requirements of Title 3 CCR Section 6739: Respiratory Protection

Harvard Fong, California Department of Pesticide Regulation.

Respiratory protection is a critical component of pesticide handler safety and a key requirement under California's pesticide regulations. This presentation provides an overview of the respiratory protection requirements established in Title 3, California Code of Regulations, Section 6739, with an emphasis on developing and maintaining a compliant respiratory protection program. Attendees will review employer responsibilities and the essential program elements necessary to protect handlers during pesticide applications. The session will cover respirator selection, medical evaluations, fit testing, proper use, inspection, maintenance, cleaning, storage, breathing air quality, and training requirements. Additional topics will include user seal checks, respirator limitations, emergency use considerations, and program evaluation to ensure ongoing compliance and effectiveness. Participants will gain a practical understanding of regulatory requirements and best management practices that support handler safety, regulatory compliance, and effective respiratory protection during pesticide handling and application activities.

This abstract was generated from the presentation description submitted for DPR accreditation.

Regulatory Updates & Common Violations

Joe Chang, Santa Barbara County Agricultural Commissioner.

California pesticide regulations continue to evolve, requiring applicators and pest control professionals to stay informed of new requirements and common compliance issues. This presentation provides an overview of recent regulatory developments affecting pesticide use in California, including updates to the California Statewide Pesticide Notification System, recent regulatory actions involving pesticide registrations and reevaluations, and the California rulemaking process. Attendees will learn how regulations are developed, where to find proposed regulatory changes, and opportunities to participate in the public comment process. The session will also review common pesticide use violations identified in Santa Barbara County, including service container labeling, handler training, personal protective equipment, decontamination requirements, pest control business registration, pesticide use reporting, and accurate measurement practices. Discussion will focus on practical steps applicators and employers can take to maintain compliance, avoid common violations, and implement best management practices that promote safe, effective, and legally compliant pesticide use.

This abstract was generated from the presentation description submitted for DPR accreditation.

Pesticide Jeopardy

Karey Windbiel-Rojas, University of California Integrated Pest Management Program.

This interactive session uses a Pesticide Jeopardy game format to reinforce key concepts in pesticide safety, laws, regulations, and application practices presented throughout the conference. Participants will apply their knowledge by answering questions covering a range of regulatory and safety topics, providing an engaging opportunity to review essential information while identifying areas that may require additional attention. Questions will address pesticide work requirements, handler safety, off-target contamination prevention, respiratory protection requirements under Title 3, California Code of Regulations Section 6739, recent regulatory updates, common compliance violations, pesticide label interpretation, and personal protective equipment requirements. Through active participation and discussion, attendees will strengthen their understanding of California pesticide regulations and best management practices while reinforcing the principles necessary for safe, effective, and compliant pesticide use.

This abstract was generated from the presentation description submitted for DPR accreditation.

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CONFERENCE HISTORY (CONTINUED)

This continues the historical table from prior proceedings (1st through 74th conferences, 1949–2022, not reprinted here) with the 75th through 78th conferences.

75th	January 18-20, 2023	—	Monterey	—	William Patzoldt
76th	January 24-26, 2024	—	Santa Barbara	—	Scott Stoddard
77th	January 22-24, 2025	—	Sacramento	—	Joy Hollingsworth
78th	January 28-30, 2026	—	Santa Barbara	—	Jason Robbins