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# **PROMOTING ECONOMIC PROSPERITY IN CALIFORNIA**

## 

## Condition Change: UC ANR contributed to improved individual and household financial stability

**Issue**

While California is the world’s fifth largest economy, the effects of the pandemic are still rippling through the economy, impacting the buying power of individual households. Inflation is finally starting to come down from 9% in 2022 and is now hovering around 2-4%. But the price of most goods are still higher than before the pandemic, and diseases like avian flu have resulted in shortages and higher prices of goods. For many families, wages have not kept up with today’s higher cost of living. Resource management, particularly for families living below the poverty line, has been critical to making ends meet.

**Methods**

In partnership with communities and allied organizations, UC ANR conducts research and delivers education leading to improvements in food resource management practices.

The CalFresh Healthy Living, UC (CFHL, UC) State Office at UC Davis provided statewide oversight, leadership, and guidance for the CalFresh Healthy Living Program. UC Cooperative Extension (UCCE) academics and CFHL, UCCE supervisors offered local leadership and guidance in program implementation and evaluation. UCCE academics also provided oversight, leadership, and guidance for the statewide Expanded Food and Nutrition Education Program (EFNEP). Curricula, such as *Plan, Shop, Save, Cook,* are designed to help adult participants gain the tools needed to take control of their money by teaching families food buying and budgeting skills, and food resource management techniques. (CFHL, UC and EFNEP)

As a result of UC ANR’s research and education, participants learned and adopted financial management practices. Outcomes with specific indicators follow.

**Outcomes**

**Participants improved food resource management practices.**

* After participating in CFHL, UC education, a statewide survey of 715 adult participants showed that 85% of participants reported improvements in at least one food resource management skill, such as comparing unit prices (51%) and shopping with a list (53%). (CFHL, UC)
* In Los Angeles and Orange Counties, pre-/post- survey results of EFNEP participants showed that 95% and 93% of participants in each county, respectively, improved in at least one food resource management practice. (Natalie Price)
* In Butte, Colusa, Glenn, Sutter and Yuba Counties, 83% of 230 EFNEP participants showed improvement in 5 or more areas of food resource management, including cooking dinner at home, comparing food prices, meal planning, looking in the refrigerator or cupboard before shopping, and making a list. (Veronica Van Cleave-Hunt)

**Change in condition: Participants saved money.**

* EFNEP graduates statewide averaged a $44.70 savings in their monthly grocery budget, which is a $536.40 savings a year per family. After completing EFNEP classes, the number of participants reporting they were unable to afford balanced meals decreased from 54% to 38%. (EFNEP)

The food resource management outcomes reported above demonstrate improved individual and household financial stability. Longitudinal studies of graduates indicate that they maintain positive behavior change two to six months after completing the program. In this way, UC ANR contributes to the public value of promoting economic prosperity in California.

## Condition Change: UC ANR contributed to enhanced community economic development

**Issue**

California needs community economic development approaches to foster economic resilience and vigor across its working landscapes. The state’s working landscapes span fishing to agriculture and ranching and from mining to renewable energy. In 2018, the nine working landscape segments paid workers $85 billion in earnings and generated $333 billion in sales; these include: agricultural distribution, agricultural production, agricultural processing, agricultural support, fishing, forestry, mining, outdoor recreation, and renewable energy. Collectively, these segments contribute significantly to the state’s economic vitality and account for more than 1.5 million jobs and nearly 70,000 business establishments. In particular, small-scale producers face challenges managing costs, marketing, and understanding and complying with regulations.

**Methods**

UC ANR’s efforts focus on California’s agriculture, ranching, and forestry to identify opportunities for economic development through innovation and entrepreneurship while also fostering environmental and social sustainability.

The UC Cooperative Extension (UCCE) County Director and the Community and Economic Development Advisor in the rural Eastern Sierra region of California work to strengthen the local economy and food system. They convened the agriculture community via Zoom for the Eastern Sierra Region of California Jobs First's strategic plan, which includes Alpine, Amador, Calaveras, Inyo, Mariposa, Mono and Tuolumne counties. (Reported by Dustin Blakey; collaborator mentioned: Aaron Wilcher)

The UCCE Woody Biomass and Forest Products Advisor in the Sierra Foothills provides outreach and education on bioenergy, wood-based products, and other forest-derived biomass products to increase public awareness. These initiatives are especially crucial for rural communities, which are more vulnerable to wildfires and in need of economic development opportunities tailored to their circumstances. Extension efforts included authoring two unique newsletters, one on bioproducts and the other one on innovative wood products, that were distributed to participants in the statewide Forest Stewardship Program. The newsletter reached 673 recipients by email with an average open rate of 59%. The advisor conducted policy engagement on pathways to improve forest resources protection through biomass utilization and value-added products. By maintaining strong connections with industry clientele and addressing their concerns, the advisor was able to assist them by providing critical information for decision-making to move projects forward. (Cindy Chen)

The UC ANR Small Farms Network provides technical assistance and extension to small-scale farmers to support production, marketing, regulatory compliance, and access to state resources. Funding for technical assistance is provided by state agency contracts for the California Underserved and Small Producer (CUSP) Program through the California Department of Food and Agriculture (CDFA). CUSP also provides direct financial assistance to them through block grants administered by nonprofit organizations. The UC ANR CUSP team provides technical assistance to the farmers in applying for grant funding, and technical advice and support to nonprofit partner organizations for documenting and addressing extreme weather challenges for small-scale farms. They provide extension support in Spanish, Hmong, Korean, Vietnamese, and Chinese. In the reporting period, they assisted a total of 986 farmers and conducted a total of 14 workshops on on-farm production practices, marketing, regulatory compliance, and access to CUSP and other grant programs. (Ruth Dalhquist-Willard, Aparna Gazula, and Hung Doan)

In addition, specifically related to drought, the UC ANR CUSP team developed a checklist for verification of on-farm impacts of drought to be used by technical assistance providers in documenting justification for direct grants to farmers. The checklist requires signature by the technical assistance provider and serves as backup documentation in case of audit.Block grant organizations allocating direct grants to farmers must document drought and other extreme weather challenges associated with grants, yet small-scale farmers, particularly those who are sole proprietors, may have difficulty providing the types of documentation that larger farming operations might have. Lastly, they extended information about a recent statewide survey of small-scale farmers that documented drought-related challenges, financial losses, and impacts to their farming operations. They created a policy brief to share the results with policy makers and elected officials. (Reported by Ruth Dalhquist-Willard; collaborators mentioned: Krista Marshall and Meaghan Donovan)

The UCCE Urban Agriculture and Small Farms Advisor delivered outreach and technical assistance in both English and Spanish to help small-scale farmers apply for state government grants supporting organic transition. The advisor served as an organic grower inspector for the Certified Naturally Grown program, a peer-to-peer certification initiative for farmers. (Amrita Mukherjee)

A UCCE Livestock and Natural Resources Advisor in rural Northern California works on agricultural succession planning to help facilitate clientele completing their estate plans. Agricultural succession plans are crucial for the financial health of agribusinesses, preserving family relationships, safeguarding legacies, and ensuring long-term viability. She managed two Agricultural Legacy Symposiums, supported by California State University Chico, a NIFA grant, local businesses, and non-profit groups. (Tracy Schohr)

As a result of UC ANR research and extension, participants learned about and adopted agricultural business management practices that contribute to community economic development. Outcomes with specific indicators follow.

**Outcomes**

**Participants learned or planned to utilize innovation and entrepreneurial strategies.**

* Newsletter readers reached out after reading the articles and expressed interests in UCCE’s work and biomass utilization potentials. Research consistently shows that educational programs and outreach activities play a significant role in increasing community awareness, addressing misconceptions, encouraging stakeholder engagement, providing economic and environmental benefits, and promoting long-term trust and behavioral change. For example, Monroe and Oxarart (2011) found that participants in a wood-to-energy outreach program were more likely to apply the knowledge and networks gained through the program in the future. In this way, this outreach effort equips communities and stakeholders with the tools needed to actively support biomass and forest product utilization, contributing to resilience and local economic development. (Cindy Chen)
* Of the 147 attendees at the two agricultural succession planning events, 100% gained new knowledge regarding elements that should be included in their succession plan, and 100% were inspired to create or modify their plans. (Tracy Schohr)

**Science-based information was applied to community economic development policy and decision-making.**

* Input from the agriculture convening was incorporated into the Sierra Jobs First Strategic Plan, which informed the regional plan for economic growth, environmental stewardship, and inclusive development. UC ANR, and the UC 4-H Youth Development Program in particular, were identified several times as key partners and potential future conveners of the community. As a result, there is interest in the Sierra Business Council in having Inyo County lead an agricultural convening group specializing in economic development in the region. (Dustin Blakey)
* As a result of UCCE’s policy engagement efforts, Mariposa County Planning Commission decided to fund the Mariposa Biomass Energy Project. The project received approval to break ground and is expected to start construction in spring 2025. The successful establishment of this facility will help pay for the removal of dead trees from around homes and public infrastructure and diversify the local economy with high paying jobs, in addition to contributing to fuel reduction efforts in the county. (Cindy Chen)
* The verification checklist developed by the UC ANR Small Farms Network was approved by CDFA for use in documenting farmer needs for drought relief funding. (Ruth Dalhquist-Willard, Aparna Gazula, and Hung Doan)
* Following two Ag Legacy Session seminars, 10 ranching families began working with legal counsel to develop and refine their succession plans. These plans encompass over 44 people with an estimated total estate value over $42 million dollars, ranging from $250,000 to $15 million. (Tracy Schohr)
* The UCCE policy brief was used by CDFA in budget discussions during 2024 to document the need for economic relief grants to small-scale farmers to address drought-related impacts to their farming operations. The California State Legislature allocated $17.9 million to CDFA’s CUSP program and expanded the funding to include relief grants for a range of climate-related and extreme weather disasters. This funding assists small-scale farmers who have experienced impacts and losses to their operations from drought, flooding, high winds, and other extreme weather events. (Reported by Ruth Dalhquist-Willard; collaborators mentioned: Krista Marshall, Meaghan Donovan)

**Change in condition: Participants secure funding to sustain small farms.**

* With technical assistance from CUSP staff, 138 small-scale farmers applied for direct relief grants through CUSP block grant organizations, and 96 small-scale farmers applied to the California Small Agricultural Business Drought and Flood Relief Grant Program under the Governor's Office of Business and Economic Development. As a result, 55 farmers received funding from CUSP block grant organizations, receiving a total of $461,565 (an average of about $8,400 per farmer). Twenty-eight farmers received funding from the California Small Agricultural Business Drought and Flood Relief Grant Program, receiving a total of $1,825,086 (an average of about $65,000 per farmer). These funds will assist small-scale farmers to remain economically viable. (Ruth Dalhquist-Willard, Aparna Gazula, and Hung Doan)
* A total of ~$2.5 million in funding was awarded to Inland Empire growers for COVID-19 and drought and flood relief. (Hung Doan)
* Of the 30 growers who received UCCE technical support, 16 growers in the Inland Empire region successfully received organic growers’ transition grants worth $150,000 from 2023-2024, and are practicing organic production in a small farming context. More than 12 farmers got organic certification for their farm business. (Amrita Mukherjee)

These aforementioned measured outcomes demonstrate changes that improve the economic, environmental, and social sustainability of California’s working landscapes. In this way, UC ANR contributes to the public value of promoting economic prosperity in California.

## Condition Change: UC ANR contributed to improved animal management, productivity and efficiency

**Sustainable Food Systems**

**Issue**

The dairy industry is California’s leading commodity in cash receipts, and the state is the leading dairy producer in the nation (2022). California’s total livestock and livestock products cash receipts went up close to 38% to $17.4 billion from 2021 to 2022. Poultry and eggs had a large 74% cash receipts increase, even though total egg production went down slightly (2022). Ranchers and dairy producers face many management and production challenges, like drought, increasing temperature, water and air quality regulations, as they strive to maintain their competitive edge. Although livestock is a high-value commodity, it can be challenging to be profitable at the ranch level. Ranchers or their family members often need to work off the ranch to make ends meet and keep the farm running. Simultaneously, there is the need to improve animal health and welfare and the ecological viability of these animal production systems. In addition, California has the most diverse aquaculture industry in the United States, in need of information on the biology and production technology of approximately 35 major and minor aquatic species.

**Methods**

UC ANR partners with public, non-profit, and private groups to create and extend new knowledge about animal systems management for dairies and livestock operations.

A UC Cooperative Extension (UCCE) Poultry Specialist at UC Davis organized a virtual symposium on Lighting Programs for Broilers, Ducks, and Turkeys in collaboration with the Poultry Extension Collaborative, which consists of extension faculty with expertise in poultry welfare. This symposium included speakers from the United States and Canada. There were 122 participants from 15 different countries, including the U.S., United Kingdom, Canada, Nigeria, Pakistan, Iraq, Iran, Germany, Turkey, and Brazil. Attendees’ professional backgrounds included veterinarians, poultry producers, allied industries, researchers, students, government employees, consultants and others. (Richard Blatchford)

A collaboration between a UCCE Specialist at the UC Davis School of Veterinary Medicine and a UCCE Livestock and Natural Resources Advisor in rural Northern California addresses clientele needs for improving cattle health through awareness, prevention, and treatment. In 2024, they designed and coordinated a 4-week online educational series for cattle producers covering key cattle health topics that drew 259 attendees. The recordings were posted on YouTube to increase accessibility. (Reported by Tracy Schohr; collaborator mentioned: Gaby Maier, Grace Woodmansee)

Lastly, a UCCE Specialist in aquaculture at UC Davis continues work on improving fish welfare at slaughter and terminal spawning. Many techniques used to create insensibility or brain death during humane slaughter in finfish do not accomplish their goal due to fish biology, size, and anatomy. Results from humane slaughter research are actively extended via regular technical transfer and continued trainings to commercial producers of sturgeon, trout in California and Idaho as well as state and federal fish hatcheries in California. Two fish welfare YouTube videos extend the information further, with the most watched video having 153,200 views with 3924 hours of watch time. This research continues to draw both national and international attention. (Jackson Gross)

A collaborative team of UCCE Dairy scientists worked on a California Dairy Research Foundation-funded project to explore opportunities for increasing by-product feeding rates without adversely impacting reproduction or production. Byproducts from food and agriculture industries are a significant component of dairy rations in California, necessitating cost-effective and sustainable feeding strategies. However, the types, proportions, and management of these byproducts vary widely across operations. A survey was sent to California dairies to collect data on byproduct types, proportions, and feeding practices. The data was analyzed to estimate their contribution to total rations and identify trends in utilization, in collaboration with nutritionists and industry stakeholders for validation. (Reported by Noelia Silva del Rio and Rubia Branco Lopes; collaborator mentioned: Jennifer Heguy)

Another UCCE Dairy Advisor continues to extend findings from a 2020 beef semen use survey. It was sent to 1,017 dairy producers in California with 141 responses (13.9%). The findings demonstrated widespread use of beef semen in dairies and the main breeding strategies adopted by dairy farmers. Extra profit was the main advantage seen by farmers, followed by control of heifer inventory and genetic improvement. This UCCE Dairy Advisor also works on improving calf management such as navel care, educating dairy farmers and their employees on best procedures, disease prevalence, and judicious use of antimicrobials. (Daniela Bruno)

A UCCE Livestock and Natural Resources Advisor offers hands-on small ruminant production and cattle/sheep/goat grazing workshops, focusing on husbandry practices, lambing systems, and grazing management. The advisor developed and delivered several advanced workshops over the last two years. These programs, which included field necropsies in collaboration with a UCCE Specialist and multi-species grazing management, were designed to help established producers and their employees develop new skills. The advisor also continued extension and policy engagement activities to reduce livestock-predator conflicts. This included engaging with statewide predator management policies and predation compensation and pay-for-presence programs. (Reported by Dan Macon; collaborator mentioned: Rosie Busch)

As a result of UC ANR research and extension, participants made changes that improve animal production systems. Outcomes with specific indicators follow.

**Outcomes**

**Participants learned and intended to adopt practices for more productive and sustainable animal management.**

* After the poultry symposium, when asked in a post-event survey (n=73), 100% of respondents said they would use the information presented in the symposium, and 88% were likely to change their behavior based on the information provided. (Richard Blatchford)
* As a result of the cattle health webinar, 80 producers reported improved awareness of cattle health topics, which included mineral health, abortion management options, artificial insemination, neonatal calf health, and vaccines. Extensive positive clientele feedback on the series also was received. For example: “Wanted to thank you and tell you what great webinars. Vet is next to impossible to get in an emergency. The information is so helpful. Less afraid of trying. Thank you again.” (Tracy Schohr)
* An evaluation after the grazing workshop measured improved grazing management skills: 92% of participants reported a great understanding of the benefits of using grazing to manage cover crops and 100% indicated they would consider using grazing in cropping systems. In the long term, using livestock grazing to terminate cover crops in annual cropping systems increases the bio-availability of nitrogen and soil carbon sequestration (Brewer et al. 2023). (Dan Macon)

**Participants adopted practices for more productive and sustainable animal management.**

* Currently four California producers, representing 90% of all farmed sturgeon in the US, utilize a nonpenetrating captive bolt gun (NPCB) for percussion stunning. The two largest fish hatcheries in California are now exclusively using the NPCB, increasing the welfare of more than 50,000 Chinook salmon annually. (Jackson Gross)

**Science-based information was applied to animal production systems policy and decision-making.**

* The survey of California dairies provided valuable insights into the types and proportions of byproducts in dairy rations, increasing understanding among producers, consultants, nutritionists, and others. The findings have been adopted by the non-profit Dairy Cares, and the California Milk Advisory Board included the results in their infographics. The information shared with industry will inform feed management practices to incorporate byproducts more effectively, enhancing cost efficiency and sustainability. (Noelia Silva del Rio and Rubia Branco Lopes)

**Change in condition: Participants have economic benefits.**

* As a result of the on-farm calf management research, the scientist noticed the workers at one of the dairy farms were not following the protocol and were spraying navels for seven days, which led to an overuse of iodine and longer time for the navels to dry. The dairy was buying more iodine than needed, and it is an expensive product ($50-120/gallon). Once brought to the dairy farmer's attention, following the protocol was implemented. Two months later, the dairy farm had reduced iodine usage by 50%, which reduced costs. (Daniela Bruno)
* When the UCCE Dairy Advisor met with a group of dairy farmers, they mentioned that the research, along with beef market prices, motivated them to start using beef semen on their dairy cows, which positively impacted their profit as crossbred dairy-beef calves typically sell $100-$300 more than purebred dairy calves. (Daniela Bruno)
* UCCE’s work on predator loss compensation contributed to the success of California Department of Fish and Wildlife’s initial wolf compensation pilot program. As a result, $3 million in compensation was paid to ranchers. The program will be renewed in 2024 with additional funding. (Dan Macon)

These measured outcomes demonstrate ranch-level advances, which help the state’s overall improvement in animal management and profitability, thus contributing to the public value of promoting economic prosperity in California, as well as the ecological viability of the livestock industry.

Condition Change: UC ANR contributed to improved animal management, productivity and efficiency

**Sustainable Natural Ecosystems**

**Issue**

California’s total livestock and livestock products cash receipts went up close to 38% to $17.4 billion from 2021 to 2022.Forage crops linked to the livestock industry are an important economic driver in California’s food-producing system. Although livestock is a high-value commodity, it can be challenging to be profitable at the ranch level. Ranchers or their family members often need to work off the ranch to make ends meet and keep the farm running. Simultaneously, there is a need to improve the ecological viability of these animal production systems.

**Methods**

UC ANR partners with ranchers, land managers, and government agencies to create and extend new knowledge about animal systems management for livestock operations.

A UC Cooperative Extension (UCCE) Advisor continued to co-organize and deliver the San Benito Weed Management Area’s Annual Rancher seminar, attended by 78 people. Topics included management techniques to control invasive weeds, biology and control of stinkwort, and using cattle grazing as a tool to control weeds. (Devii Rao)

A UCCE Advisor continued research and extension on providing enhanced irrigated pastureland management, which included establishing a demonstration site to showcase the benefits of interseeding and collaborating with Sierra Valley producers and land managers on regional assessment of irrigated pasture soil health and forage quality. The advisor also conducted ecological monitoring after the Dixie fire to determine that meadows and riparian areas met U.S. Forest Service standards for grazing. Findings were shared with the Plumas National Forest. (Tracy Schohr) In another project, the advisor led collaborative research on livestock grazing to reduce fire fuel loads. This included identifying the scale at which small ruminant grazing is effective and financially viable on non-industrial timber land. Findings were shared at a project tour. (Reported by Tracy Schohr; collaborator mentioned: Rosie Bush, UC ANR Fire Network, Katie Low, Dan Macon, and Ricky Satomi)

A UCCE Livestock and Natural Resources Advisor continued to conduct annual rangeland drought monitoring. Three representative sites were established across Siskiyou County to monitor rangeland forage production and perform long-term trend analysis. Drought loss estimation and ongoing monitoring reports were provided to the Farm Service Agency. (Grace Woodmansee)

As a result of UC ANR research and extension, participants made changes that improve animal production systems. Outcomes with specific indicators follow.

**Outcomes**

**Participants learned and intended to adopt practices for more productive and sustainable animal management.**

* San Benito Rancher Seminar participants were asked when they would incorporate what they learned. Out of 44 responses, 42 (95%) said in the next 6-12 months. In general, this would potentially lead to more effective weed management and increase ecological sustainability of rangelands. (Devii Rao)
* As a result of attending the targeted grazing project tour, 100% of 37 attendees noted the event improved awareness of targeted grazing and provided new knowledge, and 20 attendees were inspired to implement or change their targeted grazing program. (Reported by Tracy Schohr; collaborators mentioned: Rosie Bush, UC ANR Fire Network, Katie Low, Dan Macon, and Ricky Satomi)

**Participants adopted practices for more productive animal management.**

* Two of UCCE’s collaborators in the Central Valley purchased no-till drills and seeded 90 acres. The benefits of adopting these practices include higher economic return to ranchers through increased forage production and water use efficiency. (Tracy Schohr)

**Science-based information was applied to policy and decision-making.**

* Plumas National Forest utilized UCCE’s ecological monitoring findings to allow grazing on all allotments the year following the Dixie Fire. Historically, the service has delayed grazing post-fire 3-5 years for ecological concerns. Ranchers were not forced to liquidate cattle or purchase forage for over 3,000 cattle, an estimated $660,000 annual value. (Tracy Schohr)
* The Farm Service Agency utilized UCCE’s grazing estimation loss reports for drought relief payments to forage producers. Long-term drought monitoring also facilitates greater understanding of the cumulative impact from drought on forage production in Siskiyou County. (Grace Woodmansee)

These measured outcomes demonstrate forage and rangeland advances, which help the state’s overall improvement in animal management and profitability, thus contributing to the public value of promoting economic prosperity in California, as well as the ecological viability of the livestock industry.

## Condition Change: UC ANR contributed to increased agricultural and forestry efficiency and profitability

**Sustainable Food Systems** - **Fruits and Nuts**

**Issue**

California produces the majority of the nation’s fruit and nut crops. The state’s total value was $18.9 billion (2022). California was the leading producer of grapes nationwide, accounting for 93% of the total tonnage (2022). Grapes were the highest valued fruit or nut crop in California, totaling approximately $5.5 billion in production value (2022). Almonds are the state’s second highest valued fruit or nut crop, totaling $3.5 billion in production value (2022). In the nut category, California accounted for all of the nation’s production of almonds, pistachios, and walnuts and 85% percent of global almond production (2022). California farmers and ranchers must innovate and adapt to technical, social, and environmental challenges to maintain the economic vigor of California’s agricultural production. Factors such as high input prices (e.g., labor, fertilizers, and pesticides) and regulations affect the profitability of farm businesses. These factors often affect small-scale farmers more adversely, as many lack the resources or skills that larger farms have.

**Methods**

UC ANR creates and extends new knowledge about tree crop production from variety trials to post-harvest.

*Nuts*

Nut crop production in Kings and Tulare Counties has more than doubled in the past 20 years to more than 320,000 acres on over 1300 farms. Pistachio production alone has almost doubled in Kings County from 2020-2023. In response, a UC Cooperative Extension (UCCE) Advisor with expertise in pomology provides outreach and education to farm owners, generally beginning and smaller in scale farmers, farm managers, Pest Control Advisers, and Certified Crop Advisors. The crops grown and managed by the clientele are typically almonds and pistachios. Research and extension are conducted on water and nutrient management, which is one of their two major identified needs. (Doug Amaral)

Also in the California Central Valley, a UCCE Orchard Systems Advisor conducted pruning and tree-training studies on walnut and pistachio. The goal was to investigate tree training/pruning strategies to maximize light interception, yield, and precocity of walnut and pistachio. Three research trials were established in commercial orchards to evaluate the benefit of heading at planting and successive minimal pruning of walnut and pistachio. Tree growth characteristics, yield, and nut quality were evaluated. Results indicated the cost-benefit of minimal pruning and associated potential for precocity and early economic returns.The results of these studies have been extended to 1000 growers at extension meetings, as well as to the scientific community. (Elizabeth Fichtner)

Another UCCE Orchard Crops Advisor continued work on an almond variety trial, which is in peak bearing years. Early results are that poorly performing selections were eliminated, allowing growers to avoid bad cultivars and providing valuable feedback to breeders. The first promising new release, Yorizane, which is self-pollinating began to be planted more widely by the industry in 2022. The advisor also organized the Madera/Merced Pistachio Day. (Phoebe Gordon)

Further North, a UCCE Orchard Systems Advisor continued research and extension to increase informed rootstock and variety selection for almond, walnut, and prune growers. He delivered 10 grower presentations, reaching 750 attendees. In addition, a peer-reviewed publication, eight popular press publications and 15 technical reports have been extended. One of the popular press publications is a professionally produced YouTube video that distilled nearly a decade of almond variety evaluation at three sites into 15-minutes. He also led a team of farm advisors to document that irrigating an orchard before or during a freeze can reduce or eliminate tree damage. (Luke Milliron)

A UCCE Orchard Crops Advisor working on prunes conducted weekly in-season monitoring of fruit size in several north Sacramento Valley orchards. This gives growers an idea of when their fruit has reached maximum size, and, over time, can relate in-orchard management practices to fruit growth rate, which is critical to producing a large and profitable crop. More broadly, the advisor extends information on efficient, economical, and sustainable orchard crop production. (Natalia Ott)

*Tree Fruit*

A UCCE Orchard Systems Advisor focusing on fruit production co-organized seven events of a monthly meeting called Third Thursdays: Things from the Field. On each third Thursday of the month, orchard advisors host a UC Specialist or UCCE Advisor to give a talk on a seasonal orchard topic and provide a discussion-based forum for orchard producers, managers and industry members to ask questions about things they have observed in the field. These meetings were attended by a total of 120 participants. (Clarissa Reyes)

A UCCE Specialty Crops Advisor provided support to the apple industry, which has seen acreage steadily decline for decades. In 2023, the last large apple processor in the North Bay Area announced they will move out of state and sparked renewed interest in improving apple orchard care. Stakeholders specifically asked UCCE for more apple orchard management webinars. A 5-part webinar series was delivered covering key aspects of sustainable apple orchard management, reaching 116 attendees and the recordings are on YouTube (160+ views). Work with the smaller remaining apple processors and local partners is being done to better match processing capacity with local needs. In addition, work with an AES faculty/CE Specialist helps to identify and manage apple diseases and demonstrate IPM strategies for growers. They found widespread diseases and given pathogens often infect trees via pruning wounds, local pruning wound protectant trials in apples and pears were established to evaluate efficacy of new biological/organic products. (Reported by Ellie Andrews; collaborators include Jhalendra Rijal, Jim Adaskaveg, Karina Elfar, Akif Eskalen)

The UCCE Diversified Agriculture Advisor extended information to the small-scale and medium-scale growers, many with olive trees, through hands-on field days and workshops. (Clebson Goncalves)

*Viticulture*

A UCCE Viticulture Advisor working in the Central Valley evaluates the suitability and effectiveness of novel mechanization and automation technologies to improve management efficacy in table grape vineyards. Mechanization is a rapidly evolving sector in agriculture; however, large manufacturers often overlook the specific needs of specialty crops like table grapes. Conversely, small start-up companies may lack the necessary agricultural expertise and resources for product testing and validation. To bridge this gap, UCCE collaborated closely with industry professionals and manufacturers to test new mechanization and automation solutions in vineyards and actively participate in product improvement. (Tian Tian)

Another UCCE Viticulture Advisor gave a talk on a biostimulant project at the UC Davis Grape Day and organized the Southern San Joaquin Valley Grape Symposium, which was attended by 50 people. Biostimulants are a growing category of crop amendments, in which there is a strong interest in, but few replicated research trials. (Joy Hollingsworth)

As a result of UC ANR research and extension, participants learned and adopted agricultural management practices. Outcomes with specific indicators follow.

**Outcomes**

**Participants learned and intended to adopt recommended practices for plant production.**

* After the extension meetings on tree crop water and nutrient use efficiency, a majority of attendees indicated they learned something they would use in their farm management operations. Improving nutrient and water use efficiency can help conserve expensive inputs, increasing production profitability and resiliency. (Doug Amaral)
* At the meeting, 18 of 37 growers indicated they were already planting the improved rootstocks, and an additional 14 reported they were more likely to plant them after the UCCE talk. Annual walnut orchard/nursery tree losses from soil borne pathogens have been estimated at 18%, which translates into an annual loss of greater than $241 million. These improved rootstocks will result in reduced loss as they continue the ever-increasing percentage of the industry’s acreage. (Luke Milliron)
* After the North Sacramento Valley Walnut Day grower meeting that had 85 participants, 58% of the survey respondents (n=19) indicated an increase in knowledge on the meeting topics and 76% found the panel on economic situation for walnuts useful. After the Prune Day grower meeting that had 72 participants, 84% of survey respondents (n=25) indicated an increase in knowledge on the meeting topics. (Natalia Ott)
* After the pistachio field day, 88% (n=17) of post-meeting survey respondents reported learning gains about nitrogen management. (Phoebe Gordon)
* After the Third Thursdays: Things from the Field, 59 of the participants completed post-meeting surveys and 100% reported improved knowledge of the topics. The surveys also include information about clientele concerns and topics they would like to be addressed at future events. (Clarissa Reyes)
* Surveys after the apple management webinars indicated 100% of the 35 respondents increased knowledge, and 97% reported they will use knowledge gained to manage apple orchards more sustainably. This can improve tree health and yield and strengthen local apple processors. (Ellie Andrews)
* After a UCCE viticulture symposium, a post-meeting survey indicated that 100% learned something new, and 89% will use what they learned in the next year. Some examples of what was learned included ways to protect against trunk disease and improving berry color and firmness. (Joy Hollingsworth)

**Participants adopted recommended practices for plant production.**

* Widespread industry use of the recommended alternate pruning techniques have been observed. (Elizabeth Fichtner)
* As a result of UCCE extending information about the popular almond rootstock having issues in the region, several growers and one nurseryman reported steering clear of the troublesome variety/rootstock combinations, potentially saving the industry millions of dollars. (Luke Milliron)
* Of 39 responses at a UCCE grower meeting, five had already incorporated lessons on freeze prevention and an additional 30 believed the information would help prevent future damage. Despite some minor damage, for the first time after an autumn freeze, the UCCE advisor received zero calls from growers and consultants because they were now educated on freeze identification and recovery steps. The largest grower in the area said that in the past they didn’t irrigate orchards to prevent frost damage. Now, they actively irrigate during frosts. With the changing climate leading to erratic weather patterns, walnut growers need to be prepared for sudden freeze events. The improvements from the continued extension efforts on this topic, as well as the ongoing diligence of current adopters will protect tens of thousands of walnut acres from debilitating freeze damage in the coming years, thereby avoiding these severe financial losses. (Luke Milliron)
* In part because of the extension of UCCE research that identified a prune rootstock (‘Krymsk 86’) as having excellent performance and anchorage, the rootstock now accounts for 75-80% of new prune sales. Growers have reported that unlike their other poorly anchored orchards, this new rootstock withstands winter storms without blow overs, saving growers collectively millions of dollars in the years to come. When orchards have a good rootstock and variety, they are more profitable each year, and they remain profit generating for many more years than when poor selections are made. (Luke Milliron)
* The prune fruit size monitoring led to several growers over the last two years adjusting their management decisions. After showing a grower who was under irrigating his trees how his fruit growth compared to the other orchards in the area, he increased his irrigation frequency on that 100-acre block and his fruit grew more quickly. In another case, a grower cut irrigation to his 40-acre orchard almost three weeks before the fruit had stopped growing. After showing him the fruit sizing data, he turned the irrigation back on; but, if the advisor hadn’t been monitoring fruit size, he would have lost out on a considerable amount of fruit growth, substantially affecting his crop value for the year. Such orchard management improvements have the potential to increase fruit size and value on an industry scale. (Natalia Ott)
* Several nursery representatives have indicated that thousands of Yorizane trees have been sold. Many growers and consultants have reached out directly to discuss research results from the trial. One nursery even links to a PDF of an extension talk. If this cultivar is widely adopted, it could save growers money and effort by simplifying production practices. (Phoebe Gordon)
* Due to the science-based information provided during the Joint Grapes and Olive Field Day, one olive grower reported a change in the irrigation schedule and began to adopt the pressure chamber method to schedule irrigation instead of using the evapotranspiration method. Two olive growers who have been growing olives for over 10 years reported that they had never received training on the correct pruning of olive trees and that after the Pruning Olive Trees Day, they are finally adopting the correct pruning in olive orchards. (Clebson Gonclaves)
* Two grape growers adopted the camera-based yield estimation system, and one grower has purchased the new pruning equipment that UCCE evaluated. (Tian Tian)

These measured outcomes strengthened diverse California farm businesses by helping to increase their economic returns given increased yield, reduced inputs, or improved business management and marketing. These outcomes contribute to increased agricultural efficiency and profitability and the public value of promoting economic prosperity in California.

Condition Change: UC ANR contributed to increased agricultural and forestry efficiency and profitability

**Sustainable Food Systems**

**Issue**

California is a national leader in agricultural production, leading the country in cash income received for agricultural products, with 68,400 farms and ranches receiving $55.9 billion for their output in 2022, up from $51.4 billion received in 2021. California farmers and ranchers must innovate and adapt to technical, social, and environmental challenges to maintain the economic vigor of California’s agricultural production. Factors such as high input prices (e.g., labor, fertilizers, and pesticides) and regulations affect the profitability of farm and ranch businesses. These factors often affect small-scale farmers more adversely, as many lack the resources or skills that larger farms have.

**Methods**

UC ANR creates and extends new knowledge about agricultural production from variety trials to post-harvest.

Vegetable transplant nurseries are a relatively new industry in California, in the last 20 years, with no Best Management Practices specifically tailored for this production. A UC Cooperative Extension (UCCE) Specialist of Plant Pathology located at UC Davis identified some cultural practices that can be improved to reduce the risk of pathogen contamination, such as: having raised metal-benches; steam sterilizing reused trays and adequately storing them; preventing standing water and applying sanitizers to surfaces. These findings have been shared through extension meetings with growers and in one-on-one farm visits (in English and Spanish). (Johanna Del Castillo)

A UCCE Vegetable Crops Advisor continued experiments on 12 commercial fields to investigate and compare the impacts of a wider in-row spacing on grafted watermelon yield, quality, and economic gains compared to the traditional system. Grafting is an ancient production tool widely recognized to improve fruiting vegetable yield, enhance disease resistance, and tolerate nutrient and water deficiency; however, prior to UCCE’s research, grafted watermelons had not been effectively tested in California. Findings were disseminated to the cooperative growers and broader stakeholders through a field day, variety trial tour, and newsletter. In addition, for fresh market tomatoes, two advisors have been working with numerous small farm growers in the northern San Joaquin Valley to evaluate the performance of common rootstocks on stabilizing tomato yield and fruit quality. So far, around six small farm growers located in Modesto, Turlock, and Oakdale started growing grafted tomatoes and gained an average of 10-15% yield increase. (Zheng Wang and Brenna Aegerter)

A UCCE Agronomy Advisor working in the North Sacramento Valley collaborated with the UCCE Organic Agriculture Specialist located at UC Santa Cruz to organize the first UCCE Organic Agriculture Workshop in the region. Attendees were primarily growers, Certified Crop Advisers, and pest control advisers. Many academics in the region gave presentations on a range of topics and participated in the event. (Reported by Sarah Light; collaborators mentioned: Joji Muramoto, Whitney Brim-Deforest, Dan Macon, Franz Neiderholtzer, Margaret Lloyd, Patricia Lazicki)

The UCCE Local Food Systems Advisor works with 2,900 farms across four counties, ranging from a few acres to a sub-acre. He provided 19 one-on-one consultations to existing and new farmers on the following topics: orchard establishment, starting a new farm, selection of new cultivars/varieties, frost protection, olive flowering, irrigation systems, vine nutrition, manure management, soil sampling, permaculture, vegetable crops flowering, and hedgerows. He gave educational presentations on irrigation management at grower association meetings, a local college, and Natural Resources Conservation Service District meetings. (Hardeep Singh)

The UCCE Specialty Crops and Horticulture Advisor on the North Coast conducted 41 site visits, which usually led to a follow up addressing one or more specific issues, such as soil health, crop nutrition, water use efficiency, pests and diseases, and controlled environment agriculture. He also organized five workshops and collaborated on three field days with the North Coast Growers Association, Community Alliance with Family Farmers, and the UC Organic Agriculture Institute, covering a range of topics including organic nitrogen management, strategies for reduced tillage, organic weed management, and more. (Eddie Tanner)

The UCCE Diversified Agriculture Advisor extended information to the small-scale and medium-scale growers through hands-on field days and workshops, including an Organic Farming Workshop. (Clebson Goncalves)

In Southern California, the UCCE Urban Agriculture and Small Farms Advisor hosted an online symposium on sustainable agricultural practices in collaboration with the Southwestern Regional Business Center Urban Agriculture group and led by Occidental College. This one-day event targeted small-scale growers, urban farmers, traditional farmers, agribusiness owners, agricultural educators, and aspiring next-generation farmers. The sessions focused on current sustainable practices, the types and benefits of cover crops, their seasonal applications, and the financial aspects of their use. Additionally, real-life scenarios and preliminary findings from research trials were shared to help attendees consider incorporating these practices into their succession plans. The event successfully attracted 85 participants from four counties. (Amrita Mukherjee)

As a result of UC ANR research and extension, participants learned and adopted agricultural management practices. Outcomes with specific indicators follow.

**Outcomes**

**Participants learned and intend to adopt recommended practices for plant production.**

* After the annual extension meeting, 26% of 90 attendees completed a written evaluation form regarding the educational value of the meeting: 100% of respondents said that they gained knowledge that was relevant to their work; and 77% said they expected to apply what they learned in the coming 12 months, with the other 23% reporting they probably will apply what they learned but not in the near term. Topics about which they learned and intend to apply included integrated disease management of Fusarium and viruses diseases, management of parasitic weed branched broomrape, and optimizing potassium fertilization. (Brenna Aaegerter)
* After the Organic Agriculture Workshop, evaluations indicated that 83% (n=13) intend to use what they learned in the next 12 months. Presentation topics ranged from pest management, livestock integration, cover cropping, and soil and nutrient management. (Sarah Light)
* The urban agriculture symposium post-event survey evaluation (n=90) reported that 92% gained new knowledge and that the event inspired them to change/modify/adopt cover crop as a mulching system. Attendees predicted they will share some aspect of the event to their peers in the next six months, to 300 additional people. (Amrita Mukherjee)
* As a result of one-on-one consultations, 12 individuals learned and intended to adopt recommended practices for crop/varietal selection, starting a new farm, irrigation system designs, permaculture and soil sampling. Additionally, one vegetable crop producer enhanced their knowledge of abiotic factors leading to flowering issues. (Hardeep Singh)
* Post-workshop evaluation on the Healthy Soils: Restoring water on working lands event indicated that 100% (n=14) of the attendees learned new information on the basics of water management and techniques for effective irrigation scheduling. Also, 81% of the attendees said that they will implement the knowledge gained from this talk in the future and the rest, 19%, will somewhat implement it. Lastly, 100% of the attendees said that they will recommend this information to others. (Hardeep Singh)
* As a result of the workshops and fields days on the North Coast, participants reported learning gains:
  + Pierce’s disease workshop (12 participants) - 92% reported greatly improved knowledge
  + Organic Ag Field Day (38 participants) - 78% reported greatly improved knowledge
  + High tunnel workshop (14 participants) - 91% reported greatly improved knowledge
  + Dialing In Irrigation workshop (27 participants) - 96% reported greatly improved knowledge
  + Small Farm Conference Field Day (31 participants) - 91% reported greatly or somewhat improved knowledge
  + Organic Ag Field Day (19 participants) - 83% reported greatly improved knowledge (Eddie Tanner)

**Participants adopted recommended practices for plant production.**

* While working on the nursery vegetable transplant project, the scientist observed adoption of the recommended practices by producers. Growers are building more steam sterilization chambers, cover trays after steaming, and apply sanitizers more frequently to surfaces, which all work to reduce disease pressure. (Johanna Del Castillo)
* As a result of the Organic Farming Workshop, growers reported that they are adopting solarization as a strategy for weed management and using cover crops to improve soil health and fertility in vegetable crops. (Clebson Gonclaves)
* As a result of the UCCE Specialty Crops and Horticulture Advisor’s extension:
  + Three growers adopted a novel strategy leading to 15%-30% increases in their cover cropped acreage.
  + Nine growers conducted soil analysis for the first time.
  + Six growers changed to resistant cultivars/rootstocks after disease diagnosis.
  + Three growers removed vines to slow the spread of Pierce’s disease.
  + Two growers have begun using nitrogen budgets.
  + Three growers have adopted new IPM strategies for codling moth.
  + Three growers invested in upgrades to their cultivation equipment.
  + Two growers changed their stone fruit brown rot management, which led to ~10% decrease in loss.
  + One grower began using sensors to schedule strawberry irrigation, leading to a 20% reduction in water use. (Eddie Tanner)

**Change in condition: Participants have economic benefits.**

* The overall impacts of promoting grafted watermelons in California are summarized:
  + The average net gain for growing grafted watermelons is up to $2,500 per acre compared to non-grafted plants. Since 2021 the watermelon industry has widely adopted grafted watermelon in-row spacing of 4-5 feet apart, leading to an average of 15% yield increase and 35% cost reduction per acre for grafted seedlings. This consistently uses the same or even lower amount of water and fertilizers. The acreage of grafted watermelons in California increased from less than 150 in 2018 to 2,500 acres in 2024, which is 25% of the state's total watermelon acreage.
  + An interview with the cooperative greenhouse nursery, the grafted transplant supplier in California, found they benefited from a significant order increase: 50,000 transplants in 2019 (covering only 40 acres) to 2,000,000 in 2025 (covering 1,500 acres). Orders for the 2025 season came from six states. (Zheng Wang)
* One grower had $6K increase in revenue after implementing a new IPM plan for managing botrytis in blueberries, as a result of UCCE technical assistance. (Eddie Tanner)

These measured outcomes strengthened diverse California farm businesses by helping to increase their economic returns given increased yield, reduced inputs, or improved business management and marketing. These outcomes contribute to increased agricultural efficiency and profitability and the public value of promoting economic prosperity in California.

Condition Change: UC ANR contributed to increased agricultural and forestry efficiency and profitability

**Endemic and Invasive Pests and Diseases - through IPM**

**Issue**

Pests, diseases, and invasive plants decrease California’s agriculture efficiency and profitability. Pests reduce yields, render crops unmarketable, and negatively impact revenues. According to the Center for Invasive Species Research at UC Riverside, agricultural losses to exotic pests exceed three billion dollars annually in California. According to calag.ucanr.edu, Pierce’s disease alone costs California $104 million dollars a year with $56.1 million borne by the grape growers themselves for the cost of loss of production and vine replacement. (Cindy Kron) As the global population increases, crop production must increase to meet the greater food demands despite lagging resources for detection of plant pests and diseases. Science-based information is needed for growers, managers, and policymakers to develop practices and policies that sustain economic vitality while protecting environmental quality.

**Methods**

The UC Statewide Integrated Pest Management Program (UC IPM) helps growers, land managers, community leaders, and professional pest managers prevent and solve pest problems by drawing on expertise of UC scientists to develop and distribute through UC Cooperative Extension (UCCE) science-based information on managing pests using safe and effective techniques and strategies that protect people and the environment.

A UCCE Area IPM Advisor for the North Coast supported clientele to manage invasive species impacting olives and pears with IPM strategies. The advisor collaborated on research and extension projects with UCCE Extension Specialists, UCCE Advisors, UC Professors, California Department of Agriculture Scientists, USDA Researchers, Western Region IR4 (Interregional Research Project No. 4), and a Postdoctoral Fellow at the University of Copenhagen. In 2024, the advisor hosted the second biennial North Coast Olive Field Day based on feedback from key informants on industry needs. By attending the event, the 78 participants could receive Continuing Education Units (CEUs), which are required for renewal of certificates and licenses to apply pesticides with the California Department of Pesticide Regulation (DPR) and the American Society of Agronomy (ASA). (Cindy Kron)

The same Area IPM Advisor worked with grape growers in Napa and Sonoma Counties to combat the three-cornered alfalfa hopper (TCAH), a native economic pest that vectors grapevine red blotch virus, by appropriately timing when to till vineyards. The economic impact of grapevine red blotch disease is estimated to be as high as $27,740/acre in Napa County and $15,242/acre in Sonoma County. Overwintering adult TCAHs arrive in the vineyard in February, lay eggs in the ground cover and proceed to die off while the immature stages emerge and develop on the ground cover. Tilling before adults emerge, reproduce, and disperse is an effective way to reduce TCAH populations without any added costs to the grower or chemical inputs into the environment. To that end, the advisor developed a model to accurately predict the window of time before adult emergence, which was validated in five additional grape regions. Growers can access the model as a free online calculator through the UC IPM website. Information on the free calculator and how to use it has been shared through an instructional video, a North Coast IPM seminar with 170 attendees, additional industry and conference presentations, an article in the popular press, and one peer-received publication. (Cindy Kron)

A UCCE Area IPM Advisor for San Luis Obispo, Santa Barbara, and Ventura Counties conducted a multi-disciplinary, collaborative applied research projects to evaluate lettuce and celery germplasm and commercial varieties to identify sources of plant resistance to fungal, soilborne pathogens. Results have been shared through field days for clientele, grower meetings, and scientific abstracts. Field days for lettuce and celery Fusarium diseases were attended by 125 people. (Christopher Greer)

A UCCE Area IPM Advisor conducted research and extension in a wide range of crops, systems, and pests present in Southern California, especially in areas where IPM practices are not being used or are less frequently used. Agriculture is the fifth largest industry in San Diego County and generated $1.81 billion in direct sales. This value comes from a wide range of crops including many types of ornamentals, avocados, citrus, and vegetable crops that are grown throughout San Diego, Orange, and Los Angeles Counties. Over 2,000 growers, Pest Control Advisers (PCAs) and participants attended extension events, which included 16 seminars and 54 meetings on IPM topics, such as thrips management and scopes and insect ID apps for pest identification. The advisor also published seven YouTube videos, which have generated over 16,600 views. (Eric Middleton)

The same advisor provided technical assistance to growers and connected with employees of county agricultural departments regarding invasive pests. Invasive pests frequently enter Southern California and can cause significant economic and environmental damage. This is particularly problematic in San Diego and Los Angeles Counties, where pests are often intercepted at ports of entry and on imports of plants or other goods entering the state. In addition to one-on-one visits with clientele, outreach to growers included a workshop on the South American Palm Weevil attended by 58 arborists, YouTube videos, popular media interviews, and policy engagement activities. (Eric Middleton)

As a result of UC ANR research, outreach, and education, participants learned and adopted pest management practices that increased agriculture efficiency and profitability. Outcomes with specific measured indicators follow.

**Outcomes**

**Participants gained knowledge of detection and control practices for invasive and endemic pests and diseases.**

* Results from a survey following the Second Biennial North Coast Olive Field Day indicated that 100% of participants agreed that the knowledge gained from attending was worth their time and 100% planned to implement knowledge gained from attending the field day (n = 32). (Cindy Kron)
* After attending field days for lettuce and celery Fusarium diseases, 77% of post-survey respondents indicated that they gained valuable knowledge about lettuce disease management, and 60% of respondents indicated they plan to incorporate the gained knowledge into their practices. (Christopher Greer)
* Southern California growers and pest control advisers learned new information on IPM strategies. To the question, "Overall how much new information did you learn today?", 58% said a lot, 31% a moderate amount, and 14% a little. This feedback was typical of most events delivered by the advisor. (Eric Middleton)
* After attending a workshop on the South American Palm Weevil, arborists increased their knowledge scores on pre- and post-event surveys from 65% to 97% and 100% of respondents (n=28) said they would recommend the meeting to others. (Eric Middleton)

**Participants adopted recommended treatment and management practices for invasive and endemic pests and diseases.**

* Results from polls taken during the 2024 North Coast IPM seminar indicated that attendees used the model to reduce TCAH populations by timing tillage on 4,521 acres, a 378% increase since 2022. (Cindy Kron)

**Science-based information was applied to integrated pest management policy and decision-making.**

* San Diego County Ag Weights and Measures made export and import policy decisions based on the 13 recommendations and/or determinations by the UCCE ARE IPM Advisor for Southern California, including for four A-rated pests. Pests are rated an “A” by the state of California when they are known to cause economic damage and thus may trigger county and/or state actions to restrict, contain, eradicate, reject, and/or hold the pest and its known hosts. The impact of these recommendations has been to allow clientele to bring in imports without having to ship them back or destroy them, to reduce pesticide use when treatment is necessary, and has helped prevent invasive pests from spreading in the state. (Eric Middleton)

The measured outcomes reported above improved the state’s ability to prevent, control, and mitigate pests and diseases and create new opportunities for economic sustainability. Research demonstrates that increased IPM adoption saves money and in certain cases can reduce pesticide applications (Mullen et al. 2003, Gouge 2006). (Tunyalee Martin) By providing support and guidance to growers and Pest Control Advisers, UC IPM contributes to reduction in pesticide applications across the state, which mitigates risks to workers and residents near agricultural production areas as well as consumers. In these ways, UC ANR contributes to increased agricultural efficiency and profitability and the public value of promoting economic prosperity in California.

Condition Change: UC ANR contributed to increased agricultural and forestry efficiency and profitability

**Endemic and Invasive Pests and Diseases - in Viticulture and Orchard Systems**

**Issue**

Pests, diseases, and invasive plants decrease California’s viticulture and orchard systems efficiency and profitability, reducing yields, rendering crops unmarketable, and negatively impact revenues. For example, walnut blight is a disease that spreads in rain events during bloom and can directly reduce yield by over half. For example, walnut blight could put a grower out of business as the industry faces its most devastating financial situation in industry memory with very low crop price and record high cost of production. (Luke Milliron) Science-based information is needed for growers, managers, and policymakers to develop practices and policies that sustain economic vitality while protecting environmental quality.

**Methods**

UC ANR conducts research and partners with public, governmental, and private groups to extend new knowledge and develop integrated pest management plans to increase agriculture efficiency and profitability.

A UCCE Specialist at UC Riverside leads the California Citrus Clonal Protection Program (CCPP), which serves as California's first line of defense against citrus diseases. A cooperative program co-funded by federal and state agencies alongside California citrus commodity boards, the CCPP provides a safe mechanism for introducing citrus varieties into California from any citrus-growing region worldwide. These introductions support research, variety improvement, and use by the commercial industry or non-commercial users. Alongside this, the CCPP conducts research, teaching, and outreach on various topics related to citrus pathology. (Georgios Vidalakis)

A UCCE Specialist located at UC Davis continued research in the identification and control of plant pathogens affecting the fruit and nut crops. The lab processed 182 plant sample submissions and the specialist visited 32 orchards to support advisors and PCAs with disease diagnosis. Research trials were conducted with collaborating growers and at UC ANR’s Kearney Agricultural REC on the use of the fungicide, Oxathiapiprolin, to reduce risks of Phytophthora root rot in pistachio and the biological control product, Vintec, to protect almond trees against canker pathogens. Findings were shared with clientele, who include representatives of commodity boards, agrochemical and biocontrol companies, growers, fieldworkers, PCAs, and the California Department of Food and Agriculture (CDFA). In 2024, the specialist delivered 20 talks, reaching over 1,650 attendees, at local field days, field meetings, and short courses to extend current knowledge for disease management. (Florent Trouillas)

A UCCE Advisor in Colusa, Sutter and Yuba Counties conducted research and extension to show almond growers and PCAs efficient and effective ways to use newer, environmentally less risky pesticides, safely apply conventional, broad-spectrum pesticides, and understand the value of orchard sanitation — a cultural practice for navel orangeworm (NOW) management. The advisor gave seven talks and organized an annual grower meeting, field day, and pre-harvest field meeting to review pest biology, spray timing, and practices for best grower returns. (Franz Niederholzer)

A UCCE Advisor educates grape growers and crop consultants in Tulare and Kings Counties on the most efficient and effective pest management practices. The advisor organized a field day for weeds in table grapes in collaboration with another UCCE Advisor. Topics included management of herbicide resistance, sprayer calibration, and weed identification. A total of 43 people attended the meeting and 25 filled out the post-meeting survey. (Reported by Joy Hollingsworth; collaborator mentioned: Jorge Angeles)

A UCCE Local Food Systems Advisor provided one-on-one technical assistance and training for Central Sierra growers on managing endemic and invasive insects and diseases, especially powdery management in wine grapes and vertebrate pest management in orchards. (Hardeep Singh)

A UCCE Human-Wildlife Interactions Advisor conducted research and outreach on attracting insect-eating songbirds to vineyards as an Integrated Pest Management strategy that could reduce pesticide-use. The advisor led a collaborative team that studied nest box occupancy, songbird foraging patterns, diet, and insect presence on 20 farms with high and low levels of semi- natural habitat in the surrounding landscape. Overall, the team found positive impacts from bird diet and foraging behavior. Additionally, the team found factors associated with nest box placement that resulted in increased use by songbirds. In collaboration with the Wild Farm Alliance, the team shared findings with a wide range of producers and stakeholder groups at six events in varying formats, including a webinar, tailgate breakfasts, and a farm field day. The advisor delivered the results of this work in eight additional presentations via the UC IPM webinar and other regional in-person events. (Breanna Martinico)

A UCCE Viticulture Advisor continued a network-based approach to learning that actively involves stakeholders in the creation and dissemination of knowledge. The advisor and collaborators developed the trained use of Artificial Intelligence (AI) as an investigative tool to quickly assess visual symptoms associated with grapevine leafroll and red blotch diseases, demonstrating an 87% accuracy under field conditions. They also supported the use of loop mediated isothermal amplification for grapevine red blotch virus (LAMP-GRBV) by grape growers in California and developed a new sampling methodology using trunk cambium. The methodology was extended to 66 professionals in the viticulture industry. Additionally, they continued the crop oil program, which reduced leafhopper densities, mitigated feeding and crop damage, and allowed vineyards to maintain their organic certification while protecting natural enemies from disruptive pyrethroid applications. (Monica Cooper)

A UCCE Diversified Farming Advisor for Lake and Mendocino Counties conducted applied research on walnut leaf mulch as a low-input strategy for weed management. (Clebson Gonclaves)

As a result of UC ANR research, outreach, and education, participants learned and adopted practices that increased agriculture efficiency and profitability in viticulture and orchard systems. Outcomes with specific measured indicators follow.

**Outcomes**

**Participants gained knowledge of and intended to adopt recommended detection and control practices for invasive and endemic pests and diseases.**

* After attending a field day for weeds in table grapes, 96% of the responses indicated that the program met expectations and that they learned something new, and 92% intended to use something that they learned in the next 12 months. (Joy Hollingsworth)
* Ten professionals in the viticulture industry reported that they perceived LAMP-GRBV as a highly useful tool that can be implemented at moderate cost with a relatively short training period to proficiency. (Monica Cooper)
* Among users of the AI-trained investigative tool for diagnosing grapevine leafroll and red blotch disease, 77% reported being satisfied to very satisfied with the user experience, speed and accuracy of the prototype application and noted that it is a “great resource for scouting and a valuable tool to support farming decisions such as roguing.” (Monica Cooper)
* As a result of the one-on-one consultations, five individuals responsible for pest management learned and intended to adopt the recommended practices for identification and control of insect pests according to UC IPM guidelines. (Hardeep Singh)
* After attending the Calaveras Wine Grape Alliance Grower meeting focused on Grapevine Powdery Mildew Management, 100% (n=12) of the attendees said that they will recommend this meeting to others. Additionally, 87% of the attendees learned new information at this meeting and the remaining 13 % learned somewhat new information. (Hardeep Singh)

**Participants adopted recommended treatment and management practices for invasive and endemic pests and diseases.**

* As a result of one-on-one technical assistance from a UCCE advisor, two wine grape growers adopted the UC IPM guidelines for management of powdery mildew and thrips; and one olive grower adopted UC IPM recommendations to control endemic and invasive pests and diseases. (Hardeep Singh)
* After working with a prominent vineyard in Napa to implement a songbird nest box network, UCCE heard others talking about the success and how it has informed their decision to adopt these practices. Overall, the project is instrumental in providing new data-driven management recommendations to guide pest management decisions in vineyards, a crop that is worth over $1.2 billion covering 46,000 acres in Napa County. (Breanna Martinico)

**Science-based information was applied to integrated pest management policy and decision-making.**

* As a result of biological testing by the UCCE-led CCPP, 61 new citrus introductions from three different countries were released from quarantine. The CCPP's diagnostic services support California's Citrus Nursery Stock Pest Cleanliness Program allowing nurseries to produce and sell healthy trees under CDFA regulations. (Georgios Vidalakis)
* During this review period, the UCCE-led CCPP introduced four citrus varieties into California that hold special cultural or religious significance for various communities in the state. (Georgios Vidalakis)
* As a result of UCCE-led CCPP research and extension activities, 23 different citrus accessions from breeding programs in Florida were made available to California citrus researchers working on Huanglongbing (HLB) and other citrus-related projects. This marks the first time since the 2005 HLB epidemic that such materials have become accessible in California in these quantities and with this regularity. (Georgios Vidalakis)
* UCCE research and diagnostic testing led to the discovery of a new and invasive disease in almonds, “red leaf blotch.” The disease has been observed in Fresno, Madera, Merced, San Joaquin, and Stanislaus Counties, indicating it is widespread in the Northern San Joaquin Valley. Following field sampling as well as morphological and DNA/PCR analyses, the laboratory at Kearney REC confirmed the detection of *P. amygdalinum* from symptomatic leaves. This is the first detection of *P. amygdalinum* from California almond, and the pest has formally been confirmed as being present in the state by both CDFA and the USDA. UCCE is now working with the almond board of California to address this disease problem through research and extension efforts. (Florent Trouillas)

**Change in condition: Participants have economic benefits.**

* UCCE and UC IPM contributed to an estimated $4.5 million increase in grower income due to less insect damage from 2023 to 2024. In 2023, processor reports showed a $10 million crop loss in almonds, with, conservatively, an additional $10 million loss in the field. As of November 1, 2024, processor reports showed almond damage down by more than half, from 5% in 2023 to 2% in 2024. If the 2024 was as large as the 2023 crop, this would equate to $4.5 million increase in grower income. (Franz Niederholzer)
* At one ranch, use of crop oils resulted in $20,000 annual savings in pesticide application costs. (Monica Cooper)
* Based on the results from the UCCE study, small-scale walnut growers in Lake County have successfully implemented walnut leaf mulch for weed management. In organic farming systems, growers have reported a reduction in one or two mowings in the tree rows, saving $36 per acre, per time. Rows are mowed four or five times per season. Growers have also reported benefits in conventional farming systems by reducing the number of herbicide applications or even adopting spot applications, resulting in an approximate savings of $9 per acre, per spray, based on the walnut cost study. (Clebson Gonclaves)

The measured outcomes reported above can improve the state’s ability to prevent, control, and mitigate pests and diseases and create new opportunities for economic sustainability. For example, using mating disruption to reduce navel orangeworm increased the crop value in almonds by more than $250 per acre, which is more than twice the cost of using the technique. In these ways, UC ANR contributes to increased agricultural efficiency and profitability and the public value of promoting economic prosperity in California.

Condition Change: UC ANR contributed to increased agricultural and forestry efficiency and profitability

**Endemic and Invasive Pests and Diseases - In Row Crops**

**Issue**

In agricultural systems, pests reduce yields, render crops unmarketable, and negatively impact revenues. For example, beet leafhopper (BLH) is one of the damaging insects to California's processing tomatoes, mainly because of the transmission of beet curly top virus (BCTV). BCTV-infected tomato plants usually die, and there is no effective treatment for this virus. Entire fields can be lost to BCTV in its worst years. (Zheng Wang) Furthermore, California organic sales have increased by 18.2 percent from $9.4 billion in 2018 to $11.1 billion in 2022, and organic growers face pest problems that are barriers to growth. (Margaret Lloyd) Science-based information is needed for growers, managers, and policymakers to develop practices and policies that sustain economic vitality while protecting environmental quality.

**Methods**

UC ANR conducts research and partners with public, governmental, and private groups to extend new knowledge and develop integrated pest management plans to increase agriculture efficiency and profitability.

UC Cooperative Extension (UCCE) Nematology Specialists at UC Riverside conducted research on how to protect vegetable crops from plant-parasitic nematodes. In California, nematode-caused crop damage exceeds $1.8 billion per year. Both conventional and organic crop production in California face considerable nematode problems, especially with several root-knot nematode species, and new methods to protect crops are urgently needed. To this end, the specialists research new, practical, and safe strategies for managing nematodes. This includes developing and testing commercial products. Several new contact nematicides that feature different modes of action than previous generations of contact nematicides have a very low acute mammalian toxicity and little impact on non-target organisms. The specialists and collaborators showed good to excellent activity of the new nematicides against root-knot nematodes in California carrot and tomato field trials. (Jorn Ole Becker, Antoon Ploeg)

A UC Cooperative Extension (UCCE) Specialist at UC Davis works with growers, Pest Control Advisers (PCAs), and pest control operators (PCOs) to manage plant parasitic nematodes in California’s field crops, viticulture, and orchard systems. In an effort to develop safer methods for managing plant parasitic nematodes, the Specialist conducted replicated field trials at various research sites, including the UC South Coast Research and Extension Center (REC), Desert REC, and the Kern County Shafter Research Station. Over 100 potential new nematicides were field tested against plant-parasitic nematodes. These new products were evaluated in comparison to an untreated control group and a standard fumigant treatment, contributing to a robust dataset for decision-making. (Becky Westerdahl)

A UCCE Plant Pathology Specialist at UC Riverside researches the biology and management of vegetable and strawberry diseases. Information is shared with clientele through multiple avenues. In 2024, the specialist led the Fusarium Wilt of Lettuce Cultivar Trial Field Day, which was attended by 130 participants, including growers, seed companies, and commodity organizations. (Alex Putman, Yu-Chen Wang, Chris Greer)

A UCCE Advisor in the Central Coast continued to investigate chemical and non-chemical alternatives to the now banned methyl bromide pre-plant fumigant for strawberries and caneberries. Research findings were shared with industry clientele via presentations, in field consultations, hand in hand coordination with the local agriculture commissioners. (Mark Bolda)

A UCCE Vegetable Crops Advisor in Fresno County works with growers to identify and manage pests and diseases impacting tomato, garlic, melon and other vegetable crops. Operating out of the UC West Side Research and Extension Center (REC), the advisor diagnosed more than 420 issues in crop production that may result in spread of plant diseases. Additionally, the advisor undertook a comprehensive research project on managing tomato spotted wilt virus (TSWV), which included general epidemiological approaches, vector (thrips) biology, thrips control comparisons, virus genetics, and relative susceptibility of commercial varieties. Results were subsequently extended to clientele. (Tom Turini)

The same UCCE Vegetable Crops Advisor evaluated methods for reducing the transmission of plant viruses through beet leafhoppers. In replicated field trials, the advisor demonstrated neonicotinoid insecticide treatments made through the buried drip or cyantraniliprole (Verimark) treatment of transplants resulted in an average processing tomato yield increase of 32% under moderately high beet curly top virus pressure. Results were subsequently extended to clientele. (Tom Turini)

A UCCE Small Farms Advisor in Santa Clara County continued to identify or develop research-based information for pest management in peppers and specialty Asian leafy vegetables and extend research-based information on the safe handling and use of pesticides labeled for application on these crops to farmers. Educational materials were developed in Chinese, English, and Spanish and extended via seminars, workshops, and technical assistance. In 2024, workshops included Weed Management in Organic Production Systems, Management of Soil-Borne Strawberry Pathogens in Organic Production Systems, and Impact of Root Leachate Treatments on Beneficial Nematodes and Plant Growth in Organic Production Systems. (Aparna Gazula)

A UCCE Vegetable Crops Advisor conducted research on managing nematodes in vegetables crops, including bell peppers, carrots, cucurbits, tomatoes, okra, eggplants, artichokes, and beans in southern desert valleys. Findings from research have been shared through field days, clientele meetings, extension newsletters, and other extension outreach. (Philip Waisen)

Another UCCE Vegetable Crops Advisor conducted applied research on the economic benefit to grafted watermelon growers from adopting biofungicides as an alternative to widely used soil fumigation. Most fumigants used pose significant risks of air contamination, skin and eye irritation, maternal toxicity, and soil and water pollution. In contrast to the risks of applying conventional fumigants, using soil-derived microbial biofungicides can diversify soil beneficial microbial communities, avoid hazardous by-products, reduce leaching to groundwater systems, minimize volatilization, and prevent soil-borne fungal pathogens. (Zheng Wang)

A UCCE Specialty Crops Advisor for Sonoma, Marin, and Napa Counties conducts applied research projects and extension on high-impact pests, including symphylans or garden centipedes. Symphylans were the most common and economically damaging insect pest reported by vegetable growers in the North Bay Area in 2023. Since then, the advisor provided IPM assistance to 48 growers, hosted Symphylans Focus Groups, hosted a webinar with entomologists, recorded a Symphylans IPM presentation with local examples, and hosted an on-farm Symphylans Field Day. (Reported by Ellie Andrews; collaborators mentioned: Amanda Hodson)

A UCCE Vegetables Crops Advisor conducts applied research and extension activities related to monitoring and historic and emergent threats to crops. The advisor communicates broad trends and new developments to clientele through farm visits, newsletters, field days, a blog, and regular conversations. Surveys conducted by the advisor in collaboration with plant pathology faculty at UC Davis led to the identification of a new locally-evolved resistance-breaking strain of tomato spotted wilt virus (TSWV). In turn, the advisor followed up with concerned growers through three in-depth consultations on how to manage unfamiliar plant diseases. (Reported by Patricia Lazicki; collaborator mentioned: Robert Gilbertson)

A UCCE Entomology Advisor in Ventura County develops science-based sustainable pest management programs for regional crops and managed systems that are environmentally sustainable and protect human well-being. In the past year, the advisor contributed to 16 events (workshops, lectures, field days, etc.) related to sustainable pest management of crops such as citrus, avocado, and cabbage, reaching over 700 participants. (Hamutahl Cohen)

As a result of UC ANR research, outreach, and education, participants learned and adopted practices that increased agriculture efficiency and profitability in vegetable and agronomy crops. Outcomes with specific measured indicators follow.

**Outcomes**

**Participants gained knowledge of detection and control practices for invasive and endemic pests and diseases.**

* After attending the Fusarium Wilt of Lettuce Cultivar Trial Field Day, 77% of the 30 participants who completed a post-event survey reported that they acquired new insights into disease management. Additionally, 60% of survey respondents said they certainly intend to, and 27% may intend to, adopt the information provided. (Alex Putman, Yu-Chen Wang, Chris Greer)
* UCCE followed up with 38 growers and pest management professionals, who attended sustainable pest management events. The 38 respondents are responsible for managing a total of 15,200 acres of production in Ventura. One hundred percent of participants reported agreement or strong agreement that the event they attended increased their understanding of the target pest ecology and control. As a result of attending a workshop, 95% of participants agreed or strongly agreed that they intended to utilize a combination of methods (monitoring, mechanical, cultural, biological, chemical) to control the pest, rather than just one method. Ninety-five percent of participants agreed or strongly agreed that they understood how to protect beneficial insects such as predators, parasitoids, and pollinators while controlling pests. (Hamutahl Cohen)
* After attending a presentation on managing symphylans, 100% (*n*=14) of respondents reported increased knowledge of symphylan IPM, which they will use to make more informed decisions. (Ellie Andrews)
* As a result of attending a UCCE Small Farm Advisor’s workshops and seminars, growers’ knowledge about how to prevent, control, and mitigate pests and diseases increased:
  + Weed management on small farms/organic systems seminar: 24 organic small farmers increased their knowledge of weed management, and 21 intend to adopt one or more weed control strategies that were discussed.
  + Impact of Root Leachate Treatments on Beneficial Nematodes and Plant Growth in Organic Production Systems seminar: 10 organic small farmers increased their knowledge of soil-borne pathogen management and intend to adopt one or more control strategies that were discussed.
  + Management of Soil-borne Strawberry Pathogens with Organic Production System seminar: 13 organic small farmers increased their knowledge of soil borne disease management, and 11 intend to adopt one or more control strategies that were discussed. (Aparna Gazula)

**Participants adopted recommended treatment and management practices for invasive and endemic pests and diseases.**

* In Fresno and Kings Counties, UCCE recommended IPM strategies for managing tomato spotted wilt virus have been adopted on at least 70% of processing tomatoes. If these approaches, on average, avoid 2% crop loss on 70% of the acreage, then the gross benefit of the IPM program exceeds $27 million only in Fresno County. (Tom Turini)
* UCCE recommendations to manage beet leafhoppers and the plant diseases they transmit have been widely adopted in Kings County. Based on the highest risk areas in the county, the approach results in an annual economic benefit of over $3.5 million under moderate-high disease pressure over a 2,000-acre production area at prices and average yields in the 2022 Kings County Ag Commissioner’s Crop Production Report. (Tom Turini)
* By following UCCE recommendations on nematicides, a melon grower successfully managed root-knot nematodes on 23 acres of melon without impacting the yield. (Philip Waisen)
* Adopting UCCE recommendations, a small okra grower integrated compost and Velum nematicide to successfully manage root-knot nematode. The same okra grower established two acres with brown mustard cover crop as a pre-plant approach to manage the nematode through biofumigation, minimizing the need to apply nematicide at planting and in-season. (Philip Waisen)
* UCCE’s efforts have resulted in identifying a realistic alternative to berry fumigants on the central coast. Adoption of metam potassium (KPAM) has occurred on several hundred acres. Applied research, extension, and coordination with regulators will continue to identify viable, efficacious, and economically feasible options for an approaching post-fumigant berry industry. (Mark Bolda)

**Science-based information was applied to integrated pest management policy and decision-making.**

* As a result of a UCCE research on nematicides for managing plant parasitic nematodes, the California Department of Pesticide Regulation (CDPR) approved the registration of four new organic nematicides for use by California growers: DiTera, Majestene, Melocon, and Nema-Q. (Becky Westerdahl)
* As a result of UCCE research on nematicides in processing tomatoes and other vegetable crops, the Federal Environmental Protection Agency (EPA) registered three nematicides in various crops. (Jorn Ole Becker)

**Change in condition: Participants saved money.**

* Growers adopted UCCE’s recommendation to request greenhouses apply the biofungicides to watermelon transplants on 824 acres of watermelons, potentially saving those growers up to $824,000, according to UCCE’s research that found this alternative to soil fumigation could save watermelon growers up to $1,000 per acre. (Zheng Wang)

**Change in condition: Reduced pest incidence.**

* After adopting UCCE recommendation to inspect, assess risks, and improve sanitation methods at facilities for transplanting melons, the melon industry in Fresno County has not experienced any greenhouse losses due to Thielaviopsis black root rot, which previously had caused an estimated $60,000 in losses per season. (Tom Turini)
* Following an in-depth UCCE consultation on TSWV, a grower observed reduced incidence of TSWV on processing tomatoes this year. The grower had been working with his neighbors on a UCCE-recommended coordinated spray strategy for thrips, which vector TSWV. Together, these farms represent around 4500 acres of processing tomatoes. (Patricia Lazicki)

The measured outcomes reported above improved the state’s ability to prevent, control, and mitigate pests and diseases and created new opportunities for economic sustainability. For example, according to the evidence collected by UCCE Advisors, field fumigation can cost more than $2,500 per acre with the risks of agriculture-related health issues. In these ways, UC ANR contributes to increased agricultural efficiency and profitability and the public value of promoting economic prosperity in California.

Condition Change: UC ANR contributed to increased agricultural and forestry efficiency and profitability

**Endemic and Invasive Pests and Diseases - In Agronomy**

**Issue**

In agronomic systems, pests reduce yields, render crops unmarketable, and negatively impact revenues. To be profitable, rice growers and agronomic crop producers need to maximize yields and grain quality while trying to minimize costs. California rice is one of the most productive rice systems in the world and is well known for its excellent grain quality. (Luis Espino) Insect pests, weeds, and plant diseases threaten that quality. Science-based information is needed for growers, managers, and policymakers to develop practices and policies that sustain economic vitality while protecting environmental quality.

**Methods**

UC ANR conducts research and partners with public, governmental, and private groups to extend new knowledge and develop integrated pest management plans to increase agriculture efficiency and profitability.

A UCCE Advisor in Butte and Glenn Counties conducted studies and outreach to improve management of diseases impacting rice, including stem rot, aggregate sheath spot, kernel smut, bakanae, and blast. Activities included running rice variety trials, which allows growers to make informed decisions about the varieties that will work best for their location. (Luis Espino)

In Fresno and Kings Counties, a UCCE Agronomy and Nutrient Management Farm Advisor conducted applied research on new and existing pest management tools such as crop improvement, pest monitoring methods, pest management decision making, and pesticide use in small grain cereals, dry beans, and the safflower-cotton agroecosystem. The advisor conducted extension activities to reach clientele, including field days at the Kearney Research and Extension Center (REC). (Nick Clark)

A UCCE Weed Ecology & Cropping Systems Advisor serving Lassen, Modoc, Plumas and Sierra Counties worked with AES faculty and colleagues on studies that provide growers information they need to strategically choose crop varieties. Projects included breeding alfalfa for the horse market, assessing benefits of non-toxic endophyte in tall fescue, and evaluating 80 varieties of irrigated grasses in relation to persistence, yield, and livestock preference. The advisor also supports clientele to adopt IPM strategies to manage grasshoppers. Information is shared with clientele through field days, local agronomic workshops, educational materials, and newsletters. (Thomas Getts; collaborators mentioned: Charlie Brummer)

A UCCE Rice Systems Farm Advisor for Colusa County researched pest management in rice and shared findings and updated guidance with rice growers and pest control advisors through extension activities. In 2024, the advisor helped organize the Rice Pest Management Course. (Sarah Marsh Janish)

A UCCE Farm Advisor conducts research and extension to support agronomic crop production in the Delta. In collaboration with another UCCE Farm Advisor and a UCCE Specialist, the advisor developed creative activities in armyworm monitoring and herbicide evaluations as well as extended information to growers through newsletters and presentations. (Reported by Michelle Leinfelder-Miles; collaborators mentioned: Luis Espino, Kassim Al-Khatib)

As a result of UC ANR research, outreach, and education, participants learned and adopted practices that increased agriculture efficiency and profitability in vegetable and agronomy crops. Outcomes with specific measured indicators follow.

**Outcomes**

**Participants gained knowledge of detection and control practices for invasive and endemic pests and diseases.**

* After participating in the 2024 Dry Bean Field at Kearney REC, 100% of post-survey respondents (n=6) indicated they found information presented on choosing improved varieties of garbanzos and blackeye cowpeas — including for pest and disease management — useful, and 100% stated they would use information they learned in their work within a year. (Nick Clark)
* Of 25 respondents at the 2024 Kearney Field Crops and Alfalfa Field Day, 96% indicated they learned something new regarding the use of new insecticides for control of safflower pests, and 79% of them agreed they intended to use this new information in their work within a year. (Nick Clark)
* After completing the Rice Pest Management Course, participants demonstrated that they were able to identify broadleaf and sedge weeds accurately. (Sarah Marsh Janish)
* After participating in extension activities related to armyworm monitoring and management, 19 out of 23 clientele reported learning useful information, and ten of them intended to use that information over the next year. (Michelle Leinfelder-Miles)

**Participants adopted prevention and detection practices for invasive and endemic pests and diseases.**

* Following UCCE extension guidelines, growers in three valleys have started to use IPM practices to monitor their fields for grasshoppers in the spring and evaluate economic thresholds. (Thomas Getts)

**Participants adopted recommended treatment and management practices for invasive and endemic pests and diseases.**

* Approximately 95% of California’s rice acreage is planted with varieties that have been evaluated in UCCE variety trials, indicating very high levels of adoption of improved varieties. By choosing the right variety, growers maintain high productivity. (Luis Espino)
* Initial results from the irrigated grass variety trials have been used to guide the species selection by two growers planting 100 acres of pasture. (Thomas Getts)
* Alfalfa growers, especially smaller products, have modified their weed control formulas based on UCCE research on the pros and cons for alternative chemistries to paraquat. (Thomas Getts)

**Science-based information was applied to integrated pest management policy and decision-making.**

* Based on results from UCCE rice variety trials, two new rice varieties were released, M-521, a medium grain, and Calhikari-203, a premium short grain. These varieties are anticipated to be planted in 2% of the acreage. (Luis Espino)

The measured outcomes reported above improved the state’s ability to prevent, control, and mitigate pests and diseases and created new opportunities for economic sustainability. In these ways, UC ANR contributes to increased agricultural efficiency and profitability and the public value of promoting economic prosperity in California.

## Condition Change: UC ANR contributed to increased emerging food economies and markets

**Issue**

The state's agricultural sector is vibrant and diverse, producing more than 400 commodities. For many of these specialty crops, California is often the nation's major producer. Although California already has the most diverse agriculture in the nation, the search for new opportunities responds to ongoing challenges and does not stop. The agricultural sector's economic viability faces uncertainty at the individual farm, industry, and global levels. Competition based on price and quality requires all commodity groups and farmers and ranchers to continually innovate to stay abreast of market forces. Emerging technologies including robotics can provide new solutions to on-farm challenges. Small-scale and limited resource producers are more exposed to risks and susceptible to failure, thus needing different market opportunities and small-farm applications for new technologies.

**Methods**

UC ANR develops new scientific knowledge and extended science-based information that helps create new food products and market opportunities.

The UC Sustainable Research and Education Program (UC SAREP) team collaboratively co-led four workshops on best practices for harvesting and processing elderberries. This specialty crop is becoming more widely grown in California. Registration and waitlists for all four workshops totaled 133 individuals, indicating strong interest in the topic. They also developed four guides and accompanying videos on best practices related to harvesting, post-harvest handling, drying, and freezing elderberry fruit. (Erin DiCaprio and Gwenael Engelskirchen)

The UC Cooperative Extension (UCCE) Organic Materials Management in Agri-Food Systems Advisor engages in collaborative applied research and community outreach activities to develop innovative solutions for redirecting organic materials away from landfills and repurpose them for alternative uses, such as soil amendments and bioenergy production. Through meetings and discussions with various stakeholders, the advisor gathered key insights regarding the current practices and knowledge gaps in organic waste management. (Michael Cohen)

The UCCE Urban Agriculture Technology Area Advisor working in Southern California increased extension to groups associated with agriculture technology, entrepreneurial groups, urban climate resilience urban growers, and schools utilizing freight container farming. The advisor worked with the Second Harvest Harvest Food Bank of Orange County to introduce hydroponics and develop the potential for their farming system to support faster and larger plant growth compared to the current methodology, and that would conserve water by over 90% compared to their existing method. (Grant Johnson)

The unique local climate on the North Coast offers opportunities for expansion of niche crops, yet the geographic isolation creates higher costs of production and transport. Applied, local research aims to increase the diversity and volume of specialty crops grown in the region and studies practices to improve soil health, while addressing grower concerns about the applicability of research from regions outside maritime Humboldt and Del Norte Counties. The program explores opportunities to both reduce food imports into the region by expanding sales in local markets and identifying high value products that may have a comparative advantage for sales outside the region. This work has involved on-farm collaboration with six local farmers. Workshops on cropping systems and business tools focus on helping growers expand sales into new markets. One study assesses winter cauliflower as a novel crop for Humboldt and Del Norte Counties. Another project, in collaboration with a Natural Resources Conservation Service (NRCS) agronomist, pursued under-sowing clover in fall broccoli as a tool to increase cover crop acreage and as an adaptive management practice that participating growers can be reimbursed for through their conservation contracts. (Eddie Tanner)

A UCCE Vegetable Crops Advisor working on potato variety trials organized the Kern County Potato Variety field day, which was attended by 43 people, including growers, pest control advisers, and breeders, representing 99% of the potato industry from the county as well as producers from San Joaquin County, and breeders from private industry from different parts of the country. The participants were provided with an opportunity to evaluate the new varieties and their potential for adoption in Kern County and statewide as well. (Jaspreet Sidhu)

As a result of UC ANR research and extension, participants utilized research-based information on emerging food economies and markets. Outcomes with specific indicators follow.

**Outcomes**

**Participants learned about or were more likely to try out new market opportunities.**

* Participants indicated stronger intent to adopt or engage with various elderberry processes, including making value-added products, freezing, drying, growing, and selling. In 2022, elderberry was the #2 selling herbal supplements in the U.S. mainstream market with over $200 million in sales (Smith et al., 2024), indicating the crop’s potential to increase emerging food economies and markets, as well as enhance community economic development. (Gwenael Engelskirchen)
* Evaluations of the North Coast workshops to aid growers in reaching new markets demonstrated learning gains:
  + Scaling for Wholesale workshop (33 participants) – 87% reported greatly improved knowledge
  + Fund Your Farm workshop (58 participants) – 90% reported greatly improved knowledge
  + Invest in Your Farm workshop (16 participants) – 94% reported greatly improved knowledge (Eddie Tanner)
* The field day on winter cauliflower as a novel crop resulted in 90% of survey respondents reporting greatly improved knowledge, and 30% saying that they were very likely to implement what they learned. (Eddie Tanner)
* A post-evaluation survey received responses from 23 participants: 78% indicated the UCCE Potato Field Day improved their knowledge and decision-making about new varieties; and 60% expressed that they will adopt the new and improved varieties assessed in the Kern County potato variety trials. (Jaspreet Sidhu)

**Participants are trying out emerging food system strategies. NEW** (note: previous common measure was trying out new market opportunities)

* The UCCE collaboration with Second Harvest Harvest Food Bank of Orange County has been successful in advancing understanding of urban farming. They adopted a proper layout for their entire Founder's Farm and installed an irrigation system using UCCE’s specifications, which will both conserve water and save labor. Additional work is underway to increase use of hydroponics for their operation, which will improve workforce competency and novel urban growing techniques. (Johnson Grant)
* One grower is utilizing the novel adaptive management practice and is reimbursed for through the NRCS’s conservation contracts. (Eddie Tanner)
* One farmer has now tripled his winter cauliflower production to two acres. (Eddie Tanner)

**Science-based information was applied to agricultural markets policy and decision-making.**

* The organic waste management needs assessment led to a change in statewide policy. When the UCCE advisor learned from the owner of a worm farm that vermicompost did not receive procurement credit under SB1383 rules, he discussed the situation with the County of Santa Clara Recycling Waste Reduction, which then added vermicompost as a credited material under the AB2346 bill as it was being developed. It has since become law. (Michael Cohen)

**Change in condition: Increased economic value per acre.**

* Sixty Five percent of growers reported that their economic value per acre has increased by 1% to more than 10% as a result of adopting the new varieties demonstrated at previous UCCE’s potato variety trials. This includes two cultivars Primabelle and Salinero; Salinero comprised roughly 20% of the total production by one of the large growers in the area. The trials also provide confidence to growers that the varieties have been trialed in their area and are locally adapted. (Jaspreet Sidhu)

The measured outcomes reported above helped create new market opportunities, expanding revenue sources and strengthening local food systems and emerging food economies. In this way, UC ANR helps maintain the California food system's competitive edge and the state's role as a global leader in agriculture, contributing to the public value of promoting economic prosperity in California.

# **SAFEGUARDING SUFFICIENT, SAFE, AND HEALTHY FOOD FOR ALL CALIFORNIANS**

## Condition Change: UC ANR contributed to improved food safety

**Sustainable Food Systems**

**Issue**

California is a national and global leader in food production and agricultural export. The state faces social, regulatory, economic, and environmental challenges that affect our agricultural and food systems, communities, and public health. Approximately 48 million people in the United States become ill from foodborne diseases annually, and over 40% of these cases are linked to fresh produce. (Ahmed El-Moghazy) The economic burden of these outbreaks exceeds $15.5 billion per year (USDA-ERS, 2018). To address this issue, the Food Safety Modernization Act (FSMA) established the Produce Safety Rule (PSR) in 2011, with compliance dates phased in between 2018 and 2020. However, compliance remains challenging for small-scale producers due to financial constraints, language barriers, and technical complexity. (Cuong Huu Nguyen)

**Methods**

In partnership with communities and allied organizations, UC ANR conducts research and delivers education promoting improvement in farm and food system food safety.

The UC Sustainable Research and Education Program (UC SAREP) team, working in collaboration with a UCCE Specialist in food safety at UC Davis, UCCE Modoc County, and UC Master Food Preserver Program, led four workshops on best practices for harvesting and processing elderberries. This specialty crop is becoming more widely grown in California. Registration and waitlists for all four workshops totaled 133 individuals, indicating strong interest in the topic. They also developed four guides and accompanying videos on best practices related to harvesting, post-harvest handling, drying, and freezing elderberry fruit. (Erin DiCaprio and Gwenael Engelskirchen)

A UC Cooperative Extension (UCCE) Specialist in agricultural toxicology at UC Davis provided expertise after recent wildfires to address grape buyers’ concerns about elevated metal levels in the soil of nearby vineyards. (Olukayode Jegede)

UCCE is a key partner with the federal and state government to help ensure compliance with food safety regulatory requirements for on-farm production set forth by the FDA Food Safety Modernization Act (FSMA) Produce Safety Rule. UCCE provides outreach and education on these science-based standards for the safe growing, harvesting, packing, and holding of fruits and vegetables grown for human consumption. UCCE participates in the national Produce Safety Alliance (PSA), which is a collaboration between the FDA, USDA, and universities to help fresh produce growers comply with the FSMA Produce Safety Rule. Growers are required to attend the Produce Safety Alliance Grower (PSA) Training course; at least one person in a farming operation must receive the certificate.

UCCE provides expertise in on-farm food safety and production practices for CDFA’s [California Produce Safety Technical Assistance Program, that](https://www.cdfa.ca.gov/producesafety/) specifically aims to promote the success of small-scale farmers in following safe farming practices. A UCCE Specialist in Food Safety at UC Davis provides leadership for the Produce Safety Technical Assistance Program (PSTAP). During this reporting period, PSTAP has participated in 14 workshops focused on food safety, over 450 individuals were engaged. The PSTAP provides technical assistance to growers in the application of on-farm practices and processes that align with the FSMA Produce Safety Rule. These outreach engagements totaled 493 for the reporting year. (Reported by Erin DiCaprio; collaborator mentioned: Aparna Gazula)

A UCCE Specialist in food safety located at UC Riverside participated as a trainer, along with with UC ANR colleagues, to deliver several Produce Safety Rule training courses to increase food safety knowledge and regulation compliance. There were 44 trainees, including small and large growers, as well as members from safety compliance services companies, the Labor Occupational Health Program at UC Berkeley, and the California Department of Food and Agriculture (CDFA). (Reported by Ahmed El-Moghazy; collaborators mentioned: Erin Dicaprio, Aparna Gazula, Marianna Castiaux, Thais Ramos)

In Fresno County, UCCE visited 83 growers to prepare them in the event that their farm is selected for a FSMA inspection by CDFA. In addition, 41 growers participated in an on-farm food safety day, which was conducted in collaboration with the California Alliance of Family Farms. Also, there were 14 participants for a Farmers Market Nutrition Program Workshop on Requirements for the Qualified Exemption under FSMA for Farmers Market Growers. Lastly, radio show segments titled CDFA FSMA Inspections are Happening, What to Prepare For, and our Assistance were extended on Hmong Radio. (Marianna Castiaux)

In the Inland Empire of Southern California, the UCCE Small Farms Advisor learned through a workshop and needs assessment that 83 farmers were not aware of FSMA regulations and requested training in Spanish and Korean. As a result, UCCE also conducted two FSMA Produce Safety Alliance Grower Training courses and three food safety workshops in Spanish and an additional three in Korean. UCCE translated material in Korean and Spanish and provided it to producers in the area. The Small Farms team also provides specialty crop production workshops in the desert region and comprehensive food safety technical assistance through on farm visits to producers. Eight workshops, attended by over 210 beginning and small farmers, provided hands-on learning in food safety, mushroom cultivation, microgreen production, garlic production, pomegranate production, squash production, tomato production, and soil health management. (Hung Doan)

Further south in the Imperial Valley, the UCCE Food Safety and Organic Production Area Advisor working developed a bilingual (English-Spanish) Produce Safety Rule training curriculum, created simplified technical materials using visual aids and hands-on demonstrations, and established partnerships with three community organizations to enhance outreach. The advisor conducted four Produce Safety Rule certification workshops: two in English-Spanish and two in English-Korean. These workshops trained a total of 82 participants, including mostly small and first-time farmers, and also established medium/large farmers, farmworkers, NGO representatives, and state agency personnel. (Cuong Huu Nguyen)

This advisor’s community engagement extended to tribal communities through collaboration with the National Tribal Council and Torres Martinez Desert Cahuilla Indians. Through this partnership, a residential agricultural program incorporating food safety educational sessions was implemented. This initiative established ten functional residential gardens within Tribal community areas, with 25 community members participating in educational sessions. The program's reach expanded through participation in the National Tribal Council conference in Temecula, California, where information regarding food safety programs and the UC Master Gardener Program reached over 430 attendees. (Cuong Huu Nguyen)

In addition, this UCCE advisor is working on a multi-state project investigating the occurrence of antibiotic-resistant bacteria in Imperial County's production areas. The proximity of concentrated animal feeding operations to produce cultivation sites presents significant concerns, as these facilities have been found to accelerate the development of antibiotic-resistant pathogenic bacteria. They observed differences in resistance patterns between produce types and identified various resistance mechanisms. The use of composted cow manure provided early insights into the potential transfer of antibiotic-resistant bacteria from animal agriculture to produce fields. The advisor also organized the Fall Desert Workshop, attended by 75 local growers and industry representatives, and developed a best practices guide for biological soil amendments of animal origin for use in organic production, which was distributed to 150 organic farmers in Imperial and Riverside Counties. The findings were also disseminated at the International Association for Food Protection annual meeting, reaching over 3,500 food safety professionals. (Cuong Huu Nguyen)

As a result of UC ANR research and education, participants learned about and adopted farm food safety behaviors. Outcomes with specific indicators follow.

**Outcomes**

**Participants learned and intended to adopt farm food safety behaviors.**

* The 44 attendees received a completion certificate for the FSMA Produce Safety Rule training requirement. In addition, in the post-training survey, 100% of the participants selected the option of "I am committed to implementing produce safety practices on my farm". (Ahmed El-Moghazy)
* In Fresno County, 129 growers received the certificate of completion for PSA’s Grower Training course as required by the Food Safety Modernization Act. (Marianna Castiaux)As a result of the PSTAP’s 12 PSA Grower Training courses, with 96 teaching hours in English and Hmong, 129 individuals representing 46 farms received course certificates. (Erin DiCaprio)
* Through UCCE Spanish- and Korean-language training courses, 50 producers in Southern California received certificates of completion for the Produce Safety Alliance. (Hung Doan)
* After the Produce Safety Rule (PSR) certification workshops, post-event evaluations showed that 98% (80/82) of participants intended to implement PSR practices. (Cuong Huu Nguyen)
* A retrospective pre-/post-test was used to evaluate learning outcomes in the elderberry food safety workshop. Overall, attendees increased their knowledge in seven areas of food safety best practices, including strategies for minimizing food safety risks during harvest, post-harvest, storage, and when making value-added products. (Erin DiCaprio)
* After the elderberry food safety workshops, 69% of participants said they intend to make a change to their farm, business, or home use based on something they learned. The changes include incorporating food safety practices and adopting or expanding elderberry production. Specific quotes from participants:
  + “Make my [value-added] processing more consistent, cleaner, and documented”
  + “Absolutely! want to think through SOPs, when to wash berries, and other on-farm handling”
  + “I want to plant native elderberries! As much for wildlife or me and my family”
  + “Would love to incorporate more elderberry products into our farm offerings” (Gwenael Engelskirchen)
* After the UCCE engagement with the Tribal community, all participants reported the intended implementation of acquired nutritional and food safety practices. (Cuong Huu Nguyen)

**Participants adopted on-farm food safety behaviors.**

* A follow-up with 30 organic farms six months after the Fall Desert Workshop, found 60% (18/30) had switched to treated biological soil amendments of animal origin or adjusted application timing, while 40% (12/30) reported implementing new monitoring practices for antimicrobial resistant bacteria. (Cuong Huu Nguyen)

**Science-based information was applied to farm food safety policy and decision-making.**

* UCCE toxicology expertise alleviated grape buyers' concern about the safety, contamination, and toxicity of the grapes after a recent wildfire, as demonstrated by 30% of growers being able to sell their fruits. This outcome helped to preserve market value of these vineyards in Mendocino county. (Jegede Olukayode)

**Change in condition: Increased market opportunities from food safety certification. NEW**

* Follow-up surveys with 40 Produce Safety Rule certified farmers revealed an average 7% increase in sales prices when selling to large retailers. Five farmers secured new contracts with major chains including Walmart and Kroger, resulting in an estimated $12,000 average annual revenue increase per certified farm. Overall, Produce Safety Rule certification among small-scale farmers in the two counties increased from 60% to 78%. (Cuong Huu Nguyen)
* The food safety and specialty crop workshops in the desert region contributed to the formation of a new food co-op in the region, fostering collaboration and market opportunities for local farmers. (Hung Doan)

The measured outcomes reported above demonstrate improved knowledge and skills around farm food safety practices that can decrease foodborne illness and highlight UC ANR's leadership in addressing natural events and environmental issues that impact food safety. In this way, UC ANR contributes to the public value of safeguarding sufficient, safe, and healthy food for all Californians.

Condition Change: UC ANR contributed to improved food safety

**Healthy Families and Communities**

**Issue**

California is a national and global leader in food production and agricultural exports. The state faces social, regulatory, economic, and environmental challenges that affect our agricultural and food systems, communities, and overall public health. Furthermore, the Center for Disease Control and Prevention estimates that one in six people get sick from foodborne diseases each year, including 128,000 hospitalizations and 3,000 deaths.

**Methods**

UC ANR statewide programs conduct extension activities focused on improving individual and household food safety.

UC Cooperative Extension (UCCE) academics provided oversight, leadership, and guidance for the implementation of the several statewide programs that deliver food safety education: UC 4-H Youth Development Program (UC 4-H) and Expanded Food and Nutrition Education Program (EFNEP). (UC 4-H, EFNEP)

A UCCE Specialist at UC Davis worked with collaborators at Purdue University to study common practices used when making nut-based dairy analogs and soaked nuts in the home and consumer knowledge of risks associated with these activities. This information informed laboratory studies that confirmed pathogens are capable of multiplying during the nut soaking step if soaking takes place at warm (>60°F) ambient temperatures. Implications on food safety from these studies were shared with professional audiences. (Linda Harris)

As a result of UC ANR research and education, participants learned about and adopted individual and household food safety behaviors. Outcomes with specific indicators follow.

**Outcomes**

**Participants learned about home food safety practices.**

* Of 188 UC 4-H youth who responded to the statewide Healthy Living 4-H Index Study survey, 62% reported knowing how to make healthy choices for themselves due to what they have learned from 4-H programming. (UC 4-H)

**Participants adopted home food safety practices.**

* EFNEP surveyed over 2,190 adult participants, and 84% showed improvements in one or more food safety practices, such as using safe methods to thaw frozen foods or using a meat thermometer, as a result of participating in the program. Out of 4,323 youth EFNEP participants surveyed, 56% of youth in kindergarten through grade 12 showed improvements in food safety skills and knowledge. (EFNEP) Local highlight follows:
  + In Los Angeles and Orange Counties, 87% (n=284) and 84% (n=149) of adult EFNEP participants in each county, respectively, improved in one or more food safety practices. In Los Angeles, 72% (n=1127) of youth EFNEP participants used safe food handling practices more often. (Natalie Price)

**Science-based information was applied to farm food safety policy and decision-making**

* As a result of food safety research by the UCCE Specialist and Purdue partners, the British Columbia Department of Public Health requested to have their guidance on production of plant-based cheeses reviewed, ensuring effective food safety practices were shared with the public. (Linda Harris)

These measured outcomes demonstrate improved individual and household food safety practices that can decrease foodborne illness. In this way, UC ANR contributes to the public value of safeguarding sufficient, safe, and healthy food for all Californians.

## Condition Change: UC ANR contributed to improved food security

**Healthy Families and Communities**

**Issue**

One out of ten Californians does not know where their next meal will come from. Of the 4.9 million Californians struggling with food insecurity, 1.4 million are children. Food insecurity for youth increases school absences and behavioral problems and reduces children's concentration and academic achievement. There is an ongoing need to increase participation in the CalFresh (California’s Supplemental Nutrition Assistance Program) benefits program and connect families to additional resources such as the Women, Infants, and Children (WIC), USDA's Summer Food Service Program, local government aid programs, and the broader charitable food network.

**Methods**

In partnership with communities and allied organizations, UC ANR conducts research to design and deliver educational programs that promote individual and household food budget practices and overall food security.

The CalFresh Healthy Living, UC (CFHL, UC) State Office at UC Davis provided statewide oversight, leadership, and guidance for the CalFresh Healthy Living Program. UC Cooperative Extension (UCCE) academics and CFHL, UCCE supervisors offered local leadership and guidance in program implementation and evaluation. UCCE academics also provided oversight, leadership, and guidance for the statewide Expanded Food and Nutrition Education Program (EFNEP). (CFHL, UC and EFNEP)

A UCCE Community Nutrition and Health Advisor worked with a team of advisors to develop a Food Waste Reduction Education toolkit and piloted the lesson series with a group of parents. (Natalie Price)

UCCE Advisors in Santa Clara County conducted stakeholder research and engaged over 70 nonprofits, businesses, government agencies, and existing food system collaboratives to develop the Santa Clara County Food System Workplan. The Workplan presented key findings, including a review of pandemic conditions, and offered goals, strategies, action steps, and proposed evaluation metrics to assess continued progress. UCCE continues to support the County of Santa Clara in their Workplan implementation. (Reported by: Lucy Diekmann; collaborator mentioned: Laura Vollmer)

A UCCE Advisor in Santa Clara County offered a five-part professional development series on helping ensure the Silicon Valley food system serves all community members, to 292 unique attendees from 35 organizations representing all parts of the food system. (Reported by: Lucy Diekmann; collaborator mentioned: Laura Vollmer)

NPI academics provided evidence-based research, recommendations and testimony to state elected officials and state departments in support of effective nutrition and food security policy and guidance. (Christina Hecht, Wendi Gosliner, Dania Orta- Aleman, and Monica Zuercher)

As a result of UC ANR research and extension, changes were made that lead to improved food security. Outcomes with specific indicators follow.

**Outcomes**

**Participants learned about food resource management practices**

* Participants in the Food Waste Reduction Education pilot increased their confidence in many food waste reduction skills, including storing and reheating food safety, preserving food in the refrigerator or freezer, and engaging their families in meal planning (n=40). (Natalie Price)

**Participants learned how to improve community food security.**

* Participants in the food system training were surveyed about changes to their awareness, knowledge and skills as a result of participating in the workshop series. Eighty-one percent of respondents reported an increase in knowledge on food systems and strategies for promoting community-led solutions. Participants also reported an increased awareness of others working on these issues and a desire to collaborate. (Lucy Diekmann)

**Change in condition: Participants improved food security.**

* In Alameda County, 88% of CFHL, UCCE adults surveyed improved at least one food resource management topic and 52% reported running out of food before the end of the month less often. (Alexa Erickson)
* After participating in EFNEP, 95% of adult participants in Alameda County and 90% of adult participants in Contra Costa County improved in at least one food resource management practice. (Alexa Erickson)
* In Los Angeles and Orange Counties, pre-/post- survey results of EFNEP participants showed that 61% and 43% of participants in each county, respectively, improved in at least one food security indicator. (Natalie Price)
* In Butte, Colusa, Glenn, Sutter and Yuba Counties, 79% of 230 of EFNEP participants showed improvement in one or more food security indicator (i.e., not eating less than you wanted so there was more food for your family or having enough money to get food for your family). (Veronica Van Cleave-Hunt)

**Change in condition: Improved community food security.**

* Santa Clara County has continued to implement actions outlined in the Santa Clara County Food System Workplan. A Community Advisory Committee for food system and climate resilience has been created and the county has increased its investments in local food procurement by expanding its Good Food Purchasing Program. (Lucy Diekmann)
* California elected officials utilized NPI academics’ expertise to support the passage of AB 107, a bill that secures ongoing funding for the School Meals for All Program. As a result of the passage, California schools will provide high-quality food, sustain school nutrition labor in California, and ensure free meals for all students, including for the 44% of food-insecure families in California who do not qualify for free or reduced-price meals. Massachusetts’ state legislature also used data from NPI’s research to inform their decision to adopt a permanent universal school meals program. (Christina Hecht, Wendi Gosliner, Dania Orta-Aleman, and Monica Zuercher)

These measured outcomes showed learning and behavioral changes related to food resource management and informed decision-making that can lead to food policy changes at the local and state levels. They also demonstrate how UC's network of researchers and educators participate in cross-sector collaboration to address emerging food security issues. In this way, UC ANR's efforts contribute to the public value of safeguarding sufficient, safe, and healthy food for all Californians.

Condition Change: UC ANR contributed to improved food security

**Sustainable Food Systems**

**Issue**

Food insecurity is an issue in both urban and rural areas due to lack of availability of fresh produce and/or transportation issues. One out of ten Californians does not know where their next meal will come from. Of the four million Californians struggling with food insecurity, 1.2 million are children. A UC-led study found more than 42% of UC students reported being food insecure, and the numbers for other California college students are even higher with more than 50% of Cal State students and 70% of students at California community colleges.

**Methods**

UC Master Gardener volunteers provide the public with the knowledge and skills to increase their edible gardening success, reducing food loss and fostering the opportunity for garden grown fresh produce to be distributed in local communities. Science-based horticultural information is extended through educational workshops, demonstration gardens, phone advice, Farmer’s Market booths, social media, newsletters, websites, and individual contacts. (UC Master Gardener Program)

The UC Cooperative Extension (UCCE) Vegetable Crops Advisor working in the Inland Empire of Southern California works with Torres Martinez Tribe to improve access to healthy food, knowledge of sustainable crop production, and food sovereignty. In collaboration with the tribe, the UCCE multidisciplinary team of nutrition and agriculture Advisors, with the support of a grant Advancing California Opportunities to Renew Native Health Systems, implemented and expanded several backyard garden projects, including at a Tribal senior garden and a child development center on the reservation. (Philip Waisen)

Partnering with UC Gill Tract Community Farm and UC Berkeley’s Rausser College of Natural Resources, a UCCE Specialist works to provide educational programming, food security, and food sovereignty to UC students, UC Village residents, and the surrounding community. (Jennifer Sowerwine)

As a result of UC ANR research and extension, changes were made that lead to improved food security. Outcomes with specific indicators follow.

**Outcomes**

**Change in condition: Participants improved food security.**

* Of 588 members of the public who participated in UC Master Gardener volunteer-led public education events, 51% reported that they applied gardening practices that reduced food loss in a statewide follow-up survey. (UC Master Gardener Program)

**Change in condition: Improved community food security.**

* Seventy-nine members of the public, who participated in UC Master Gardener volunteer-led educational activities with a focus on food gardening and who responded to the statewide survey, donated produce to community programs that distribute food to individuals in need of food assistance. (UC Master Gardener Program)
* The Torres Martinez Tribe’s expanded backyard gardens supplied healthy fruits and vegetables and reduced overall grocery spending in their households. In total, the backyard gardens produced up to 10 lbs of cucumbers, 5 lbs of watermelons, 20 lbs of okra, 15 lbs of squash, 20 lbs of tomato, 5 lbs of water spinach, 2 lbs of spring onions, 3 lbs of mint, 3 lb of basil, and 3 lbs of strawberry, and 20 lbs of leafy greens. The organically grown, fresh produce was shared with neighbors. In addition, citrus trees in the backyards continue to produce fresh fruit for the families. Two participating families further extended their backyard gardens with extra beds. They indicated they would continue to grow beyond the end of the project. (Philip Waisen)
* At the UC Berkeley Gill Tract Community Farm, 3,000 pounds of produce were harvested and distributed from the Farm to the community at the weekly donation-based Farm Stand and to the Bear Pantry at the UC Village, helping to reduce food insecurity among UC students and their families. (Jennifer Sowerwine)

These measured outcomes showed learning and behavioral changes related to growing practices at home and community gardens. Research shows home gardens and community gardens increase access to fresh, locally produced fruits and vegetables. These efforts also demonstrate how UC's network of researchers and educators participate in cross-sector collaboration to address food security issues. In this way, UC ANR's efforts contribute to the public value of safeguarding sufficient, safe, and healthy food for all Californians.

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# **DEVELOPING A QUALIFIED WORKFORCE FOR CALIFORNIA**

## Condition Change: UC ANR contributed to increased workforce retention and competency

**Sustainable Food Systems**

**Issue**

California requires a highly skilled workforce to remain competitive, prosperous, and an innovative global leader. A Pew Research Center study projects that U.S. job growth will increase as it has in the past 35 years in occupations that require higher levels of education, training, and experience. Technological advances have reduced manual labor in agriculture but increased the need for skilled labor. Projections for near-future retirements of people working in California's agricultural production, marketing, and post-harvest handling sectors indicate severe re-staffing needs. The California Agricultural Vision statement (2023) for the California Department of Food and Agriculture (CDFA) strongly recognizes the critical need to upskill the next generation of farmers and farmworkers. Landscape management professionals are also in need of training; California's landscaping services is a $9 billion industry.

**Methods**

UC ANR’s extensive network links campuses and communities across California to develop information and tools needed to train agricultural and landscape management professionals.

A UC Cooperative Extension (UCCE) Specialist located at UC Davis developed the California Master Beekeeper Program, which provides science-based education on beekeeping to a variety of interested clientele groups: general public, educators, youth, beekeepers, growers, pesticide applicators, etc. The program currently has 13 satellite locations throughout the state and is working on adding a couple more this coming year. In 2023-2024 the program offered over 30 in-person and on-line workshops and courses ranging in levels from Beginner Beekeeper courses to higher level topics such as queen rearing and queen instrumental insemination. (Elina Nino)

A UCCE Viticulture Advisor works to foster an agricultural workforce capable of adaptation and innovation through a nuanced understanding of knowledge dissemination and uptake. Her work is responsive to a stakeholder needs assessment: 74% of respondents identified a need for communication and collaboration skills, including effective communication (21%), negotiation (18%), positive personal attributes (14%) and leadership (4%). Trainings were delivered to viticulture professionals to improve their skills in empathy, understanding, curiosity, and transparency, as well as address how to hold difficult conversations and foster effective collaboration. (Monica Cooper)

A UCCE Soils, Water, and Subtropical Crops Advisor continued irrigation and nutrient classes in collaboration with Ventura County Farm Bureau. (Ben Faber)

The UCCE Specialty Crops and Horticulture Advisor on the North Coast is connecting beginning farmers with current research and best practices that would support their efficiency, profitability, and ecological sustainability. He developed and delivered a series of four classes to beginning farmers with 42 participants. (Eddie Tanner)

As a result of UC ANR research and extension efforts, participants learned skills and adopted strategies to improve workforce competency.

**Outcomes**

**Participants learned agricultural production management competencies.**

* During this reporting period, the California Master Beekeeper Program had 117 participants completing their level, of which there are four. Seven program participants obtained their Master certification, bringing the total to 34. They completed independent projects that addressed the following valuable issue facing California beekeepers: a pollen library with associated nutritional analysis for local pollinator-supportive plants; new portable bee courses that can be used by any bee clubs or other organizations seeking curriculum; disaster preparedness for Honey Bee removal protocol development; swarm network for connecting beekeepers; and homeowners in need of swarm removal. (Elina Nino)
* Participants in the viticulture training reported an increased ability to move stuck conversations, address difficult issues, and collaborate with their co-workers and external partners. One participant’s favorable experience with positive communication strategies led them to “adopt the mutual learning approach to inquiry and collaboration in most aspects of their professional life”. (Monica Cooper)
* An aggregate of the beginning farmer training evaluations showed knowledge gains of “greatly” increased by 88% of participants on all topics, with 97% of participants selecting “greatly” or “somewhat” increased. (Eddie Tanner)

**Participants gained agricultural production competencies.**

* As a result of completing the irrigation and nutrient classes, Ventura County growers obtained permits to irrigate. Learning how to manage salts and improve water management contributes to less runoff from fields and less disease in orchards. (Ben Faber)

The measured outcomes reported above demonstrate gains in knowledge and cutting-edge skills that increase workforce retention and competency. A [2007 World Bank study](https://openknowledge.worldbank.org/handle/10986/5990) determined the effects of agricultural education and training on agricultural productivity, including enhanced worker productivity, increased grower abilities to choose prime combinations of inputs and outputs, and increased grower capacity to innovate and adopt new technologies. (Maria de la Fuente). In this way, UC ANR contributes to increasing workforce competency and the public value of developing a qualified workforce in California.

Condition Change: UC ANR contributed to increased workforce retention and competency

**Healthy Families and Communities**

**Issue**

California requires a highly skilled workforce to remain competitive, prosperous, and an innovative global leader. A Pew Research Center study projects that U.S. job growth will increase as it has in the past 35 years in occupations that require higher levels of education, training, and experience. A qualified workforce is needed in youth education and health promotion.

**Methods**

UC ANR’s extensive network links campuses and communities across California to develop information and tools needed to train workers within educational settings and urban, agricultural, and natural resource communities.

UC Cooperative Extension (UCCE) academics provided oversight, leadership, and guidance for the statewide implementation of the UC 4-H Youth Development (UC 4-H) statewide program, which conducts research and extends new knowledge to youth development professionals. (UC 4-H) For example, UC 4-H supports the California 4-H Camping Conference, which provides teenage youth, adult volunteers, and 4-H professional staff with training, best practices, and resources for high-quality camping programs. In 2024, 139 people from 36 different counties attended the conference. (Marianne Bird, Nicole Marshall-Wheeler) A UCCE academic also convened a conference for 65 4-H professionals and created a Thriving Youth workgroup to advance applied research on the 4-H Thriving Model. (Gemma Miner)

A UCCE Community Nutrition and Health Advisor partners with local agencies and coalitions in Los Angeles and Orange County, working to coordinate efforts, cross-train partners, and seek collective solutions to food insecurity. The advisor provided training for the Orange County Health Care Agency on preserving food to prevent food waste and reduce food insecurity. (Natalie Price)

A UCCE Advisor convened the Santa Clara County Food System Alliance’s monthly meetings, bringing people from different food system sectors together to network and collaborate, and to extend knowledge and information on developing food systems. (Lucy Diekmann)

UCCE extended knowledge to 50 California Conservation Corp instructors on youth development theory and practice. Additionally, the partnership between California Conservation Corps and Environmental Stewards reached 499 youth Corpsmembers. California Conservation Corps is a workforce development program in which youth learn specialized skills and engage in one year of service. (Gemma Miner and Greg Ira)

A UCCE Youth Development Program Advisor partners with youth-serving organizations to improve youth programming. The advisor trained youth development professionals to enhance their application of positive youth development. (Sally Neas)

Nutrition Policy Institute (NPI) Academics partner with the California Department of Public Health and local health departments to evaluate CalFresh Healthy Living (CFHL) programs. Academics provide technical assistance, training, expertise, and other resources to local health departments (LHDs) to improve competencies when evaluating their activities, enabling local health departments to identify successes and areas for program growth and improvement. (Reported by: Amanda Linares, Carolyn Rider and Miranda Westfall; contributors mentioned: Summer Cortez, Janice Kao, Evan Talmage) In 2023, NPI launched the Leaders in Eating and Activity Practices (LEAP) program, recognizing 131 schools, 124 early care and education programs, and 78 out-of-school time programs across California for achieving best practices in healthy eating and active living. All 333 sites received recognition in one or more specific areas: nutrition, physical activity, gardens, or breastfeeding support. Additionally, 38 sites were awarded gold, silver, or bronze for comprehensive achievement of overall nutrition and physical activity practices. To receive a LEAP award, sites reported wellness practices on a Site-Level Assessment Questionnaire and partnered with their Local Health Department's CFHL program to plan and implement health promotion projects. These projects target a range of children's nutrition and physical activity behaviors by changing policies, systems, and the environment at schools and childcare programs. (Janice Kao, Carolyn Rider, Reka Vasicsek and Miranda Westfall)

As a result of UC ANR research and extension efforts, participants learned skills and adopted strategies to improve workforce competency.

**Outcomes**

**Participants learned about new evidence-based information to improve food systems and food security.**

* As a result of participating in the Santa Clara County Food System Alliance, 100% of members improved their ability to carry out their work by improving their understanding of the food system and building relationships and trust with other organizations. Additionally, 78% of members increased their confidence to enact food systems change. (Lucy Diekmann)
* As a result of training provided by a UCCE Advisor, 86% Orange County Health Care Agency staff participants planned to teach the information about preserving food and food waste prevention to others (n=15). Additionally, 80% of participants planned to adopt the practices they learned in the training to reduce food waste. (Natalie Price)

**Participants learned about new evidence-based information in youth education programs.**

* After attending a 4-H Cooking Academy training, Expanded Learning staff grew in their skills facilitating youth education programs: Out of 42 Expanded Learning staff, 92% percent felt confident teaching hands-on cooking activities to youth, 97% felt they knew how to utilize food safety techniques in their cooking lessons, 98% felt comfortable teaching cooking and nutrition to youth, and 90% felt confident in leading the curriculum. (Nicole Marshall-Wheeler)
* Participants of the California 4-H Camping Conference increased their knowledge of best practices, regulations and policy, program practices in camp settings, resources available in their camp role, and confidence in their camp leadership role. (Nicole Marshall-Wheeler and Marianne Bird)
* As a result of attending a conference for 4-H professionals, 83% of attendees reported having a comprehensive understanding of the 4-H Thriving Model of Positive Youth Development (Gemma Miner)
* Seventy-nine percent of California Conservation Corp (CCC) youth instructors felt most ready to incorporate team building strategies into their work with CCC members. (Gemma Miner)
* As a result of training provided by UCCE, 90% of participating youth development professionals had a better understanding of how to support positive youth development. (Sally Neas)

**Participants gained needs assessment and program evaluation competencies.**

* In a survey of 13 LHD staff, 77% reported knowing how to get answers to their impact and outcome evaluation questions, and 85% knew how to find the resources they need online. Additionally, 39% of respondents indicated that an infographic resource provided by NPI helped them design, improve, or communicate about their CFHL programming. (Amanda Linares and Miranda Westfall)
* In a survey of 10 LHD staff, 90% reported knowing how to get answers to their questions about adult nutrition education evaluation, and 80% know how to find the resources they need online. Additionally, 46% of respondents indicated that an infographic resource provided by NPI helped them design, improve, or communicate about their CFHL programming. (Amanda Linares and Miranda Westfall)
* In a survey of 29 LHD staff, 76% reported knowing how to get answers to their questions about program evaluation and reporting and 80% of 20 respondents reported knowing how to get answers to their question about using a Site-Level Assessment Questionnaire. (Miranda Westfall)
* After attending a workshop to learn how to use a Data Storytelling Toolkit provided by NPI, LHD staff responded positively, with all but one workshop participant (31 of 32 responding to the post-training evaluation) indicating that they intended to create a data story using the toolkit. Aligned with the objectives of the Toolkit, LHDs have shared that they intend to use it to gain buy-in for their programs, demonstrate program impacts, and enhance evaluation capacity. (Summer Cortez, Carolyn Rider, Evan Talmage and Miranda Westfall)
* After attending a live training on how and when to use a needs assessment tool for school districts, LHD staff were able to implement the assessment in 14 school districts across eight California counties. (Janice Kao, Carolyn Rider)
* Within six months of launching the LEAP program, two-thirds of surveyed LHDs reported utilizing the LEAP digital promotions package to promote their partners' healthy eating and physical activity interventions and 22% reported utilizing the LEAP award criteria to inform intervention planning at their partner sites. (Carolyn Rider, Reka Vasicsek and Miranda Westfall)

**Participants gained workforce competencies.**

* Four hundred ninety-nine youth received a California Naturalist certification through the partnership with California Conservation Corps. Research suggests that individuals who participate in job corps programs (Schochet et al., 2008) can experience a 12% earnings gain. Similarly, findings from a California workforce study (Rothstein et al., 2022) found evidence approaching significance that participating in youth career and training services is beneficial with quarterly employment increases for trainees by 3.8%, and quarterly earnings increase by 11.5%. (Greg Ira)

**Participants adopted recommended best practices to improve youth development programs.**

* As a result of training and technical assistance on positive youth development provided by UCCE, a Boys and Girls Club has increased youth retention and 84% of youth at a 4-H camp said they plan to return. (Sally Neas)

The measured outcomes reported above demonstrate changes in learning and improvements in participants’ professional skills. Youth development and public sector professionals learned cutting-edge skills that increase workforce retention and competency. In this way, UC ANR contributes to increasing workforce competency and the public value of developing a qualified workforce in California.

Condition Change: UC ANR contributed to increased workforce retention and competency

**Sustainable Natural Ecosystems**

**Issue**

California requires a highly skilled workforce to remain competitive, prosperous, and an innovative global leader. A Pew Research Center study projects that U.S. job growth will increase as it has in the past 35 years in occupations that require higher levels of education, training, and experience. A qualified workforce is needed to equip the next generation of working landscapes professionals.

**Methods**

UC ANR’s extensive network links campuses and communities across California to develop information and tools needed to train working landscapes professionals.

The UC Environmental Stewards Program conducts activities and training to introduce Californians to the wonders of our unique ecology and engage the public in the study and stewardship of California’s natural communities. It aims to increase knowledge, skills, identity, and self-efficacy related to California's natural history and environmental issues, increase public participation and civic engagement in environmental education, and enhance citizen science, climate adaptation, and planning toward environmental and climate justice. Each year, the program co-develops, delivers, and evaluates instructor trainings to partner organizations, who then extend the Environmental Stewards and Climate Stewards certification courses. (Greg Ira)

As a result of UC ANR research and extension efforts, participants learned skills and adopted strategies to improve workforce competency.

**Outcomes**

**Change in condition: Increased qualified workforce in environmental stewardship.**

* The Environmental Stewards Program’s Alumni Impact Survey found that 66% of respondents (n=336) indicated that their course improved their capacity to do work-for-pay. In addition, 235 alumni indicated their course also helped them find new work in a related field and 15% indicated it also helped them advance their career by being promoted or moving to a higher-level position in another job. (Greg Ira)

The measured outcomes reported above demonstrate changes in learning and improvements in how participants work. Working landscapes professionals learned cutting-edge skills that increase workforce retention and competency. In this way, UC ANR contributes to increasing workforce competency and the public value of developing a qualified workforce in California.

Condition Change: UC ANR contributed to increased workforce retention and competency

**Sustainable Natural Ecosystems**

**Issue**

California requires a highly skilled workforce to remain competitive, prosperous, and an innovative global leader. A qualified workforce is needed to equip the next generation of forest and climate workers. However, post-graduate transition into professional forestry is challenging due to rigorous education requirements (seven years of apprenticeship, or an accredited 4-year degree with 3 years of apprenticeship) and the licensing exam (30% pass rate). The profession has also historically relied on core skills training through apprenticeships, which can create difficulty in navigating the industry without a guide or insider knowledge. Rising cost of education and the seasonal nature of early career work additionally presents barriers for low-income Californians. (Ricky Satomi)

**Methods**

UC ANR’s extensive network links campuses and communities across California to develop information and tools needed to train fire, forestry, natural resources, and climate professionals.

UCCE academics and community partners have collaborated to deliver the Forestry and Natural Resources Career Mentorship Program, a statewide mentoring program aimed at training new members of the forestry and natural resources workforce. To date, the program has supported the professional development of 308 early-career professionals and students studying forestry and natural resources, including those who identify as women, nonbinary, Black, Indigenous, Latine, Asian, Pacific Islander, or LGBTQIA. This CAL FIRE supported program pairs forestry students with a professional mentor and delivers workshops related to professional development skills, career path exploration, and networking to students at all credentialed forestry programs and five community college forestry programs in the state. (Katie Low and Ricky Satomi)

A UCCE Forestry Youth Education Academic Coordinator oversaw four separate week-long professional learning events for educators in Humboldt, Shasta, El Dorado, and Tuolumne Counties. The goal of the institute is to support PreK-12 educators in becoming more literate in forestry and natural resource management concepts and associated career pathways. Sessions combined field-based learning opportunities and environmental education curriculum to certify educators in Project Learning Tree and Project Water Education Today. (Austin Roughton)

A UCCE Advisor continued to expand the capacity of the Central Coast Prescribed Burn Association to increase climate resilience, ecological sustainability of range resources, and improve management and use of land. This included providing training and technical assistance to conduct burns as well as managing consultant contracts and CAL FIRE grants. (Reported by Devii Rao; collaborator mentioned: Barb Satink Wolfson)

UCCE Advisors and an Academic Coordinator continued to deliver the Forest Stewardship workshops across the state as part of the Forest Stewardship Education Initiative which began in 2020. The goal is to extend recommended actions to private landowners and land managers to help them increase their forests’ resilience to wildfire and climate change. In the last five years, 28 nine-week workshops were attended by 549 participants across California including Lake, Amador-Calaveras, Butte, Napa, Trinity, Solano-Sacramento, Santa Clara-Santa Cruz, San Bernardino, Fresno-Madera, San Luis Obispo Counties and the Lake Tahoe Basin. An additional 26 learning sessions and field days were delivered on topics requested by workshop participants. (Reported by Kim Ingram; collaborators mentioned: Susie Kocher, Mike Jones, Yana Valachovic, Brian Woodward, and Ricky Satomi)

UCCE Forestry and Natural Resources Advisors have designed and delivered 13 Geospatial Information System (GIS) trainings to natural resource and forest practitioners throughout Northern California since 2019. These workshops address new technology that may replace traditional field tools with a particular interest in rapid post-fire severity assessments to inform recovery planning. (Reported by Ricky Satomi; collaborators mentioned: Ryan Tompkins, Mike Jones, Susie Kocher, Yana Valachovic, UC ANR’s Informatics and GIS Program)

A UCCE Academic Coordinator at UC Merced coordinated the Climate and Agricultural Science workshop for 12 students. The workshop consisted of lectures, panels, hands-on activities, team projects, and farm field tours. Topics included weather and climate, effective climate science communications; regenerative agriculture; integrated pest management; small farms operations, and climate smart agriculture. (Samuel Ikendi)

As a result of UC ANR research and extension efforts, participants learned about career opportunities and adopted strategies to improve workforce competency.

**Outcomes**

**Participants increase interest in pursuing climate and forestry careers.**

* UCCE’s California Forestry Mentorship Program increased students’ (n=308) interest in pursuing forestry careers by 42%; and 52% of participants developed professional relationships which continued after completion of the program.(Ricky Satomi)
* Climate and Agricultural Science workshop participants indicated how the workshop motivated their future aspirations via the following written feedback:
  + “I want to pursue a career in agriculture and education.”
  + “I don’t want to teach in the traditional school system. I want to create my own outdoor school that teaches horticulture and culinary.”
  + “I also want to get inner city youth more aware of agriculture and the career possibilities they have. Growing up in the Bay Area, you’re told people who work in tech are the ones who make money but you’re not taught much about agriculture.” (Samuel Ikendi)

**Participants increase adoption of modern tools.**

* As a result of UCCE’s GIS workshop trainings, natural resource and forest practitioners (n=297) increased adoption of modern tools from 6% to 93% in the last few years, which contributes to increased workforce competency. (Ricky Satomi)

**Participants increased capacity to deliver forestry curriculum to youth.**

* UCCE’s Forestry Institute for Teachers program certified 108 educators in Project Learning Tree and 99 educators in Project Water Education Today. Graduates received three university-accredited continuing education units. Thirty-six educators reported successfully implementing forestry curriculum projects with students. As a result of UC ANR research and extension efforts, participants learned skills and adopted strategies to improve workforce competency. (Austin Roughton)

**Change in condition: Increased qualified workforce in forestry and fire management.**

* The Forestry and Natural Resources Career Mentorship Program increased the entry of 120 students into the forestry workforce by 42% in the last year. (Katie Low) UCCE used
* Ripple Effect Mapping to measure outcomes of the Central Coast PBA, which included identifying seven people who either changed their career path or gained substantial professional development to increase their effectiveness in prescribed fire, due to participating in the PBA. This highlights how UCCE’s efforts increased the prescribed fire workforce. Specific examples include
  + two career transitions into forestry and natural resources careers
  + one transition to a structure and wildland firefighter career;
  + the decision retool an existing GIS business to fire-specific GIS work; and
  + two students gaining a sub-contractor position or internship doing PBA work. (Devii Rao and Barb Satink Wolfson)
* Multiple Forest Stewardship workshop participants provided qualitative data indicating increased workforce competency, as demonstrated through one quote: "The education I have received from you and your colleagues during the three workshop cohorts I have been part of, has given me some knowledge and credibility when working with agencies like Napa County and Napa Firewise." (Kim Ingram)

The measured outcomes reported above demonstrate increases in understanding of career opportunities and increased capacity of forestry and climate professionals. Participants learned cutting-edge skills that increase workforce retention and competency. In this way, UC ANR contributes to increasing workforce competency and the public value of developing a qualified workforce in California.

Condition Change: UC ANR contributed to increased workforce retention and competency

**Endemic and Invasive Pests and Diseases**

**Issue**

California requires a highly skilled workforce to remain a competitive, prosperous, and innovative global leader. A Pew Research Center study projects that U.S. job growth will increase as it has in the past 35 years in occupations that require higher levels of education, training, and experience. Technological advances have reduced manual labor in agriculture but increased the need for skilled labor. Projections for near-future retirements of people working in California's agricultural production, marketing, and post-harvest handling sectors indicate severe re-staffing needs. The California Agricultural Vision statement (2017) of the California Department of Food and Agriculture (CDFA) strongly recognizes the critical need to equip the next generation of agricultural workers. Landscape management professionals are also in need of training; California's landscaping services is a $9 billion industry.

**Methods**

UC ANR’s extensive network links campuses and communities across California to develop and extend integrated pest management (IPM) information and tools to train farmers and pest management professionals.

A UC Cooperative Extension (UCCE) Academic Coordinator leads the UC IPM Pesticide Safety Education Program (PSEP), which serves pesticide users in the state in California, specially licensed, professional pesticide applicators and private applicators (growers), who apply restricted materials and pesticides of general use through both direct and train-the-trainer educational opportunities. In 2024, PSEP provided 18, full-day workshops, to certify participants to train fieldworkers and handlers in required annual pesticide safety training. Workshops were delivered in English (n=10) and Spanish (n=8). Two were presented in person for collaborative projects with UC Davis Environmental Health & Safety and the Center for Land Based Learning. (Jasmin Patricia Ramirez-Strain)

A UCCE Specialist located at the UC ANR Kearney Agricultural Research and Extension Center (REC) promoted best practices for pesticide spray applications to enhance efficiency, effectiveness, and environmental sustainability of critical crop protection efforts against pests and diseases in the San Joaquin Valley, which has over 24 million acres of farm in operation. The specialist organized and delivered multiple trainings and presentations, including at the Weed School for Table Grapes (28 participants), the 2024 San Diego County Vineyard Day (35 participants), Stanislaus Tree and Vine IPM Breakfast Meeting (45 participants), and 2024 Stanislaus Department of Agriculture Continuing Education program (27 participants). (Reported by Peter Larbi)

The UCCE Specialist also organized and delivered Citrus Spray Decision Support Workshops. There were 10 participants, which included growers, applicators/operators, pest control advisors, certified crop advisors, regulators, policymakers, scientists, and others. As part of the training, participants were introduced to the UCCE-developed Airblast Spray Advisor web app. (Reported by Peter Larbi; collaborators mentioned: Christian Becerra, Geoffrey Shimotsu)

A UCCE Specialist at UC Davis provided presentations on the management of plant parasitic nematodes for pest management professionals. Participants’ mastery of content areas was assessed through an end of training test. They received one hour of continuing education credits, which are necessary to maintain their Agricultural Pest Control Advisor (PCA) licenses with the California Department of Pesticide Regulation. (Becky Westerdahl)

A UCCE Human-Wildlife Interactions Advisor hosted the 17th bi-annual West Coast Rodent Academy in collaboration with the California Pest Management Association, Target Specialty Products, and Veseris. Held at the South Coast REC in Irvine, this three-day workshop provided in-depth training on rodent ecology and IPM for 45 participants from diverse backgrounds in the pest control industry. Led by the UCCE Advisor, industry experts shared practical skills and the latest research on rodent behavior, disease, trapping, and rodenticide impacts. (Niamh Quinn)

A collaborative team from UCCE partnered with SoCal Edison to train staff and contractors to identify Goldspotted Oak Borer infestations and trigger swift response, demonstrating enhanced workforce capacity to combat invasive species and protect California's forests. The Goldspotted Oak Borer primarily targets coast live oaks, California black oaks, and canyon live oaks. The decline of these iconic trees disrupts natural habitats and negatively impacts local economies that rely on healthy forests for recreation, tourism, and timber resources. As new infestations continue to rise in Los Angeles and Orange Counties, timely identification and management are crucial for safeguarding oak forests and their associated wildlife. There is an urgent need to both partner with those regularly inspecting trees and provide opportunities to enhance workforce competency in pest management. To address this need, UCCE organized a comprehensive four-hour training session that equipped participants with essential skills for identifying GSOB infestations, implementing effective management strategies, and preventing the pest's spread by properly disposing of infested plant material. Instruction came from UCCE Advisors and the Natural Resources Director for the La Jolla Band of Indians. (Reported by Beatriz Nobua-Behrmann; collaborators mentioned: Chris Shogren, Randall Oliver, Julie Clark)

Fresno County small farmers face significant language barriers to obtaining and maintaining their pesticide applicator permits. To address this, UCCE extension developed an innovative, participant-based curriculum for small-scale farmers, produced didactic materials on pesticide regulations, conducted events such as bilingual workshops and field days, and tailored culturally relevant educational materials in English, Hmong and Spanish. The Small Farms Academic Coordinator, created review materials for the Pesticide Application Certificate Exam and offered five Pesticide Application Certificate exam prep courses. The curriculum has served as a resource in UCCE workshops in Santa Clara, Merced, Sacramento Counties. (Marianna Castiaux)

Asian farmers in the San Francisco Bay Area face significant language and cultural barriers to obtaining and maintaining their pesticide applicator permits. For the past seven years, in collaboration with the Santa Clara County Agricultural Division, UCCE has coordinated annual workshops on topics related to pesticide safety, laws and regulations, and IPM. In 2024, UCCE offered the Bay Area Chrysanthemum Growers Association (BACGA) Continuing Education Workshop and education seminars. (Aparna Gazula)

As a result of UC ANR research and extension efforts, participants learned skills and adopted strategies to improve workforce competency.

**Outcomes**

**Participants learned pest management and detection techniques.**

* After participating in the Citrus Spray Decision Support Workshop, 100% reported gains in learning and 89% indicated that they would recommend the Airblast Spray Advisor web app to others. (Peter Larbi)
* After attending a workshop on identifying the Goldspotted Oak Borer, 60% of attendees completed a post-training survey, with all respondents unanimously expressing increased confidence in identifying and managing tree pests and a commitment to applying their newly found knowledge. (Beatriz Nobua-Behrmann)

**Participants gained pest management competencies.**

* After participating in PSEP trainings, 207 individuals were certified to train other pest management professionals. When asked if the learning objectives were successfully delivered, 90% of the participants in the Spanish-language workshops strongly agreed and 10% agreed. In the English-language workshops, 69% strongly agreed, 29% agreed and 2% were undecided. Based on estimates from participants, PSEP estimates that this year’s cohort will train a total of 34,905 fieldworkers and 4,873 handlers in pesticide safety. (Jasmin Patricia Ramirez-Strain)
* The West Coast Rodent Academy helped build a well-trained workforce equipped to address California's rodent control challenges using IPM principles. One hundred percent of participants learned something new at the workshop and are planning to use this knowledge to change their behaviors in the future. All of the participants felt that they had increased competence in their jobs because of their attendance at the West Coast Rodent Academy. Post-event follow-up has shown that participants are implementing what they learned during the Academy. For example, one pest control professional shared that he started using stop feed baits and polyurethane sealant when securing devices, which has been more effective for managing rats. (Niamh Quinn)
* Post-event evaluations for trainings and presentations on sprayer calibration and spray efficacy show that participants had learning gains:
  + 100% of 20 participants at the 2024 Stanislaus Department of Agriculture Continuing Education class on sprayer calibration reported learning a little to a great deal;
  + 97% of the 28 participants at the Weed School for Table Grapes reported learning a little to a great deal; 100% of the 30 participants at the 2024 San Diego County Vineyard Day reported learning a little to a great deal; and 100% of 17 participants at the Stanislaus Tree and Vine IPM Breakfast Meeting reported understanding of how to achieve good on-target coverage. (Peter Larbi)
* After attending the Continuing Education Seminar and the Bay Area Chrysanthemum Growers Association Continuing Education Workshop, 115 farmers increased their knowledge about Pesticide Safety and Notification Training Requirements for Field Workers and Handlers, New DPR Neonicotinoid Regulations and Fumigation Licensing Requirements, New Private Applicator Certificate (PAC) Testing Requirements, Vertebrate Pest Control, Restricted Material Notification Requirements, and Updates. (Aparna Gazula)
* After attending a UCCE presentation on managing plant parasitic nematodes, 500 pest management professionals scored 70% or above on a quiz of the content covered and received one hour of continuing education credits to maintain their PCA licenses. (Becky Westerdahl)
* After completing UCCE courses in pesticide regulatory requirements, five growers passed the Pesticide Application Certificate Exam. (Marianna Castiaux)
* Within two months of the training session, SoCal Edison staff detected two previously unreported Goldspotted Oak Borer infestations. Equipped with the knowledge gained from UCCE, they promptly implemented best management practices. UCCE then coordinated a collaborative response, bringing together local and state agencies to address the infestations. (Beatriz Nobua-Behrmann)

The measured outcomes reported above demonstrate changes in learning and improvements in how participants work. Decision-makers and pest management managers learned cutting-edge skills that increase workforce retention and competency. For pest management professionals, these skills also ultimately support reduced pesticide use in California. According to California Pesticide Use Report data, there was a reduction in pesticide use in the top perennial specialty crops in the San Joaquin Valley from 2018 (94.6 lbs. per application or 1.95 lbs. per acre) to 2022 (81.7 lbs. per application or 1.77 lbs. per acre), which improves environmental sustainability and community health. (Peter Larbi) In this way, UC ANR contributes to increasing workforce competency and the public value of developing a qualified workforce in California.

## Condition Change: UC ANR contributed to increased effective public leaders

**Issue**

According to data from the United Nations, half of the world's population was under 25 years old in 2024. In 2018, 61% of U.S.-based Pew Research respondents stated that "significant changes" are needed in the American government's fundamental "design and structure" to make it work for current times. This global majority of young people must be prepared to provide leadership in a dynamic and changing world, with emerging issues such as climate change and increasingly complex political, social, and economic challenges.

**Methods**

UC ANR’s extensive network and youth development programs equip the next generation of public leaders.

UC ANR developed, evaluated, and delivered evidence-based educational programs that provided youth with leadership skills. UC Cooperative Extension (UCCE) academics provided oversight, leadership, and guidance for the statewide implementation of the UC 4-H Youth Development Program (UC 4-H). Program activities like Marketing Yourself & Your Project, 4-H Club Officer Training and 4-H State Leadership Conference empowered youth to take on leadership roles in research, teaching, and service-learning projects to improve their communities. (UC 4-H)

The CalFresh Healthy Living, UC (CFHL, UC) State Office at UC Davis provided statewide oversight, leadership, and guidance for the CalFresh Healthy Living Program. UC Cooperative Extension (UCCE) academics and partnered with both UC 4-H and CFHL, UC program staff to facilitate the delivery of the *Cooking Academy* series, which empowers teens with the knowledge and skills to provide nutrition education to elementary school students. (CFHL, UC and UC 4-H)

The UC 4-H On the Wild Side (OTWS) program is a field trip program that aims to enthuse and educate elementary school children about nature and the outdoors, and encourage community involvement and leadership skills in teenagers. Over several months, teen staff and adult volunteers orchestrate and deliver weekend camp programs to elementary-aged students. Teens receive training in environmental curricula and teach inquiry-based science, then design and deliver one to two weekend programs with up to 90 children at each session. In 2024, 18 teens delivered OTWS to 44 students from two elementary schools. (Marianne Bird)

As a result of UC ANR research and educational efforts, youth participants learned and applied scientific methods, leadership, presentation, and advocacy skills. Outcomes with specific indicators follow.

**Outcomes**

**Participants felt more confident in their leadership skills.**

* A retrospective pre-post survey showed that teens delivering a 4-H day camp program grew in their teaching and leadership skills. Teens reported growth in speaking before a group, how to teach science and foster a sense of discovery for children, being part of a team, and teaching others. (Marianne Bird)
* After participating in the Marketing Yourself & Your Project workshop, a survey of 14 youth participants showed an increase in confidence in several areas related to marketing: 79% reported the felt they knew how to make a list of potential buyers; 71% felt more confident in writing a buyer’s letter; and 69% felt confident in creating a script to present when speaking to potential buyers. (Nicole Marshall-Wheeler)
* Youth who attended the 4-H Club Officer Trainings reported they better understood their officer duties and felt more prepared to successfully complete those duties. Ninety-six percent of participants reported feeling excited to be a 4-H club officer and hold a leadership role. (Nicole Marshall-Wheeler)
* After attending the California 4-H State Leadership conference, 86% of youth attendees reported that they are likely to take on more leadership roles. (Gemma Miner)

**Change in condition: Community benefited from demonstrated youth leadership.**

* Of the 18 OTWS teen teachers who delivered the program to elementary school youth, 72% indicated they grew in their ability to plan. Teens also grew in their ability to lead discussions, teach, and organize their time. Ninety percent of 4-H OTWS elementary school participants scored better in their understanding of fire ecology, water quality, salmon migration, forest ecology, and limiting factors, showing that teen teachers effectively taught elementary school students. (Marianne Bird)
* Of the 31 *Cooking Academy* teen teachers who delivered the curriculum to elementary school youth, 80% indicated they grew in their ability to plan. Teens also grew in their ability to teach others (80%) and in public speaking (94%). One participant shared, “The best part [of Cooking Academy] is helping kids and learning something new every time, which has helped in my overall character development.” Follow-up surveys of *Cooking Academy* elementary school participants showed that 64% tasted foods they had not previously tried and that they would eat the featured food again, and 50% were willing to ask that the food be cooked at home. (Marianne Bird)

The measured outcomes reported above demonstrate that leadership skills were learned and applied for the benefit of local California communities. In this way, UC ANR contributes to the public value of developing a qualified workforce for California.

## 

## Condition Change: UC ANR contributed to improved college readiness and access

**Issue**

California requires a highly skilled workforce to remain competitive, prosperous, and an innovative global leader. According to the National Center of Education Statistics, California’s graduation rate improved to match the national rate of 87% in 2021-22. Improved college readiness and access can contribute to the development of a qualified workforce for California and a robust and thriving state economy.

**Methods**

UC ANR’s youth and community development programs equip the next generation for college and successful careers.

UC Cooperative Extension (UCCE) academics provide oversight, leadership, and guidance for the statewide implementation of the UC 4-H Youth Development Program (UC 4-H), which reached nearly 68,449 youth and had over 7,434 adult volunteers that contributed several hundred thousand hours to the program. Program activities empowered youth to take on leadership roles in research, teaching, and service-learning projects to improve their communities. (UC 4-H) A UCCE 4-H Youth Development Advisor in San Diego and Orange County supported an Imagine Science Collaborative, a network of youth development organizations that promotes STEM education. (Liliana Vega)

UCCE helps improve scientific literacy in young people. A UCCE Advisor in Marin led the planning of a North Bay Science Discovery Day with 52 sponsors, 75 exhibitors and over 10,000 child and adult attendees. The event is designed to spark young people's wonder and curiosity for science, technology, engineering, and mathematics (STEM). (Steven Worker)

A UCCE Advisor led presentations and field tours at Kearney Research and Extension Center. Fifteen people, primarily high school students under the USDA-UC Merced Bridge program, participated in the field tour. (Jackie Atim)

As a result of UC ANR research and educational efforts, youth participants demonstrated learning gains to better prepare them for college and careers. Outcomes with specific indicators follow.

**Outcomes**

**Participants had positive attitudes and learned information about preparing for college and careers.**

* Ninety-seven 4-H youth statewide responded to the college and career readiness 4-H Index survey and reported learning information to prepare them for college and a career as a result of what they learned at UC 4-H programs. One-hundred seventeen youth reported understanding the amount of education it will take in the future to achieve career goals. Sixty-eighty percent of youth reported that they work harder to get better grades in school. (UC 4-H)
* One hundred forty 4-H youth between the ages 9-18 responded to the science 4-H Index survey about positive attitudes and aspirations toward science they may have gained in the 4-H program. (UC 4-H) Specific outcomes include:
  + 42% of youth reported liking a job that involves STEM (science, technology, engineering and math) .
  + 38% of youth reported interest in studying STEM after high school.
* After attending the California 4-H State Leadership conference, 83% of youth attendees reported that they are likely to apply to a UC for college. (Gemma Miner)
* Youth who participated in Imagine Science fostered positive associations with Science, Technology, Engineering and Math (STEM) (Liliana Vega):
  + 83% of students showed a positive change in STEM Engagement.
  + 79% of students showed a positive change in STEM Identity.
  + 73% of students showed a positive change in STEM Career Interest
* Youth whose parent/guardian responded to a survey at the North Bay Science Discovery Day reported an increase in their fascination and enjoyment in STEM (87%) and an increase in their interest in STEM (86%). Additionally, 88% of attendees were able to speak to a scientist or engineer. (Steven Worker)
* Post-presentation survey results indicated that 98% of participants gained new knowledge after participating in a farm tour. (Jackie Atim)

**Participants adopted science and teaching skills to prepare them for college and careers.**

* Forty-five percent of 4-H youth responded to the science 4-H Index survey indicating development of skills in STEM as a result of 4-H programming. (UC 4-H)

These measured outcomes demonstrated knowledge and skills learned and positive attitudes related to science, college, and careers, which are a pathway to entering the workforce. In this way, UC ANR contributes to the public value of developing a qualified workforce for California.

## Condition Change: UC ANR contributed to increased civic engagement

**Healthy Families and Communities - In Youth Development**

**Issue**

Civic engagement in adolescence is related to higher life satisfaction and educational attainment, and is related to lower rates of arrest in emerging adulthood. Active participation in volunteerism and civic engagement not only fosters skills and confidence among individuals to make them more employable, but also cultivates strong community bonds. These connections inspire individuals to invest in their communities, promoting prosperity and enhancing the overall quality of life.

**Methods**

The UC 4-H Youth Development Program (UC 4-H) delivers educational programs that increase civic engagement. For example, On the Wild Side (OTWS), and Water Wizards are UC 4-H programs that empower youth to take on leadership roles in research, teaching, and service-learning projects to improve their communities. UC Cooperative Extension (UCCE) academics offered local leadership and guidance in needs assessment, program implementation, and evaluation. UC 4-H reached nearly 68,449 youth participating in clubs, afterschool programs, and camps, who were involved in projects around civic engagement, healthy lifestyles, science, engineering and technology. Civic engagement projects included four focus areas: community engagement, service, civic education, and personal development. Over 7,434 adult volunteers contributed several hundred thousand hours to the program. (UC 4-H) The CalFresh Healthy Living, UC (CFHL, UC) State Office at UC Davis provided statewide oversight, leadership, and guidance for the CalFresh Healthy Living Program. UC Cooperative Extension (UCCE) academics and partnered with both UC 4-H and CFHL, UC program staff to facilitate the delivery of the *Cooking Academy* series, which empowers teens with the knowledge and skills to provide nutrition education to elementary school students. (CFHL, UC and UC 4-H)

As a result of UC ANR research and educational efforts, participants demonstrated increased civic engagement. Outcomes with specific indicators follow.

**Outcomes**

**Participants had positive attitudes and gained skills for civic engagement.**

* One hundred eighty-eight 4-H youth responded to the Civic Engagement 4-H Index survey about what they may have learned at 4-H. Sixty-eight percent of the youth reported that they look for ways to help people in their community, and 81% reported filling their time with positive activities that support their communities. (UC 4-H)
* A 4-H Civic Engagement Needs Assessment found that 92% of 4-H youth get involved in their community because they want to help others or help their community. Additionally, 4-H youth strongly agree that the program gives them opportunities to serve their community and advocate for things they care about. (Nicole Marshall-Wheeler)
* In Alameda and Sacramento Counties, 79% of students grew in their knowledge about water as a result of participating in the UC 4-H Water Wizards program, increasing their understanding of community water issues. In Sacramento County, 85% of students could name at least one water issue in their community. (Marianne Bird and Sally Neas)
* Eighty-six percent of teen teachers from the 4-H *Cooking Academy* series in Sacramento indicated they are definitely encouraged to volunteer more as a result of the program. (Marianne Bird)

**Participants engaged in civically-minded water conservation practices.**

* Forty-two percent of Sacramento County students and 81% of Alameda County students reported using less water as a result of participating in the UC 4-H Water Wizards program. (Marianne Bird)

**Change in condition: Increased civic engagement.**

* Of the 188 4-H youth who responded to the Civic Engagement 4-H Index survey about what they may have gained through 4-H, 73% reported they had volunteered in their community , and 68% said they look for ways to help when they learn about a problem in the community. (UC 4-H)
* A 4-H Civic Engagement Needs Assessment found that a majority of 4-H youth participated in civic engagement activities between once (24%) and twice (32%) a month. (Nicole Marshall-Wheeler)
* Of 18 teen teachers who delivered OTWS, a program that aims to enthuse and educate elementary school children about nature and outdoors, 94% agreed or strongly agreed that they felt they had made a significant contribution to their community as a result of the project. (Marianne Bird)
* All 31 teen teachers in Sacramento County who delivered the Cooking Academy curriculum, a series that teaches elementary school students how to prepare healthy food options, agreed or strongly agreed that they felt they had made a significant contribution to their community as a result of the project. (Marianne Bird)
* All teen teachers from the 4-H *Cooking Academy* series in Sacramento County agreed or strongly agreed that they had made a difference in their community. (Marianne Bird)

These measured outcomes demonstrated learning and behavior changes related to civic engagement. Research shows civic engagement outcomes can lead to employability, emotional connection to communities, and a more qualified workforce. UC ANR’s youth development programs equip the next generation to be active participants in their communities, contributing to a robust and thriving state economy.

Condition Change: UC ANR contributed to increased civic engagement

**Healthy Families and Communities - In Nutrition**

**Issue**

California requires a highly skilled workforce to remain competitive, prosperous, and an innovative global leader. Volunteering and civic engagement can develop skills and confidence that make individuals employable and create attachments to communities that encourage people to invest, spend, hire, and promote the quality of life in their community.

**Methods**

UC ANR delivers educational programs that increase civic engagement. This includes UC-managed volunteers and individuals from other organizations. (EFNEP; UC Master Food Preserver)

CFHL, UC worked with over 231 youth leaders statewide to lead direct education activities about nutrition, physical activity, and health across 9 counties through Youth as Teachers programming where older youth are trained to facilitate lessons to younger youth. Over 1,250 youth statewide were also involved with shaping Policy, Systems, and Environmental (PSE) changes in their communities across 20 counties through participation in activities such as Youth-led Participatory Action Research Projects (YPAR), Student Nutrition Advisory Councils (SNAC), and Youth Garden Leaders efforts. (CFHL, UC)

As a result of UC ANR research and educational efforts, participants demonstrated increased civic engagement. Outcomes with specific indicators follow.

**Outcomes**

**Participants had positive attitudes and gained skills for civic engagement.**

* After participating in Youth as Teachers programming with CFHL, UC, 62 youth responded to a follow-up survey saying that they “Agree” (52%) or “Strongly Agree” (42%) they can apply knowledge in ways that solve real life problems through community service. (CFHL, UC)
* After participating in the YPAR projects with CFHL, UC, 15 youth responded to a follow-up survey saying that they could “Yes, probably” (40%) or “Yes, definitely” (53%) make a difference in their community. (CFHL, UC)
* After participating in SNAC or other youth leader programming with CFHL, UC, 42 youth responded to a follow-up survey saying that they “Agree” (50%) or “Strongly Agree” (45%) they gained skills through serving their community that will help them in the future. (CFHL, UC)

**Change in condition: Increased civic engagement.**

* Over 2,271 volunteers donated 33,797 hours across three statewide programs.
  + 1,811 CFHL, UC volunteers donated over 25,412 hours towards nutrition and physical activity education. (CFHL, UC)
  + 328 EFNEP volunteers donated over 2,038 hours towards assisting in nutrition extension programming (EFNEP)
  + 690 UC Master Food Preserver volunteers donated over 34,384 hours towards food preservation classes and demonstrations. (UC Master Food Preserver)

These measured outcomes demonstrated learning gain and behavior change related to civic engagement. Research shows civic engagement outcomes can lead to employability, emotional connection to communities, and a more qualified workforce. UC ANR’s youth development programs equip the next generation to be active participants in their communities, contributing to a robust and thriving state economy.

Condition Change: UC ANR contributed to increased civic engagement

**Sustainable Natural Ecosystems**

**Issue**

California requires a highly skilled workforce to remain competitive, prosperous, and an innovative global leader. Volunteering and civic engagement can develop skills and confidence that make individuals employable and create attachments to communities that encourage people to invest, spend, hire, and promote quality of life in their community.

**Methods**UC ANR delivers educational programs that increase civic engagement. This includes UC-managed volunteers and individuals from other organizations.

The UC Environmental Stewards Program conducts activities and training to introduce Californians to the wonders of our unique ecology and engage the public in the study and stewardship of California’s natural communities. It aims to increase knowledge, skills, identity, and self-efficacy related to California's natural history and environmental issues, increase public participation and civic engagement in environmental education, and enhance citizen science, climate adaptation, and planning toward environmental and climate justice. Each year, the program co-develops, delivers, and evaluates instructor trainings to partner organizations, who then extend the Environmental Stewards and Climate Stewards certification courses. (Greg Ira)

As a result of UC ANR research and educational efforts, participants demonstrated improved capacity for and increased civic engagement. Outcomes with specific indicators follow.

**Outcomes**

**Participants improved environmental stewardship capacity.**

* Based on course evaluations from Environmental Stewardship courses, participants self-reported improving their capacity to do volunteer service (95% of 563). Across the program’s different course offerings, participants reported additional capacity outcomes:
  + 38% of 511 participants increased in scientific inquiry skills (e.g., “I am capable of following instructions or protocols for participatory science projects”).
  + 33% of 877 participants increased self-efficacy related to environmental action. (e.g., “I am capable of making a positive impact on the environment”). (Greg Ira)

**Change in condition: Increased civic engagement.**

* The number of Environmental Stewards alumni has grown to over 10,000 individuals, all of whom are required to complete a service-oriented stewardship project. In 2024, Environmental Stewards volunteers donated over 87,000 hours engaging in participatory science, land, and water stewardship, environmental justice, and education and interpretation activities. An alumni impact study provided evidence that these hours are a conservative estimate as only 15% of volunteers who self-report their hours and 92% of alumni respondents reported engaging in stewardship in the field as a result of taking an Environmental Stewards course. (Greg Ira)

These measured outcomes demonstrated increased civic engagement. Research shows civic engagement outcomes can lead to employability, emotional connection to communities, and a more qualified workforce; thus, contributing to a robust and thriving state economy.

Condition Change: UC ANR contributed to increased civic engagement

**Sustainable Food Systems**

**Issue**

California requires a highly skilled workforce to remain competitive, prosperous, and an innovative global leader. Volunteering and civic engagement can develop skills and confidence that make individuals employable and create attachments to communities that encourage people to invest, spend, hire, and promote the quality of life in their community.

**Methods**

The UC Master Gardener Program welcomes members of the public to apply to the program where they receive a minimum of 50 hours of training over the course of 16 weeks. The UC Master Gardeners receive education and certification, and in exchange are required to volunteer a minimum of 50 hours in the first year and 25 hours each subsequent year. UC Master Gardeners must complete a minimum of 12 hours of continuing education per year, starting their second year. (UC Master Gardener Program)

A crucial premise of the California Master Beekeeper Program is volunteerism. As a result of the train-the trainer efforts, certified volunteers provide science-based education opportunities in their communities. These are just a few examples of what they do: conduct pollinator outreach in local K-12 schools and at large public events such as California Honey Festival, they mentor novice beekeepers and teaching beekeeping courses locally, they contribute educational articles to local and national trade outlets, they also assist with swarm removal, disaster honey bee colony relocation, etc. To uphold the high standards of the program, the participants have completed 863 continued education hours in order to keep up with new information. (Elina Nino)

**Outcomes**

**Change in condition: Increased civic engagement.**

* Over 6,318 Master Gardener volunteers provided 510,063 hours of public service in 50 of California’s 58 counties, by extending research-based information on environmental horticulture to help the public grow home, community, and school gardens more sustainably. (UC Master Gardener Program)
* Master Beekeeper volunteers provided 3,042 contact volunteer hours reaching 16,914 community members to educate them about the importance of pollinators to continued food supply. (Elina Nino)

These measured outcomes demonstrated learning gain and behavior change related to civic engagement. Research shows civic engagement outcomes can lead to employability, emotional connection to communities, and a more qualified workforce; thus, contributing to a robust and thriving state economy.

# 

# **DEVELOPING AN INCLUSIVE AND EQUITABLE SOCIETY**

## 

## Condition Change: UC ANR contributed to improved living and working conditions for California's food system and farmworkers

**Sustainable Food Systems**

**Issue**

In 2021 there were 21.1 million full- and part-time jobs related to the agricultural and food sectors – 19.5% of total U.S. employment (Economic Research Service). Farmworkers are a vital component of those jobs, yet they continue to live in poverty with poor health indicators and limited access to health care services. Farm labor conditions are intricately entwined with farmworker quality of life, farm profitability, and the socioeconomic vitality of agricultural communities. For example, recent labor shortfalls have reached as high as 20% in California, resulting in $3 billion in lost productivity. Agriculture is one of the most hazardous industries for workers. (Monica Cooper) In 2020, there were 11,880 injuries that required days away from work ([National Institute for Occupational Safety and Health](https://www.cdc.gov/niosh/index.htm)).

**Methods**

UC ANR continues research and extension efforts to improve conditions for workers in California’s food system.

A UC Cooperative Extension (UCCE) Viticulture Advisor continued work to promote equitable farm labor conditions with quantitative tools and educational opportunities. The agriculture-specific workplace assessment tool, the Agricultural Job Satisfaction Survey (AJSS), that she helped develop queries workers, providing feedback to employers on farm labor conditions. Collaboration with external organizations increases uptake of the AJSS among wine grape and other specialty crop growers. They surveyed 28 farmworkers across five employers. (Monica Cooper)

The UC ANR Small Farms Network provided input on improvements to California Underserved and Small Producer (CUSP) Program block grant administration, which is funded through the California Department of Food and Agriculture (CDFA). The UC ANR CUSP team submitted multiple public comments to CDFA, including recommendations to ensure that nonprofit organizations administering block grants did not require additional information or participation from farmers beyond what the CUSP program requires for documentation and program administration. (Reported by Ruth Dahlquist-Willard; collaborators mentioned: Aparna Gazula, and Hung Doan)

As a result of UC ANR research and extension efforts, participants gained understanding and informed policies to improve food system and farmworker conditions.

**Outcomes**

**Science-based information was applied to labor policy and decision-making.**

* As a result of UCCE interaction with the Agricultural Commissioner in Santa Barbara County to provide an evidence-based understanding of the working-life of farmworkers, the information was ultimately used by a task force comprising staff from the California Department of Pesticide Regulation and Office of Environmental Health Hazard to accurately assess risk of pesticide exposure over time. (Monica Cooper)
* The CDFA accepted many of the proposed recommendations from the CUSP team, including that nonprofit organizations can no longer require grant applicants to participate in additional meetings, receive marketing materials from the organization, provide photos and testimonials, or provide additional documentation beyond what CDFA already requires. These changes are expected to improve the experience of small-scale and underserved farmers applying for CUSP direct relief grants and improve communication and coordination between the UC ANR CUSP team and nonprofit organizations administering the block grants. (Ruth Dahlquist-Willard, Aparna Gazula, Hung Doan)

The measured outcomes reported above demonstrate changes to improve the working conditions for those working in the California food system, many of whom live in poverty and have poor health. In this way, UC ANR contributes to the public value of developing an inclusive and equitable society.These efforts also benefit the food system through workforce retention, improved safety, and product quality.

## 

## Condition Change: UC ANR contributes to increased diversity, inclusiveness, and cultural competency in California's workplaces.

**Healthy Families and Communities**

**Issue**

California is the most diverse state in the nation by many standards, including race/ethnicity, languages, and socio-economics. It is a minority-majority state, where no single ethnic group forms a majority of the population. However, more than half of the children in California are Latino. The median annual income for Latino, Native American, and African American households in California is well below the state median income. This income gap correlates to opportunity gaps in critical areas like access to high-quality youth development programs and early college preparation. California continues to be challenged by social, health, and economic inequities.

**Methods**

UC ANR builds cultural competency skills, implements community-centered programs, and develops proactive policies to increase diversity and inclusiveness. UC ANR engages in intentional efforts to ensure that all members of the public have equitable access to UC ANR resources. UC ANR academics live and work in communities building trust and credibility to solve local problems together through research, outreach, and education.

UC Cooperative Extension (UCCE) works to improve diversity, inclusion and belonging in youth development programs. UCCE academics co-lead the Justice, Equity, Diversity and Inclusion (JEDI) Advisory Committee, a group of 27 4-H youth, volunteers, and staff that spearheads the implementation of JEDI best practices within the program. Additionally, a UCCE academic provides technical assistance on issues of access, equity and belonging. (Kaitlyn Murray, Liliana Vega)

A UCCE Youth Development Advisor provided training to 75 environmental educators on actionable and culturally responsive climate change education. (Sally Neas)

A UCCE Specialist at UC Berkeley presented a webinar titled, “Indigenous Agroforestry, Food Security and Sovereignty,” to a national audience. The specialist used their experience partnering with the Karuk Tribe and collaborating on research topics such as agroecological resilience, food security and food sovereignty to share best practices for Tribal research partnerships. Over 1,000 people registered and more than 500 people attended the webinar. (Jennifer Sowerwine)

As a result of UC ANR’s multipronged efforts to better reach underserved audiences, program staff gained cultural competency skills, and UC ANR increased engagement with diverse communities across California. Outcomes with specific indicators follow.

**Outcomes**

**Participants gain cultural competency skills in their work.**

* After attending a training on actionable and culturally responsive climate change education, 100% of environmental education professionals said they would apply aspects of the training. (Sally Neas)
* After attending the Indigenous Agroforestry, Food Security and Sovereignty presentation on Tribal research partnerships, 68% of poll respondents said the information presented was new to them, 46% said they could use this information immediately, and 97% of attendees said they could use the information within the next year. Eighty-one percent said they would be very or somewhat likely to change their actions in the future based on the information presented in this webinar. (Jennifer Sowerwine)

**Change in condition: California’s youth development programs are more inclusive. NEW**

* As a result of UCCE’s support, UC 4-H has implemented a number of actions to make 4-H spaces more accessible and inclusive. Gender-inclusive housing and sensory rooms have been added to state conferences, guidance has been updated to include more inclusive 4-H branded t-shirts, instances of discrimination have been addressed, and disability accommodation procedures are being reviewed to better serve all Californians. Sensory rooms are a youth-led project to create spaces for youth to get specific sensory input and regulate their emotions during potentially overstimulating conferences and meetings. These sensory rooms support the participation of neurodivergent and all youth in our program. (Kaitlyn Murray)
* Through an Imagine Science Collaboration with Girls Inc, YMCA, and Boys and Girls Clubs, UC 4-H in San Diego was able to reach a more diverse youth population, reaching a total of 44 youth: 80% Latinx, 18% Black, 1% white, and 1% multi-racial youth. (Liliana Vega)

These measured outcomes demonstrate how UC ANR has strengthened its internal capacity to do effective outreach to diverse audiences to have participants better reflect the state's diversity. UC ANR increased access to opportunities and created environments where different kinds of people can thrive and succeed. In this way, UC ANR contributes to the public value of developing an inclusive and equitable society. The UC Berkeley Haas Institute of Fair and Equitable Society finds California consistently ranking in the top half amongst the states for inclusiveness. However, the state dropped from fourth to fifteenth in the nation between 2023 and 2024, indicating there is still much work to do.

Condition Change: UC ANR contributes to increased diversity, inclusiveness, and cultural competency in California's workplaces.

**Sustainable Food Systems**

**Issue**

In California, over 8% of producers with day-to-day decision-making input on farms and ranches are producers of color or identify as multi-racial and 12% identify as Hispanic (National Agricultural Statistics Service 2017). Statewide, the farms run by farmers of color are smaller, make less money, and receive less government support than their white-operated counterparts, including access to extension services (National Agricultural Statistics Service 2007, 2012). A 2017-2018 survey conducted by the California Farmer Justice Collaborative revealed that they more often draw upon family and community networks rather than professional extension providers. Many extension personnel in California do not share the cultural and social histories of these producers of color, and therefore would benefit from learning new skills and strategies for building successful professional relationships with these producers. (Sonja Brodt) Across all programs, UC ANR must increase the cultural competency and awareness of personnel and volunteers in order to improve outreach to communities historically underinvested by Extension.

**Methods**

UC ANR engages in intentional efforts to ensure that all members of the public have equitable access to UC ANR resources. UC ANR academics live and work in communities building trust and credibility to solve local problems together through research, outreach, and education.

With funding from the Department of Pesticide Regulation, the UCCE Small Farms Advisor in Capitol Corridor continued to deliver an extension IPM program for Hmong and Iu Mien farmers, immigrants from Southeast Asia who predominantly grow conventionally managed strawberries, vegetables, and flowers in Sacramento. Language and cultural barriers have prevented these farmers from integrating into and receiving resources standard for California farmers. The advisor provided technical assistance and outreach on topics such as regulatory requirements and incentive programs and partnered with UC Master Food Preservers to provide trainings on jam preservation and requirements for selling the jam. Participation in the program increased from approximately 110 to over 150 in 2024. (Reported by: Margaret Lloyd; collaborators mentioned: Michael Yang, UC Master Food Preserver Program)

Partnering with UC Gill Tract Community Farm and UC Berkeley’s Rausser College of Natural Resources, a UCCE Specialist works to provide educational programming, food security, and food sovereignty to UC students, UC Village residents, and the surrounding community. (Jennifer Sowerwine)

As a result of UC ANR’s multipronged efforts to better reach underserved audiences, program staff gained cultural competency skills, and UC ANR increased engagement with diverse communities across California. Outcomes with specific indicators follow.

**Outcomes**

**Change in condition: The food system is more inclusive.**

* Hmong and Iu-Mienh farmers working with the UCCE Capitol Corridor small farms IPM program are more connected to financial and technical resources, and ultimately more economically stable and resilient.
  + Sixteen farmers were able to legally and safely sell jam at their farm stands, empowering farmers to increase profits by selling higher-value, shelf-stable products.
  + Farmers were connected with new wholesale markets where they could sell excess fruit during peak production. Three farmers sold 20-30 flats of fruit to a local wholesaler that would have otherwise gone to waste. This market opportunity represented 3-5% of their total income, helping them increase profitability while reducing waste.
  + Two farmers purchased 25,000 plants of 10 new disease-resistant strawberry varieties. One farmer previously experienced 100% crop loss due to a severe infestation, and with the new varieties was able to completely reverse the outcome and restore profits.
  + Over $300,000 has been awarded to 38 farms, from diverse funding sources including the California Department of Food and Agriculture and the Natural Resources Conservation Service.
  + Eighteen of the Iu Mien farmers applied compost for the first time, using nearly 300 tons of compost across 75 acres. The practice protects and conserves soil quality and sequesters an estimated 194 pounds of carbon.
  + Operator ID Number compliance among participating farmers increased by 25%.
  + Thirty farmers with land inside an oriental fruit fly quarantine zone had previously been out of compliance with regulations to manage the infestation and experienced 100% crop loss. With guidance from the UCCE Advisor, all 30 farmers came into compliance by 2024 and applied the required management strategies, preventing potential crop destruction. (Margaret Lloyd)
* The UC Gill Tract Farm is now growing several culturally relevant crops identified by a needs assessment survey of UC Village residents. The crops will be distributed for free through the UC Bear Pantry, serving low income students and their families. (Jennifer Sowerwine)

These measured outcomes demonstrate how UC ANR has strengthened its internal capacity to do effective outreach to diverse audiences and have participants better reflect the state's diversity. UC ANR increased access to opportunities and created environments where different kinds of people can thrive and succeed. In this way, UC ANR contributes to the public value of developing an inclusive and equitable society. The UC Berkeley Haas Institute of Fair and Equitable Society finds California consistently ranking in the top half amongst the states for inclusiveness. However, the state dropped from fourth to fifteenth in the nation between 2023 and 2024, indicating there is still much work to do.

# 

# **PROMOTING HEALTHY PEOPLE AND COMMUNITIES**

## Condition Change: UC ANR contributed to improved health for all

**Healthy Families and Communities - In Nutrition**

**Issue**

California has the largest population of any state in the U.S. and is home to over 39 million people. California’s large population creates pressure on community resources and presents numerous challenges to health and safety, including for chronic disease prevention. According to the CDC, more than three million Californians suffer from diabetes and over eight million suffer from heart disease, leading to an estimated $50 billion in healthcare costs. Poor nutrition and lack of physical activity are major risk factors for the development of chronic diseases.

**Methods**

In partnership with communities and allied organizations, UC ANR produces new knowledge, tools, programs, and policy-relevant research that result in healthy living for individuals.

The CalFresh Healthy Living, UC (CFHL, UC) State Office at UC Davis provides statewide oversight, leadership, and guidance for the CalFresh Healthy Living Program. UC Cooperative Extension (UCCE) academics and CFHL, UCCE supervisors offer local leadership and guidance in program implementation and evaluation. CFHL, UC, and UCCE offices throughout the state offer nutrition education aligned with policy systems and environmental change initiatives to generate sustainable healthy outcomes in communities. Partnering with SNAP-Ed funded and non-funded organizations furthers local engagement and impact. CFHL, UC delivered nutrition education programs to over 99,500 youth and adults, and 4,200 food tastings with over 79,800 students and 3,390 adults. CFHL, UC supports implementation of policy, systems, and environmental changes that work together to promote nutrition and physical activity practices, and improve health outcomes for CFHL, UC participants. (CFHL, UC) UCCE academics also provide oversight, leadership, and guidance for the statewide implementation of the UC 4-H Youth Development Program (UC 4-H). These programs work together to provide hands-on, experiential learning opportunities about healthy lifestyles with curricula like the *Cooking Academy* series. (CFHL, UC and UC 4-H)

UCCE academics provide oversight, leadership, and guidance for the statewide implementation of the statewide Expanded Food and Nutrition Education Program (EFNEP). This program serves adults with income less than 185% of the federal poverty level and youth that attend Title 1 schools in which 50% or more of the students qualify/receive free or reduced-price lunch or live in households that receive food assistance. EFNEP delivered evidence-based curricula to 13,673 youth and adults. (EFNEP)

A UCCE Advisor piloted a healthy cooking program in a juvenile hall facility. This program provided two hours of education weekly to incarcerated youth, where they learned healthy cooking, food safety and nutrition while preparing for careers in food service. This program is a collaboration between the UC 4-H Program, the CalFresh Healthy Living Program and the UC Master Food Preservers. (Sally Neas)

An NPI academic partnered with Impact Justice and ChangeLab Solutions to develop and provide nutrition education workshops to 135 formerly incarcerated individuals. Through this partnership, train-the-trainer nutrition education workshops have led to more individuals offering nutrition education workshops to formerly incarcerated people. (Wendi Gosliner)

As a result of UC ANR research and extension, participants learned about and adopted strategies to improve individual health and wellness. Outcomes with specific indicators follow.

**Outcomes**

**Participants gained knowledge about, changed attitudes toward, or intended to adopt healthy eating practices.**

* Over 700 CFHL, UC participants statewide responded to a survey about their experience with the *Plan, Shop, Save, Cook* or *Making Every Dollar Count* curricula, with 49% reporting more frequently thinking about healthy food choices when deciding what to feed their family. (CFHL, UC)
* Students who participated in CFHL, UC food tastings reported being more willing to eat the food again (72%) and being more willing to ask for the food at home (66%). (CFHL, UC) Local highlight follows:
  + In Los Angeles, 66% of over 2,500 students in the 105 classes surveyed after taste tests said they would be willing to eat the featured food item again and 59% were willing to ask for the featured food item at home. (Natalie Price)
  + In Butte, Colusa, Glenn, Sutter and Yuba Counties, 70% of over 21,500 students in 1,070 classes surveyed after taste tests of local, fresh produce said they would be willing to eat the featured food item again and 63% were willing to ask for the featured food item at home. (Veronica Van Cleave-Hunt)
* When preschool teachers of CFHL, UCCE participating sites in Alameda County were asked if more students could identify healthy food choices after participating in classes, 100% answered “agree” or “strongly agree”. (Alexa Erickson)
* In Alameda and Contra Costa Counties, survey results of youth EFNEP participants showed that 80% and 85% of participants in each county respectively improved their abilities to choose foods according to Federal Dietary Recommendations or gained knowledge. (Alexa Erickson)
* After participating in the healthy cooking program, 100% of the incarcerated youth reported learning new cooking skills through the program. Additionally, several youths reported that they are now considering careers in food service. (Sally Neas)
* In Nevada County, 47% of youth who participated in *Cooking Academy* (n=69) felt “extremely confident” in preparing food for themselves. (Matthew Rodriguez)
* Surveys of teen teachers who delivered the *Cooking Academy* curriculum showed that 77% plan to eat the recommended amount of fruits and vegetables, 82% know how to follow a recipe to make something to eat, 59% plan to prepare healthy foods or snacks with their family, and 100% indicated they learned more about healthy food choices. (Marianne Bird)
* After participating in a nutrition education workshop, 81% of formerly incarcerated individuals reported an intention to eat more fruits and vegetables. In a follow up interview, one participant said, “Since the workshop, I have begun to not only eat vegetables with dinner, I eat vegetables with breakfast also.” (Wendi Gosliner)

**Participants adopted healthy eating practices.**

* In a statewide survey of over 700 adult CFHL, UC participants’ diet, many reported making improvements in several healthy eating practices, such as drinking soda less often (36%), eating more cups of fruits and vegetables in a day (66%), and using the nutrition facts label more often (53%), while the 711 adults surveyed about food resource management reported using MyPlate to make food choices more often (67%) after participating in CFHL, UC education. A statewide survey of over 2,000 youth CFHL, UC participants showed that 49% of youth ate vegetables more times yesterday, 43% ate fruit more times, and of the 1,700 youth surveyed about sugary drink consumption 42% drank sugar sweetened beverages fewer times after participating in CFHL, UC education. (CFHL, UC) Local highlight follows:
  + In Contra Costa County, a CFHL, UCCE program focused on reaching older youth and people who have historically been left out of programming, including transition age foster youth, by incorporating gardens into classes at community sites. The program reached 331 students, and the youth surveyed (n=176) reported an average of 1.5 more instances of eating vegetables or fruits yesterday from pre to post (p<.001). (Alexa Erickson)
* In Sacramento County, *Cooking Academy* elementary school participants increased their intake of fruits and vegetables from five to six servings daily. (Marianne Bird, Marcel Horowitz)
* EFNEP surveyed over 2,190 adult participants, and 98% reported improvements in their diet quality, including eating red and orange vegetables (62%) and dark green vegetables (61%) more often each week, along with eating fruit more often each day (58%). Out of 4,323 youth EFNEP participants surveyed, 82% reported improvements in their diet quality, including eating more vegetables (28% of 3rd through 5th graders and 30% of 6th through 12th graders) and eating more fruit (30% of 3rd through 5th graders and 31% of 6th through 12th graders). (EFNEP) Local highlights follow:
  + In Alameda and Contra Costa Counties, survey results of adult EFNEP participants showed that 97% and 99% of participants in each county respectively improved in one or more diet quality indicator (eating more fruits and vegetables daily, drinking less soda and sugary drinks, and cooking dinner at home more often). (Alexa Erickson)
  + In Los Angeles and Orange Counties, pre/post-surveys of adult EFNEP participants showed that 97% (n=284) and 99% (n=149) of participants in each county, respectively, improved in one or more diet quality indicators, such as eating more fruits and vegetables. (Natalie Price)
  + In Los Angeles County, 85% of youth EFNEP participants improved their ability to choose food according to USDA recommendations. (Natalie Price)
  + In Butte, Colusa, Glenn, Sutter and Yuba Counties, 229 out of 230 adult EFNEP participants surveyed showed improvement in one or more diet quality indicators and 79% of the 230 participants showed improvement in 7 or more diet quality indicators. (Veronica Van Cleave-Hunt)

**Participants adopted healthy lifestyle and decision-making practices.**

* In a statewide survey of 700 adult CFHL, UC participants, many reported making improvements in several healthy lifestyle practices, such as increasing the number of days in which they were physically active for at least 30 minutes (52%) and making small changes to be more physically active more often (52%) after participating in CFHL, UC education. (CFHL, UC)
* EFNEP surveyed over 2,190 adult participants, and 83% reported improvement in their physical activity behaviors. Sixty-five percent of adults made small changes to be active more often and 54% increased the number of days they exercised for at least 30 minutes. Out of 4,323 youth EFNEP participants surveyed, 47% reported improvement in physical activity practices or knowledge. Twenty-five percent of 3rd through 5th graders and 43% of 6th through 12th graders increased the number of days they were active for at least 60 minutes. (EFNEP) Local highlights follow:
  + In Los Angeles and Orange Counties, pre/post-surveys of adult EFNEP participants showed that 86% (n=284) and 82% (n=149) of participants in each county, respectively, improved in one or more physical activity behaviors. (Natalie Price)
  + In Butte, Colusa, Glenn, Sutter and Yuba Counties, 97% of 230 adult EFNEP participants surveyed showed improvement in one or more physical activity behaviors. (Veronica Van Cleave-Hunt)

The measured outcomes reported above lead to improved health for Californians where they live, learn, work, and play. Furthermore, longitudinal studies of EFNEP graduates indicate that they maintain positive behavior change 2-6 months after completing the program (Dollahite, 2014; Koszewski, 2011; Swindle, 2007). Healthy habits can prevent or reduce the detrimental effects of chronic disease, and for every dollar spent on California EFNEP, there is a savings of

$8.34 in healthcare costs (California EFNEP Impact Report, 2018). Collectively these efforts contribute to the public value of promoting healthy people and communities.

Condition Change: UC ANR contributed to improved health for all

**Sustainable Food Systems**

**Issue**

California has the largest population of any state in the U.S. and is home to 39 million people. California’s large population creates pressure on community resources and presents numerous challenges to health and safety, including for chronic disease prevention. According to the Center for Disease Control, more than three million Californians suffer from diabetes and over eight million suffer from heart disease, leading to an estimated $50 billion in healthcare costs. Poor nutrition and lack of physical activity are major risk factors for the development of chronic diseases. The average American diet, particularly for low-income families, is deficient in fresh produce in comparison to USDA dietary guidelines.

**Methods**

The statewide implementation of the UC Master Gardener Program leverages a network of program coordinators, academics, county directors, and volunteers working together to provide science-based information to the public on food gardening through outreach and education. (UC Master Gardener Program)

As a result of UC ANR research and extension, participants learned about and adopted strategies to improve individual health and wellness. Outcomes with specific indicators follow.

**Outcomes**

**Participants adopted edible gardening practices.**

* Participants of public education events led by UC Master Gardener volunteers responded to a 2024 statewide survey and 72% of 612 attendees reported starting or improving the growing of edible plants and 56% of 590 attendees expanded varieties of edible plants grown. (UC Master Gardener Program)

**Participants spent more time gardening and outdoors.**

* 67% of 1,204 respondents spent more time gardening and outdoors, which is associated with improved individual emotional and physical health. (UC Master Gardener Program)
* Over one thousand participants of UC Master Gardener volunteer-led educational programs reported in a statewide survey that they started or improved practices on 3,895,767 square feet of home gardens in California. (UC Master Gardener Program)

The measured outcomes reported above lead to improved health for Californians by increasing the quality and quantity of fresh, locally produced fruits and vegetables. In addition, spending more time gardening and outdoors improves both physical and mental/emotional health. Gardening is considered a moderate to high intensity exercise. According to the Center for Disease Control and Prevention, you can burn up to 300 calories during just one hour of light gardening and yard work. The National Institutes of Health recommends 30-45 minutes of gardening three to four times per week as an excellent healthy living strategy. In addition, research with students has demonstrated that just 30 minutes spent in nature after completing a stressful task improves their mood. The students who were studied exhibited lower levels of cortisol, the stress hormone. Collective improvements to individual community members' health contribute to the public value of promoting healthy people and communities.

## Condition Change: UC ANR contributed to improved community health and wellness

**Healthy Families and Communities - In Nutrition**

**Issue**

California has the largest population of any state in the U.S. and is home to over 39 million people. California’s large population creates pressure on community resources and presents numerous challenges to health and safety, including for chronic disease prevention. According to the CDC, more than three million Californians suffer from diabetes and over eight million suffer from heart disease, leading to an estimated $50 billion in healthcare costs. Public health experts agree that poor nutrition, lack of physical activity, school, community, home environments, income level, and education are factors in the development of chronic diseases.

**Methods**

In partnership with communities and allied organizations, UC ANR produces new knowledge, tools, programs, and policy-relevant research that contribute to healthy communities.

The CalFresh Healthy Living, University of California (CFHL, UC) State Office at UC Davis provides statewide oversight, leadership, and guidance for the CalFresh Healthy Living Program. University of California Cooperative Extension (UCCE) academics and CFHL, UCCE supervisors offer local leadership and guidance in program implementation and evaluation. UCCE academics provided oversight, leadership, and guidance in educational programs and policy, systems, and environmental (PSE) interventions delivered statewide through CFHL, UC. Programs such as Edible Gardens were conducted to increase healthy choices, food-based gardening, and quality physical activity in early childhood centers, schools, and community environments. (CFHL, UC)

NPI academics and UCCE Specialists provided evidence-based research, recommendations and testimony to state elected officials and state departments in support of effective nutrition and physical activity policies and guidance. (Reported by: Dania Orta-Aleman, Christy Getz, Carolyn Rider, and Hannah Thompson; contributors mentioned: Janice Kao, Miranda Westfall)

An NPI academic partnered with Impact Justice and ChangeLab Solutions to enhance access to fresh and local fruits and vegetables for incarcerated individuals at California Department of Corrections and Rehabilitation facilities by connecting the facilities to a local food hub. (Wendi Gosliner)

As a result of UC ANR research and extension, participants learned about and adopted strategies to improve community health and wellness. Outcomes with specific indicators follow.

**Outcomes**

**Partners adopted community-level changes that contribute to improved community health and wellness.**

* CFHL, UC reported statewide Policy, Systems, and Environment (PSE) changes at 420 SNAP-Ed sites, contributing to improved community health and wellness for more than 119,700 people. For example, 174 program sites in 22 counties made at least one physical activity-related PSE change; more than half of these sites improved the quality and/or number of opportunities for structured physical activity. (CFHL, UC) Local highlight follows:
  + CFHL, UCCE in Alameda supported the addition of playground stencils to encourage physical activity at a childhood education site. (Alexa Erickson)
* CFHL, UC sites statewide adopted or enhanced edible gardening and food access strategies, including new or expanded edible gardens at 167 sites, providing opportunities for the community to work in an edible garden at 127 sites, initiating or expanding use of garden produce for meals and snacks at 66 sites, initiating or expanding a mechanism for distributing seedlings and/or other materials to families or communities for home gardening at 25 sites, initiating or expanding farm-to-table use of fresh or local produce at 16 sites, and developing new or improved policies related to edible gardens at 3 sites. (CFHL, UC)
* An NPI academic helped initiate a first-of-its-kind Harvest of the Month program, which delivered nearly 12,000 pounds of fresh, locally grown produce to incarcerated people in California during its first 4 months of operation. (Wendi Gosliner)

**Science-based information was applied to community health and wellness policy and decision-making at local, state, and national levels.**

* California elected officials utilized NPI academics’ expertise to support the passage of SB 291, “Recess for All.” Data provided by the academics illuminated current deficiencies and inequities in California students’ access to recess, supporting the need for new legislation. As a result of the passage of SB 291, elementary schools with students in grades K-6 are required to have 30 minutes of recess a day and the practice of withholding recess as a punishment is prohibited. (Janice Kao, Carolyn Rider, Hannah Thompson, Miranda Westfall)
* An NPI academic provided a farm-to-school research brief that contributed to the California state legislature’s decision to restore farm-to-school funding to the 2023 state budget. (Dania Orta-Aleman) A UCCE Specialist at UC Berkeley also provided a report to the California legislature that formed the basis for their decision to expand farm-to-school funding in 2024 to $52.8 million. (Christy Getz) Farm-to-school programs benefit both farmers and students, increasing produce sales for farmers, while providing fresh, local produce to students.

The measured outcomes reported above demonstrate learning, action, and policy changes that can improve community health and wellness. Collectively these efforts contribute to the public value of promoting healthy people and communities.

Condition Change: UC ANR contributed to improved community health and wellness

Endemic and Invasive Pests and Diseases

**Issue**

About half the pesticides sold in California are applied in non-agricultural areas, targeting pests in residential homes, landscapes, gardens, schools, and commercial/structural buildings. (Karey Windbiel) Pests–both invertebrates, such as bed bugs, cockroaches, human lice, fleas, mosquitoes, ants, and termites, and vertebrates, such as rodents and coyotes– pose significant challenges to community health. Many can spread disease and unsanitary situations, and the chemicals used to control them can harm human health (Jim Farrar) and negatively impact the environment (Siavash Taravati). Moreover, many invertebrate species have developed insecticide resistance (Andrew Sutherland). Integrated Pest Management (IPM) programs for pests impacting community health have the potential to increase pest control efficacy, decrease number of insecticide applications, decrease potential for insecticide exposure, and thus increase community well-being, as well as increase economic viability for the pest control industry and its stakeholders. Urban pests impacting community health are of particular concern to schools, child care centers, landlords, tenants, businesses, and property managers. It is critical that housing professionals, school districts, child care centers, and pest control professionals understand the legal roles and responsibilities associated with providing pest management in residential and care settings.

**Methods**

In partnership with communities, UC ANR produces new knowledge, tools, programs, and policy-relevant research that contribute to healthy communities by preventing and managing urban pests, especially those that impact the physical and mental wellbeing of humans, minimizing exposures to pesticides.

The UC IPM Associate Director of Urban and Community IPM ensures the content within the UC IPM home and garden web pages is accessible and understandable so urban and community (hereafter referred to as “urban”) audiences can solve their pest problem in the least toxic way possible. UC IPM reaches urban audiences through social media, updated Pest Notes, monthly live webinars, which are subsequently posted on YouTube, the Home & Pest Newsletter, videos, and in-person workshops for volunteers and professionals who interface with the public. In FFY2024, the Pest Notes publications received 3.8 million views. Live attendance for each webinar has ranged from 50 to 620 with an average of 244. As of 10/21/2024, UC IPM had posted 38 webinars, which received a cumulative 59,085 views. (Karey Windbiel)

A UCCE Specialist at UC Riverside (UCR) investigates and develops strategies for managing pests, including Argentine ants, bed bugs, spiders, termites, and wasps, in urban settings such as homes, apartments, commercial buildings, museums, and recreational areas. The specialist also researches various pest problems along the suburban - agricultural interface, which become hot spots as cities expand into the areas that used to be agricultural land. To this end, the specialist organized both hour-long workshops and one-day educational seminars for pest management professionals and UC Master Gardeners volunteers around the state on Sustainable Pest Management topics in urban areas. The advisor organized one-day educational workshops focused on the core principles of low-impact ant management in Riverside, attended by 114 participants, and in Davis, attended by 59 participants. (Dong-Hwan Choe)

The same UCCE Specialist at UCR maintained a leading role in organizing the UCR Urban Pest Management Conference. This long-standing annual meeting, 2011 to present, is well attended by pest management professionals throughout California and the Southwest United States, providing an ideal setting to communicate updates on scientific research and regulations to those who can immediately utilize the information. In 2024 there were 99 attendees from the pest management industry, research laboratories, state regulatory agencies, and chemical manufacturing. (Dong-Hwan Choe)

A UC Cooperative Extension (UCCE) Area IPM Advisor for Southern California disseminated information about the latest technology to manage structural pests. Structural pest control deals with pests in or around structures (buildings, vehicles, ships, etc.). In the U.S., more than 20,000 companies make up the structural pest control industry, which generated around $8.6 billion in total service revenue in 2017. With over 13 million households, California is a very important center for structural pest control businesses. To increase understanding of the biology and management of structural pests and increase clientele’s awareness of the more efficient and environmentally-friendly IPM methods, the advisor presented talks in-person and online, including a training organized by the UC IPM Urban and Community team. The advisor also initiated a new webinar series called “Pest Insight.” Pest Insight is the only university-hosted webinar in California that is open to the public and is focused on providing structural/urban pest control content to professionals. All other webinars are centered around agriculture, making Pest Insight a unique and critical resource. (Siavash Taravati)

A UC Cooperative Extension (UCCE) and Agricultural Experiment Station collaboration evaluated the relative efficacy and cost of IPM strategies and tactics and develop new management tools and techniques, increasing adoption of and demand for IPM services for bed bugs, cockroaches, fleas, rodents, ants, and other urban pests. Research findings have included significant decreases in pest infestations, which may bring immediate relief to those who live, work, and study at demonstration sites. For example, bed bug demonstration sites typically include 50 to 100 residential units, each housing one to four residents, many of whom have experienced barriers to accessing safe and healthy housing due to age, ability, income, or other factors. Research has demonstrated effective new monitoring and management strategies for use in multi-unit housing environments and schools and child care environments. Science-based recommendations are shared with pest management professionals within California's structural pest control industry to address pests that cause physical and emotional harm to humans, threaten homes and other structures, and pose nuisances. Various methods have been used, including peer-reviewed publications, newsletter and trade magazine articles, presentations, hands-on workshops, web sites, social media interactions, and individual consultations. (Andrew Sutherland)

A UCCE Advisor addresses human-wildlife conflicts in urban environments, focusing on public education and mitigation strategies. Collaborating with UC Master Gardeners, the advisor provides accessible, science-based resources to the public on urban rodent and coyote conflict management. In the past year, the advisor delivered nine talks to multiple groups, including cities, garden clubs, and rare fruit growers, ensuring broad outreach. (Niamh Quinn)

As a result of UC ANR research and extension, participants learned about and adopted pest management strategies to improve community health and wellness. Outcomes with specific indicators follow.

**Outcomes**

**Participants learned integrated pest management strategies to maintain public health.**

* Evaluations of UC IPM webinars for urban audiences show that on average, 55% of live attendees said they would implement practices they learned immediately, while 34% said they would within 6 months. When asked whether they would share the information they learned with others, 88% said ‘yes’. (Karey Windbiel)
* After attending an online training by the UC IPM Urban and Community team, 96% percent of structural/urban pest control professionals said that they learned something new. Also, 96% of the participants stated that they will share information they learned with others, and 81% of the participants said that they will implement some of the practices they learned either immediately or within the next 6 months. (Siavash Taravati)
* A UCCE Advisor reported that between 72 and 100% of participants in online and in-person programming on IPM for schools and child care environments increased their knowledge about the Healthy Schools Act, the legal roles and responsibilities associated with providing IPM services to schools and child care centers, specific IPM strategies and tactics, and specific evaluation tactics. (Andrew Sutherland)
* After the 2024 UCR Urban Pest Management Conference, 61 participants completed a post-event survey. For the question “As a result of participating in today's conference, I intend to apply at least one thing that I learned for what I do in urban pest management” (with 1 for strongly disagree and 5 for strongly agree), the average score was 4.84. (Dong-Hwan Choe)
* After attending one of the two full-day educational seminars on low-impact ant management, 69 participants completed a post-workshop survey. For the question “As a result of participating in today's workshop, I intend to apply at least one thing that I learned for what I do in urban pest management” (with 1 for strongly disagree and 5 for strongly agree), we got 4.8 (n = 19) and 4.9 (n = 50) (both average values) for Davis and Riverside workshops, respectively. Comments from participants highlighted how valuable they found the training. One commented, “I really enjoyed the conference. We have been doing our own version of a low impact service. I was happy to learn our service is very close to what is being explored.” (Dong-Hwan Choe)
* After attending trainings on urban rodent and coyote conflict management, 82% of the audience (221 UC Master Gardeners and 109 general public) improved their understanding of urban wildlife management strategies. Moreover, 91% of attendees planned to adopt at least one new strategy to mitigate human-wildlife conflicts, such as habitat modification or safe exclusion techniques. (Niamh Quinn)

**Participants adopted integrated pest management strategies to maintain public health.**

* Individual follow-ups with structural/urban pest control professionals who attended Pest Insight trainings show that they have successfully implemented practices learned. These testimonials highlight the real-world impact of the webinar series to improve pest control strategies and protect the environment against harmful effects of pesticides. (Siavash Taravati)
* Observations suggest that urban IPM program participants and clientele, both those who have received technical assistance and those who participated in online and in-person courses, have changed their behavior by increasing preventive and non chemical control tactics and by decreasing unnecessary pesticide applications after receiving UCCE technical assistance. (Andrew Sutherland)
* Ongoing discussions with regulators and pest control operators indicate that adoption of monitoring tactics and alternative treatments for managing drywood termites are accelerating in California. (Andrew Sutherland)
* In 2024, testimonials indicating national increases in adoption of baits for peridomestic cockroaches were received and documented. (Andrew Sutherland)

The measured outcomes reported above demonstrate learning, action, and policy changes that can improve community health and wellness by adopting IPM strategies that reduce exposures to urban pests while also limiting exposure to pesticides. Overall, UCCE research and extension supports community health by reducing risk of pesticide exposures that come from direct applications, environments, and foodways. The Department of Pesticide Regulation has reported reductions in pesticide risk between 2012 and 2022. Ten-year trends in pounds of pesticides applied document a 20% reduction in carcinogens, 45% reduction in cholinesterase inhibitors (neurotoxins), 17% reduction in fumigants (biocides), 77% in potential groundwater contaminants, 45% reduction in reproductive toxins, and 21% reduction in toxic air contaminants. During this period, there has also been a reduction in pesticide residues on food, particularly fresh fruit and vegetables. According to the 2023 Pesticide Data Program report from the USDA-Agricultural Marketing, 99% of the 9,832 food samples from California and eight other states had residues below the EPA established tolerances and 38.8% had no detectable pesticide residue, meaning that pesticide residues on fruits and vegetables are unlikely to be harmful to human health. (Jim Farrar) Collectively these efforts contribute to the public value of promoting healthy people and communities.

## Condition Change: UC ANR contributed to improved access to positive built and natural environment

**Issue**

There are documented health benefits of spending time in nature. Yet, a 2019 landscape and urban planning study found inequities in access to urban vegetation in communities that are more ethnically, racially diverse, and have lower income levels. Furthermore, 30% of Californian youth do not have parks, sidewalks, and community centers in their neighborhood. According to the World Health Organization, physical activity is important for children and adolescents to promote bone health, healthy growth, and motor and cognitive development. Additionally, 31% of adults do not meet physical activity guidelines, which is shown to help prevent and manage diseases such as cardiovascular diseases, cancer, and diabetes, as well as reduce symptoms of depression and anxiety and improve overall well-being.

**Methods**

UCCE academics provided leadership and science-based information for the statewide implementation of the UC Master Gardener Program. Volunteers delivered public education workshops on sustainable landscaping and edible gardening. (UC Master Gardener Program)

CalFresh Healthy Living, UC Cooperative Extension (CFHL, UCCE) in Alameda County collaborated with the Alameda County UC Master Gardener Program to renovate a large edible garden at the South County Homeless Project, a 24-bed residence for individuals experiencing homelessness. The UC Master Gardener Community Garden Team designed the garden and enlisted volunteers to evaluate and amend the existing soil. CFHL, UCCE supplied soil while the UC Master Gardeners provided seedlings. UC Master Gardeners also lent their expertise to the residents with the workshop, “Gardening Basics.” (Alexa Erickson)

As a result of UCCE research and extension efforts, participants learned and applied sustainable landscape and edible gardening practices, which increased access to positive built and natural environments. See condition change outcome below.

**Outcomes**

**Change in condition: Improved positive built and natural environments.**

* Sixty-four participants of UC Master Gardener volunteer-led educational programs reported in a statewide survey that they applied practices to 53,208 square feet of school and community gardens. Gardening interventions have the potential benefit to the broader community. A 2016 nationwide study found that living near greenery may help you live longer due to less air pollution, more physical activity, more social engagement, and most significantly better mental health as measured by a lower prevalence of depression. (UC Master Gardener)
* South County Homeless Project residents, the UC Master Gardener Program of Alameda County and CFHL, UCCE in Alameda County worked together to restore the site’s large edible garden and planted 19 varieties of fruits, vegetables, and herbs. Residents and staff also stated that being in the garden helped reduce stress and that it was nice to spend time in a peaceful space. One resident gardener shared, "(The garden) relaxes me from stress. I love the garden." Additionally, produce from South County Homeless Project’s edible garden was harvested regularly and enjoyed fresh by residents and incorporated by the chef into house meals. (Alexa Erickson)

These measured outcomes demonstrated individual learning gains related to the environment and PSE changes that created more opportunities to spend time in gardens and outdoors. In this way, UC ANR improved access to green spaces and the outdoors for people and communities where they live, learn, work, and play. According to the Center for Disease Control and Prevention, you can burn up to 300 calories during just one hour of light gardening and yard work. In addition, research with students has demonstrated that just 30 minutes spent in nature after completing a stressful task improves their mood. The students who were studied exhibited lower levels of cortisol, the stress hormone. Collectively these efforts contribute to the public value of promoting healthy people and communities.

# **PROTECTING CALIFORNIA’S NATURAL RESOURCES**

## 

## Condition Change: UC ANR contributed to improved management and use of land

**Issue**

Public and private land in California is managed for a wide variety of uses. Challenges include loss of productive working landscapes, tree loss, human and wildlife conflicts, protecting water quality, living in fire-prone areas, and a better understanding of ecosystem services. Research and extension are needed to help residents and land managers balance the social, economic, and ecological benefits of land management.

**Methods**

UC ANR activities focus on management strategies concerning wildlife and land maintenance.

A UC Cooperative Extension (UCCE) Specialist’s lab at the UC Berkeley location continued to lead community-based projects related to Sudden Oak Death (SOD), including SOD Blitzs. Over 500 residents per year volunteer to help with detecting the disease and producing detailed local maps of disease distribution, identifying areas for proactive management. In 2024 SOD Blitz volunteers conducted 28 blitzes in 18 counties from the Oregon border to Santa Barbara County, surveyed more than 23,000 trees, and sampled approximately 1,800 to be tested at UC Berkeley. The 28 local activities reached a broad clientele across the state, including the Kashia Pomo and the Karuk native tribes. The map can be used to identify areas where the infestation may be mild enough to justify proactive management. A questionnaire was sent to users of the databases and maps to understand the impact of SOD BLITZ, including property owners, professionals, and property managers. (Matteo Garbelotto)

A UCCE Specialist at the UC Davis location continued research and extension work in adaptive rangeland decision-making. This included collaborating with scientists across the Western US to synthesize a core set of guiding principles on successful livestock grazing management. The principles have been instrumental in Extension education efforts as well as policy engagement activities. (Leslie Roche)

A UCCE Advisor developed an applied research and extension program to address high priority problems involving pest wildlife to support agricultural producers, federal, state, and local natural resources wildlife managers, Pest Control Advisers, and the general public. One topic included the 2.2 million geese who winter in California’s Sacramento and Central Valleys, and have caused a dramatic increase in damage to farmers and ranchers. UCCE used surveys to document $8.04 million in direct losses across 54 farming and ranching sites. Findings were shared via white papers and one-pagers for government and elected officials. (Reported by Breanna Martinico; collaborators mentioned: Morgan Doran)

Geese also create human-wildlife conflicts on California’s North Coast. Aleutian geese have an estimated population at over 200,000, which is a success story for the recovery of an endangered species, but has created burden on agricultural fields. A UCCE Advisor re-established the Aleution goose working group in cooperation with the California Department of Fish and Wildlife (CDFW) and delivered three workshops about the Aleutian goose population, managing public land to improve habitat, economic impacts on farms and ranches, and hunting opportunities. (Jeffery Stackhouse)

The same advisor continued research and extension on elk management in collaboration with the CDFW and private landowner community. This advisor co-led the creation of the first Elk Working Group on the North Coast, which brings interested parties together to make meaningful informed change. The advisor has also provided CDFW with data to support elk management plans in the past. (Jeffrey Stackhouse)

A team of UC ANR academics and Informatics and Geographic Information Systems (IGIS) staff continued research on landscape-scale water use of Douglas-fir encroachment in oak woodlands. The team established field plots in Humboldt and collected data on soil moisture, tree health, restoration costs and timber sales, forage recovery, and residual fuels. Findings were shared with policymakers to address oak woodlands conservation, fir forest encroachment, and the resulting losses in wildlife habitat, livestock grazing, biodiversity, and other ecosystem services. (Jeffery Stackhouse)

Two UCCE Advisors conducted collaborative research with ranchers on factors affecting oak regeneration in the North Coast and Humboldt County. For the last eight years, the team evaluated plots to determine if livestock, deer browsing, or other environmental influences are responsible for the lack of recruitment of oak seedlings to saplings. Research findings indicate deer browsing is largely responsible. (Reported by Jeffery Stackhouse; collaborator mentioned: Lenya Quinn-Davidson)

A UCCE Forest and Natural Resources Advisor continued research to improve land management in the Sierra Nevada foothills region. The advisor collaborated with the University of Nevada Reno to design and implement the statewide Sierra Nevada Adaptive Management Experiment identifying alternative forestland management practices in the face of changing climate and economic conditions. This included assessing species provenance and climate-adapted resilience, resistance, and transition silvicultural treatments. This project is supported by the California Department of Forestry and Fire Protection (CAL FIRE), core industrial partners, UC Berkeley, and Stanislaus Tuolumne Experimental Forest. Preliminary findings have been extended through public signage, field workshops, and conference presentations. (Reported by Ricky Satomi; collaborator mentioned: Rob York)

As a result of UC ANR research, outreach, and education, participants learned and adopted practices that improved land management. Outcomes with specific measured indicators follow.

**Outcomes**

**Science-based information was applied to land management policy and decision-making.**

* UCCE’s ongoing collaborative work in grazing management and adaptive decision making has consistently informed policy discussions around USDA Natural Resources Conservation Services practices, such as the January 2024 Conservation Practice Standard 528 update. This standard aims to improve the health and vigor of plants and animals in all lands where grazing and browsing occurs. (Leslie Roche)
* Solano County Farm Bureau utilized UCCE’s research findings to inform California Department of Fish and Wildlife of the need to maintain hunting regulations that reduce farm damages. UCCE’s research findings were also utilized in Washington D.C. in conversations about the need for federal disaster assistance in the Farm Bill. (Breanna Martinico)
* UCCE’s elk management research and extension work contributed to CDFW’s ten time increase in allowable elk harvest across landowners’ tags and five time increase in tags available to the public in Humboldt and Del Norte Counties. Additionally, CDFW increased the season length for landowner tags to address the low harvest rates of allotted elk, which increased success from 20% to 100% in 2024. These changes in elk harvesting reduce human-wildlife conflicts as one elk eats roughly 70% of what one cow eats. (Jeffery Stackhouse)
* UCCE’s data supported a better understanding of the environmental and economic cost of conifer encroachment at the landscape scale and the passage of AB 2276 (Wood) in 2024. This bill increases the allowable tree size of Douglas firs that can be removed in certain oak woodland restoration projects, supports oak resiliency, and provides flexibility to oak woodland restoration planners and operators. In addition, the change makes restoration projects more economically feasible for private landowners and increases potential revenues from the sale of lumber from these projects. (Jeffery Stackhouse)

**Change in condition: Money saved.**

* UCCE’s wildlife conflict efforts in Humboldt and Del Norte Counties led to legislative changes for Aleutian goose management and the local hunting season for geese. A UCCE survey found that this change saved the average livestock producer in Humboldt and Del Norte Counties approximately $53 per acre in goose-prone areas. When extrapolated to a total savings in high-goose grazing areas, this savings adds up to approximately $1.2M a year in Humboldt and Del Norte Counties alone, promoting economic prosperity in California. (Jeffery Stackhouse)

**Change in condition: Trees saved.**

* The SOD Blitz volunteers reported that they were able to work with 64 land managers in 2024 to protect 654 trees over 148 acres with an average success rate of 89% and at an average cost of $57 per tree. Given the high value of trees treated, the estimated direct economic value associated with the program was $981,000. (Matteo Garbelotto)
* Collaborating ranchers in UCCE’s oak regeneration research project have already begun applying deer fences to protect oak seedlings throughout their properties based on research findings. As a result, one rancher claimed to have protected over 300 oaks in one year alone. (Jeffery Stackhouse)

**Change in condition: Forests restored.**

* UCCE’s research collaborations resulted in over 1,500 acres of forestland treated and 120,000 trees planted in the Sierra Nevada region. The application of climate-adapted silvicultural strategies and species provenances will improve management and use of land across forests in the climate-impacted foothill region. (Ricky Satomi)

The measured outcomes reported above demonstrate how UC ANR has contributed to improvements in land management policies and practices that can maximize the benefits that managed lands provide. In this way, UC ANR contributes to the public value of protecting California’s natural resources.

Condition Change: UC ANR contributed to improved air quality

**Issue**

More than 90% of Californians breathe unhealthy air sometime during the year. Air pollution causes premature deaths per year, as well as asthma attacks, emergency room visits, and lost school and work days each year. Since 2003, California Department of Pesticide Regulation (CDPR) has documented hundreds of acute illnesses caused by accidental fumigant exposure to agricultural workers and people living near fumigated fields.(Joji Muramoto) According to the CDPR, sources of air pollution include vehicle exhaust and pesticides. California has been at the forefront of developing ways to mitigate air pollutant concentrations and the impacts of existing air pollution. The California Department of Food and Agriculture and CDPR’s Pest Management roadmap aims to eliminate high-risk pesticides by 2050. This roadmap was published in 2023 and is anticipated to include fumigants, which are toxic air contaminants.

**Methods**

UC ANR partners with public, governmental, and private groups to extend new knowledge and develop agricultural management practices to improve air quality.

A UCCE Area IPM Advisor for San Luis Obispo, Santa Barbara, and Ventura Counties conducted research and extension activities related to soilborne pathogens impacting high value strawberry and vegetable production on the Central Coast. These systems often rely solely on pre-plant soil fumigation that is expensive, often not effective, and poses a health hazard. UC Integrated Pest Management explains that fumigants are a major contributor of volatile organic compound emissions, which react with other chemicals to create ozone, a major air pollutant. To address this issue, the advisor has been collaborating with UCCE specialists, advisors, UC staff, CSU faculty, USDA scientists, and growers. These multi-disciplinary, collaborative applied research projects aim to reduce fumigant use in strawberry for soilborne disease management. Results have been shared through field days for clientele, grower meetings, and scientific abstracts. (Christopher Greer)

As a result of UC ANR research, outreach, and education, participants learned and adopted practices that improved air quality. Outcomes with specific measured indicators follow.

**Outcomes**

**Participants gained knowledge of non-fumigant management practices.**

* After seeing results of reduced fumigation trials, a few strawberries growers have communicated they are starting to feel more comfortable with reduced fumigant rates and question the traditional attitude that the highest rate of fumigant is best. (Christopher Greer)

**Participants adopted non-fumigant management practices.**

* By using multispectral imagery, a UCCE Advisor and grower collaborators were able to map plant mortality due to charcoal rot disease in strawberry, allowing reduced fumigation rates by up to 20% in the following season in areas of strawberry fields where disease risk was lowest. In reduced fumigation areas, there was no observed increased disease, and yields were not significantly different than in areas that received a full rate of fumigant. (Christopher Greer)

The measured outcomes reported above demonstrate improved knowledge and adoption of non-fumigant pest control practices that reduce air contaminants.Many more non-fumigant tools to control pests and diseases are needed, especially to reach CDFA and CDPR’s sustainability goals by 2050. According to CDPR, the average pounds of total fumigant active ingredients used on strawberries per year between 2019 and 2022 is 9,368,685 lbs/year. (Joji Muramoto) Furthermore, in 2023 CDPR conducted monitored air samples at locations in the state with high pesticide use and found no pesticide concentrations exceeding levels that are considered harmful to human health (Jim Farrar). In these ways, UC ANR contributes to improved air quality and the public value of promoting healthy communities.

## Condition Change: UC ANR contributed to the protection and conservation of soil quality

**Issue**

Soil health is essential for productive agricultural lands. Critical issues that require solutions in California include addressing salinity and nutrients in the soil. Healthy soils can lead to reduced greenhouse gas (GHG) emissions, improvements in crop yields, drought and flood tolerance, and better air and water quality. Soil health can be improved through farm management that increases soil organic matter. Proper understanding and care of soil are essential for a healthy and abundant food supply for Californians.

**Methods**

UC ANR develops research projects and extends information throughout the state to better understand management strategies, including cover cropping, to build soil health.

A UC Cooperative Extension (UCCE) Soil Resource Specialist located at UC Davis continued to develop decision support tools to guide land and water resource management, including the new app, the Soil Taxonomy Explorer (https://casoilresource.lawr.ucdavis.edu/ste/) . This tool allows users to map all of the hierarchical levels of Soil Taxonomy including formative elements within the taxa. Users show up to six layers per map. This is a powerful educational tool that enables users to visualize how taxa occupy various soil forming environments across the U.S. Clientele include growers, ranchers, consultants, agencies, and the general public. (Anthony O’Geen)

In another project, the specialist evaluated soil health promoting practices in rangelands incentivized by state and federal agencies. Although these practices may have other benefits, findings show that common soil health promoting practices have minimal impact on soil health in California rangelands. After 12 years of restoration with native perennial grasses, soils showed no change in carbon. Moreover, after five years of applying compost and range seeding, minimal change was observed with soil health indicators. These findings are being shared with UCCE educators, ranchers, and state and federal agency staff. (Anthony O’Geen)

A UCCE Technology and Innovation Advisor in the central San Joaquin Valley conducted research on enhancing climate resilience of small farms with waste-derived engineered hydrogels, which will determine the potential of waste-derived engineered hydrogels use under water-limited conditions, providing actionable insights for growers and specific crops. Findings were shared during meetings with growers. (Manpreet Singh)

*Cover crops*

A UCCE Advisor in the Delta region continued research and extension projects to understand how agricultural management affects soil health. This included a project to understand rice farmers’ inclination or inhibition to rotate crops by implementing a winter cover crop. Different cover crops were evaluated for their ability to survive through winter conditions and for their biomass production. Findings were extended through three newsletter/blog articles, two fact sheets, and one on-farm field day. (Reported by Michelle Leinfelder-Miles; collaborator mentioned: Whitney Brim-DeForest)

A UCCE Agronomy Advisor serving Sutter, Yuba, and Colusa Counties evaluated the benefits of soil management practices like applying cover crops in the winter and crop-livestock integration. Findings from these collaborative projects were shared at field days, in presentations and white papers, and conferences. (Sarah Light)

Research on establishing hedgerows in rice is ongoing. A UCCE collaboration of Rice and Agronomy Advisors co-planned the inaugural Hedgerows in Rice Field Day, where hedgerow plant selection was discussed. There were 41 people in attendance. (Reported by Sarah Marsh Janish and Sarah Light; collaborator mentioned: Whitney Brim-Deforest)

A UCCE Specialty Crops Advisor continued cover crop research and extension projects in collaboration with the Contra Costa Resources Conservation District, a regional seed company, walnut grower, and other UCCE personnel. Findings were shared at field demonstration days, educational videos, blog articles, and virtual site visits. (Kamyar Aram)

A UCCE Vegetable Crops Advisor in Imperial and Riverside Counties continued applied research projects with small growers in the region, which is known to have sandy loam soils with poor water-holding capacity. Furthermore, growers in the region tend to fallow vegetable fields in the summer, which exposes the soil to high temperatures, depletes soil’s organic matter, and reduces its ability to perform ecosystem functions like decomposition and mineralization. UCCE’s projects addressed these challenges by evaluating composting and cover crops that are known to improve soil health. Findings were shared via newsletters, clientele meetings, and a soil conservation practices campaign. (Philip Waisen)

A UCCE Food Safety and Organic Production Area Advisor in Riverside, Imperial, and San Diego Counties co-led a project investigating the effects of cover cropping practices on soil health and disease suppression. The team evaluated four cover crop species: cowpea, sunn hemp, brown mustard, and Sudan grass, compared to a fallow treatment. Soil physical, chemical, and biological parameters were assessed before cover crop termination. Sunn hemp and cowpea provided higher plant-available nitrogen. Findings were presented at key conferences and organized a field day. (Cuong Huu Nguyen)

As a result of UC ANR research, outreach, and education, growers learned and adopted practices to improve soil quality and conservation practices. Outcomes with specific measured indicators follow.

**Outcomes**

**Participants learned about or intended to adopt recommended soil management practices.**

* Growers shared that they increased their level of understanding (100%) about UCCE’s hydrogel concept and research after the meeting. Hydrogels have the potential to enhance soil health, water retention, and crop yield. (Manpreet Singh)
* After learning about UCCE’s winter cover crop project, 12 out of 13 clientele indicated that they learned useful information, and 8 out of 11 expressed an intention to use the information they learned over the next year. (Michelle Leinfelder-Miles)
* Clientele who attended UCCE’s cover crop field days reported the following:
  + In Colusa County, 100% (n=15) reported that they intend to use what they learned within the next 12 months.
  + In Sutter County, 84% (n=41) reported that they intend to use what they learned within the next 12 months.
  + After attending the field day about grazing summer crops, 88% (n=16) reported that they intend to use what they learned within the next 12 months.
* After the first Hedgerows in Rice Field Day, evaluation surveys found 78% (n=18) of respondents replied with “agree” or “strongly agree” when asked if they planned to use what they learned at this meeting in the next 12 months. (Sarah Light and Sarah Marsh Janish)

**Participants adopted recommended soil health management practices.**

* UCCE’s soil conservation campaign in Riverside and Imperial Counties has resulted in adoption of cover cropping and composting practices, which build soil organic matter for improved microbiology and buffering services like regulating soil pH and salinity levels. Additionally, these cover crops contributed plant-available nitrogen estimated at 100-140 pounds per acre, equivalent to saving $80-112 per acre. Specific examples of adoption include:
  + 6 acres of compost for nematode, nitrogen, and soil health management in fruiting vegetables bell pepper and okra.
  + 36 acres of sunn hemp cover crop and 56 acres of vetch cover crop both in a vineyard. Philip Waisen)
* UCCE documented an increase in cover crop planting in Sutter, Yuba, and Colusa Counties through conversations with a cover crop seed company that shared an increase in sales. The adoption of this practice was also observed through federal incentives program applications since the UCCE Advisor began this work. (Sarah Light)
* In Contra Costa County, UCCE observed some of the growers starting to use cover crops in their orchards after attending meetings or demonstrations. (Kamyar Aram)
* Clientele in Riverside, Imperial, and San Diego Counties initially responded to post-field day surveys intent to implement or expand cover cropping practices (85%). A six-month follow-up revealed that 60% had indeed planted summer cover crops on a trial basis, covering 320 acres across the region. (Cuong Huu Nguyen)

**Science-based information was applied to soil and water management decision-making.**

* UCCE’s Soil Taxonomy Explorer tool is being used by the USDA Natural Resources Conservation Services, including soil survey staff who use this information for soil survey updates and to plan the concepts of their new soil survey legends. As such, UCCE helps people make informed decisions about land use and natural resource management. (Anthony O’Geen)
* UCCE’s research findings in soil health practices in rangelands are changing policy. For example, the USDA-NRCS is removing the application of compost to rangelands as a formal incentivized conservation practice. (Anthony O’Geen)

**Change in condition: Reduced pest incidence in soil. NEW for this story**

* Last year, one UCCE Advisor reported an outcome of a small okra grower planting six acres of brown mustard crop. The grower reported that the cover crop provided a biofumigation effect, eliminating the need to treat nematodes. So, in addition to soil health benefits, like regulating soil pH and salinity levels, the grower saved at least $60 per acre by eliminating the need to apply the nematicide, Velum. (Philip Waisen)

The measured outcomes reported above demonstrate that growers learned and intend to adopt healthy soil practices. UC ANR has contributed to improvements in decision-making and potential technologies that will have the potential to improve soil quality, structure, water-holding capacity, and nutrient cycling.Through these efforts, UC ANR contributes to the public value of protecting California’s natural resources.

## Condition Change: UC ANR contributed to increased ecological sustainability of agriculture, landscapes, and forestry

Endemic and Invasive Pests and Diseases

**Issue**

Endemic and invasive pests and diseases cause widespread damage to agriculture, landscapes, and forests. The spread of invasive pests has increased in recent decades, linked to global travel, produce trade, and climate change. In 2022, the California Department of Pesticide Regulation identified that California used over 181 million pounds of pesticides. Pesticides are often used to control weeds, insects, and other pests. However, when used incorrectly, they can cause environmental problems. Growers, land managers, forestry, residents, and pest control experts need pest management tools and strategies that minimize the impact on natural pest enemies and pollinators, the potential for water and soil quality problems, the impact on aquatic invertebrates, and endangered species.

**Methods**

UC ANR partners with public, governmental, and private groups to develop and extend new knowledge about integrated pest management (IPM) for growers, land managers, and pest control professionals.

*Agriculture*

A UC Cooperative Extension (UCCE) Specialist from UC Davis coordinated and facilitated the Accreditation to Improve Restoration (AIR) program statewide for restoration nurseries to prevent the spread of Phytophthora into native ecosystems. For the AIR program, the specialist coordinates nursery audits, plant testing, workshops, meetings, and consultations. As of 2024, AIR has 20 nurseries actively participating in the program, with 10 of those fully accredited, and the remaining ones are in progress of obtaining accreditation. From September 2023 to July 2024, the AIR program conducted nine nursery audits, tested over 1,900 plants, provided consulting to at least eight new nurseries interested in joining the program, and developed educational resources in English and Spanish. (Johanna Del Castillo Múnera)

A UCCE Small Farms Advisor supported growers to manage rodent pests through non-chemical means. Rodent control is a major challenge faced by small-scale farms. Gophers and ground squirrels can cause substantial damage to plants and infrastructure. Chemical control options such as aluminum phosphide have high toxicity and may require restricted materials permits to acquire. The use of boxes to attract barn owls may be a viable non-chemical alternative. UCCE provided growers information on owl boxes through extension meetings, fact sheets, and hands-on demonstrations. This included a tailgate meeting to learn about options for making and purchasing owl boxes. (Ruth Dahlquist-Willard)

A UCCE Urban Agriculture and Small Farms Advisor provided technical assistance, training, and resources for growers in the Los Angeles area to increase IPM adoption, promote climate-resilient practices, reduce chemical use, and develop adaptive monitoring systems to address the challenges of climate change and pollution. The Urban Agriculture program has conducted over 20 farm visits, connecting growers with the UC Davis Plant Diagnostic Lab for sample analysis and expert consultations on plant disease confirmation and potential solutions. Additionally, the program has developed a local resource listing soil testing facilities to help growers access information on where to send samples, particularly for heavy metal analysis related to plant diseases. Technical assistance and funding were provided for soil toxicity sampling at three farms in East Los Angeles County, with the aim of demonstrating real-time data and developing remediation strategies for future seminars. (Amrita Mukherjee)

A UCCE Viticulture Advisor for Kern County conducted applied research on sustainable and efficient practices within the table grape industry. Information was shared with clientele through a variety of extension activities, including field days, presentations, and one-on-one technical assistance. The advisor presented to 70 attendees on sustainable vineyard management at the Southern San Joaquin Valley Grape Symposium. (Tian Tian)

*Landscapes*

UCCE Specialists at UC Davis in collaboration with UCCE Advisors, researchers from the Northern California and United States Golf Associations, 14 golf course superintendents, and a UC Davis graduate student conducted trials to develop a sustainable management program for plant parasitic nematodes. In field trials conducted at two golf courses in Monterey County and two in San Mateo County, the research team focused on understanding the biology and population cycling of *A. pacificae* and other nematodes on golf course greens. They also explored potential alternative solutions, including safer chemical options and the potential effectiveness against nematodes of currently registered fungicides and insecticides. (Reported by Becky Westerdahl; collaborators mentioned: James Baird, Ole Becker, Larry Costello, and Ali Harvandi)

A Livestock and Natural Resources UCCE Advisor in Lassen County initiated a multi-stakeholder partnership in 2001, which continues to be an active and effective means of managing and enhancing the broad expanse of sagebrush rangelands in the county. Together, they conduct hands-on, collaborative, participatory, rangeland restoration projects in an adaptive management framework. UCCE created extension documents providing grazing management guidance after wildfire and practical control strategies for the weed western juniper to support on-the-ground management. (David Lile)

A UCCE Area IPM Advisor for Southern California conducts outreach with pest management professionals on appropriate ways to reduce pesticide runoff in urban areas. Pest management professionals from Los Angeles, Riverside and Orange Counties learned about using granular pesticide formulations to control red imported fire ants. An alternative to liquid insecticides, these granules have a lower concentration of pesticides, are less likely to cause pesticide runoff, and are generally more effective for controlling fire ants. The advisor presented several talks, including a professional webinar for the Pesticide Applicators Professional Association. The presentation addressed ways pest management professionals can avoid violating pesticides laws, especially those related to pesticide run-off prevention and surface water pollution mitigation. (Siavash Taravati)

A UCCE Advisor developed extension resources and applied research projects to address and reduce human-wildlife conflicts in urban and agricultural areas in Southern California. One project involved understanding the impacts of anticoagulant rodenticides on urban carnivores, which included evaluating the presence of anticoagulant rodenticides in liver, feces, and hair of San Joaquin kit foxes and investigating rodenticide pathways in an urban system through the use of isotopically labelled bait. (Niamh Quinn)

A UCCE Environmental Horticulture Advisor in Los Angeles researched and promoted awareness of pests and diseases that threaten urban and natural ecosystems. These pests and diseases undermine the aesthetic and cultural value of green spaces, raise maintenance costs, pose safety risks, and exacerbate the effects of climate change. For example, pest- and disease-weakened trees become more susceptible to extreme weather events and human influences, further stressing the ecosystem services they provide. In 2024, the advisor gave 22 extension presentations on pests and diseases to over 2,000 clientele. The advisor also collaborated with local and state agencies to develop and implement an IPM program for the Cuban Slug at a botanical garden. (Christopher Shogren)

A UCCE Entomology Advisor in Ventura County conducts research and extension to enhance conservation of beneficial and endangered insects in agricultural, urban, and natural ecosystems to protect California’s natural resources. The advisor contributed to four events attended by 252 participants, including UC Master Gardener volunteers, youth, other community members, and agricultural professionals. Learning objectives included: knowledge of insects common to different ecosystems, knowledge of why endangered species are declining, and knowledge about how to protect beneficial insects such as pollinators and natural enemies. (Reported by: Hamutahl Cohen; collaborators mentioned: Neal Williams, Adam Lambert)

*Forestry*

A UCCE Specialist at UC Berkeley delivered research-based information to stakeholders in real time, which is pivotal when dealing with emergent invasive diseases with dynamic host and geographic ranges. Heterobasidion Root Disease (HRD) is a major problem in coniferous forests in California and worldwide, contributing to high mortality, which, in turn, affects bark beetle outbreaks and wildfires. Building on decades of research, the UCCE Specialist and research collaborators spearheaded a novel method for detecting HRD using spore trapping. (Matteo Garbelotto)

In consultation with public and private landowners, a UCCE Advisor conducted research on invasive weed species on rangelands and forests, such as perennial pepperweed, scotch broom, and the federally listed noxious weed bearded creeper. These species can damage the ecosystems, increase fire risk, and reduce agricultural production. To share information, the advisor led three in-person trainings on calibrating herbicide applications, which were attended by a total of 150 participants. The advisor also organized one field tour on invasive species, gave seven educational presentations to clientele, authored blog posts and newsletters, and communicated about invasive weed issues to local government officials, and politicians. (Thomas Getts)

As a result of UC ANR research, outreach, and education, participants learned and adopted practices that led to the increased ecological sustainability of agriculture, landscapes, and forestry. Research and activities that resulted in outcomes with specific measured indicators follow.

**Outcomes**

**Participants learned or intended to adopt pest management practices, including IPM strategies.**

* After attending the Southern San Joaquin Valley Grape Symposium, 34 participants completed the post-event survey. More than 74% reported gaining new knowledge that they intend to apply within the next year. (Tian Tian)
* After attending a professional webinar on IPM strategies to control imported fire ants, all 32 pest management professionals were satisfied or very satisfied with the content and quality of the presentation on pest control regulations. Additionally, 91% stated that they learned something new 89% of them stated that they have or will implement some of the practices they learned in the future. (Siavash Taravati)
* After attending a tailgate meeting to learn about managing rodent pests by attracting owls, all nine growers indicated increased knowledge on the benefits of barn owls, attracting owls, making owl boxes, and not using rodenticides when having an owl box. Eight growers indicated they would definitely use an owl box on their farm, and one indicated they might use one. (Ruth Dahlquist-Willard)
* After attending workshops on calibrating herbicide applications, 99% of participants surveyed “gained confidence and skills in regard to properly applying herbicides”. (Thomas Getts)
* As a result of the one-on-one consultations with a UCCE Urban Agriculture Advisor, two onion growers intended to do disease sampling tests for nutrient management in farms in collaboration with the UC Davis disease diagnostic lab. (Amrita Mukherjee)
* After participating in the Small Farm Conference 2024, 94% of attendees who completed a post-survey reported they felt the event greatly improved their understanding of soil toxicity's impact on plant disease and pest management through Phyto-remediation. More than 80% intended to use that information in their work. (Amrita Mukherjee)
* UCCE talks on diseases impacting pine and ficus trees throughout Orange and Los Angeles Counties received an average rating of 4.8 out of 5 on follow-up surveys (n=98).
* One respondent commented, “The ficus presentation was probably the most confirmative, productive presentation I have ever experienced.” (Christopher Shogren)
* After attending UCCE events related to conserving beneficial and endangered insects, a subset of participants (n=79) completed a post-event survey: 100% reported agreement or strong agreement that the event they attended increased their knowledge of why pollinators are declining and how to protect them. As a result of attending a workshop, 99% of participants agree or strongly agree that they intend to actively protect beneficial insects by planting flowers, reducing pesticide use, supporting pollinator-friendly farmers, or some other practice. (Hamutahl Cohen)

**Participants adopted recommended pest management techniques.**

* After attending a tailgate meeting to learn about managing rodent pests by attracting owls, five out of nine growers constructed their own owl boxes to use on their farms. (Ruth Dahlquist-Willard)
* One grower who attended a UCCE field day on powdery mildew started to apply fungicide rotation that had been tested in a showcased UCCE research project. (Tian Tian)
* The Plumas County Office of the Agricultural Commissioner / Sealer of Weights and Measures and local landowners in Sierra Valley have shifted away from using chlorsulfuron based on UCCE research showing perennial pepperweed may be resistant to that chemistry. (Thomas Getts)

**Science-based information was applied to integrated pest management policy and decision-making.**

* As a result of UCCE research on sustainable management of nematodes in turfgrass, the California Department of Pesticide Regulation registered a new biological nematicide, DivaNem, for use on turfgrass. (Becky Westerdahl)
* Forestry officials in the European Union have adopted the novel method for detecting HRD developed by a UCCE Specialist. Subsequently, the U.S. Forest Service is now collaborating with the specialist to refine and adopt the detection method as well. (Matteo Garbelotto)
* UCCE research led to the creation of isotopically labelled rodenticide, a ground-breaking tool that allows the evaluation of mitigation outcomes at both state and federal levels, including regulatory agencies like the Department of Pesticide Regulation (DPR) and the Environmental Protection Agency (EPA). The methodologies developed for tracing rodenticides have potential applications for other pesticide types, paving the way for revolutionizing how pesticide drift is measured. This advancement could substantially mitigate environmental impacts by offering a precise and scalable tool for monitoring pesticide dispersal and exposure. (Niamh Quinn)
* UCCE work on invasive annual grasses has resulted in the Fish and Wildlife Service’s decision to treat over 1,000 acres of intact sage grouse habitat. (Thomas Getts)

**Change in condition: Reduced pest incidence.**

* Among AIR-accredited nurseries, no Phytophthora has been detected, indicating the effectiveness of the proposed management practices at reducing the risk of introducing these pathogens into restoration sites. (Johanna Del Castillo Múnera)
* A UCCE-led IPM program at a botanical garden in San Marino succeeded in eradicating the Cuban Slug. (Christopher Shogren)

**Change in condition: Rangeland restored.**

* Between 2021-2024, UCCE contributed to building clientele capacity in Lassen County, resulting in the following changes:
  + over 18,000 acres of the weed western juniper have been removed;
  + 10,000 acres of annual grass treated;
  + 10,000 acres of range seedings or beneficial shrub planting completed; and
  + over 4 miles of stream restoration. (David Lile)

The measured outcomes reported above improved the state’s ability to prevent, control, and mitigate pests and diseases. IPM programs contributed to decreased use of certain pesticides reducing the associated environmental, as well as health, risks. According to CDPR’s 2021 Pesticide Use Report, ten-year trends include a 40% reduction in cholinesterase inhibitors (neurotoxins), 18% reduction in fumigants (biocides), 81% in potential groundwater contaminants, 58% reduction in reproductive toxins, and 22% reduction in toxic air contaminants. (Jim Farrar) In these ways, UC ANR contributes to the increased ecological sustainability of agriculture, forestry, and diverse landscapes and the public value of protecting California’s natural resources, helping California realize the many benefits of its rich and diverse natural resources.

Condition Change: UC ANR contributed to increased ecological sustainability of agriculture, landscapes and forestry

Sustainable Natural Ecosystems

**Issue**

Nearly 33% of California’s land is covered by forest, which provides clean air and water, carbon sequestration, and habitat for plants and wildlife. Since 2018, nearly 1.5 million acres of forest have been impacted by wildfires. There is a critical need for landowners and managers to understand how to implement a variety of forest management practices that allow for the restoration and conservation of these services. Identifying ecosystem restoration and management practices is needed for California’s plants, wildlife, and other natural resources to continue to thrive.

**Methods**

UC ANR partners with public, governmental, and private groups to develop and extend new knowledge to forest managers to help them increase the ecological sustainability of their forests.

A UC Cooperative Extension (UCCE) Forest Advisor in Humboldt and Del Norte Counties helped provide stewardship classes and Tree School programs for forest landowners. The advisor was also part of a UCCE team that supported comprehensive regulatory reform through a decade of research that culminated in the development of new permitting pathways for oak woodland restoration via changes in regulations before the California Board of Forestry and Fire Protection and policy through Assembly Bill 1958 and Senate Bill 901. This allowed landowners to use a California Environmental Quality Act permit process to carry out forest management in an effort to restore oak woodlands. In another project, the advisor surveyed foresters about their experiences with these permits. UC ANR’s research provided the evidence for the policy and regulatory changes. (Yana Valachovic)

A UCCE academic collaborated with the U.S. Forest Service on their greenhouse screening program to identify tree families with a natural immunity to white pine blister rust. This disease is caused by the non-native fungal pathogen *cronartium ribicola* with severe mortality occurring in six California native conifer species. The research specialist also collaborated with a UCCE Advisor on the Mitchell Mine fuel break demonstration project, which identified successful chemical treatment methods that prevent vegetation regeneration on a fuel break. Findings were shared via reports and a presentation to the Amador Board of Supervisors. (Reported by Brian Allen; collaborator mentioned: Scott Oneto)

UCCE Advisors and an Academic Coordinator continued to deliver the Forest Stewardship workshops across the state as part of the Forest Stewardship Education Initiative which began in 2020. The goal is to extend recommended actions to private landowners and land managers to help them increase their forests’ resilience to wildfire and climate change. In the last five years, 28 nine-week workshops were attended by 549 participants across California including Lake, Amador-Calaveras, Butte, Napa, Trinity, Solano-Sacramento, Santa Clara-Santa Cruz, San Bernardino, Fresno-Madera, San Luis Obispo Counties and the Lake Tahoe Basin. An additional 26 learning sessions and field days were delivered on topics requested by workshop participants. (Reported by Kim Ingram; collaborators mentioned: Susie Kocher, Mike Jones, Yana Valachovic, Brian Woodward, and Ricky Satomi)

A UCCE Forest and Natural Resources Advisor in the Sierra Foothill region addressed the critical need of artificial reforestation due to wildfire impacts. The advisor led a coalition of U.S. Forest Service, CAL FIRE, American Forests, and industry experts to develop cone survey standards. Aligning cone survey standards between agencies and industry led to improvements in cone collection efforts. Results of this effort were distributed through development of factsheets and a storymap tool. The advisor also continued extension efforts to improve public understanding of forest and sustainable ecosystem management. Eighteen workshops and several presentations reached over 650 local clientele. Topics included forest management, fuel management, herbicide use, and post-fire stewardship. (Ricky Satomi)

As a result of UC ANR research, outreach, and education, participants learned and adopted practices for forest management. Outcomes with specific measured indicators follow.

**Outcomes**

**Participants learned strategies for forest stewardship.**

* Forest Stewardship workshop participants who responded to a survey (n=87) indicated interest across the range of management activities that forest landowners can take. Attitudes and perceptions increased positively for each: (pre-workshop to post-workshop, very or definitely interested)
  + Prescribed fire: 44% to 73%
  + Fuels reduction: 71% to 97%
  + Tree thinning: 51% to 88%
  + Timber harvest: 15% to 37%
  + Mapping forest inventory on property: 25% to 55%
  + Forest management plan: 29% to 88% (Kim Ingram)
* After participating in stewardship classes or a Tree School program, participant evaluation surveys (n=225) indicated that 99% agreed or strongly agreed that they could use the information within the next 6 months. (Yana Valachovic)

**Participants adopted recommended practices for forest management.**

* Since 2020, the number of Forest Stewardship workshop participants who adopted UCCE’s recommended practice of completing a free initial site visit by a Registered Professional Forester increased to 104, which is up from 79 last year. These forest landowners manage over 10,696 acres of forestland in California. This practice leads to the development of a forest management plan and implementation of forest management activities, potentially improving overall forest health and resiliency, and reducing the negative effects of wildfire. Seventeen participants continue to have an ongoing, professional relationship with the resource professional after the site visit. (Kim Ingram)
* UCCE conducted interviews with a subset of forest stewardship participants (n=56) who have had their initial site visits about their progress towards plan development, obtaining funding, and forest management. Post-workshop, 20% had an existing plan that was updated and 38% had developed a plan or are close to finalizing a plan. The top five management activities include thinning, burn piles, defensible space work, road work, and invasive species removal. Twenty-eight applied for and received cost-share funding. (Kim Ingram)
* As a result of attending stewardship workshops and/or Tree School programs, five participants with property in the Humboldt-Del Norte area have had visits with a forester and developed management plans covering 900 acres. (Yana Valachovic)

**Science-based information was applied to forest management decision-making.**

* UCCE’s forester survey data was used to support revising one of the permits to reduce costs and increase utility, resulting in a legislative change [AB 2276 (Wood, 2024)]. Following the bill's passage, the permit is before the Board of Forestry to finish the enabling regulations. The legislation sailed through the legislature in 2024, indicating the sea change in supporting forest restoration and resiliency. (Yana Valachovic)
* The U.S. Forest Service greenhouse screening program utilized genetic tools developed in collaboration with UCCE to increase the efficiency of detecting needle pines with natural immunity to white pine blister rust. As a result, 612 sugar pine samples were collected. Detection of this disease prevents native California tree mortality but is expensive; this new tool saves greenhouse operations $2,000 per tree removed. (Brian Allen)
* The Amador County Board of Supervisors utilized expertise gained from UCCE’s trainings to be advisors at the 2024 Forestry Challenge. This challenge is an event for high school students to learn about technical forestry and current forestry topics. (Brian Allen)
* UCCE’s Cone Survey Tool Pilot has been incorporated by state, federal, and community partners in cone survey efforts across California. In concert with a prolific masting year, successful collections across the states have improved the ability to artificially reforest forests impacted by wildfire. (Ricky Satomi)

**Change in condition: Oak woodlands restored. NEW**

* UCCE’s long-term policy work and systems thinking approach contributed to 3,000 acres of oak restoration in the North Coast. This builds on several previously reported outcomes: Oak restoration is becoming a mainstream practice, as demonstrated in 2023 by landowners utilizing over 70 permits to restore oak woodlands across the state. This number has increased from seven permits reported in 2018, when UCCE’s research and policy engagement activities contributed to the passing of California Assembly Bill 1958 (Wood, 2016). (Yana Valachovic)

The measured outcomes reported above demonstrate how UC ANR supports the implementation of forest management and restoration practices and policy. Increased ecological sustainability of forests helps California realize the many benefits of the state’s rich and diverse natural resources. Thus, UC ANR contributes to the public value of protecting California’s natural resources.

Condition Change: UC ANR contributed to increased ecological sustainability of agriculture, landscapes, and forestry

Sustainable Natural Ecosystems

**Issue**

Rangelands are the largest land use in California at over 62.9 million acres and account for over 50% of the state. Range provides clean air, carbon sequestration, clean water, and habitat for plants and wildlife. It is imperative to support the $1 billion in ecosystem services that rangelands provide across the state. Issues of most concern include drought, climate change, catastrophic wildfires, and the threat of urban sprawl. (Scott Oneto) There is a critical need for landowners and managers to understand the impacts of a variety of different management practices, including the restoration and conservation of these services. Identifying ecosystem restoration methods and ecosystem management practices is needed for California’s plants, wildlife, and other natural resources to continue to thrive.

**Methods**

UC ANR leads collaborative research and extension efforts and supports the adoption of practice to increase the ecological sustainability of rangelands.

A UC Cooperative Extension (UCCE) Advisor continued research and extension in the conservation of biological diversity and social sustainability in San Francisco Bay Area working rangelands, where nearly one-third of all federally-listed threatened and endangered species in California are found (97 species). Science-based knowledge of grazing and rangeland management was developed and extended via workshops and publications to rangeland managers and livestock producers to support species conservation, mitigate threats to biological conservation, restore livestock ponds, support compost application, and address concerns from livestock grazing including climate impacts. (Sheila Barry)

The advisor also continued developing and extending science-based knowledge to address conservation of biological diversity and concerns from livestock grazing, including climate impacts. At the Central Coast Rangeland Coalition Workshop, the advisor provided information on the creation of livestock ponds in the San Francisco Bay Area, and the value of ecosystem services for rangeland managers and ranchers. The advisor also hosted two workshops on climate smart strategies for rangelands for producers and rangeland managers. (Sheila Barry)

A UCCE Advisor in San Luis Obispo and Santa Barbara Counties continued to conduct collaborative research about the sustainable use of rangelands for private owners, managers, and public and non-profit agencies. The advisor conducted an irrigated pasture seeding trial and field days to provide information about drought updates and improved summer forage. Additional rangeland management extension activities were delivered to meet clientele needs, including one workshop about ground squirrel control. (Royce Larsen)

As a result of UC ANR research, outreach, and education, participants learned and adopted practices that led to the increased ecological sustainability of rangeland. Outcomes with specific measured indicators follow.

**Outcomes**

**Participants learned and intend to adopt conservation strategies for range management.**

* Participants of the Central Coast Rangeland Coalition workshops reported the following outcomes in post-meeting surveys:
  + Of the 46 attendees who participated in the livestock pond restoration workshop, 63% increased their knowledge of livestock pond habitat management and 77% learned something about grazing and wildlife management that they would apply.
  + Of the 53 attendees who attended the value of ecosystem services workshop, 58% increased their knowledge of valuing ecosystem services and 64% learned about practices that they would apply to improve rangeland sustainability. (Sheila Barry)
* In a survey after climate smart strategies workshops, producers and rangeland managers (n=43) reported 69% increased their knowledge a lot on sequestering carbon on rangelands and 83% learned about climate-smart practices to apply to rangeland. (Sheila Barry)
* Twelve of 22 attendees responded to the irrigated pasture field day evaluation, with 75% stating they gained useful information. (Royce Larsen)
* Eleven of 44 attendees responded to the ground squirrel control workshop evaluation, with 100% stating they gained useful information. (Royce Larsen)

**Change in condition: Rangeland restored.**

* As a result of UCCE’s research on grazing and management for conservation of San Francisco Bay Area endangered species habitat, grazing management practices are supporting habitat for endangered butterflies, reptiles, amphibians, birds, and flowering plants across over 211,000 year (up from 200,000 reported last year) in San Mateo, Santa Clara, Alameda, and Contra Costa Counties. (Sheila Barry)

The range management measured outcomes reported above demonstrate how UC ANR supports the implementation of rangeland restoration practices and policy and regulation. Increased ecological sustainability of range helps California realize the many benefits of the state’s rich and diverse natural resources. Thus, UC ANR contributes to the public value of protecting California’s natural resources.

Condition Change: UC ANR contributed to increased ecological sustainability of agriculture, landscapes, and forestry

Sustainable Food Systems

**Issue**

California’s large population of 39 million people raises environmental concerns for the state’s urban landscapes and urban-rural interfaces, such as effects on pollinator populations, green waste, and water quality and quantity issues. There is an opportunity to improve landscape management industry practices. For example, changes in fertilizer and pesticide applications can reduce negative impacts on the environment, especially surface water contamination. There is also the opportunity to conserve water, given 50% of residential water consumption statewide is applied to landscapes.

**Methods**

UC ANR translates research into actionable landscape management strategies and extends science-based information about environmental horticulture.

The UC Master Gardener Program has volunteers in 50 counties serving 55 counties by research-based information on environmental horticulture to help the public grow home, community, and school gardens more sustainably. Over 6,328 Master Gardeners volunteered 510,063 hours. (UC Master Gardener Program)

The UC Cooperative Extension (UCCE) Specialty Crops and Horticulture Advisor on California’s rural North Coast delivered an extension program for horticulture clientele, which includes commercial nurseries, municipalities, the community garden programs of Tribes, and nonprofits. He organizes and collaborates in extension meetings, provides individualized advising, and provides coordination and education for the region’s UC Master Gardener Program. (Eddie Tanner)

As a result of UC ANR research and extension, participants learned and adopted sustainable landscaping and gardening practices. Outcomes with specific indicators follow.

**Outcomes**

**Participants adopted recommended practices for sustainable landscaping.**

* Members of the public participating in the volunteer-led UC Master Gardener education events reported the following through a statewide follow-up survey:
* Created and enhanced pollinator-friendly gardens; for example, 72% (of 309 respondents) started or improved their use of plants that attract and support pollinators, and 53% (of 298 respondents) started or improved the practice of providing water sources for pollinators. They also learned about creating nesting habitats. They reported applying what they learned to 1,017,448 square feet of pollinator habitat. This improves yields from home food gardens and supports local agriculture productivity.
* Used recommended green waste reduction practices; for example 50% (of 229 respondents) started or improved using finished compost as a soil amendment. This recycles organic matter and contributes to less green waste in landfills.
* Adopted improved landscape water use efficiency practices; for example, 65% (of 468 respondents) started or improved using mulch, and 63% (of 466 respondents) started or improved the practice of selecting low water-use plants. In addition, participants reported removing 84,472 square feet of turf. These practices reduce landscape water use.
* Adopted integrated pest management practices; for example, 75% (of 518 respondents) started or improved monitoring for pests or diseases, and 57% (of 517 respondents) started or improved the practice of removing or not introducing invasive plants. These practices slow the spread and protect natural and managed ecosystems. (UC Master Gardener Program)
* As a result of the UCCE North Coast effort, the following environmental horticulture practices were adopted.
  + IPM was adopted on apple trees in the Tribe’s Potawot Community Food Garden, which resulted in removing Nectria canker to prevent future infection.
  + City of Rio Dell reduced irrigation frequency as a result of the UCCE ornamental trees inspection.
  + The Elkhorn Herbals Plant Nursery adopted the recommended commercial nursery fertilizer and irrigation strategies, which helped extend the salability of vegetable starts. (Eddie Tanner)

**Change in condition:** **Increased ecological sustainability**. **NEW**

* The improved irrigation design was implemented on the community garden with the Yurok tribe, which led to a reported 40% water savings. (Eddie Tanner)
* Adoption of wireworm IPM led to an estimated 60% reduction in damage to potatoes at the Tribe’s Tishannik garden. (Eddie Tanner)

Together the measured outcomes reported above demonstrate that because of UC ANR’s efforts, some landscapes are now more ecologically sustainable – supporting pollinators, reducing and reusing green waste otherwise going to landfills, protecting water quality, and saving water. UCCE research estimates that implementing best management practices for irrigating landscapes could save between 1.3 million to 2.9 million acre-feet of water per year in California. In this way, UC ANR contributes to the public value of protecting California’s natural resources.

## Condition Change: UC ANR contributed to improved water quality

**Issue**

Poor water quality can result from a variety of point and nonpoint sources of pollution such as land development, land-use practices, or pollutants and sediment in runoff from stormwater in urban and agricultural sites. Inefficient irrigation systems can lead to large volumes of subsurface water drainage, increasing the leaching of nitrates into water. When nitrate in a public water supply reaches or exceeds 45 mg/l standards, costly measures are required to remove it. In California, multiple areas have elevated nitrate contamination levels in groundwater, including the San Joaquin Valley, Santa Ana Valley, and Salinas basins. Water quality regulations for irrigated lands in California require that growers monitor water use and nutrient discharges to limit the movement of fertilizers into groundwater and surface water. In addition to managing agricultural lands, protecting water quality from rangelands is also a significant concern as surface runoff and groundwater on rangelands provide essential municipal water sources for regional communities.

**Methods**

UC ANR uses applied research to better understand the impacts of agricultural and rangeland management practices on water quality and extends outreach to growers, ranchers, government agencies, and the public.

UC ANR’s California Institute for Water Resources includes a Nitrogen and Irrigation Initiative to improve nitrogen and irrigation management in the state by sharing relevant knowledge and assisting with implementation so growers can adopt practices in their specific circumstances. As water quality and quantity regulations are implemented in Central Valley and Central Coast regions, adoption of improved nitrogen and irrigation management practices is crucial for growers. The Academic Coordinator for this initiative coordinated UCCE Advisors, Specialists, and Staff Research Associates who conducted 68 workshops and webinars, 43 on-farm demonstrations, and 323 consultations, reaching over 3,000 growers and consultants. (Rachel Shellabarger)

A UCCE Advisor continued research and extension efforts to protect water quality and address surface water resources in San Diego County, nutrient loads in the Salton Sea, and waste discharge requirements for agricultural drainage water in Southern California. This included six trials at UC ANR’s Desert Research and Extension Center and 25 trials in commercial fields of leaf, romaine and head lettuces, dehydrated onion, and carrot in the Imperial and Coachella Valleys. (Ali Montazar)

The advisor also conducted collaborative research on salinity and drainage in 800 acres of alfalfa fields, 500 acres of onion fields, 400 acres of date palms, 200 acres of carrot fields, 250 acres of lettuce fields, 100 acres of avocados fields in the Imperial, Palo Verde, Coachella, Escondido, and Temecula Valleys. Findings were presented to the agriculture industry as well as local irrigation and water advisory groups. (Ali Montazar)

UCCE continued efforts to adapt CropManage for the low desert crops to address Salton Sea water quality concerns. CropManage is an online irrigation and nutrient management decision support tool that fills a gap in providing accurate information to achieve full economic gains in a sustainable, water quality approach. UCCE conducted outreach activities and provided equipment to encourage local growers to use this tool. (Ali Montazar)

A UCCE Advisor continued research and extension on improving nitrogen management. The advisor delivered a Small Grains Nitrogen Management Webtool Training and a presentation to the Colusa Glenn Subwatershed Program, an organization that helps growers comply with regulations. The advisor also collaboratively delivered statewide Nutrient Management Workshops for the USDA NRCS. (Reported by Sarah Light and Nick Clark; collaborators mentioned: Deanne Meyer and Daniel Geisseler)

A UCCE Small Farms Advisor gave 31 talks and workshops on nitrogen management, a crucial nutrient for plant growth that can become an environmental pollutant when used in excess. The talks and workshops reached over 1500 clients. (Margaret Lloyd)

A UCCE Advisor in the Eastern Sierra region continued to bring water quality expertise in regional water quality planning for the impaired Bishop Creek watershed. UCCE provided technical service and led a planning process that included partner agency and local rancher input. In the last year, the advisor continued to provide science-based information to inform the Vision Plan for the Lahontan Regional Water Board that proposed an alternative to the current regulatory framework. (Dustin Blakey)

As a result of UC ANR research and extension, participants learned and adopted practices that improve water quality. Outcomes with specific indicators follow.

**Outcomes**

**Participants learned about and intended to adopt recommended management practices for preserving water quality.**

* Nitrogen and Irrigation Initiative workshop participants learned about how to implement nitrogen and irrigation practices more efficiently, which can contribute to improved water quality. Specifically, participants who responded to a survey reported that as a result of attending workshops:
  + 91-94% acquired new knowledge
  + Up to 60% intend to adopt a new practice
  + Up to 80% learned how to use a practice they were already using better. (Rachel Shellabarger)
* Post-event evaluations of the Small Grains Nitrogen Management Webtool training series indicated that participants (n=9) increased their knowledge by the following percentage points: 167% on soil nitrate quick tests; 145% on N-rich reference zones; and 235% on use of the Webtool. (Sarah Light)
* Evaluations of the training hosted by the Colusa Glenn Subwatershed indicated that 82% of attendees (n= 28) plan to use what they learned in the next 12 months and 85% learned useful information. (Sarah Light)
* For the Nutrient Management Workshops throughout the state, 98% of 44 survey respondents learned something useful and 95% said they planned to use the information during their professional work within the next year. Expected impacts for this program include improved water quality as clientele come into compliance with environmental regulatory requirements by improving their nitrogen use. (Sarah Light and Nick Clark)

**Participants adopted recommended management practices for preserving water quality.**

* Two growers in Colusa County shared with UCCE that they learned about Small Grains Nitrogen Management Webtool through our extension efforts, and that they had such success with reducing nitrogen application on the first field that they tried, that this year they plan to implement the practice on all of their wheat fields. (Sarah Light)
* After attending workshops on nitrogen management, evaluations from participants and one-on-one feedback show that many growers are adjusting their compost and fertilizer practices based on the recommendations provided by the UCCE Small Farms Advisor. (Margaret Lloyd)
* CropManage was used in 14 romaine and head lettuce fields involved in a UCCE lettuce study on nearly 400 acres. Growers who adapted the CropManage in lettuce fields with sandy soils (180 acres) found a considerable reduction in water (an average of 0.9 ac-ft/ac) and nitrogen fertilizer (120 lbs. N/ac) compared with the standard practices. Adopting water and nutrient management practices is vital for addressing water quality concerns in the low desert region. (Ali Montazar)
* Fifteen growers, up from eight last year, in the Imperial Valley modified their salt leaching practices following UCCE’s recommendations from the salinity and drainage research. (Ali Montazar)

**Science-based information was applied to water quality policy and decision-making.**

* The Imperial Valley Irrigated Land Coalition and Coachella Valley Irrigated Land Coalition adapted the nitrogen removal lettuce crop coefficient developed by UCCE’s studies and transformed these data into the quotient N applied/N removed, which is reported along with the applied N to the Colorado River Basin Regional Water Board. (Ali Montazar)
* The Lahontan Region Water Board’s Vision Plan used information from UCCE to remove alfalfa and hay leases from the parcels requiring Ranch Water Management Plans as there was essentially no risk to water quality. This saves that lessee effort needed for compliance under the plan. (Dustin Blakey)

The improved practices reported above enable managers to reduce pollutants, leading to more environmentally sustainable farming and ranching. By reducing pollutants such as nitrates from fertilizers, pesticides, and animal waste that run off or leach from agricultural, rangelands, and landscapes into water supplies, UC ANR helps preserve water quality. Thus, UC ANR contributes to the public value of protecting California’s Natural Resources.

## Condition Change: UC ANR contributed to improved water use efficiency

**Issue**

More than nine million acres of farmland in California are irrigated, representing roughly 80% of all water used for businesses and homes. The state faces challenges to meet its water demands. As the state’s population expands and agricultural water uses are curtailed to meet new sustainable groundwater management guidelines, there can be an expected decrease in water availability and increased competition between urban, environmental, and agricultural water uses.

**Methods**

UC ANR conducts research projects throughout the state to identify more efficient water practices and extends them to growers, managers, decision-makers, and the public to transform how Californians use water.

A UC Cooperative Extension (UCCE) Specialist at UC Riverside continued to conduct research and outreach to preserve turfgrass, which is a multibillion-dollar industry in California. This includes researching desirable turf with improved drought resistance. Approximately nine acres of turf are dedicated to research in Riverside, and remote research is conducted at more than 20 golf courses and sod farms throughout California and five other states. (James Baird)

A UCCE Advisor conducted applied research and extension activities in irrigation efficiency in San Diego County, where virtually no surface or groundwater water is available and improving irrigation efficiency is essential to maintain nursery and floriculture industry profitability and regulatory compliance. Educational presentations and YouTube videos in English and Spanish reached clientele, including growers, production managers, local agencies, and non-profit organization staff. In another project, three advisors tested 20 different models of sprinklers commonly used in the California plant industry. Findings were shared with nurseries to improve water distribution uniformity. (Gerry Spinelli)

A UCCE Advisor continued water use efficiency research with collaborative growers to address recurring long-term droughts and water shortages. Specifically in the Imperial, Coachella, and Temecula Valleys and San Diego County, the advisor provided training and installed over 850 soil moisture sensors of various types and 55 Tule evapotranspiration sensors in commercial fields. In another project, the advisor assessed optimal deficit irrigation strategies for alfalfa in 22 commercial fields in the Palo Verde and Imperial Valleys. The advisor also conducted irrigation research on seven commercial date palms in the low desert. Findings were disseminated to the agriculture industry and partner organizations via technical guidelines, articles, grower meetings, and workshops. (Ali Montazar)

The UCCE Advisor led an avocado large scale irrigation project in San Diego, Riverside, Ventura, and Orange Counties. This included surveying 87 orchards, conducting extensive field measurements, and developing and disseminating irrigation tools and information to avocado growers. (Ali Montazar)

A UCCE Soils and Irrigation Advisor in Kern County conducted training workshops for growers, crop and pest control professionals, and irrigation consultants. Workshops specifically focused on managing young orchards given most irrigation extension usually focuses on mature trees. (Tobias Oker)

A UCCE Advisor initiated a technical assistance program related to fertilizer and water needs for younger tree crops. This project involved four workshops across the San Joaquin Valley which included clientele who work or grow tree crops in Merced and Madera Counties. (Cameron Zuber)

A UCCE Advisor is leading a Water Efficiency Technical Assistant WETA) project and delivered the 2024 Young Orchard Irrigation and Nutrient Management Workshops to 191 participants across various counties in the San Joaquin Valley. The workshop topics included how to improve water and nutrient use efficiency and improve water quality by matching water and nutrient amounts to young trees. The advisor also conducted collaborative research on delayed irrigation in walnuts in a commercial orchard trial in Stanislaus County. Findings were shared with clientele at the Quad-County Walnut Institute. (Abdelmoneim Mohamed)

A UCCE Advisor serving Sutter, Yuba, Butte, and Placer Counties conducted research to reduce irrigation inputs and extended results by hosting one grower meeting about the start-of-irrigation in walnut and potential to delay water application based on actual tree need, rather than weather-based assumptions. This facilitated field visits with two growers. (Clarissa Reyes)

A UCCE Specialty Crops Advisor in Sonoma, Marin, and Napa Counties conducted research and extension to address dry farming for extreme climate conditions and limited water access. The advisor co-hosted a Dry Farming Strategies Workshop in collaboration with an experienced dry farmer and other collaborators. (Ellie Andrews)

A UCCE Orchard Systems Advisor in the Sacramento Valley continued to extend information findings about previous UC collaborative research on walnuts, irrigation strategies, and pressure chambers. Methods included publications, grower talks, farm calls, mass media interviews, and consultation. (Luke Milliron)

A UCCE Vegetable Crops Advisor continued research and extension in the San Joaquin Valley, especially in adapting UCCE’s CropManage, a weather-based online decision-support tool that provides recommendations for efficient and sustainable irrigation and fertilization applications. The advisor implemented field trials on 300 acres of processing tomato fields and 500 acres of watermelon fields, co-reviewed CropManage recommendations with clientele, and hosted field demonstrations. (Zheng Wang)

As a result of UC ANR research, outreach, and education, participants learned and adopted practices that improved water use efficiency. Outcomes with specific measured indicators follow.

**Outcomes**

**Participants learned and intended to adopt water use efficiency strategies.**

● End-of-session survey responses from San Diego nursery and floriculture clientele indicate that 87% of participants (n= 145) plan to adopt the tools that UCCE presented about irrigation management, pressure optimization, salinity management, irrigation management for potted ornamentals and pumps fundamentals and that 88% of participants increased their skills a lot or hugely. (Gerry Spinelli)

● The Bakersfield young orchards workshop had 51 attendees and 11 of them responded in a post-workshop survey that they had learned something new and would most likely put it into practice in the future. (Tobias Oker)

* Over 130 Merced and Madera clientele attended young tree workshops and of the people who responded to a survey, 100% gained knowledge and of these 80% said they would use this knowledge within 12 months of the workshops. (Cameron Zuber)
* Of the 70 respondents who completed the post-workshop survey for the Young Orchard Irrigation and Nutrient Management Workshops, 96% reported an increase in their knowledge of irrigation and nutrient management for young orchards. Additionally, 91% of respondents indicated their intention to adopt water-saving practices. (Abdelmoneim Mohamed)
* At the 2024 Quad-County Walnut Institute, 68 participants reported that they planned to improve water use efficiency after learning about delayed irrigation. (Abdelmoneim Mohamed)
* Dry Farming Strategies Workshop 100% of the participants who responded to a survey (n=13) reported increased knowledge that they will use to make more informed decisions. (Ellie Andrews)

**Participants adopted recommended irrigation or other water and soil management practices.**

● As a result of UCCE’s sensor-based water management and irrigation training, 62 Southern California growers adopted soil moisture sensing tools for irrigating dehydrated onion, carrot, alfalfa, lettuce, date palm, spinach, sweet corn, sugar beet, avocado, wine grapes, and wheat. (Ali Montazar)

● As a result of attending UCCE’s grower meeting, two growers invited UCCE to their orchards to implement practices based on reduced irrigation input research: measuring plant-water status for subsequent weeks at the beginning of the season to determine when to start applying water and dial in their irrigation timing. Adoption of orchard and irrigation management practices will increase ecological sustainability of agriculture, improve water quality, and improve water-use efficiency. (Clarissa Reyes)

● At one meeting, 14 of 39 walnut growers had already adopted UCCE’s recommended pressure chamber strategy and an additional 12 said they were likely to adopt after the meeting (67% collectively). One grower showed behavioral intent by asking where he could buy a pressure chamber. A large influential grower who also custom farms for many growers shared that growers are adopting the pressure chamber more and more each year, and has heard other growers say, “I don’t schedule irrigation without it.” (Luke Milliron)

**Science-based information was applied to water use policy and decision-making.**

● West Coast Turf, a large sod supplier, licensed Coachella hybrid bermudagrass, which was developed by the UC Riverside turfgrass program. This turf has improved drought resistance and winter color retention. (James Baird)

* UCCE’s policy engagement activities with the Butte County Farm Bureau resulted in $4 million of SWEEP funds being awarded to growers. This builds capacity for water use efficiency savings, as well as potential reduction in greenhouse gas emissions. (Luke Milliron)

**Change in condition: Water saved.**

* Two nurseries in San Diego adopted the tools recommended by UCCE: a 50-acre California native nursery and a 200-acre herbaceous annuals nursery. If the 200-acre nursery adopted the recommended efficient sprinklers on the whole 200 acres, water use would decrease from 90 inches of irrigation water per year to 58 inches, with 32 inches of water saved per year. On 200 acres, this corresponds to savings of 532 acre-feet of water. For the nursery, this would imply $1,330,000 savings per year. Additionally, there are water quality benefits as less water is being infiltrated and contaminating groundwater resources, and there is less runoff contaminating surface water resources. (Gerry Spinelli)
* San Joaquin Valley growers have increasingly taken the recommendations of CropManage to reference their irrigation and fertilization schedules. By the season of 2024, watermelon and tomato growers in the northern San Joaquin Valley saved an average of 10-15% of total amount of irrigation without a yield drop with the use of CropManage as their important reference to irrigation schedules. Most of the processing tomato fields with CropManage now received an average of 22 inches of water per acre compared to 26 inches without CropManage. This is an equivalent saving of 110,000 gallons of water per acre. Also, watermelon growers adjusted the schedule of nitrogen application following CropManage’s recommendations and saved 20% nitrogen on average (170 lbs./acre vs. 210 lbs./acre before using CropManage). Currently, the impacted acreage of watermelons and processing tomatoes in the northern San Joaquin Valley that utilizes CropManage for the irrigation decision support has grown from zero before 2021 to 600 and 400 acres in 2024, respectively. (Zheng Wang)
* The collaborative grower in the delayed irrigation project in walnuts saved up to five inches of water and three growers adopted this practice. (Abdelmoneim Mohamed)
* Fifteen date growers in Southern California adopted UCCE’s irrigation guidelines. According to previous UCCE research, growers who adopted the guidelines conserved an average of 15% in annual water usage. (Ali Montazar)
* Forage growers in the desert region who collaborated in UCCE’s deficit irrigation program conserved an average of 1.1 acre-feet/acre in more than 150,000 acres of alfalfa, bermudagrass, and kleingrass fields. This practice provided a notable water conservation for the region last summer and has a high potential of water saving in the Colorado River Basin (approximately 1.3 million acre-feet). (Ali Montazar)
* In Southern California, 15 avocado growers adopted UCCE’s avocado irrigation guidelines. According to previous UCCE research, growers who adopted the guidelines experienced an average of 13% in water savings and a $940 water cost reduction per acre. (Ali Montazar)

These water use efficiency outcomes reported above demonstrate how Californians better understand and adopt water use efficiency measures. Ultimately, improved water management will increase water cost savings, reduce water usage, benefit the end-user, and reduce groundwater over-pumping in California. For example, it was estimated in 2019 that California growers could save approximately $147 billion gallons of water per year by using California Irrigation Management Information System (CIMIS) weather data to inform more efficient water practices (Zilberman, et al., 2019). In another example, UCCE Farm Advisors and UC Davis AES faculty found that a walnut grower could save approximately 350,000 gallons per acre, per year, which is equivalent to half of an Olympic size swimming pool, using a combination of delayed irrigation and pressure chambers to indicate tree water stress. (Luke Milliron) Thus, UC ANR contributes to the public value of protecting California's Natural Resources.

## Condition Change: UC ANR contributed to increased water supply security

**Issue**

California's climate has the largest precipitation and streamflow variability in the contiguous United States. Groundwater pumping chronically exceeds natural recharge in many agricultural regions of the state; in fact, statewide groundwater overdraft estimates range from 500,000 to 1.5 million acre-feet per year. Many groundwater basins have seen significant reductions in groundwater levels over time, which is increasingly problematic in the face of climate change. This trend, coupled with a growing urban population, requires more efficient management of water resources. (Ellen Bruno) Furthermore, in 2023, California became the first state in the U.S. to authorize direct potable reuse, or blending purified wastewater directly into drinking water, underlining the potential for climate-resilience and water security. Several large, centralized wastewater recycling projects are currently in development. While this provides reason for optimism, there are still many hurdles to overcome and potential negative consequences to avoid. Simultaneously, under-resourced local communities face a variety of water challenges, including those related to water affordability, distrust of tap water, and accessing a clean, safe water supply. (Edith de Guzman)

**Methods**

UC ANR extends new knowledge to increase understanding of groundwater resources and inform water supply security efforts.

A UC Cooperative Extension (UCCE) Specialist at UC Davis conducted a collaborative project to monitor groundwater level fluctuations in Scott Valley and assessed the real impact of agricultural practices on river flow and water availability. This work led to several invitations to present on water-related issues. (Reported by Guiliano Carneiro Galdi; collaborator mentioned: Thomas Harter)

Another UCCE Specialist at UC Davis continued the UCCE Groundwater Hydrology Program to develop scientific and technical information. The advisor also served on technical advisory committees with and provided consultation on groundwater science and management issues to local, regional, state, and federal regulatory agencies. (Thomas Harter)

A UCCE Specialist at UC Los Angeles co-led the establishment of a technical advisory committee (TAC) to provide guidance to policymakers and water agencies on regional advanced wastewater treatment investments that will be taking shape in the coming years. The effort surveyed, interviewed, and convened the TAC and the leaders of the Los Angeles region’s major water agencies to derive recommendations aimed at the primary decision-makers making investment decisions. This work resulted in a report distilling TAC’s input into eight actionable recommendations. The report was shared widely, with the TAC and the water agencies, as well as with a broader audience via a news story, email blast, and social media. (Edith de Guzman)

The specialist also conceived, curated, and secured participation and support for a science-based, interactive extension project which used art to engage audiences in water systems. The exhibit tackled five distinct themes: 1) affordability or water; 2) tap water (dis)trust can lead to buying more bottled water or sugary drinks which is more costly, unhealthy, and damaging to the environment; 3) human right to water, such as safe, clean drinking water in homes; 4) imported water given 85-90% of L.A. City’s water comes from distant watersheds, creating negative impacts on distant ecosystems, wildlife habitat, and limiting economic development where the water is sourced; and 5) local water and groundwater as a source for people and wildlife. (Edith de Guzman)

As a result of UC ANR research and education, participants and decision-makers increased understanding and capacity to change behaviors and policies that will increase water supply security. Outcomes with specific measured indicators follow.

**Outcomes**

**Science-based research is applied to water supply policy and planning.**

* Data from UCCE’s Scotts Valley ground level monitoring project has been used by the Department of Water Resources (DWR) to calibrate an integrated hydrologic model and supports the development and implementation of the Siskiyou County Groundwater Sustainability Plan under the Sustainable Groundwater Management Act. This builds on a previously reported outcome about DWP using UCCE data to develop this hydrologic model. Here is a section extracted from the DWR Water Curtailment Order “The active groundwater recharge project has shown local groundwater improvement.” (Giuliano Galdi)
* UCCE’s groundwater science consultation and technical advisory effort contributes to providing a groundwater pollution compliance pathway for six million acres of highly diversified agricultural production with a farm gate production value of over $30 billion. (Thomas Harter)
* Los Angeles agencies adopted science-based recommendations on wastewater treatment investments, including the projects led separately by the City of Los Angeles’ Bureau of Sanitation and the Department of Water and Power be combined into one effort with a single name and purpose. The effort has resulted in science-based research being applied to water supply policy and planning and the recommendations are being used to inform additional decisions. (Edith de Guzman)
* Two Los Angeles arts-based organizations decided to host UCCE’s science-based, traveling, interactive exhibit, which contributed to challenging the assumptions about tap water’s inferiority. In total, 2,169 people visited the exhibit during this reporting period, 345 of whom participated in a blind water tasting where they sampled three brands of bottled water along with tap water and recorded their guesses about what they were tasting. The overall identification accuracy was approximately 31.8%, indicating that participants struggled to correctly identify the brands despite many of them expressing strong opinions about which brand they prefer. The top brands chosen were tap and Dasani (which is actually bottled municipal tap water), challenging assumptions about tap water’s inferiority. Tap was often confused with bottled water brands, suggesting that tap water is not easily distinguishable. This demonstrates how UCCE’s strategic partnerships advance understanding about water supply and security, from the household to the regional level. (Edith de Guzman)

The measured outcomes reported above demonstrate integrated local strategies that strengthened community understanding and local decision-making related to the state’s water supply. Thus, UC ANR contributes to the public value of protecting California's natural resources.

# **BUILDING CLIMATE RESILIENT COMMUNITIES AND ECOSYSTEMS**

## 

## Condition Change: UC ANR contributed to increased preparedness and resilience to extreme weather and climate change

Sustainable Food Systems

**Issue**

Increasingly extreme and erratic weather patterns caused by climate change threaten crop yields and farm profits across the state. Ranchers must continue to adapt to climate stressors, such as increased temperatures and occurrences of drought, and can aid in reducing climate change through their ranching practices. In particular, the development and adoption of alternative manure management practices that reduce greenhouse gas emissions from dairy and livestock operations are needed.

**Methods**

UC ANR collaborates with agencies, land managers, and communities that have been impacted by catastrophic fires, droughts, heat waves, and urban heat islands. Science-based information is provided to aid in wildfire response, recovery, and prevention efforts and develop improved practices.

Since 2019, UC ANR’s Climate Smart Agriculture (CSA) team has supported 12 dairy and livestock operations in five counties through the Alternative Manure Management Program (AMMP), with $7.5M in funding from the California Department of Food and Agriculture. The program supports the adoption of pasture-based management, alternative manure treatment and storage, and solid separation or conversion from flush-to-scrape practices that contribute to significant reductions in greenhouse gas emissions and operation costs for producers. Clientele continue to receive support from UC Cooperative Extension (UCCE) in the implementation of climate-smart projects. (Hope Zabronsky)

Counties across the state are implementing Livestock Pass Programs that permit conditional access into evacuation areas to care for livestock sheltering in place by identifying commercial livestock operators to emergency responders. With frequent wildfires in the state, it is important to support animal welfare and the agricultural economy without hindering emergency efforts. A UCCE Livestock and Natural Resources Advisor in rural Northern California provided technical support to colleagues and emergency services on the development of 11 such county programs across the state. The advisor also shared information about the program with the Ministry of Agriculture and Food in British Columbia and USDA Vietnam Exchange Program. (Tracy Schohr)

Nearby, the UCCE Livestock and Natural Resources Advisor in Siskiyou County continued to lead the first Livestock Pass Program in the state to include the U.S. Forest Service as a formal partner. This program is critical as many ranchers are permittees that graze remote, federally owned allotments during peak fire season, increasing their risk of being impacted by wildfire. During this review period, the advisor organized five annual trainings, maintained a database of ranch operation information, created and issued Passes in collaboration with the Agricultural Department, and managed the required annual renewal process for enrolled ranchers. Eight factsheets have been developed for ranchers and first responders. (Grace Woodmansee)

As a result of UC ANR research and extension, participants learned and adopted practices that lead to improved preparedness and resilience to climate change and extreme weather.  Outcomes with specific measured indicators follow.

**Outcomes**

**Participants adopted climate-resilient strategies.**

* InSiskiyou County 103 ranchers, representing 58 unique operations, have enrolled in the Livestock Pass Program, 43 of which are US Forest Service permittees. (Grace Woodmansee)
* In Plumas and Sierra Counties, 49 ranchers qualified for Ag Disaster Access Passes, as a result of UCCE training on disaster preparedness and wildfire safety. (Tracy Schohr)

**Science-based information was applied to livestock policy and decision-making.**

* The Livestock Pass program in Siskiyou County is now a formal component of the Office of Emergency Services County Emergency Plan and included in OES training materials. Importantly, the program is well respected and relied upon by Siskiyou County ranchers. “I tell people all the time to get it… if you have livestock you need this Pass. I’m a firm positive advocate for the program. One day or a few hours out of your life to get certified can save your entire livelihood of livestock,” reported a Pass Holder and US Forest Service Klamath National Forest Permittee. Enrollment in the program increases safety for stakeholders during emergencies and reduces livestock losses, contributing to building climate-resilience in communities across Siskiyou County. (Grace Woodmansee)

**Change in condition: Reduced greenhouse gases.**

* The AMMP projects supported by the UC ANR Climate Smart Agriculture Team have contributed to reducing over 20,600 metric tons of carbon dioxide per year, the equivalent of removing more than 4,584 gasoline-powered passenger vehicles driven per year. (Hope Zabronsky)

**Change in condition: Improved wildfire disaster response. NEW**

* During wildfires in the region, the Ag Pass Program successfully provided access to over 14 livestock producers in Plumas Sierra Counties to safely care for or evacuate animals. (Tracy Schohr)
* During two recent major wildfires, 10 ranchers in Siskiyou County used their Pass to access public and private land over 20 times to perform animal welfare checks and evacuate animals from impacted areas. Improved disaster response was made possible by the advisor coordination with the Emergency Operations Center, providing briefings at agency meetings (CAL FIRE, USFS), working with liaisons to disseminate program information, facilitating Pass use, and answering questions from community members and first responders. (Grace Woodmansee)

The measured outcomes reported above demonstrate participants learning about and developing new management paradigms to address the challenges of a changing climate on agriculture and food systems. Adopting new strategies and policies informed by UC ANR’s science-based research will help increase animal agricultural resiliency. In these ways, UC ANR contributes to building climate-resilient communities and ecosystems.

Condition Change: UC ANR contributed to increased preparedness and resilience to extreme weather and climate change

Sustainable Food Systems

**Issue**

Increasingly extreme and erratic weather patterns caused by climate change threaten crop yields and farm profits across the state. Growers must continue to adapt to climate stressors, such as increased temperatures and occurrences of drought, and can aid in reducing climate change through their farming practices. In particular, anticipated more severe droughts are expected to seriously impact crop yields, as warmer winters lead to reduced water storage; therefore, developing more drought-tolerant or water-efficient crops is needed. There is a huge need for research on climate change related pests and expected damage to agriculture.

**Methods**

UC ANR collaborates with agencies, land managers, and communities that have been impacted by catastrophic fires, droughts, and heat waves. Science-based information is provided to aid in recovery and prevention efforts and develop improved practices.

*Climate Smart Agriculture Program*

UC ANR’s California Institute for Water Resources administers the Climate Smart Agriculture Program in partnership with the California Department of Food and Agriculture. The program promotes the widespread adoption of climate-smart agriculture practices that benefit farmers, ranchers, and the broader community by increasing on-farm resilience to climate change and providing ecosystem services such as soil carbon sequestration and improved water retention. The Academic Coordinator supported three UCCE Advisors and ten Community Educators in delivering workshops and hands-on assistance to clientele in 33 counties. Specifically, the team supported the implementation of identified agricultural management practices related to two state programs, the Healthy Soils Program (HSP) and the State Water Efficiency and Enhancement Program (SWEEP). Finally, the team provided translation services to producers in Spanish, Mandarin, Hmong, Cantonese, Punjabi, Thai, and lu-Mienh. (Hope Zabronsky)

In prior years, the UCCE Small Farms Network in Fresno County assisted 57 small-scale farmers to implement SWEEP projects including conversion to drip irrigation, repairs to improve pump efficiency, and installation of variable frequency drives. Through a Water Efficiency Technical Assistance grant, UCCE collected data on water and energy use on farms that had implemented SWEEP projects, including attempting to collect energy use records. (Ruth Dahlquist-Willard)

The UC Cooperative Extension (UCCE) Specialist in climate adaptation in agriculture located at UC Merced worked collaboratively with UCCE advisors to develop and deliver six climate-smart ag workshops and trainings across the state for farmers, and two trainings for technical service providers. He is working to quantify risks associated with insects under climate change to enable the agricultural industry to prioritize development of varieties that are resistant to insect borne diseases and be able to minimize future risks associated with potentially damaging insect pests for various crops. They published on the effects of climate change on Oriental Fruit Moth, Peach Twig Borer, and Codling Moth. (Tapan Pathak)

A UCCE Academic Coordinator located at UC Merced organized and evaluated a regional climate-smart agriculture workshop for farmers, technical service providers, media professionals, Pest Control Advisers, Certified Crop Advisers, and government and industry partners. Presentation themes included climate change trends and impacts, integrated pest management, cover crops, CalAgroClimate tools, and the CDFA Web repository. There were 122 participants from Merced, Ventura, Monterey, and Tulare Counties. (Samuel Ikendi)

*Sorghum*

Sorghum holds the fifth position globally among cereals in total production and is recognized for its drought tolerance, among other benefits. It serves as human food in various parts of the world, offering nutritional benefits and being gluten-free. It is also utilized in animal feed, biofuel, and other bio-products. A UCCE Specialist in abiotic stress continues work to identify the best-performing commercial forage and grain sorghum varieties suitable for adoption in California. Sorghum forage and grain variety trials and demonstrations are held at the Kearny Research and Extension Center (REC), the West Side REC, and UC Davis. More than 40 forage and 20 grain sorghum varieties, typically bred in the Midwest, have been evaluated in California soils and environment, to provide yield and nutritional data that inform California growers during variety selection decisions. These results were extended through the Field Crop, Forage, and Alfalfa, and Forage Field Day field that had 80 participants. (Jackie Atim)

*Climate-adaptive, culturally meaningful crops*

Many growers want training in seed preservation, production of culturally significant crops, and diversification for climate resilience. A Specialty Crops Advisor co-organized a field day led by a local farmer and experienced crop breeder who trained growers in seed selection to maintain and enhance culturally meaningful crops in a changing climate. (Ellie Andrews)

As a result of UC ANR research and extension, participants learned and adopted practices that lead to improved preparedness and resilience to climate change and extreme weather.  Outcomes with specific measured indicators follow.

**Outcomes**

**Participants gained understanding of and intend to use strategies to respond to climate change and extreme weather.**

* Participants gained valuable insights into sorghum agronomy, deficit irrigation techniques, and the diverse applications of sorghum in biofuels and other bioproducts. Post-presentation survey results revealed that 96% of attendees improved their knowledge of sorghum and expressed interest in learning more about it. (Jackie Atim)
* After the field day on seed preservation in a changing climate, 90% (n=10) reported they will use knowledge gained to make more informed, sustainable and effective farm decisions. (Ellie Andrews)
* In combined pre-workshop assessments so far, (n=231), the overall mean knowledge of climate-smart ag programs and practices was 2.7, which falls within “minimal knowledge” and after the workshop, the overall mean knowledge changed significantly to 4.0 which is “adequate knowledge”. By topic:
  + Knowledge of climate change trends - before the workshop 33.3% (n=40) of participants had basic knowledge, and after the workshop 81% (n=97) gained additional or superior knowledge.
  + Climate change impacts on their cropping systems - before the workshop 44.2% (n=53) had basic knowledge, and after attending the workshop 92% (n=110) gained adequate or superior knowledge. Similar results were found for adaptation practices and tools and resources. (Tapan Pathak)
* For the workshops on climate change and pest topics for growers and technical service providers, beforehand only 2% had superior knowledge, and after workshops 44% reported superior knowledge. (Tapan Pathak)
* Participants of the regional climate smart agriculture workshop responded to a pre/post survey (n=122) and reported the following knowledge gains after the workshop. By topic:
  + Climate change trends - 33% (n=40) had basic knowledge before the workshop, and after 80% (n=97) gained additional or superior knowledge.
  + Climate change impacts on their cropping systems - 44% (n=53) had a basic knowledge of before, and after 92% (n=110) had gained adequate or superior knowledge.
  + CalAgroClimate tools for managing agricultural risks - before the workshop, 53% (n=65) had no knowledge, and after 43% (n=52) had gained adequate knowledge
  + Climate change impacts on pests - before the workshop, 37% (n=45) had a basic knowledge, and after 74% (n=90) had gained adequate or superior knowledge.
  + On winter cover crops, before 31% (n=37) had basic knowledge, and after 66% (n=80) had gained adequate or superior knowledge. (Samuel Ikendi)

**Participants adopted climate-resilient strategies.**

* As a result of the HSP and SWEEP grant funded projects, with $38.3 M awarded since 2019, farmers and ranchers in 33 of California’s 58 counties implemented science-based climate-smart practices that support climate change mitigation by reducing greenhouse gas emissions and sequestering carbon, and promoted climate change adaptation by increasing on-farm resilience. The focus has been on adopting practices that build healthy soils, increase water use efficiency, and improve manure management. (Hope Zabronsky)

**Change in condition: Reduced greenhouse gases.**

* As a result of the climate smart agriculture practices adopted through the HSP projects, there is the potential to reduce 282,200 metric tons of carbon dioxide (MTCO2e) over three years, as measured by the [HSP Comet planner tool](http://comet-planner-cdfahsp.com/). Furthermore, [research shows](https://www.cdfa.ca.gov/oefi/healthysoils/docs/CompostApplicationRate_WhitePaper.pdf) that Healthy Soils Program practices such as compost application increases the amount of organic matter in the soil, amongst numerous other benefits. Compost application is just one fundable practice farmers can implement to help reduce greenhouse gasses on their operation.
* As a result of the SWEEP projects, there is the potential to reduce 48,300 MTCO2e and 10.2 billion gallons of water over ten years, as measured by California Air and Resources Board (CARB) Greenhouse Gas Emission Reduction Tool ([SWEEP GHG Calculator on CDFA's website](https://www.cdfa.ca.gov/oefi/sweep/)). (Hope Zabronsky)
* UCCE was able to verify reduced energy costs for 12 farmers, and 21 farmers were verified as using less water through analysis of flow meter data. Pump efficiency tests were conducted on 19 farms that had previously completed SWEEP project installation between 2017-2020. There was an average increase in pump efficiency of 11% following pump repairs and other SWEEP improvements. These preliminary results indicate an increase in water and energy efficiency with financial benefits to farmers and corresponding reductions in greenhouse gas emissions and groundwater pumping. (Ruth Dahlquist-Willard)

The measured outcomes reported above demonstrate participants learning about and developing new management paradigms to address the challenges of a changing climate on agriculture and food systems. Adopting new strategies and policies informed by UC ANR’s science-based research will help increase agricultural resiliency. In these ways, UC ANR contributes to building climate-resilient communities and ecosystems.

Condition Change: UC ANR contributed to increased preparedness and resilience to extreme weather and climate change

Sustainable Natural Ecosystems - In the Environmental Stewards Program

**Issue**

The associated effects of climate change are increasing the risk of extreme weather events that negatively impact California’s ecosystems and communities. Because of our changing climate, rangelands, forests, peri-urban, and urban areas are experiencing the effects of intense wildfires, persistent droughts, and urban heat islands. Land managers and communities need effective response and adaptation strategies to prepare to deal with the growing risks.

**Methods**

UC ANR collaborates with agencies and communities to deliver science-based climate-related extension programs.

The UC Environmental Stewards Program conducts activities and training to introduce Californians to the wonders of our unique ecology and engage the public in the study and stewardship of California’s natural communities. It aims to increase knowledge, skills, identity, and self-efficacy related to California’s natural history and environmental issues, increase public participation and civic engagement in environmental education, and enhance citizen science, climate adaptation, and planning toward environmental and climate justice. Each year, the program delivers and evaluates instructor trainings to partner organizations, who then extend the trainings. The statewide program also maintains and delivers Climate Stewards trainings to partners and monitors evaluation results of participants. Climate Stewards is a hybrid, flipped classroom, adult education curriculum that improves climate change literacy and civic engagement for community and ecosystem resilience. Partners include community-based organizations, state agencies, and higher education institutions. (Sarah Mae Nelson)

As a result of UC ANR research and extension, participants learned and adopted practices that lead to improved preparedness and resilience to climate change and extreme weather.  Outcomes with specific measured indicators follow.

**Outcomes**

**Change in condition: Climate resilient land.**

* California Naturalist and Climate Stewards program alumni who were either certified or completed a community college course in the last few years responded to a delayed-post survey (1,391 respondents, a 18% response rate). The findings indicate that they potentially reduced carbon emissions by 4,181 tons of CO2 this year, which is up from 1,782 reported last year. This has been extrapolated from research by Cordero et al. (2020), which indicates that focused climate education can result in individual carbon emissions reduction by up to 2.86 tons of CO2 per year. Furthermore, alumni respondents reported obtaining skills that are critical components for community resilience to climate impacts (Doppelt, 2016). Evaluation survey responses show that participants who strongly agreed that they had the skills to communicate climate change with friends, family, and colleagues progressed from 11.2% before the class to 40.4% immediately after the class to 63.3% 6-48 months after taking the class. Similarly, participants who strongly agreed that they had the skills to communicate share climate mitigation, adaptation, and resilience strategies progressed from 8.2% before the class to 30.0% immediately after the class to 41.4% 6-48 months after taking the class. This demonstrates that over time, as course participants put these skills into practice, they are becoming more confident in their abilities. (Sarah Mae Nelson)

The measured outcomes reported above demonstrate participants applying strategies to address the challenges of a changing climate. Adopting mitigation strategies informed by science-based research will help increase the resiliency of working landscapes and decrease the impact of climate change. In these ways, UC ANR contributes to building climate-resilient communities and ecosystems.

Condition Change: UC ANR contributed to increased preparedness and resilience to extreme weather and climate change

Sustainable Natural Ecosystems - In Forestry & Fire

**Issue**

The associated effects of climate change are increasing the risk of extreme weather events that negatively impact California’s ecosystems and communities. Because of our changing climate, rangelands, forests, peri-urban, and urban areas are experiencing the effects of intense wildfires. During 2020, one of the most devastating years in California fire history, over four million acres burned, and over 10,000 structures were damaged or destroyed. Land managers and communities need effective response and adaptation strategies to prepare to deal with the growing risks. Communities need to be better prepared to mitigate the growing risks of hazards from fires.

**Methods**

UC ANR collaborates with agencies, land managers, and communities at risk of catastrophic fires. Science-based information is provided to aid in recovery and prevention efforts and develop improved practices.

A UC Cooperative Extension (UCCE) Specialist at UC Santa Barbara continued research to understand mechanisms that drive fire hazard. This includes developing a fire regime triangle conceptual framework for predicting future fire frequencies; examining the roles live fuel moisture, aridity, and human land development have on large fires; and developing models that highlight the importance of inter-annual climate variation, in addition to time-since-fire in many ecosystems. The specialist works collaboratively with California Department of Forestry and Fire Protection (CAL FIRE) and others to incorporate findings into products and programs. (Max Moritz)

A UCCE Forestry Advisor provided over 100 fire-related talks and trained community groups across California in home hardening and defensible space assessment. (Yana Valachovic)

*Prescribed fire*

The UC ANR Fire Network is a collection of UCCE scientists and staff who conduct fire-related research, workshops, webinars, fact sheets, hands-on fire trainings, and collaborations with the goal of creating more fire resilient communities and landscapes, allowing Californians to better live and thrive with fire. The Fire Network also conducted policy engagement activities to increase opportunities for beneficial fire on private lands in California. (Lenya Quinn-Davidson and Jeffery Stackhouse)

A UCCE Advisor continued to expand the capacity of the Central Coast Prescribed Burn Association to increase climate resilience, ecological sustainability of range resources, and improved management and use of land. This included providing training and technical assistance to conduct burns as well as managing consultant contracts and CAL FIRE grants. (Reported by Devii Rao; collaborator mentioned: Barb Satink Wolfson)

A UCCE Livestock and Natural Resources Advisor who is part of the Fire Network continued to conduct community capacity building efforts to support fire training planning, and equipment for Humboldt County’s Prescribed Burn Association. To date, 1,500 community members have been trained through the association. Furthermore, the advisor delivered six range-improvement fire trainings and 14 personal ranch trainings, which involve bringing fire education directly to larger-scale ranches when specific weather conditions are met. These larger scale ranches typically have enough family members or staff to conduct burns safely. (Jeffery Stackhouse)

The UCCE Fire Academic Coordinator and UCCE Central Sierra Forestry Advisor co-hosted a foothill fire practitioner workshop with the Placer Resource Conservation District on the use of prescribed fire. The coordinator also delivered other wildfire preparedness extension activities, including a ranch hardening workshop. (Reported by Katie Low; collaborators mentioned: Susie Kocher)

A UCCE Specialist at UC Davis conducted applied research in invasive weed and restoration ecology. This included partnering with the UC McLaughlin Reserve to conduct and initiate long-term monitoring of burned sites. (Justin Valliere)

*Prescribed grazing*

Information on livestock's value in managing vegetation to reduce fuel loads was extended at UCCE’s livestock pass trainings in Alameda and Santa Clara Counties and at a field tour for rangeland managers. Policy makers and rangeland managers attended the field tour to view sites where grazing has managed fuels and maintained grasslands. (Sheila Barry)

A UCCE academic conducted a fuel break trial to assess how grazing to reduce fine fuels can effectively limit wildfire spread in the wildland-urban interface where rangeland meets residential areas. The research included tools like Gallagher eShepherd virtual fencing and addressed fuel hazards like deerbrush and medusahead. The findings provided strong evidence that virtual fencing can be successfully used to manage pastureland in ways that were not feasible with traditional fencing, along with best practices for implementation. (Brian Allen)

In another virtual fencing project, a UCCE Advisor in Lassen County conducted commercial scale testing of GPS technology tracking, and virtual fencing tools. Approximately 800 head of cattle on three ranches were collared and tracked. At commercial scales, this project successfully demonstrated use of virtual fencing systems to effectively improve cattle distribution across grazing units from 2,000 to 9,000 acres in size, reduce fuel load, and to exclude cattle from entering environmentally or culturally sensitive areas. (David Lile)

A UCCE Livestock and Natural Resources Advisor continued research and extension activities on increasing adaptive capacity and addressing wildfire risk. Ranchers and land managers must adapt to a variety of climate change impacts, including drought, wildfire, and extreme weather. The advisor was part of a team analyzing climate-smart sheet grazing practices as well as evaluating the use of grazing as a fuels management tool in forested landscapes. Extension activities included field days. (Dan Macon)

UCCE academics continued a multi-year collaborative study evaluating targeted grazing in woodland and forest ecosystems at Blodgett Forest Research Station in El Dorado County and in Butte County. Initial findings were shared with grazer and forest practitioners through factsheets, field tours, and presentations. (Reported by Ricky Satomi and Tracy Schohr; collaborators mentioned: Dan Macon, Roselle Busch, Katie Low)

As a result of UC ANR research and extension, participants learned and adopted practices and changed policies that lead to improved preparedness and resilience to climate change and extreme weather.  Outcomes with specific measured indicators follow.

**Outcomes**

**Participants gained skills and understanding of strategies to respond to climate change and extreme weather.**

* The UCCE Fire Academic Coordinator utilized surveys to collect the following extension participant learning outcomes:
  + 36% of 39 fire practitioner workshop participants indicated they were more likely to implement prescribed fire on their property because of the knowledge gained from the workshop.
  + 35% of 15 ranch hardening workshop participants indicated they intend to apply workshop knowledge to their ranch immediately after the workshop. (Katie Low)
* UCCE used Ripple Effect Mapping to identify outcomes of the Central Coast PBA, including:
  + As a result of attending Central Coast PBA TREX workshops, six participants from Costa Rica learned about how to set up incident command teams and take that information back to their country.
  + One participant gained skills to be able to effectively describe a 1,500 acre wildfire that was burning in her area. She said that a few of her neighbors had called the fire agency, but no one came. She then called and knew the correct terminology to describe what the smoke was doing before, what it was doing now, the size of the fire, and how fast it was moving. After that call the fire agency came right away. The PBA helped provide her with the knowledge and language to use to better explain the situation and get help. (Devii Rao and Barb Satink Wolfson)
* Participants of the targeted grazing field day reported they had a greater understanding of how to use targeted grazing to reduce fuel loads in forested environments, and over half reported they would implement targeted grazing on lands that they managed (100% of 37 participants). (Dan Macon)

**Participants adopted climate-resilient strategies.**

* As a result of training from a UCCE Forestry Advisor, 170 homes in Mariposa and all 500 properties in Shelter Cove, Humboldt County have been assessed for fire risk, with mitigation plans in development. (Yana Valachovic)

**Science-based information was applied to fire and climate-resilient policy and decision-making.**

* UCCE’s fire probability models have been used to evaluate statewide Fire Hazard Severity Zone Maps and in CAL FIRE’s protocol for proposed fuel treatment projects. This grounds CAL FIRE’s avoided wildfire emissions program in the most current scientific understanding of climate and fire interactions, which will help identify where fuel reduction treatments are likely to intersect with expected fire activity in coming decades. (Max Moritz)
* UC ANR’s Fire Network academics continued to contribute to the passage of California Senate Bills related to fire, such as the Prescribed Fire Liability Pilot Program: Prescribed Fire Claims Fund (SB926, 2022). This bill created a $20 million state-backed fund to fill insurance gaps for prescribed fire. Additionally, the Natural Resources Conservation Service is using UCCE’s review of the 2022 California Prescribed Fire program to use USDA funds to support agricultural and traditional burning activities throughout the state on private properties. These build on previously reported policy outcomes to bring beneficial fire to California lands, such as the development of a state-certified burn boss program (SB1260, 2018) and a bill that reduces the liability concerns of landowners and cultural burners (SB332, 2021). (Lenya Quinn-Davidson and Jeffery Stackhouse)
* Communities who received technical assistance from UC ANR’s Fire Network have adopted prescribed burn associations (PBAs). Since 2017, UCCE helped facilitate development of over 25 PBAs which have made burning a viable and effective vegetation treatment on private lands. Specifically in Humboldt County, the PBA has more than 250 paying members. (Jeffrey Stackhouse and Lenya Quinn-Davidson)
* Participation of Santa Clara and Alameda County policy makers in UCCE’s grazing field tours supported policy change with the approval of SB 675, which includes prescribed grazing as a practice to mitigate wildfire impacts. (Sheila Barry)

**Change in condition: Climate resilient land.**

* UCCE’s collaborative fire trainings brought beneficial fire to over 700 acres of beef ranches in Humboldt County, as well as to 2,100 acres through UCCE’s contributions to the Humboldt County PBA. Furthermore, UCCE’s personal ranch training resulted in 10 of 14 ranches burning on their own land and helping with burns on neighboring ranches. (Jeffery Stackhouse)
* UC McLaughlin Reserve conducted a prescribed burn on six acres in partnership with UCCE. This contributes to controlling invasive plant species and promoting native plant diversity. (Justin Valliere)
* UCCE’s capacity building efforts contributed to the Central Coast PBA conducting four prescribed burns in Monterey County over a total of 83.4 acres and one burn in Santa Cruz County over a total of 14.5 acres. A total of 97.9 acres were burned across the two counties. The purpose of the burns were for fuels reduction, natural resources benefit, cultural burns, and training. (Devii Rao and Barb Satink Wolfson)
* As a result of UCCE’s collaborative research with Gallagher eShepherd virtual fencing collars reduced fuel. Specifically:
  + 37 cattle grazed a 120-foot-wide fuel break between annual rangeland and residential houses; the cattle reduced forage by 81%.
  + 35 of the cattle with the virtual fencing collars were concentrated on a targeted 2-mile stretch of forested rangeland with high deer brush density from July 2024 to September 2024. This strategy allows focused grazing on priority areas within a larger forest to reduce fuel loads and competition with desirable timber species. Additionally, 65 other cattle without collars were allowed to graze freely, which caused some disruption, but the cattle with collars demonstrated 95% compliance.
  + Cattle with virtual fencing collars in the medusahead trial reduced viable seedheads to 77 per square meter, compared to 2,080 per square meter in ungrazed control. This trial benefited 3 acres of medusahead-infested rangeland. (Brian Allen)
* As a result of UCCE’s collaborative virtual fencing research in Lassen County, fine fuel loads were reduced by 50%, creating a defensible space 500 yards wide. This research also demonstrated that through more effective management, ranchers may be able to capture far more forage for cattle production and fuel reduction while meeting federal grazing standards and guidelines. (David Lile)
* As a result of collaborating with UCCE on prescribed grazing research, fire risk has been reduced on 106 acres of forestland at the Blodgett Forest Research Station and in Butte County. This ongoing research will provide land managers and grazers with best practices on treatment timing, herd monitoring, and ruminant toxicity identification. (Ricky Satomi and Tracy Schohr)

The measured outcomes reported above demonstrate participants learning about and developing new management paradigms to address the challenges of a changing climate.

Adopting mitigation strategies and new policies informed by UC ANR’s science-based research will help increase forest, rangeland, and community resiliency and decrease the impact of fires and droughts. For example,prescribed burning is estimated to reduce carbon dioxide and particulate matter emissions in forested ecosystems by approximately 18-25% when compared to a wildfire of the same size (Wiedinmyer and Hurteau 2010) (Devii Rao). This work must continue because according to CAL FIRE, the total acreage burned by wildfire in 2024 increased to 1,050,000 acres, compared to less than 350,000 acres burned in 2023.

Condition Change: UC ANR contributed to increased preparedness and resilience to extreme weather and climate change

Healthy Families and Communities

**Issue**

As the planet warms, advancing climate health by increasing access to green space, planting trees in urban neighborhoods, improving environmental quality, and reducing exposure to heat and other climate impacts are recognized as critical solutions. (Edith de Guzman) Communities must also continue to mitigate climate stressors, including methane, a greenhouse gas with global warming potential approximately 25 times higher than carbon dioxide. Recent state legislation, such as the California SB 1383 Short-Lived Climate Pollutants Bill, focuses on diverting all forms of organic waste, including food waste, from landfill disposal in order to eliminate greenhouse gas emissions such as methane. (Sheila Barry)

**Methods**

UC ANR collaborates with communities that experience heat waves and urban heat islands. Science-based information is provided to aid in policy implementation and develop improved practices.

A UC Cooperative Extension (UCCE) Specialist at the UC Los Angeles location organized the Urban Forestry for Changing Times: The Practice of Science and the Science of Practice symposium. More than 170 researchers, practitioners, community members, and representatives from government and nonprofit organizations attended. Topics included the state of urban forestry research, science delivery, and communication in Los Angeles. (Edith de Guzman)

The specialist also co-founded the LA Urban Forest Equity Collective (UFEC) to address inequities in heat-related risk. UFEC is a consortium of forestry experts, Los Angeles City staff, community-based organizations, researchers, and consultants aiming to create holistic strategies to advance urban forest equity in the lowest-canopied neighborhoods. UFEC released a suite of five publications that redefine the problem of urban forest equity and present actionable solutions for community members, local groups, and city leaders. After partnering with communities and the City of Los Angeles to guide priorities and identify pathways from research to implementation, UFEC presented a framework intended to be replicable regionally and beyond Los Angeles. It provides practical tools to prioritize and plan for the increased presence of trees and shade in urban areas, and offers decision-making support, community engagement strategies, and evocative renderings showing implementation pathways for two nature-based solutions in Los Angeles neighborhoods. (Edith de Guzman)

A UCCE Specialist at UC Merced worked on the Central Valley Community Composting Project (<https://www.cvccompost.com/about>) which aims to achieve greenhouse gas reduction and foster adaptive agroecosystems centered on social justice. The primary clientele consisted of three organizations from Merced, Fresno and Tulare Counties and their partners. More than five workshops have been conducted in the last year and a curriculum is in development. (Srabani Das)

A UCCE Soil Health and Organic Materials Management Advisor conducted collaborative projects and activities with county agencies and consulting firms to implement the RainSmart Rebate Program in Orange County and the Waterscape Rebate Program in San Diego. The advisor specifically contributed to discussions and technical assistance on the use of composted mulch materials in these two turf rebate programs. The collaboration addresses several complex regional issues, such as utilizing compost from qualifying producers who meet requirements of SB 1383. (Natalie Levy)

As a result of UC ANR’s extension efforts, community practitioners and local governments learned and adopted practices that lead to improved resilience to climate change.  Outcomes with specific measured indicators follow.

**Outcomes**

**Participants gained knowledge about urban forestry.**

* A post-symposium survey revealed that attendees’ knowledge level on topics covered at UCCE’s urban forestry event was increased:
  + On a five-point knowledge scale ranging from “I knew nothing” to “I could have taught this,” 31% of respondents reported pre-symposium knowledge levels of 4 or 5 (“I knew a lot” or greater). After the symposium, 65% of respondents reported that they reached this high level of topical knowledge — an increase of 34 percentage points.
  + 95% of respondents stated they gained new insights about the importance of bridging research and practice in urban forestry.
  + 90% said the symposium improved their understanding of the need for research to advance and improve the field of urban forestry. (Edith de Guzman)

**Science-based information was applied to climate-resilient policy and decision-making.**

* The City of Los Angeles Office of Forest Management adopted UFEC’s decision-making framework to guide prioritization of urban forestry planning and implementation processes, including toward the City’s goal to increase tree canopy by 50% in the neighborhoods of greatest need by the 2028 Olympic and Paralympic Games in Los Angeles. This outcome indicates that the city is institutionalizing UFEC’s science-based approach to address heat-related risk. (Edith de Guzman)
* As a result of UCCE’s project, three community composting sites have been established in the Central Valley and 25 people are engaged in composting, which is a tool for greenhouse reduction and diverting organic waste from landfills. (Srabani Das)
* UCCE’s role in the San Diego Waterscape Rebate Program and Orange County’s pilot RainSmart Rebate program contributed to homeowner associations’ (HOAs) adoption of mulch thereby contributing to the state’s SB 1383 goals to reduce greenhouse gas emissions. Six homeowner associations (HOAs) and residents in San Diego retrofitted thousands of square feet of lawns using native plants and mulch. In Orange County, two HOAs are expected to convert over 50,000 square feet using compost and mulch. (Natalie Levy)

The measured outcomes reported above demonstrate urban forestry knowledge gains and government decision-making due to UCCE’s extension efforts. In these ways, UC ANR contributes to building climate-resilient communities and ecosystems.