

# Working for the Benefit of All Californians

2019 UC ANR Annual Report



**UNIVERSITY OF CALIFORNIA**  
Agriculture and Natural Resources

# Delivering the UC ANR Mission



**I**t's always a pleasure to share the many wonderful stories of how the great people within University of California Agriculture and Natural Resources (UC ANR) deliver our mission. We collaborate with a wide array of partners to bring the power of UC research in agriculture,

natural resources, nutrition, economics and youth development to local communities across California — improving the lives of all 40 million residents. Our statewide programs, institutes and strategic initiatives annually deliver thousands of research projects, extension workshops, and programs throughout the state to support our mission: Engage UC with the people of California to achieve innovation in fundamental and applied research and education that supports

- sustainable, safe and nutritious food production and delivery
- economic success in a global economy
- a sustainable, healthy, and productive environment
- science literacy and youth development

As an example, agriculture is such a complex industry these days that farmers need to know not only how to successfully grow a crop or raise an animal, but also need to be well versed in the latest in technology, business, regulations, finance, markets, and more. Climate change, drought, invasive species, and other issues challenge the ability of

our natural resources to deliver critical ecosystem services. Add into that mix natural disasters, economic disparities, and shifting consumer demands, and we see that the need for new technologies, better systems, and effective problem-solving is greater than ever.

Scientific expertise from our land grant university, coupled with long-standing partnerships in the field, enable our UC Cooperative Extension (UCCE) scientists and staff to develop and deliver those solutions. Our UCCE advisors then communicate that science effectively to many audiences and help inform the development of sound policies that further the public good. The result? Prosperous farms, healthy ecosystems, thriving communities, and opportunities for people to engage in implementing solutions.

Despite such success stories, problems remain, and the issues grow more complicated. The future will hold situations we have never seen before. Scientists and local residents from a variety of disciplines need to share information, look for synergies, and collaborate in new ways. Engineers need to be curious about what biologists have to say, and biologists need to be curious about the economic development angle. This kind of transdisciplinary science and diverse partnership is what UC ANR is all about; it's how we work to solve the challenges we all face.

Our overarching goal is to have a positive impact on the lives of all Californians. As you review the many ways that we are working toward that goal, we invite you to collaborate with us. Please let us know if you'd like to engage in any of our programs or projects—we welcome your partnership and look forward to joining forces with you this year and in the years to come!

*Glenda Humiston, Vice President,  
University of California Agriculture and Natural Resources*

## 2018- 2019 Highlighted Outputs & Activity



**24**

novel ideas led to patents

**900**  
policy engagement activities

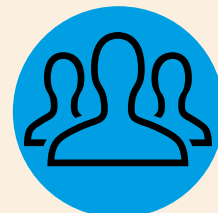


**2,100**

credible, audience-driven educational materials

**>41,600**

meetings, workshops, field days and courses held



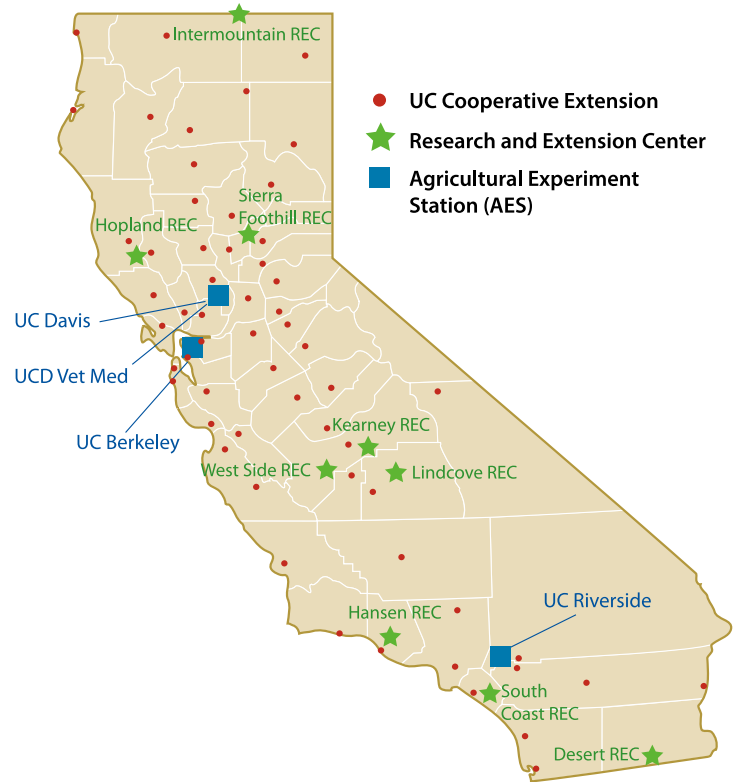
**887,000**

direct contacts/ educational exchanges with adults and youth

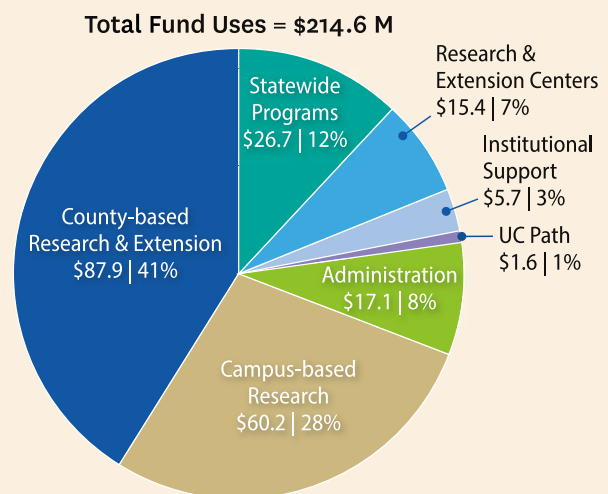
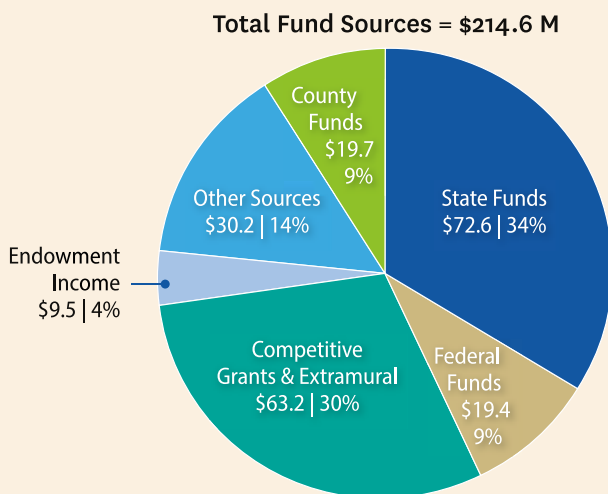
UC ANR operates a statewide network of researchers and educators dedicated to the development and application of knowledge to address local agricultural, environmental and health issues. The network of local Cooperative Extension sites and research and extension centers is often the face of the University to residents who may never set foot on a UC campus. By working and living among those we serve, UC ANR expands UC's reach to engage all people and communities in California, ensuring equal access to the UC system.

In 2019, 170 University of California Cooperative Extension (UCCE) advisors were conducting research, outreach and education from locally based CE offices serving all 58 counties from 70+ locations throughout the state. Nine research and extension centers (RECs), located in a variety of ecosystems across the state, provide places for researchers to conduct field experiments and educational opportunities for the public. Approximately 560 affiliated Agricultural Experiment Station researchers were located at three campuses, and 120 CE Specialists were located at six campuses, RECs and county offices.

UC ANR includes statewide programs and institutes, which work through and with our county offices and community partners. The statewide programs include UC California Naturalist, UC Master Gardener, 4-H Youth Development, Expanded Food and Nutrition Education, UC Master Food Preserver, Informatics and Geographic Information Systems, UC Integrated Pest Management, UC Sustainable Agriculture Research and Education, Agricultural Issues Center and CalFresh Healthy Living, UC. The institutes are the Nutrition Policy Institute and California Institute for Water Resources.



### UC ANR Division Budget FY 2018- 2019



# Promoting Economic Prosperity in California



## Improved individual household and financial stability

### Low-income families save money on food

Curriculum delivered through the Expanded Food and Nutrition Education Program helps limited-resource participants develop food buying and budgeting skills. Of 187 EFNEP graduates in Tulare and Kings counties, 81% showed improvement in food resource management practices. Additionally, 89 participants saw an average of \$70.70 cost savings in their monthly food budgets, maximizing use of their limited resources. ([Deepa Srivastava](#))

### Seniors learn to make affordable, healthy meals

CalFresh Healthy Living, UC participants learn about tools to save money on food. CFHL, UC participants over 60 years old (n=432) in Alameda County reported the following improvement in retrospective surveys (n=66): 98% knowing easy ways to save money on food, 86% knowing simple healthy meals to make, and 92% understanding food ads. ([Mary Blackburn](#))

## Improved animal management, productivity and efficiency

### Technology improves aquaculture

A UCCE project works with California's sturgeon and steelhead producers in the aquaculture industry to discuss modern technologies that can be applied to the handling and slaughter of fish. On-farm research is being conducted to optimize the use of these technologies to increase aquatic animal welfare and labor efficiencies. Three farms adopted technology and improved the welfare of thousands of finfish. ([Jackson Gross](#))

### Study on dairy regulations informs state Legislature

Ten dairies enrolled in a surveillance study led by UCCE to evaluate the impact of two recent regulatory changes. The amended Veterinary Feed Directive and the California Senate Bill (SB) 27 increased veterinary oversight of distribution and use of medically important antimicrobial drugs for livestock. Results from the surveillance study were included in a 2019 report to the state Legislature. ([Emmanuel Okello](#))

## Enhanced community economic development

### Small farmers start new enterprises

California's Sierra Foothills are home to a diversity of small farms, most less than 20 acres with a wide variety of crops. On-farm workshops focused on building producers' skills in economic and market analysis, risk management and business planning. As a result, 58 producers from Placer, Nevada and surrounding counties assessed their resources and decided whether to start a new farm or enterprise. (Cindy Fake)

### Planning tools expand ranching operations

Another UCCE effort in the Sierra Foothills worked with aspiring, new and experienced ranching businesses and targeted grazing businesses. Two ranching operations used planning tools to analyze and ultimately adopt enterprise expansion plans. These businesses each created an additional full-time job within their communities. (Dan Macon)

### Informing investments in California's working landscapes

UC ANR worked with the California Community Colleges Center of Excellence for Labor Market Research and the California Economic Summit to research the economic value of working landscapes to the state's economy. The study found that California's working landscapes, which include agriculture and several natural resources-dependent industries, account for 6.4% of the state's economy – the sixth largest sector of California's economy. Specifically, working landscapes contribute \$333 billion in sales and support more than 1.5 million jobs. This research and the report support economic development strategies and will be used to help policymakers understand the need for investment in working landscapes. (Glenda Humiston)



## Increased emerging food economies and markets

### Coffee an alternative for small farmers

UCCE research is evaluating techniques for small farmers to optimize coffee production in San Diego County. Trends show an increased demand for specialty high-value coffees, which could be valued at \$50,000 per acre compared to \$10,000 to \$20,000 per acre for citrus or avocados. Small-scale prospective coffee growers have learned it is possible to grow their own nursery plants, reducing startup costs. These limited-resource farmers are trialing coffee using coffee plant starts provided by UCCE. (Ramiro Lobo)



**950%**

increase in the use of citrus materials tested by the Citrus Clonal Protection Program

**\$2.9**

million estimated food cost savings for EFNEP families



**>600**

CFHL, UC participants in Making Every Dollar Count, now know ways to save money on food

**86%**

of farm business planning participants in Placer and Nevada reported being profitable



# Promoting Economic Prosperity in California

## Increased agriculture and forestry efficiency and profitability

### Research enables early detection of pests

UC Agricultural Experiment Station scientists study early detection of pests to help avoid expensive pest management and disruption in commerce. Examples of research include developing a rapid assay to detect the spinach downy mildew pathogen, which will guide crop management decisions ([Krishna Subbarao](#)); developing the first antibody-based diagnosis of citrus greening disease using pathogen effectors as detection markers ([Wenbo Ma](#)); developing decision-support to know when sugar-beet nematode populations are large enough to trigger a pest management tactic; and synthesizing and field-testing sex attractant pheromones of North American wireworm species. ([Jocelyn Millar](#))

### Postharvest cracking in cherries reduced

A study of commercially available techniques to reduce cracking in sweet cherries found using these techniques and surface drying prior to storage reduced the amount of cracked cherries from 35 lb. to 19 lb. per 100 lb. of packaged product. These results enabled the industry to market a higher quality product and cut product waste. ([Irwin Donis-Gonzalez](#))

### Mating-disruption used to control navel orangeworm

Pest control advisers (PCAs) in the San Joaquin Valley participated in a UCCE project using mating disruption to reduce navel orangeworm infestations. As a result, there was a 25% increase in the number of PCAs using this technique. Acreage in the southern San Joaquin Valley using mating disruption increased from 16% to 39%, and from 6% to 37% in the northern San Joaquin Valley. These growers, who represent nearly 420,000 acres of almonds valued at \$2.6 billion annually, profit from reduced crop loss. ([David Haviland](#))

### Agronomic practices reduce alfalfa losses at high elevations

Roundup Ready alfalfa suffered crop injury and lower yields after Roundup was applied in the intermountain region. Researchers investigated the crop injury and recommended agronomic practices to reduce yield losses. To reduce the risk of crop injury, they set the maximum crop height for Roundup application followed by frost. Approximately 50% of growers were able to use this information to prevent yield loss in the 2019 growing season. ([Thomas Getts](#))

### Rice growers benefit from IPM recommendations

UCCE scientists provided diagnostic services to rice growers to confirm herbicide resistance in rice fields. To date, 50% of the rice fields in California have submitted samples for diagnostic testing and received Integrated Pest Management recommendations to manage weeds. Interacting with rice growers, the scientists found that 100% of extension participant growers adopted UC weed science program recommendations. The recommendations not only solved a serious weed problem, but also cut cost by at least 25%. ([Kassim Al-Khatib](#))

### Rapid diagnoses enable treatment in tomatoes

A plant pathology laboratory at the UC West Side Research and Extension Center rapidly diagnoses production issues. For example, in 2019, when late blight in tomatoes was diagnosed in Fresno County, UCCE provided outreach and education on an effective treatment. The late blight was treated and did not become an issue. If it had gone untreated, the 155 acres of tomatoes could have been ruined, losing \$700,000. ([Thomas Turini](#))

### Disease management used in vineyards

Researchers assessed factors leading to canker disease in table grape vines, then recommended strategies to manage the disease, which included removing old stumps before replanting and spraying fungicides after pruning during the establishment phase. Over the last five years, growers started adopting these practices and currently 100% remove stumps before replanting and 75% spray a fungicide after pruning. They documented a significant reduction of the disease and higher proportion of marketable fruit in treated blocks. Adoption of these practices will help extend the long-term productivity and profitability of the vineyards in the Coachella Valley. ([Carmen Gispert](#))



# Developing a Qualified Workforce in California

## Increased workforce retention and competency

### Support for the citrus industry

UC Davis Agricultural Experiment Station scientists built a database of pest management practices in citrus production by combining data gathered by farmers, independent pest control advisers and the California Department of Pesticide Regulation. The project resulted in improved pest management practices of California's citrus growers and the pest management consultants they hire. The scientists used the data to recommend effective and non-disruptive pesticides. (Jay Rosenheim)



### Computer science programs increase confidence and skills

In Santa Clara County, teen teachers and afterschool staff received 4-H training in delivering computer science programs to young children. They reported increased confidence teaching the material (100% of 52 teens) and increased understanding (98% of 35 staff). The teens, staff and 4-H staff and volunteers adopted the best practices to deliver computer science programs to 393 children from diverse backgrounds. (Fe Moncloa)

### 4-H Camp leaders gain leadership skills

UCCE academics lead the California 4-H Camp Outcomes Study, which assesses youths' independence, friendship skills, emotional safety, self-efficacy, affinity for nature and leadership skills. Teens leading resident camp programs at 22 locations across the state reported significant increases in several skills including planning, teaching, leading group discussions, working as a team member, speaking before a group, seeing things objectively, and sharing their opinions with adults. (Marianne Bird)

## More effective public leaders

### 4-H Leadership Academy develops youth leaders

Thirty-two 4-H Student Advisory Nutrition Council Club student leaders in San Luis Obispo and Santa Barbara Counties participated in Leadership Academy. Almost all agreed that due to their participation they learned how to be a better leader (95%) and improved their presentation skills (95%). Qualitative data collected from the Leadership Academy show themes of improved recognition of career pathways and increased confidence in being a leader. (Shannon Klisch, Katherine Soule)

## Improved college readiness and access

### Science literacy increased

In Riverside and San Bernardino counties, 27 youths served as teen teachers along with 31 adults for the Youth Experiences in Science project. They applied science knowledge and skills to deliver the Project Learning Tree curriculum to more than 6,000 children in programs that provided at least six hours of introductory science to the youths. (Claudia Diaz Carrasco)



88%

of youth report social and leadership skills, including value and respect for other cultures

73%

of 4-H youth grades 8 to 12 reported aspirations such as studying science after high school



## Increased civic engagement

### 4-H youth engage with communities

Almost 800 4-H youths responded to the Civic Engagement common measures survey about what they may have learned at 4-H. Youths reported that they like to help people in their community (100%) and feel a responsibility to help their community (96%). Additionally, 78% of youths report having critical teamwork skills related to diversity. These are skills that become increasingly important as the population in California and the U.S. are becoming increasingly racially and ethnically diverse. (California 4-H Youth Development Program)

# Safeguarding Sufficient, Safe and Healthy Food for All Californians



## Improved food safety

### Safe food-handling practices improve

In Santa Barbara and San Luis Obispo counties, 98.8% of 623 professionals, volunteers and teen leaders increased their knowledge of food safety as a result of participating in the Master Food Preserver Program's workshops about safe food-handling practices. Additionally, 68 workshop participants demonstrated a statistically significant increase in knowledge. Participants learned about core home food-safety practices, including: 1) how to safely clean food preparation and storage spaces, as well as food items, 2) separating different types of foods and food preparation tools to increase safety, 3) cooking food to safe temperatures, and 4) cooling and storing foods at safe temperatures. (Dayna Ravalin, Katherine Soule)

### Risk mitigation improves food safety

To reduce the risk of microbial contamination from food-borne pathogens in fresh produce grown organically with animal-based soil amendments, one research project provided scientific evidence to support regulations that require a minimum wait time between the use of untreated manure (i.e., raw manure and aged manure) and crop harvest. Several foodborne pathogens are commonly associated with human illness such as E. coli, Salmonella and Listeria. Research findings will inform ongoing Food & Drug Administration risk assessments and the organic and fresh produce industries. (Alda Pires)

### Food safety curriculum recognized by FDA

A major update to U.S. food safety regulations occurred in 2011, impacting growers and food processors of all sizes. A standardized one-day grower training curriculum recognized by the Food and Drug Administration was used by

UCCE to provide growers in Butte County information they need to comply with food safety regulations; 50 growers received certificates of completion. (Linda Harris)

## Improved food security

### Low-cost food preservation techniques

The Master Food Preserver Program provides instruction on proper freezing and dehydrating techniques. For example, the San Luis Obispo program partnered with local food banks to extend information to 1,800 low-income residents, the majority of whom were Spanish-speaking. These participants learned low-cost, safe home food preservation techniques, and 98% (of 117) reported the lessons would help them increase food resources. (Dayna Ravalin, Katherine Soule)

### Food security symposium creates collaboration

UC Cooperative Extension co-chaired a food security symposium that brought together more than 85 service organizations serving southeast Los Angeles. The symposium created opportunities for collaboration between organizations while defining food security, sharing resources and explaining critical policies. Eighty-six percent (of 98 survey respondents) reported increased understanding of policies affecting food insecure individuals and food assistance programs. The symposium laid the groundwork for a collective impact model to achieve greater results. (Natalie Price)

### Gardening practices reduce food losses

A survey found that 414 people who participated in UC Master Gardener volunteer-led public education events applied gardening practices that reduced food loss. Additionally, 12% donated produce to community programs that distribute food to individuals in need of food assistance. (UC Master Gardener Program)



88%

of CFHL, UC adults improved in one or more food resource management behaviors.

86%

of EFNEP adults improved in one or more food safety practices





# Building Climate-Resilient Communities and Ecosystems

## Increased preparedness and resilience to extreme weather and climate change

### New legislation for fire prevention and resiliency

UC ANR scientists worked with private landowners to demonstrate the techniques and benefits of using prescribed fire on private lands across the state. They raised more than \$350,000 in grants to support community-based prescribed fire organizations with training, planning and equipment. The momentum informed three bills that were signed into law in 2019. SB 901 includes \$200 million per year for the next five years to fund forest health and fire prevention work, including prescribed fire. SB 1260 focuses primarily on prescribed fire and includes pieces on liability and training. AB 2091 mandates the development of new insurance options for prescribed fire. UC ANR research to improve fire resiliency also led to another bill, AB 38, which includes a funding mechanism to help retrofit homes to meet the new wildfire resilience standards. (Jeffery Stackhouse, Lenya Quinn Davidson, Yana Valachovic)

### Increased awareness of localized climate vulnerabilities

A network of UCCE scientists helped conduct California's Fourth Climate Assessment. Regional outreach workshops were held to share resources and support adaptation planning. One scientist organized a public workshop in the North Coast Region of California. Of 200 workshop participants from local government, tribes and non-governmental organizations, 90% gained a better understanding of regional vulnerabilities to climate change and 77% learned strategies for local climate action. (Ted Grantham)



125

farmers participating in climate smart agriculture program received grants

### Toxicology tests verify safety

During the devastating 2018 fire season, growers were unsure if forage crops covered in ash were safe for animal consumption. A collaborative effort to collect and analyze samples with a veterinary toxicologist determined there was no contamination due to the fires. It was important to verify the safety and quality of the crops as toxic impacts could have been financially devastating to the \$6.37 billion industry. (Betsy Karle)

### Forage tested for extreme conditions

UC's Agricultural Experiment Station is testing alfalfa, forage grasses and available germplasm from around the globe to help growers select successful species and varieties for now and the future. Germplasm are being tested at multiple locations in California under varying production systems. Growers are benefitting by understanding which varieties are adaptable to drought conditions and can optimize limited water. (Charles Brummer, Dan Putnam)

### New guidelines for forest managers

UC ANR's work on prescribed fire has also led to the development of a new statewide program called California Prescribed Burn Boss Certification. The program creates a pool of licensed practitioners who will be qualified to lead burns on private lands, therefore increasing public safety and restoring ecological processes to forests. UC ANR's work also contributed to new guidelines for CAL FIRE personnel throughout the state, which makes permitting and prescribed fire operations more consistent. (Rob York)

### Maintaining food production

An inter-institutional team developed a policy report "Managing Drought in a Changing Climate", which provides guidance on decisions that need to be made now to ensure long-term sustainability of water resources in California, such as how to manage water to maintain food production, particularly in the face of potential prolonged drought. This work was shared through the Public Policy Institute of California with the US Environmental Protection Agency and recommendations from the report were incorporated in the Governor's 2020 Water Resilience Portfolio. (Paul Ullrich)

# Protecting California's Natural Resources



## Improved air quality

### Improved emissions methodology

A UCCE study, funded by the California Air Resources Board (CARB), identified diverse practices implemented on dairies to reduce methane emissions, and improved methodology to estimate emissions. Previous estimates indicated the dairy industry was more than halfway to meeting the state's 2030 goal of a 40% reduction in emissions. CARB is in the process of refining estimated emissions and greenhouse gas inventories to determine if mandatory reductions will be needed to meet the 2030 goal. CARB is using the new methodology to help refine the inventories.

(Deanne Meyer, Betsy Karle)

## Improved management and use of land

### Annual rangeland forage production data aids ranchers

The annual rangeland production study is entering its 70th year and is part of a statewide effort to quantify yearly forage production on annual rangelands. Large year-to-year

fluctuations in forage production are characteristic of California's rangelands. To document these annual differences, UC ANR advisors visit over 70 permanent sites across the state to measure and record this information. With the advent of USDA drought assistance programs, this data has become critically important in the decision of whether to declare drought or other types of forage loss. This scientific approach validates the variation in annual range production from year-to-year and gives ranchers a better understanding of available feed. (Scott Oneto)

## Protected and conserved soil quality

### Improved soil data reliability

To provide growers and consultants with scientific evidence of the quality and reliability of commercial soil-testing laboratories, scientists assessed the accuracy and precision of soil chemical analysis performed by eight commercial laboratories. Growers, consultants and academics have been very receptive to the results and have used the information to reassess which laboratory to use. Reliable soil analysis will help improve research accuracy, profitability and environmental sustainability. (Andre Biscaro)

## Increased ecological sustainability of agriculture, landscapes, and forestry

### Identifying appropriate habitat for urban species

Researchers at the UC Davis Agricultural Experiment Station used a reconciliation ecology approach to identify how landscapes designed and created by people can support native species and ecosystem services. For example, one study found that approximately three times the number of migrant birds were observed foraging in native, valley oak trees as opposed to non-native tree species, such as London plane trees, despite valley oak only representing 15% of available canopy. This study shows urban foresters the ecological importance of native tree species in the urban landscape. (Steven Greco)

### Pest management to protect natural resources

Agricultural Experiment Station projects address the impacts of pest and disease management to minimize harm to natural resources. For example, research advances on the impact of the fungal pathogen *Batrachochytrium dendrobatidis* on amphibians is being used to develop management actions for the National Park Service. (Erica Rosenblum) Other research demonstrated that because aquatic weed beds and decaying weeds benefit invertebrates, they are likely vital to fish productivity. Total weed eradication could reduce fish populations. (Sharon Lawler)

### Invasive beetle infestations reduced

UCCE scientists led a monitoring program in Orange County (OC) Parks to address invasive shot-hole borer beetles. OC Parks management uses the results to make decisions regarding tree treatments and removals, based on the level of beetle infestation and overall tree health. In many of the parks where trees were treated or removed, the number of trees infested with the shot-hole borer beetles were reduced by 10% to 30%. (Beatriz Nobua-Behrmann)

### Schools learn integrated pest management

Turfgrass integrated pest management training was offered to more than 130 school landscape clientele at the Weed Management Expos for School sites in Northern and Southern California. Forty-three percent of the 130 survey respondents reported they planned to incorporate integrated pest management practices and pursue alternatives to conventional pesticides in their management of school landscapes. (Cheryl Wilen, Maggie Reiter)

### Improved practices after rodent academy

The three-day West Coast Rodent Academy educated 180 professionals. Over 90% of 43 survey respondents indicated they improved their ability to identify rodents and implement safe work practices that reduce the risk of contracting rodent-borne disease. Participants developed an integrated pest management plan, communicated with customers about the importance of pest management, and improved in following rodenticide labels. A majority of respondents believe these changes led to more efficient management, decreased negative environmental impacts, and increased customer satisfaction. (Niamh Quinn)

### Monitoring improves treatment timing

Scouts monitored 224 citrus orchards in five regions of California and measured the impact of grower-applied insecticides on Asian citrus psyllid (ACP). ACP is the vector of the deadly bacterial disease Huanglongbing, which threatens the citrus industry. As a result of the monitoring, the timing and types of insecticides used in areawide treatment programs in two of the regions have been adjusted, resulting in significantly lower ACP populations in 2019 compared to 2017. (Elizabeth Grafton-Cardwell)

### Protecting giant sequoia

Only 75 groves of native giant sequoia exist. Through research and extension on these groves, a management plan was developed for a grove of giant sequoias owned by the Save the Redwoods League. The plan is designed to protect the grove from high severity fire in the future. (Rob York)



**900,000**

square feet of pollinator habitat improved as a result of UC Master Gardener events

**>5,000**

acres managed by 10 companies adopted the novel method to bait Argentine ants



# Protecting California's Natural Resources



## Improved water quality

### Understanding toxicity in aquatic habitats

Wetlands and aquatic habitat are among the most biologically diverse land types and play important roles in hydrology and water quality, providing unique ecosystem services to California. UC Davis Agricultural Experiment Station is examining the environmental fate of commonly used agricultural pesticides and informing state water boards, wildlife agencies and growers about pesticide choices based on persistence and toxicity. The long-term impact is cleaner water while maintaining productive agricultural systems. (Ron Tjeerdema)

### New methods to reduce nitrogen leaching

Growers now have additional tools to minimize nitrate leaching. Excess soil nitrogen lost via leaching during the crop production cycle and the winter fallow period jeopardizes groundwater resources that municipalities depend on for drinking water. UCCE researchers in Monterey County found that adding high carbon compost and nitrification inhibitor nitrapyrin to fields in the fall sequesters nitrate and minimizes nitrate leaching during the winter. As a result, nitrapyrin will be registered in 2020 for use on leafy vegetables and nitrate leaching is likely to be reduced as growers implement this practice. (Richard Smith)

## Increased water supply security

### Expansion of groundwater recharge

One multi-year project is assessing the use of storm and flood water on agricultural lands to improve groundwater recharge. The work has expanded to include almonds, alfalfa, vineyards and irrigated pastures (Helen Dahlke)

### Decision support to meet water standards

A team of UC collaborators produced criteria to support decisions made by water regulators and managers in California regarding water loss performance standards required by state law. The economic model and analysis informed performance standards being established by the State Water Resources Control Board under state law SB 555. These performance standards will be imposed on the largest water utilities across the state. (Ellen Bruno)

## Improved water use efficiency

### Irrigation technology improves yield

Trials indicate that subsurface drip irrigation (SDI) has the potential to improve yields and the efficiency of water and fertilizer use for alfalfa, sugar beets and dehydrated onions. Initial findings showed an average of 1.3 acre-feet/acre water conserved and 18% yield increase. A sugar beet grower in Imperial County who used SDI and followed irrigation and nitrogen management recommendations was able to conserve about 20% water (100 acre-feet) and 20% of nitrogen fertilizer.

(Aliasghar Montazar)

### Landscape sites improve water use

Water use at 30 parks, school districts and other professionally managed sites in six California climate zones was measured before and after hands-on training was provided to site managers. Twenty one sites significantly reduced water use while maintaining health and attractiveness, including water savings of 50% or more at some sites. Results were used by the California Department of Water Resources to support reduced potable water allocations to commercial landscapes, saving more water. Between 1.3 million and 2.9 million acre-feet of water could be saved per year if Californians' implement these best management practices on landscapes.

(Janet Hartin)

# Developing an Inclusive and Equitable Society

## Improved living and working conditions for California's food system and farmworkers

### Techniques reduce pesticide exposure

Applied pest management research led to new strategies to more effectively control the sugarcane aphid in sorghum. An observed outcome of the sorghum pest management research has been a reduction in unnecessary insecticide applications, better pest monitoring methods, and the potential to use soil drench and liquid pesticide injections directly below the surface of soil. Together these will likely lead to improved working conditions for California's farmworkers by diminishing pesticide exposure. (Nicholas Clark)

### Monitoring to protect workers

An Agricultural Experiment Station researcher at UC Davis is working on rapid tools for monitoring food production systems to safeguard worker and consumer safety. This project is deploying simple, accurate tests for a range of potential toxicants in food systems, from pesticide residues to mycotoxins. This project delivers technology directly to producers to solve key problems in food supply. (Bruce Hammock)

## Increased diversity, inclusiveness and cultural competency in California's workplaces

### UC Master Gardener Program engages Latinx community

The UC Master Gardener Program has expanded Spanish-language online resources including how-to videos, and local efforts are underway to better engage the Latino community. For example, the Fresno County Master Gardeners started to teach select workshops in Spanish at

a public library, a new location that was more accessible to Spanish-speaking clientele (UC Master Gardener Program, Maggie Reiter).

### Los Naturalistas become certified naturalists

The first bilingual and bicultural California Naturalist Certification course was adapted by local instructors and delivered to the Urban Conservation Corps of the Inland Empire. Graduates, known as Los Naturalistas, now offer nature-based tours in Spanish with a Latino cultural twist. This fills a void in the availability of environmental literacy services for Spanish-speaking people in San Bernardino and Riverside counties. (UC California Naturalist Program, Claudia Diaz Carrasco)

### Practices adopted in 4-H to engage Latinx youth

From the Ground Up research project identified practices to recruit, engage and sustain the participation of Latinx youth in 4-H. Fifty-nine extension professionals and 4-H volunteers and nine 4-H youth learned and implemented new practices to engage Latino populations. Riverside, Merced, and Santa Clara counties adopted these practices in their programs. In addition, 4-H staff, academics and specialists worked on their own intercultural competence to recognize the complexity of the dimensions of diversity. (Fe Moncloa, Russell Hill)

### Culturally responsive program supports Asian small farmers

UCCE scientists co-authored a policy paper identifying challenges for diversified, socially disadvantaged farmers and proposing changes to reporting requirements for applied nitrogen for farms under 45 acres. As a result of the proposal, 45 farmers received one-on-one training on total nitrogen applied reporting required by Central Coast Regional Water Quality Control Board, and were able to avoid fines of up to \$1,000 per day. Changes to reporting requirements, adopted by the State Water Control Board, set precedence for the state and can benefit ethnically diverse and socially disadvantaged farmers in other counties. (Aparna Gazula)



**744%**

increase in Latino 4-H youth enrollment in Merced County

# Promoting Healthy People and Communities



## Improved health for all

### Evaluation tool measures CFHL success

Nutrition Policy Institute provided evaluation for agencies implementing CalFresh Healthy Living (CFHL) interventions. In 2019, NPI found statistically significant increases in the frequency of combined fruit and vegetable consumption (0.34 times/day) and decreases in the frequency of sweets consumption (0.25 times/day) among 2,932 youth receiving a CFHL intervention over comparison groups. (Amanda Linares)

### Positive response to nutrition and exercise pilot

UCCE academics collaborated with community partners to pilot a new CFHL, UC program in Kings County that coupled nutrition education classes with Bailoterapia, dance therapy exercise classes. CFHL initiated the classes and identified a promotora, community champion, to sustain the dance classes. A majority, 83% of participants not already practicing the promoted healthy eating or active living behaviors, indicated their intention to do so within the

next week. After the classes, eight participants reported a significant increase in the frequency of making small changes to be more active. Community partners attributed the program's success to a variety of factors including respect for cultural social-norms and values. (Deepa Srivastava, Barbara Mknelly, Angie Keihner)

### Students improve healthy food choices

UCCE academics provided oversight, leadership and guidance for the statewide implementation of the Expanded Food and Nutrition Education Program (EFNEP) statewide programs. Local programs utilized statewide evaluation tools to measure participant outcomes. EFNEP in Alameda and Contra Costa counties conducted pre/post surveys with over 1,000 students as a sample of the 6,684 students reached, with 80% reporting improvement in choosing healthy foods and 26% drinking less sugar sweetened beverages. Teachers reported that they observed students increasing their fruit and vegetable selection and consumption at lunch; bringing healthier snacks to school; and sharing what they learned with their families. (Marisa Neelon)

**95%**

of 3,600 adult EFNEP participants surveyed met all recommended practices in diet quality



**1,200,000**

square feet of home gardens in California were improved with information from UC Master Gardeners



**82%**

of 4,300 youth EFNEP participants surveyed improved their ability to choose foods according to federal dietary recommendations



**143**

sites CFHL, UC sites implemented edible gardens where participants eat, work and learn

## Improved community health and wellness

### Increase in physical activity

CalFresh Healthy Living, UC reported policy, systems and environmental changes at 397 SNAP-Ed sites, contributing to improved community health and wellness for more than 170,000 people. Specifically, over 223 UC CalFresh program sites in 31 counties made at least one physical activity-related change. More than half of these sites improved the quality of structured physical activity. ([Statewide CFHL, UC Program](#))

### Policy improvements to WIC

The Nutrition Policy Institute collaborated on a national longitudinal study that showed the longer children from low-income families were on USDA's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), the better their diet quality. It highlights potential benefits of extending WIC until children are eligible for school meals. Other studies led to the addition of yogurt to WIC food packages, and greater program flexibility by showing that online nutrition education can be as effective as traditional in-person classes. ([Lorrene Ritchie](#))



## Improved access to positive built and natural environments

### Seniors active in gardens

Garden education programs at senior living facilities in Alameda County led to a tripling of the number of active garden plots. Almost 120 seniors, now gardening, reported they had never planted a container garden before the intervention. Additionally, 30% of the seniors trained by UC Master Gardeners went on to volunteer as garden peer-educators and wellness ambassadors. ([Mary Blackburn, Katherine Uhde](#))

### New school gardens

CFHL, UC in Riverside County partnered with the UC Master Gardener Program to help two schools adopt new gardens through policy, systems and environment interventions. They also continued to maintain school gardens at six other locations, which enabled sites to adopt garden-based learning programs as well as increase healthy food access. ([Chutima Ganthavorn](#))

### Campuses adopt healthy vending policies

Evaluation findings of the UC Healthy Vending Guidelines, developed by UC ANR Nutrition Policy Institute and colleagues, confirmed increased access to healthy foods for university students. Specifically, seven campuses now have health/wellness policy or programs that cover vending machines. Furthermore, six campuses have added language into their vending contracts to include healthy items. These policy changes improve the access and availability of healthy vending options that are then purchased and likely consumed by campus communities. ([Janice Kao](#))



**For questions about this annual report please contact**

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