

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Sustainable Natural Ecosystems

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	3%		3%	
102	Soil, Plant, Water, Nutrient Relationships	3%		13%	
111	Conservation and Efficient Use of Water	6%		4%	
112	Watershed Protection and Management	3%		3%	
121	Management of Range Resources	18%		4%	
122	Management and Control of Forest and Range Fires	6%		1%	
123	Management and Sustainability of Forest Resources	20%		1%	
131	Alternative Uses of Land	4%		2%	
132	Weather and Climate	2%		8%	
133	Pollution Prevention and Mitigation	2%		8%	
135	Aquatic and Terrestrial Wildlife	10%		4%	
136	Conservation of Biological Diversity	10%		13%	
141	Air Resource Protection and Management	7%		8%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	1%		3%	
212	Diseases and Nematodes Affecting Plants	0%		3%	
305	Animal Physiological Processes	0%		3%	
311	Animal Diseases	0%		3%	
605	Natural Resource and Environmental Economics	4%		8%	
610	Domestic Policy Analysis	1%		5%	
702	Requirements and Function of Nutrients and Other Food Components	0%		3%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	31.4	0.0	70.4	0.0
Actual Paid	6.2	0.0	9.1	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
977267	0	958247	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
977267	0	958247	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
11199343	0	60557576	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

UC ANR's integrated research and extension activities will conduct research projects, workshops, education classes and demonstrations, as well as one-on-one interventions. In addition, the programs will use PSAs, newsletters, mass media, web sites and collaborations with other agencies and organizations to create and deliver programs.

2. Brief description of the target audience

- Farmers
- Ranchers
- Inland fishery owners/operators
- Governmental agencies
- Agricultural and fishing organizations
- Owners/managers of private and public rangeland, forest and wildlands
- Community organizations
- Resource managers

3. How was eXtension used?

UC ANR academics used eXtension to participate in and contribute to Communities of Practice, to answer "Ask an Expert" questions, and for other networking purposes. The Division looks forward to the re-invention into a system of greater value to California Extension.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	43882	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2014
 Actual: 5

Patents listed

1. Engineering Isoprene (C₅H₈) Hydrocarbons in Cyanobacteria
2. BIOLOGICAL ACTIVITY OF YX ALLELES OF PHYTOCHROME EXPRESSED IN TRANSGENIC PLANTS
3. A RECOMBINANT ENDO-BETA-1,2-XYLANASE FROM THE THERMOPHILIC ACIDOPHILIC CELLULOLYTIC BACTERIUM ACIDOTHERMUS CELLULOLYTICUS WITH ACTIVITY FROM
4. PRODUCTION OF CELLULASE ENZYMES IN PLANT HOSTS USING TRANSIENT AGROINFILTRATION
5. A NOVEL APPROACH TO FUNCTIONAL GENOMIC STUDIES OF THE SUPERFAMILY OF RECEPTOR-LIKE PROTEIN KINASE-RLK's) IN PLANTS

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	65	336	401

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Classes/Short Courses Conducted

Year	Actual
2014	56

Output #2

Output Measure

- Workshops Conducted

Year	Actual
2014	34

Output #3

Output Measure

- Demonstrations and Field Days Conducted

Year	Actual
2014	15

Output #4

Output Measure

- Newsletters Produced

Year	Actual
2014	5

Output #5

Output Measure

- Web Sites Created or Updated

Year	Actual
2014	8

Output #6

Output Measure

- Research Projects Conducted

Year	Actual
2014	138

Output #7

Output Measure

- Videos, Slide Sets and Other AV or Digital Media Educational Products Created

Year	Actual
2014	1

Output #8

Output Measure

- Manuals and Other Printed Instructional Materials Produced

Year	Actual
2014	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Governmental agencies, agricultural and fishing organizations, resource managers and other stakeholders in inland fishery management issues, participating in the programs, will gain knowledge of strategies and techniques for sustainable use of inland fishery resources.
2	Farm, ranch, private and public forest and wildlands owners/mangers, participating in natural resource management programs, will gain knowledge of strategies and techniques for sustainable use of natural resources.
3	Fire protection and land management agencies, land and home owners, community organizations, and landscape professionals, participating in wildland fire education programs, will gain knowledge on how to increase fire resistance of homes and landscaping.
4	Farm, ranch, and landscape owners/managers and allied industry professionals and governmental agency representatives, participating in air quality education programs, will gain knowledge of the atmospheric system and/or how policies, products, plants, and practices can help improve air quality.
5	Ranch and private and public rangeland owners/managers, participating in rangeland management programs, will gain knowledge of recommended techniques for rangeland monitoring and management, and grazing and browsing.
6	Ranch and private and public rangeland owners/managers, participating in the programs, will adopt recommended techniques for rangeland monitoring and management, and grazing and browsing.
7	County urban plan made more sustainable.
8	Cattlemen Association formally adopted a new tool to help ranchers show they are good stewards.
9	Dairy producers meet regulatory compliance and receive savings.
10	New knowledge on ecosystem services is applied to conservation decision making.
11	Native bee habitat and populations increase on agricultural land.

Outcome #1

1. Outcome Measures

Governmental agencies, agricultural and fishing organizations, resource managers and other stakeholders in inland fishery management issues, participating in the programs, will gain knowledge of strategies and techniques for sustainable use of inland fishery resources.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Farm, ranch, private and public forest and wildlands owners/mangers, participating in natural resource management programs, will gain knowledge of strategies and techniques for sustainable use of natural resources.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Fire protection and land management agencies, land and home owners, community organizations, and landscape professionals, participating in wildland fire education programs, will gain knowledge on how to increase fire resistance of homes and landscaping.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Farm, ranch, and landscape owners/managers and allied industry professionals and governmental agency representatives, participating in air quality education programs, will gain knowledge of the atmospheric system and/or how policies, products, plants, and practices can help improve air quality.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Ranch and private and public rangeland owners/managers, participating in rangeland management programs, will gain knowledge of recommended techniques for rangeland monitoring and management, and grazing and browsing.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Ranch and private and public rangeland owners/managers, participating in the programs, will adopt recommended techniques for rangeland monitoring and management, and grazing and browsing.

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

County urban plan made more sustainable.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Conservation is a highly important issue to urban communities. Science-based information is needed on landscape water management, hazard tree assessment and management, pest management, and sustainable tree care. There is interest to minimize the use of pesticides in urban areas through using pest resistant varieties. Each year, structural failures in urban trees

cause property damage and/or personal injury, and cities spend thousands of dollars each year repairing damage to sidewalks, curbs, and gutters caused by tree roots.

What has been done

UCCE provides educational programs and research in urban forestry, to support city and county parks, green space managers, street tree programs, commercial tree and landscape professionals, schools, and nonprofit environmental groups. Working with the California Department of Water Resources, UCCE developed a method of determining water needs of urban landscapes, and over 1,500 species of landscape plants have been assessed. Information on key risk factors in standing trees in order to assess the potential for failure, and strategies to reduce damage has been collected and shared. During 2014, UCCE provided two head planners for Santa Clara County working on a tree species selection with information on the pest vulnerability of their tree palette.

Results

Decision-makers were informed on tree species selection for Santa Clara County's 2050 Urban Greening plan, which greatly enhanced the sustainability of the tree planting plan. The resilience to pests and diseases of the county's future urban forest will be improved.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #8

1. Outcome Measures

Cattlemen Association formally adopted a new tool to help ranchers show they are good stewards.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is increasing pressure on ranchers to show their stewardship of the land and natural resources. The laws or regulations covering water quality, endangered species, air quality, and food safety are increasing. Citizens have a great interest in having clean water, safe food and a healthy ecosystem. At the same time private land owners are feeling that these outside regulations are suppressing their private property rights. It is important for ranchers to show they are good stewards and yet be able to earn a living from the land they own.

What has been done

A UCCE project was designed to help ranchers show they are managing properly, by creating and implementing a voluntary self-assessment program to evaluate all aspects of ranching operations to ensure the sustainability of production, lands, and families. UCCE held several planning meetings including CE advisors and specialists, the Ranch Committee, members of the National Grazing Lands Coalition and the Natural Resources Conservation Service (NRCS). UCCE organized workshops to "Beta Test" the Ranching Sustainability Analysis (RSA) system for its clarity and usefulness. In addition, through three other workshops and a ranch water quality short course portions of the RSA were discussed.

Results

Implementation of the Ranching Sustainable Analysis (RSA) program has been slow, but it is starting to take off. The San Luis Obispo Cattlemen Association has formally adopted the RSA. In addition, the National Grazing Lands Coalition is now on board.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources

Outcome #9

1. Outcome Measures

Dairy producers meet regulatory compliance and receive savings.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Dairy operators have identified the need for education and assistance to understand what is necessary for environmental compliance related to Waste Discharge Requirements and Air District requirements.

What has been done

UCCE continued work on the California Dairy Quality Assurance Program (CDQAP), collaborating with all pertinent regional regulatory agencies. Previously successful outreach methods, including workshops, fact-sheets and industry newsletters, continued to be used to provide up-to-date information and compliance assistance to dairy operators and their consultants. Classes were offered to provide updates on regulatory requirements and support producers in meeting the program's educational requirements for certification (6 hours of water quality and 2 hours of air quality). Classes were attended by producers who did not yet have the minimum education requirements. Forty one producers completed education requirements for certification.

Results

Third-party evaluation and certification continued to be successful, allowing participating producers to confirm regulatory compliance and enjoy 50% reduced water permit fees. 78 facilities were evaluated with 27 first-time certifications and 45 re-certifications in 2013-2014. The fee discount is valued at approximately \$300 to \$5,000 per facility per year, depending on dairy size. A total of 668 facilities were eligible for fee discounts. Based on the 2014-2015 state water board fee schedules this has an estimated savings for producers of between \$1.1 and \$1.6 million.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #10

1. Outcome Measures

New knowledge on ecosystem services is applied to conservation decision making.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Land managers have restored river and stream banks using revegetation technologies with native plant material for over four decades in coastal California, achieving multiple ecosystem functions and natural resource management objectives. The number of river and stream restoration projects in the United States has steadily increased since the 1980s, with over \$2 billion spent on river restoration in California.

There is a need for new knowledge to understand long term carbon sequestration potential within coastal California streams to maximize these ecosystem services. More science-based information is needed to inform policies and programs to mitigate greenhouse gas emissions and develop market driven incentives for carbon sequestration.

What has been done

The UC ANR watershed team is completing a novel pilot study of carbon sequestration and nutrient cycling resulting from watershed restoration and riparian revegetation. The researchers collaborated with Natural Resource Conservation Service, Resource Conservation Districts and restoration consultants to locate revegetation sites. Landowners and land managers provided permission to access property and information about previous stewardship projects, grazing management and ranch history. 42 sites were sampled ranging from 0 to 45 years in time since restoration (i.e. project age) documenting carbon. In addition to wildlife habitat and water quality, watershed restoration appears to have also improved air quality. Total and labile carbon increase over time as project age increases. Multivariate analysis is in progress to ascertain if keystone species or certain functional groups maximize long-term carbon storage. Research findings are being disseminated on multiple levels to local partners, regional programs and international disciplines.

Results

The conservation partnership, including, most importantly, its farmers and ranchers have a fuller appreciation for what they have accomplished, and are applying the results towards options to improve long-term agricultural viability. Landowners are prioritizing new sites for conservation and restoration projects, in addition to organizing old ranch photos that document pre-project conditions of previously restored sites. Local Resource Conservation Districts are implementing water quality trading credits, and grant funds are being leveraged to install new stream restoration projects. Policies encouraging ecosystem services have also utilized the results to validate how conservation practices have improved numerous ecological attributes and functions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
132	Weather and Climate

Outcome #11

1. Outcome Measures

Native bee habitat and populations increase on agricultural land.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Although some agricultural activity has a negative impact and is partially responsible for decline of wild native and honey bees, agricultural land has the potential to provide habitat for local wild native and honey bees. There is a need to identify appropriate "best practices" for habitat management by farmers, that won't overburden their already busy daily routines even if it produces clear benefits to crop production.

What has been done

UC ANR researchers have worked together to survey and evaluate ecological relationships of native California bee species and their flowers in selected agro and urban ecosystems. They have installed native bee plants and artificial nests, conducted bee monitoring to identify key bee species, and led many outreach and education workshops, presentations, and tours. Topics covered: the basics of bee-plant relationships, host plant selection, habitat installation and maintenance, native bee ecology, basic identification, and monitoring. In addition, scientific papers have been published and posters presented at major conferences. A new book is also now available: California Bees and Blooms: A Guide for Gardeners and Naturalists. Lastly, a website is maintained with up-to-date information (www.helpabee.org).

Results

There have also been significant changes in perceived value of native bees. Farmers are now paying attention to how their actions may impact native bees. The farmers and farmworkers now look for and identify native bees on the planted habitats. In addition, farmworkers learned to identify California annuals and avoid them when weeding. There are 18 newly established acres of native bee habitat on the treatment farms. While more study is required, it appears these

habitats are working to increase native bee populations on the treatment farms, and may be supporting increased populations of native bees overall. Some farmers have recognized the marketing value of their new habitats, particularly as the media continues to focus on honey bee decline.

4. Associated Knowledge Areas

KA Code	Knowledge Area
136	Conservation of Biological Diversity

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

During FY 2014, California continued to face its worst drought in decades. Water supply and quality for agricultural, urban, and environmental systems has become one of the state's biggest challenges. UC ANR has focused efforts to serve as a resource both in offering everything from near-term management advice to farmers and ranchers to the innovative work being carried out by researchers on a vast array of issues from drought resistant crops to snow sensors to climate change.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

UC ANR's quantitative and qualitative outcomes recorded from the evaluation studies are reported under the State Defined Outcomes section.

Key Items of Evaluation

The Report Overview's federal Planned Program summary of accomplishments highlights UC ANR's most significant work during FY 2014, especially the research developments. In addition, significant success stories are reported as qualitative outcomes under the State Defined Outcomes section.