V(A). Planned Program (Summary)

Program # 11

1. Name of the Planned Program

Environmental Horticulture

☑ 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
102	Soil, Plant, Water, Nutrient Relationships	30%		0%	
111	Conservation and Efficient Use of Water	35%		0%	
216	Integrated Pest Management Systems	35%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Paid	22.9	0.0	0.0	0.0
Actual Volunteer	37.8	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**
316791	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
316791	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
800827	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The outreach efforts of the Environmental Horticulture PRU provided education and services to encourage the adoption of research-based best management practices (design, plant selection, establishment, and management practices) and diagnostic techniques/services by green industry professionals and the home gardener. The goal was that professional and lay practitioners use reasonable inputs of labor, water, fertilizers and pesticides to produce attractive, functional, cost-effective and sustainable ornamental landscapes.

2. Brief description of the target audience

Home gardeners and professional green industry professionals and youth gardeners.

3. How was eXtension used?

Agents respond to Ask an eXpert.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1621607	13435	24925	171673

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

Patent Applications Submitted

Year: 2014

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	277	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Classes, trainings, workshops, demonstrations, field days, technical assistance, etc. conducted

Year	Actual
2014	2287

Output #2

Output Measure

- One-on-one direct client contacts by site visit, office drop-in, e-mail, telephone, Ask an eXpert, etc.

Year	Actual
2014	21542

Output #3

Output Measure

- Meetings convened and /or facilitated

Year	Actual
2014	350

Output #4

Output Measure

- Kits or similar resources loaned or provided

Year	Actual
2014	858

Output #5

Output Measure

- Extension-related research and assessment projects

Year	Actual
2014	173

Output #6

Output Measure

- Web hits

Year	Actual
2014	1177046

Output #7

Output Measure

- Indirect contacts through Media releases/appearances, newsletters, blog posts, or other non-peer reviewed publications

Year	Actual
2014	21542

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	EH1.1) Participants report using or intention to use new technologies and/or intention to adopt or adoption of best management practices and/or policies promoting best management practices in their landscapes, businesses and/or communities.
2	EH2.1) Participants report intention to change or they have changed pest management strategies, intent to utilize or utilizing new technologies to assist with pest diagnosis and management, intent to adopt or adopting integrated pest management strategies and/or intention to adopt or adopting of policy promoting or utilizing integrated pest management strategies.
3	EH3.1) As a result of Colorado Master Gardener (CMG) training and on-going support, CMGs report increased competence (confidence and proficiency/accuracy) in educating the public.

Outcome #1

1. Outcome Measures

EH1.1) Participants report using or intention to use new technologies and/or intention to adopt or adoption of best management practices and/or policies promoting best management practices in their landscapes, businesses and/or communities.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1174

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The average household in Colorado spends over $1,000 annually on landscape care and gardening supplies (http://www.greenco.org/images/downloadables/GreenCO-ExecSumFinal08.pdf). Landscaping yields an average of a 109% return on every dollar spent, much more so than other home improvements. (http://ellisonchair.tamu.edu/emphasis-areas/marketing-economics/economic-benefits-of-plants/).

What has been done
One example: A fun and educational event in Pueblo happened the first weekend of June. Ten gardens were open to the public, with name tags on plants and information about design and maintenance in the garden biographies and plant lists. The xeritour is a collaborative event, planned and supported by CSU Extension-Pueblo County, the Southeast Colorado Water Conservancy District (SECWCD), and Pueblo West Community Xeriscape Gardeners. Gardens are chosen based on beauty, but must conform to water-wise gardening principles. The goal is to provide inspiration and to demonstrate that even in the harsh conditions of Pueblo and Pueblo West, homeowners can have sustainable, colorful landscapes that are long on beauty but short on water bills and maintenance. This was the 9th year for the tour, which is held the first weekend of June. Gardens in Pueblo are open on Saturday and the event is planned by SECWCD staff and Colorado Master Gardener volunteers. The 2014 event featured the public garden at the Sangre de Cristo Art Center and 4 private gardens in older neighborhoods that had been remodeled from turf to colorful, waterwise landscapes surrounded by mature trees. On Sunday, the tour featured gardens in Pueblo West, showcasing young landscapes with little turf, but gardens that support native arthropods, provide water for birds, and edibles for the homeowners. The public garden at Cattail Crossing looked the best it has in years, showing that when nature

provides some spring rainfall, a low-water garden can truly shine. This garden was awarded the Plant Select Showcase Garden Award last June and is managed by the all-volunteer Pueblo West Community Xeriscape Gardeners.

Results
Overall, 1174 participants reported using or intending to use new technologies and/or intention to adopt or adoption of best management practices and/or policies promoting best management practices in their landscapes, businesses and/or communities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water

Outcome #2

1. Outcome Measures

EH2.1) Participants report intention to change or they have changed pest management strategies, intent to utilize or utilizing new technologies to assist with pest diagnosis and management, intent to adopt or adopting integrated pest management strategies and/or intention to adopt or adopting of policy promoting or utilizing integrated pest management strategies.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	329

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
New pest outbreaks affecting horticultural plants have been occurring in Colorado with increasing frequency in recent years. Oak agrilus borer and Japanese beetle were detected 2003. Japanese beetle was eradicated in the Tri-River area in 2004, but reappeared in the Front Range in 2005 where it continues to be a growing problem. In 2013, emerald ash borer was detected in Boulder County; the presence of this insect presents the potential to cause millions of dollars of damage to the Front Range urban forest. Mountain pine beetle epidemics have occurred off and on since the 1950s and by 2011 had affected 752,000 acres of Colorado. (Results of the 2011 Aerial

Detection Survey in Region 2, U.S. Forest Service, Rocky Mountain Region). Spotted wing drosophila was been reported in Fort Collins and the Denver metro area in 2013; this insect will be a significant problem for both commercial and home gardener small fruit production. Another important introduced insect, the brown marmorated stink bug, is likely to become a problematic Colorado pest in the near future. The impact of these invasive species has received increased attention from state and Federal governments and IPM programs are under development to mitigate their negative impacts. These programs need major enhancements to adequately protect human health, our food supplies, and the environment from the impact of pests and pest management tactics. Extension personnel have collaborated with other agencies in delimitation studies, public education, pest identification and research and developing management strategies. As pests are introduced or break out, extension personnel continue to devote time and effort towards them.

What has been done
Western Colorado Pest Management Workshop. The workshop provides continuing education credits (CECs) for private, public, and commercial pesticide applicators.

Results
Overall, 329 participants reported an intention to change or they did change pest management strategies, intend to utilize or are utilizing new technologies to assist with pest diagnosis and management, intend to adopt or are adopting integrated pest management strategies and/or intend to adopt or are adopting of policy promoting or utilizing integrated pest management strategies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #3

1. Outcome Measures

EH3.1) As a result of Colorado Master Gardener (CMG) training and on-going support, CMGs report increased competence (confidence and proficiency/accuracy) in educating the public.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	431

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Questions about turf and gardens outnumber availability of Extension staff to respond. Trained volunteers increase capacity to meet local demand.

What has been done
Most counties have a gardening help desk whereby the public can get gardening questions (including diagnosis of disease, insect and weed problems) answered by agents, specialists, and volunteers. In 2012, agents and Colorado Master Gardeners answered over 200,000 public gardening questions via phone, email, websites, newsletters, and other contact methods. Plant diagnostics are offered in many counties throughout Colorado. Jefferson County has a Plant Diagnostic Clinic that receives samples from all over the Front Range, and other counties offer diagnostic services as well. In 2012, over 8,000 horticultural diagnostic problems were addressed in CO counties.

Results
431 CMGs report increased competence (confidence and proficiency/accuracy) in educating the public.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
216	Integrated Pest Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Natural Disasters including invasive pest introduction, drought, flooding, hail, moisture/temperature trends can influence pest life cycles which will require redirection of effort to accommodate current needs.
Economic problems may lead more individuals to acquire/redirect their IPM strategies according to resource limitations or opportunity; more individuals may grow their own food crops, requiring redirection of programming efforts; individuals may spend less on landscape and turf, requiring redirection of programming efforts. Colorado Master Gardener volunteer numbers may be less due to increased costs associated with the program and personal economic situation.
Government regulations may alter pesticide, water and plant availability and use, redirecting efforts to alternative materials and methods.

Population changes may increase the demand on volunteer and staff time or may increase demands in specific areas such as food production. Increases in under-served populations may alter programming delivery methods.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

There is an increased demand for local food production at the home gardener and commercial levels. There is also increasing concerned about food insecurity in the mountains of Colorado. Rural communities and those in areas with extremely short growing seasons rely almost exclusively on fresh produce and other food items trucked into the area. Increasing local production of crops will make areas more food secure. Season extension techniques will play a large role in crop production at high elevation areas with extremely short (~60-120 day) growing seasons depending on elevation and microclimate.

Key Items of Evaluation

Three Colorado counties (San Miguel, Teller and Eagle) have been growing warm season, cool season and winter greens under different season extension covers since 2010.
Raised beds (>22 inches tall, 4' wide x 12' long) are used at all locations. Covers tested have been:

- 3.5 and 5 mm polyethylene covers (Solexx) with automatic vents
- mini-hoops covered with an under layer of spun-bonded polypropylene row cover fabric and a top layer of polyvinyl alcohol film (Diobetalon or Tuff Bell)
- spun-bonded polypropylene row cover fabric alone
- polyvinyl alcohol film (Diobetalon or Tuff Bell) alone
- uncovered beds

Plants tested have included:

- lettuces in late winter through early winter
- cold-hardy greens (spinach, kale, corn salad, arugula) in fall through spring
- warm season crops (green beans, squash, cucumbers and peppers) in the summer.

Fresh yield weights have been recorded and monthly photographs taken of each test plot. Air temperature and soil temperature in each test plot have been monitored for the length of the trial using automated data loggers.
Lettuces grown under the polyvinyl alcohol film (Diobetalon or Tuff Bell) alone followed by the double layer of spun-bound polypropylene row cover fabric and polyvinyl alcohol film have performed best (highest yield and quality) in spring through fall. Lettuces planted in late winter or held over in early winter have performed best under double layer of spun-bound polypropylene row cover fabric and polyvinyl alcohol film during late winter and early winter. Results for lettuces grown under spun-bonded polypropylene row cover fabric alone are inconclusive.
Warm season crops (green beans and squash for example) have performed best under the double layer of spun-bound polypropylene row cover fabric and polyvinyl alcohol film. Results for warm season crops grown under spun-bonded polypropylene row cover fabric alone and polyvinyl alcohol film (Diobetalon or Tuff Bell) alone are inconclusive.
Results for yield and quality for fall and winter greens are not conclusive for any treatment.