

**V(A). Planned Program (Summary)**

**Program # 5**

**1. Name of the Planned Program**

Climate Change

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
104	Protect Soil from Harmful Effects of Natural Elements	10%		10%	
112	Watershed Protection and Management	10%		10%	
132	Weather and Climate	20%		20%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	10%		10%	
205	Plant Management Systems	10%		10%	
306	Environmental Stress in Animals	10%		10%	
307	Animal Management Systems	10%		10%	
605	Natural Resource and Environmental Economics	10%		10%	
608	Community Resource Planning and Development	10%		10%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

**1. Actual amount of FTE/SYs expended this Program**

Year: 2014	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	2.0	0.0	2.6	0.0
<b>Actual Paid</b>	2.0	0.0	2.8	0.0
<b>Actual Volunteer</b>	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
31925	0	153429	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
31925	0	153429	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

UW Research and Extension activities will focus on best species and variety selection as well as effectiveness of production practices as aspects of climate changes. Invasive species, and drought will be addressed through educational programs which enhance strategies to control global warming and will likely create opportunities for Wyoming agriculture to both profit and contribute to mitigation of forces driving change in climate.

Basic work in carbon storage in ecosystems, the implications of agricultural and land management practices on storage, and education related to these questions will be addressed. Plant species and variety adaption to the changing ecosystem will be critical to maintaining the agricultural productivity for the state. Educational programs will help producers and land managers understand the implications of drought for grasslands and cropping ecosystem management. The implications of climate change for invasive species and ecosystem management implications are important opportunities for UW AES and Extension.

**2. Brief description of the target audience**

The University of Wyoming is committed to reaching underrepresented groups and individuals and to implementing the objectives of equal opportunity regulations relative to the consideration and treatment of clientele for participation in all programs regardless of their race, national origin, gender, age, religion, or disability. Specific target audience groups for the climate change program include agriculture producers, commodity groups, and agriculture agencies. Horticulture and small acreage audiences will also benefit from water conservation and risk management components of the program.

**3. How was eXtension used?**

eXtension is utilized as a resource for educators and clientele. The link to eXtension is prominently displayed on the UW Extension Web site home page. Additionally all extension employees are made aware of professional development opportunities available through eXtension. UW Extension participates in "Ask an Expert", educators respond to clientele questions on this topic when appropriate.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	8207	100000	150	1000

**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
<b>Actual</b>	1	6	7

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of agriculture producers participating in educational programs. Target is number of program participants.

<b>Year</b>	<b>Actual</b>
2014	2000

**Output #2**

**Output Measure**

- Number of educational programs conducted targeting climate change. Target is the number of programs.

<b>Year</b>	<b>Actual</b>
2014	28

**Output #3**

**Output Measure**

- Research on production practices in the face of climate changes. Target is the number of research publications, bulletins, reports, and presentations.

<b>Year</b>	<b>Actual</b>
2014	13

**Output #4**

**Output Measure**

- Research to determine the relationship between climate change and competition among native and invasive plant species. Target is the number of research publications, bulletins, reports, and presentations.

<b>Year</b>	<b>Actual</b>
2014	15

**Output #5**

**Output Measure**

- Research on strategies to mitigate release of greenhouse gases into the atmosphere. Target is the number of research publications, bulletins, reports, and presentations.

<b>Year</b>	<b>Actual</b>
2014	7

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Awareness created through extension and research efforts. Target is the number of participants in extension and research programs reporting that they have gained awareness on topic.
2	Agriculture, horticulture and small acreage participants will increase awareness of climate change and the impact on horticulture production. Target is number of participants reporting outcome.
3	Producers will implement practices in animal and plant production which will mitigate climate change. Target is the number of producers reporting outcome.
4	Research that will create awareness of production practices, invasive plant species, and potential to mitigate greenhouse gas emissions in the face of climate change. Target is the number of projects reporting this outcome.

## **Outcome #1**

### **1. Outcome Measures**

Awareness created through extension and research efforts. Target is the number of participants in extension and research programs reporting that they have gained awareness on topic.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2014	346

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Wyoming is a rangelands state where small changes in temperature and growing season and amount and timing of precipitation can have a dramatic effect on the success of plant communities in the ecosystem. Best species and variety selection as well as effectiveness of production practices will change as aspects of climate changes. Invasive species are a particular problem in the dry cold desert ecosystem as small changes in climate can shift the competitive relationship among plant species. This can have a significant effect on plant community diversity and rangelands productivity. Periodic and sustained drought is another critical factor in the success of agriculture in Wyoming. Some evidence suggests that drought and other climate variability may be more of a factor as the climate warms. In addition, strategies to control global warming will likely create opportunities for Wyoming agriculture to both profit and contribute to mitigation of forces driving change in climate.

#### **What has been done**

UW research and extension activities focus on best species and variety selection as well as effectiveness of production practices as aspects of climate changes. Invasive species, and drought were addressed through educational programs which enhance strategies to control global warming and will likely create opportunities for Wyoming agriculture to both profit and contribute to mitigation of forces driving change in climate. Basic work in carbon storage in ecosystems, the implications of agricultural and land management practices on storage, and education related to these questions are addressed. Educational programs presented help producers and land managers understand the implications of drought for grasslands and cropping ecosystem management.

## Results

Participants in the 28 educational programs conducted by UW Extension reaching 346 youth and adults reported gaining awareness and knowledge on the subject.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
104	Protect Soil from Harmful Effects of Natural Elements
112	Watershed Protection and Management
132	Weather and Climate
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
306	Environmental Stress in Animals
307	Animal Management Systems
605	Natural Resource and Environmental Economics

### Outcome #2

#### 1. Outcome Measures

Agriculture, horticulture and small acreage participants will increase awareness of climate change and the impact on horticulture production. Target is number of participants reporting outcome.

#### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

#### 3a. Outcome Type:

Change in Knowledge Outcome Measure

#### 3b. Quantitative Outcome

Year	Actual
2014	1400

#### 3c. Qualitative Outcome or Impact Statement

##### Issue (Who cares and Why)

Wyoming is a semi-arid climate state where small changes in temperature and growing season and amount and timing of precipitation can have a dramatic effect on the success of plant communities in the ecosystem. In urban areas, small acreages, and towns, horticulture has become an important component of UW Extensions agriculture efforts. Best species and variety selection as well as effectiveness of production practices will change as aspects of climate

changes. Invasive species are a particular problem in the dry cold desert ecosystem as small changes in climate can shift the competitive relationship among plant species. This can have a significant effect on plant community diversity and rangelands productivity. Periodic and sustained drought is another critical factor in the success of agriculture including horticulture in Wyoming. Some evidence suggests that drought and other climate variability may be more of a factor as the climate warms. In addition, strategies to control global warming will likely create opportunities for Wyoming agriculture to both profit and contribute to mitigation of forces driving change in climate.

#### **What has been done**

UW Extension educators in crop and livestock systems and horticulture address climate change in numerous production programs presented throughout the state. The energy extension coordinator provides programming specific to climate change mitigation. Newspaper inserts, magazines, and newsletters also assist in information dissemination. Landowners with 50 acres or less are targeted in small acreage management programs which is a foci in the state. A new program last year involved a train the trainer model for real estate professionals who are first contact with new residents to the state focusing on soils and climate. Trained Master Gardeners participated in 2552 continuing education hours which include climate and impact on horticulture production.

#### **Results**

100 percent of participants indicated they had gained awareness and knowledge as a result of educational programs. Over 50 percent of participants in UW Extension programs on xeriscape, landscape design, water conservation, and plant selection and livestock production have made changes in practices as a result of educational efforts.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
104	Protect Soil from Harmful Effects of Natural Elements
112	Watershed Protection and Management
132	Weather and Climate
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
306	Environmental Stress in Animals
307	Animal Management Systems
605	Natural Resource and Environmental Economics

### **Outcome #3**

#### **1. Outcome Measures**

Producers will implement practices in animal and plant production which will mitigate climate change. Target is the number of producers reporting outcome.

#### **2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2014	1500

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Wyoming is a rangelands state where small changes in temperature and growing season and amount and timing of precipitation can have a dramatic effect on the success of plant communities in the ecosystem. In urban areas, small acreages, and towns, horticulture has become an important component of UW Extension agriculture efforts. Best species and variety selection as well as effectiveness of production practices will change as aspects of climate changes. Invasive species are a particular problem in the dry cold desert ecosystem as small changes in climate can shift the competitive relationship among plant species. This can have a significant effect on plant community diversity and rangelands productivity. Periodic and sustained drought is another critical factor in the success of agriculture including horticulture in Wyoming. Some evidence suggests that drought and other climate variability may be more of a factor as the climate warms. In addition, strategies to control global warming will likely create opportunities for Wyoming agriculture to both profit and contribute to mitigation of forces driving change in climate.

**What has been done**

UW Extension educators in crop and livestock systems and horticulture address climate change in numerous production programs presented throughout the state. The energy extension coordinator provides programming specific to climate change mitigation. Newspaper inserts, magazines, and newsletters also assist in information dissemination.

**Results**

100 percent of participants indicated they had gained awareness and knowledge as a result of educational programs. Drought and climate variability continues to be an on-going issue in Wyoming.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
104	Protect Soil from Harmful Effects of Natural Elements
112	Watershed Protection and Management
132	Weather and Climate
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems

306	Environmental Stress in Animals
307	Animal Management Systems
605	Natural Resource and Environmental Economics

**Outcome #4**

**1. Outcome Measures**

Research that will create awareness of production practices, invasive plant species, and potential to mitigate greenhouse gas emissions in the face of climate change. Target is the number of projects reporting this outcome.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2014	6

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Amphibians are declining globally, many species for unexplained reasons. Long-term monitoring efforts are needed to understand these trends. In particular, the conservation status of pond-breeding amphibian species is poorly established in Wyoming, simply due to lack of information.

**What has been done**

Water samples have been collected from a variety of habitats across SE Wyoming and the Plains and Praire Potholes region. We are developing an environmental DNA test for monitoring amphibian presence. Environmental DNA, in this case, uses DNA from the target species extracted from the water in (potentially) occupied habitats.

**Results**

All species present could be established from a few water samples collected at one sampling point, reducing both field effort and error. Many of these species are threatened to be listed under provisions of the Endangered Species Act and/or are species of concern in Wyoming.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
112	Watershed Protection and Management

132	Weather and Climate
306	Environmental Stress in Animals

#### **V(H). Planned Program (External Factors)**

##### **External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges

##### **Brief Explanation**

Weather extremes and drought often affect program participation. Funding is vital to this new program, changes in appropriations could impact funding. Additionally, global market changes impact both research and extension programs in agriculture.

#### **V(I). Planned Program (Evaluation Studies)**

##### **Evaluation Results**

End of session evaluations were used to determine outcomes of educational efforts. In addition, small acreage (land conversion) has implemented three land demonstration projects in central and SE Wyoming mitigating soil erosion, and climate change issues. Drought has been an issue for agriculture producers for almost a decade; follow up on risk management is conducted informally.

100% of program participants report gaining awareness and knowledge of the topics covered in educational programs.

Over 50% report that they plan to make positive changes as a result of classes.

Energy audits are being implemented resulting in changes which contribute to money saved and increased efficiency of energy use.

##### **Key Items of Evaluation**

100 percent of program participants report gaining awareness and knowledge of the topics covered in educational programs.

Over 50% report that they plan to make positive changes as a result of classes.

Energy audits are being implemented resulting in changes which contribute to money saved and increased efficiency of energy use.