V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Sustainable Energy

☑ 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	20%		20%	
121	Management of Range Resources	20%		20%	
131	Alternative Uses of Land	0%		10%	
133	Pollution Prevention and Mitigation	0%		10%	
401	Structures, Facilities, and General Purpose Farm Supplies	10%		10%	
402	Engineering Systems and Equipment	20%		20%	
608	Community Resource Planning and Development	30%		10%	
	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	3.0	0.0	3.2	0.0
Actual Paid	3.0	0.0	3.1	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**
47887	0	147146	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
47887	0	147146	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

Media will be used to familiarize the public with UW College of Agriculture and Natural Resources areas of programming and personnel in regard to sustainable energy. Media releases in local newspapers, radio spots and television advertisements will inform the public of upcoming extension programs. Newsletter articles distributed both electronically and through the mail by county offices, area teams, and the University of Wyoming will reach general public and agriculture producers locally, regionally, and statewide. Public educational programs with invited speakers and extension specialists and educators presenting research-based information will continue to be held in response to local, state, and national energy sustainability. Demonstrations of technology and skills training will be included in education curriculum to enhance educational effectiveness. Field tours will be organized to provide producers with the opportunity to observe industry procedure (i.e., tour of an ethanol plant).

The Sustainable Agriculture Research and Extension Center (SAREC) located at Lingle, Wyoming will provide a resource base for integrating agriculture production and renewable energy based programs.

Educational programs will emphasize sustainable energy practices such as bio-fuels and wind energy, reclamation and restoration of disturbed lands, and energy conservation practices. Other methods will include individual interaction with landowners educating them on resources available to assist them with sustainable energy practices. UW Extension will provide coordination with other colleges on the UW campus such as Engineering and the School of Energy Resources, state and federal agencies to provide education on this topic, and funding for this effort. UW Extension will also provide educational opportunities for professionals involved with reclamation and restoration of disturbed lands.

The University of Wyoming's College of Agriculture and Natural Resources will conduct research and direct extension programming efforts to help ensure prudent use of the state's precious resources.

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. Participants will include policy makers for county, state, and federal government agencies, crop producers, livestock producers, energy companies, general public, and the scientific community. An

existing secondary audience will be the media, general public, and interest groups not directly involved in production agriculture (i.e., environmental groups). Energy conservation methods will be targeted at both agriculture and general public audiences.

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" questions submitted by clientele receive responses from educators or specialists within this subject expertise when appropriate.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	15169	100000	418	5000

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	1	5	6

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of individuals participating in sustainable energy programs. Target is the number of contacts.

Year	Actual

2014	1500

Output #2

Output Measure

- Determine ecosystem services affected by energy development and reclamation efforts. Target is the number research publications, bulletins, reports, and presentations.

Year	Actual
2014	10

Output #3

Output Measure

- Evaluate the potential for production of bioenergy. Target is the number of research publications, bulletins, reports, and presentations.

Year	Actual
2014	6

Output #4

Output Measure

- Number of educational programs or activities focusing on sustainable energy by UW Extension. Target is the number of educational programs implemented.

Year	Actual
2014	32

Output #5

Output Measure

- Number of collaborative partnerships formed to address sustainable energy in Wyoming. Target is the number of partnerships.

Year	Actual
2014	25

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Awareness created focusing on sustainable energy topics. Target is the number of individuals reporting this outcome.
2	Partnerships will be developed with agencies and organizations to expand sustainable energy efforts. Target is the number of partnerships formed.
3	New technologies or devices used in ag production systems and/or farmsteads. Target is the number of new technologies developed.
4	Create awareness of research on ecosystem services affected by energy development and reclamation efforts. Target is the number of projects reporting this outcome.
5	Create awareness of research on the potential to produce bioenergy. Target is the number of projects reporting this outcome.

Outcome #1

1. Outcome Measures

Awareness created focusing on sustainable energy topics. Target is the number of individuals reporting this outcome.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The State of Wyoming is well known for being a critical source of the nation's supply of natural resources. Because fossil fuels are essentially an irreplaceable base for Wyoming's vibrant energy industry, the College of Agriculture and Natural Resources conducts research and direct extension programming efforts to help ensure prudent use of the state's precious resources. In addition to fossil fuel resources, Wyoming also possesses abundant renewable energy resources including wind, solar, hydroelectric, geothermal, and biomass. Both small-scale, such solar photovoltiacs or geothermal heat pumps, and utility-scale, primarily wind energy, are important issues. Development of renewable technologies such as specific systems that can be used in agriculture production and/or farmsteads and small-scale power generation where power can be sold such as wind energy are also important issues. Conservation and preservation of our natural resources, both land and water is an ongoing effort for both extension and research.

What has been done

The University of Wyoming College of Agriculture and Natural Resources research and extension efforts in sustainable energy focus on efficiency and conservation specifically in relation to farm and agriculture production. In addition, residential and public conservation education is targeted toward the general public and businesses. In fall 2009, UW Extension partnered with the School of Energy Resources at UW to fund an energy extension coordinator who provides leadership and coordination for extension energy programs in the college. Initial training for field extension educators was conducted. In addition to educational programs to raise awareness and knowledge, UW Extension has developed a Web site for information, publications, and a set of educational videos. To maximize outreach efforts, partnerships have been developed with the College of Engineering and Applied Science, School of Energy Resources, the Wyoming State

Energy Office, Wind Energy Research Center, USDA Rural Development, Natural Resource Conservation Service, and the Wyoming Business Council. UW Range specialists and area educators have partnered with the UW Reclamation and Restoration Center to develop and implement Reclamation 101 schools for agriculture land owners and agency personnel.

Results
In 2014, UW Extension initiated an issue team focusing on sustainable energy issues. 100 percent of participants in the 32 programs held reported gaining awareness of the topic and gaining knowledge. Early partnership efforts have resulted in increasing effectiveness of programs through multiple collaborators.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
121	Management of Range Resources
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation
401	Structures, Facilities, and General Purpose Farm Supplies
402	Engineering Systems and Equipment
608	Community Resource Planning and Development

Outcome #2

1. Outcome Measures

Partnerships will be developed with agencies and organizations to expand sustainable energy efforts. Target is the number of partnerships formed.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The State of Wyoming is well known for being a critical source of the nation's supply of natural

resources. Because fossil fuels are essentially an irreplaceable base for Wyoming's vibrant energy industry, the College of Agriculture and Natural Resources strives to conduct research and direct extension programming efforts to help ensure prudent use of the state's precious resources. In addition to fossil fuel resources, Wyoming also possesses abundant renewable energy resources including wind, solar, hydroelectric, geothermal, and biomass. Both small-scale, such solar photovoltiacs or geothermal heat pumps, and utility-scale, primarily wind energy, are important issues. Development of renewable technologies such as specific systems that can be used in agriculture production and/or farmsteads and small scale power generation where power can be sold such as wind energy are also important issues. As an energy rich state, conservation and preservation of our natural resources, both land and water is an ongoing effort for both extension and research.

What has been done
To maximize outreach efforts, partnerships have been developed with the College of Engineering and Applied Science, School of Energy Resources, the Wyoming State Energy Office, Wind Energy Resource Center, USDA Rural Development, Natural Resource Conservation Service, and the Wyoming Business Council. The UW Reclamation and Restoration Center, Energy Industry, local partners focusing on local food production are additional partners.

Results
Partnerships have increased resources, both financial and human capital to maximize outreach efforts. Integrated program efforts are in progress.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
121	Management of Range Resources
401	Structures, Facilities, and General Purpose Farm Supplies
402	Engineering Systems and Equipment
608	Community Resource Planning and Development

Outcome #3

1. Outcome Measures

New technologies or devices used in ag production systems and/or farmsteads. Target is the number of new technologies developed.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arsenic is considered as one of the most potent carcinogenic contaminants of drinking water. Over 137 million people in more than 70 countries are affected by arsenic poisoning through drinking water supplies. Arsenic enters water supplies from natural deposits of the earth?s crust and/or anthropogenic activities (e.g., agriculture production, mineral mining including uranium, coal burning power plants, solid waste disposal).

What has been done
A flow-through filtration system for field applications was designed, developed, and tested to remove arsenic from groundwater. Several groundwater samples were pumped through the flow-through reactor consisting of CuO nanoparticles.

Results
Results, using CuO particles with a flow-through reactor suggest that the technique is efficient and effective at arsenic removal under natural conditions and high arsenic concentrations. These results could help develop a simple on-step arsenic removal process for field applications.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
401	Structures, Facilities, and General Purpose Farm Supplies
402	Engineering Systems and Equipment

Outcome #4

1. Outcome Measures

Create awareness of research on ecosystem services affected by energy development and reclamation efforts. 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	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The state of Wyoming has implemented a plan by Executive Order from the Governor?s Office to carry out a Sage-Grouse Core Area Management Plan to protect the Greater Sage-Grouse which are currently being considered for placement on the Endangered Species List. A requirement of the Core Area Management Plan is to limit land disturbance to 15% of total land area.

What has been done
The Douglas Core Area Restoration Team has been assembled to plan and conduct appropriate restoration projects in the Douglas Core Area. The team consists of members with expertise in land and ecosystem restoration, oil and gas resource development, wildlife biology and management, range management as well as stakeholders.

Results
Major impacts of this project include: 1) developing expertise in Wyoming in regard to planning and implementation of large sage-grouse habitat restoration projects, and 2) generation of an appropriate method to plant greenhouse grown sagebrush seedlings into established vegetation communities with a high success rate.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
121	Management of Range Resources
131	Alternative Uses of Land
402	Engineering Systems and Equipment
608	Community Resource Planning and Development

Outcome #5

1. Outcome Measures

Create awareness of research on the potential to produce bioenergy. Target is the number of projects reporting this outcome.

Not Reporting on this Outcome Measure

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
- Competing Programmatic Challenges

Brief Explanation

Funding for this new program is essential in development and implementation of both research and extension efforts. Weather extremes are a factor in agriculture production outcomes regarding crops for alternative fuels.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

End of session written evaluations were utilized to collect outcome data. In addition personal follow-up with the local educator or UW Energy Extension Coordinator was conducted. 100% of program participants indicated they increased awareness and knowledge as a result of educational efforts. Educators and professional agency personnel who participated in training on renewable energy and reclamation issues reported increased knowledge, skills and increased confidence in disseminating information on these topics.

Program participants reported that in some instances, alternative energy options are not cost effective therefore contributed to decision making which is a positive outcome.

Key Items of Evaluation

Increased awareness and knowledge on sustainable energy issues

Program participants reported that in some instances, alternative energy options are not cost effective therefore contributed to decision making which is a positive outcome.