

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

**Program # 8**

**1. Name of the Planned Program**

Sustainable Energy

**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%	
	<b>Total</b>	100%		100%	

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

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Actual	2.0	0.0	3.0	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
29563	0	372252	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
168709	0	372252	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**

Both UW AES and CES are in a unique position to help citizens make sound science-based decisions on the use of natural resources to develop new sources of renewable energy.

Media was 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 were utilized to 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, 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 continue to be held in response to local, state, and national energy sustainability. Demonstrations of technology and skills training were included in education curriculum to enhance educational effectiveness. Field tours were 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 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 CES 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 CES 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 conducts 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 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 is the media, general public, and interest groups not directly involved in production agriculture (i.e., environmental groups). Energy conservation methods are targeted at both agriculture and general public audiences.

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

### **1. Standard output measures**

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	{NO DATA}	{NO DATA}	{NO DATA}	{NO DATA}
<b>Actual</b>	2810	20000	300	1000

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

**Patent Applications Submitted**

Year: 2010  
 Plan:  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2010	Extension	Research	Total
<b>Actual</b>	0	9	9

**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	Target	Actual
2010	{No Data Entered}	2809

**Output #2**

**Output Measure**

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

Year	Target	Actual
2010	{No Data Entered}	15

**Output #3**

**Output Measure**

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

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2010	{No Data Entered}	5

**Output #4**

**Output Measure**

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

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2010	{No Data Entered}	61

**Output #5**

**Output Measure**

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

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2010	{No Data Entered}	7

**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	Research: Create awareness of ecosystem services affected by energy development and reclamation efforts. Target is number of projects reporting this outcome.
5	Research: Create awareness on the potential to produce bioenergy. Target is 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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2010	{No Data Entered}	2809

### **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 photovoltaics 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 CES 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; a Western SARE grant (\$110,000) was obtained by Montana State University in collaboration with the UW CES Energy Extension Coordinator to implement a Western Region training on energy issues (release of funds has delayed this until Fall 2011). In addition to educational programs to raise awareness and knowledge, CES is in development of 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.

### Results

In 2010, CES initiated an issue team focusing on sustainable energy issues. 100 percent of participants in the 61 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
401	Structures, Facilities, and General Purpose Farm Supplies
402	Engineering Systems and Equipment

### 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	Quantitative Target	Actual
2010	{No Data Entered}	7

#### 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 photovoltaics 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.

#### **Results**

Partnerships have increased resources, both financial and human capital to maximize outreach efforts. Partnerships have leveraged funding to support an innovative energy internal grant program for CES. Integrated program efforts are in progress.

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

<b>KA Code</b>	<b>Knowledge Area</b>
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.

Not Reporting on this Outcome Measure

### **Outcome #4**

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

Research: Create awareness of ecosystem services affected by energy development and reclamation efforts. Target is number of projects reporting this outcome.

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

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2010	{No Data Entered}	3

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

**Issue (Who cares and Why)**

Over 140,000 acres of land in Wyoming have been impacted by drilling for surface mining for coal. State and federal laws require that lands disturbed by surface coal mining be reclaimed. Land managers, livestock producers, wildlife managers, and ecologists require information regarding the long term recovery and stability of these reclaimed ecosystems to manage them properly.

**What has been done**

The Soil Ecology Laboratory at the University of Wyoming has been conducting long term studies of ecosystem recovery on reclaimed surface coal mined lands. Results of these studies thus far indicate that reclaimed semiarid rangeland ecosystems are resilient and are recovering from disturbance associated with surface coal mining.

**Results**

These studies validate the effectiveness of regulatory performance standards in the Surface Mine Reclamation and Control Act of 1977. Data collected support the assumption that minelands can be reclaimed effectively and returned to long term sustainability and support previous land uses in the long term. This work also indicates that through reclamation functioning ecosystems can be reconstructed and their ecosystem services can be reestablished.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
121	Management of Range Resources
131	Alternative Uses of Land

**Outcome #5**

**1. Outcome Measures**

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

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2010	{No Data Entered}	2

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

**Issue (Who cares and Why)**

Farmers and ranchers in Wyoming operate under harsh climatological and economic constraints. New agricultural technologies that relieve these constraints and integrate with existing production activities are vital to healthy economic development in rural parts of the state. Aquaculture of oil-producing microalgae has been identified as an appropriate method of biodiesel production in arid regions of the Western U.S.

**What has been done**

The project includes formulating and testing genetic engineering strategies for improving the growth of algae in the presence of oxygen radicals and studying the use of industrial carbon dioxide emissions as a growth enhancer for algae. The algal biomass produced by this study will be used for experimental fertilization of forage grass plots and bare soils.

**Results**

Practical application of our findings by the private sector in Wyoming is estimated to occur within 10 years. In the meantime, the project employs and trains two or more graduate and undergraduate students per year, on average. These students are part of a growing technical workforce needed by the nascent algal biofuel industry and other sectors of the agricultural economy.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation
401	Structures, Facilities, and General Purpose Farm Supplies
402	Engineering Systems and Equipment
608	Community Resource Planning and Development

## **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. As a new planned program, the first year heavily involved training and awareness for extension educators.

## **V(I). Planned Program (Evaluation Studies and Data Collection)**

### **1. Evaluation Studies Planned**

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)

### **Evaluation Results**

### **Key Items of Evaluation**