

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

#### **Program # 3**

##### 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	0%		5%	
123	Management and Sustainability of Forest Resources	20%		5%	
131	Alternative Uses of Land	10%		5%	
133	Pollution Prevention and Mitigation	10%		2%	
141	Air Resource Protection and Management	5%		3%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		15%	
204	Plant Product Quality and Utility (Preharvest)	0%		15%	
205	Plant Management Systems	0%		5%	
206	Basic Plant Biology	0%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		5%	
402	Engineering Systems and Equipment	25%		5%	
403	Waste Disposal, Recycling, and Reuse	15%		10%	
511	New and Improved Non-Food Products and Processes	0%		5%	
601	Economics of Agricultural Production and Farm Management	0%		5%	
603	Market Economics	10%		2%	
605	Natural Resource and Environmental Economics	5%		3%	
	<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>	80.0	0.0	45.0	0.0
<b>Actual Paid</b>	48.0	0.0	48.0	0.0
<b>Actual Volunteer</b>	0.0	0.0	0.0	0.0

**2. Institution Name:** Washington State University

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
120596	0	161509	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
120596	0	161509	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
11557607	0	3277018	0

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

**1. Brief description of the Activity**

Research will be conducted on energy-related yield and production and processing efficiency of using agricultural and woody biomass, algae and oil seeds. Economic analyses will be conducted on these various energy systems to assess thresholds for local and regional application of these technologies. Extension programs will be developed to teach and demonstrate alternative energy systems such as anaerobic digestion, biomass production, oil seed production, increasing energy efficiency, and utilization of wind and solar energy systems.

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

The target audiences will include farmers, business owners, homeowners, industry technology providers, project developers, and public agencies and utilities.

**3. How was eXtension used?**

eXtension was not used in this program

**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>	4214	6619	63	0

**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>	0	49	49

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

**Output Target**

**Output #1**

**Output Measure**

- Number of workshops, demonstrations, and symposia conducted related to alternative energy and energy efficiency.

Year	Actual
2014	17

**Output #2**

**Output Measure**

- Number of peer reviewed (official) WSU Extension publications related to sustainable energy that are published annually.  
 Not reporting on this Output for this Annual Report

**Output #3**

**Output Measure**

- Number of graduate students with a significant professional orientation in the area of Sustainable Energy.

<b>Year</b>	<b>Actual</b>
2014	54

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

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

O. No.	OUTCOME NAME
1	Percentage of evaluated participants who demonstrated increased knowledge and skills relative to biofuels, energy efficiency, and alternative energy sources.
2	The number of farmers that applied information provided by this program to produce biofuel crops.
3	The number of households and enterprises reporting reduced energy consumption as a result of WSU programs.
4	The number of forest and woodland owners who applied information from this program in the production of wood for biofuels.
5	The acres of forestland and cropland impacted by our programs to advance the production of biofuel feedstocks.

## **Outcome #1**

### **1. Outcome Measures**

Percentage of evaluated participants who demonstrated increased knowledge and skills relative to biofuels, energy efficiency, and alternative energy sources.

### **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	95

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

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

Regional systems for renewable, biomass-based, liquid transportation fuels (i.e. gasoline, diesel, and jet fuel) are needed to support energy independence, reduce net carbon emissions, stabilize fuel prices for consumers, provide new economic opportunities for landowners, and bring jobs and economic development to rural communities. Renewable bio-based chemicals are a stepping stone to biofuels and can provide similar benefits to communities.

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

To raise awareness of the Advanced Hardwood Biofuels (AHB) project, increase bioenergy literacy, and prepare regional stakeholders for a developing biofuel industry, numerous field tours were held at demonstration sites, workshops, symposia, and exhibits throughout the four-state region of Washington, Oregon, Idaho, and California. In addition, presentations were made at both national and international meetings, along with a website; video segments; newsletters; and social media engagements.

#### **Results**

Based on past event evaluations, an average of 96% of surveyed participants reported a better understanding of hardwood biofuels. In addition, 98% of survey participants reported that they were moderately, or highly likely, to communicate to others what they learned. Similarly, 94% of symposia participants reported being moderately, or highly likely, to share with others knowledge from the event.

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

<b>KA Code</b>	<b>Knowledge Area</b>
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
603	Market Economics
605	Natural Resource and Environmental Economics

## **Outcome #2**

### **1. Outcome Measures**

The number of farmers that applied information provided by this program to produce biofuel crops.

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

- 1862 Extension
- 1862 Research

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

Change in Action Outcome Measure

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

<b>Year</b>	<b>Actual</b>
2014	0

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

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

Regional systems for renewable, biomass-based, liquid transportation fuels are needed to support energy independence, reduce net carbon emissions, stabilize fuel prices for consumers, provide new economic opportunities for landowners, and create jobs and economic development to rural communities. Hybrid poplar is one species that may suit this need. In order for this system to be successful, stakeholders need to be well informed about the project, understand the opportunities and constraints, and receive technical assistance based on up-to-date research results.

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

To raise awareness of the project, numerous field tours at plantation demonstration sites, workshops, symposia, and exhibits throughout the four-state region of Washington, Oregon,

Idaho, and California. In addition, presentations were made at national, regional, state and local meetings. A Hardwood Biofuels Webinar Series was developed to share information to local, regional, and national audiences

### **Results**

In post-event evaluations, an average of 95% of surveyed field tour participants reported a better understanding of hardwood biofuels, but no farms have applied the information at this stage.

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management
205	Plant Management Systems
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
601	Economics of Agricultural Production and Farm Management
603	Market Economics
605	Natural Resource and Environmental Economics

### **Outcome #3**

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

The number of households and enterprises reporting reduced energy consumption as a result of WSU programs.

Not Reporting on this Outcome Measure

### **Outcome #4**

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

The number of forest and woodland owners who applied information from this program in the production of wood for biofuels.

#### **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	80

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

**Issue (Who cares and Why)**

Northwest Advanced Renewables Alliance (NARA) is a five-year, \$40 million project supported by USDA to explore woody biomass as a source of aviation biofuels. The focus is overcoming key obstacles that prevent wood-based jet fuel and petrochemical substitutes from being economically viable. NARA takes a holistic approach to building a supply chain for aviation biofuel with the goal of increasing efficiency in everything from forestry operations to conversion processes. The project includes a broad alliance of private industry and educational institutions from throughout the Northwest.

**What has been done**

NARA units, research, extension and industry members worked as partners and facilitators with the ultimate goal of empowering the stakeholders to plan and implement the changes needed to build, develop, and sustain a bio-refinery infrastructure. The goal of the outreach team is to promote stakeholder bioenergy literacy and build regional supply chain coalitions for development of a framework of biofuel and co-products production from woody biomass. End outcomes of this goal are sustainable production of bio-jet fuel and co-products and rural economic development

**Results**

NARA Outreach and Education Team engaged in western Montana, Northern Idaho panhandle, and Northeast Washington to create a broad forest stakeholder group investigating aviation biofuels development in the region. Washington Clean Energy stakeholders have now formed a Forest Biomass Coordination Group (led by Peter Moulton of the WA Department of Commerce) and are coordinating with a similar group in Oregon as a result of NARA Outreach Team engagement

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse

511	New and Improved Non-Food Products and Processes
605	Natural Resource and Environmental Economics

### **Outcome #5**

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

The acres of forestland and cropland impacted by our programs to advance the production of biofuel feedstocks.

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
- Populations changes (immigration, new cultural groupings, etc.)

##### **Brief Explanation**

**The steady decrease in fuel prices during 2014 and the high cost of manufacturing of hardwood biofuels has currently made hardwood biofuels not economical to produce. At the current rate, farmers would have to give their poplar production away for free. Plans for a partial capacity biofuels refinery in Northeast Oregon has been put on hold until biofuels can compete on the market and additional investors can be found. Competing priorities, reduced staffing, reduced budgets and completion of grant projects have reduced the time that Extension personnel can dedicate to energy audits and improving the energy efficiency of homes and commercial buildings.**

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

##### **Evaluation Results**

**Overall, program participants have a greater awareness, increased knowledge, and understanding of biofuel crop production but realize that it is not economical at this time.**

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

**Post-event evaluations of Extension personnel, farmers, agency personnel and private business were used to determine knowledge gain. End of meeting forms are used for workshops, conferences and field day events. Major, regional field days are evaluated through personal interview or follow-up online surveys.**