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

**Program # 2**

**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 |
|---|---|---|---|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships | 10% | | 10% | |
| 112 | Watershed Protection and Management | 5% | | 5% | |
| 123 | Management and Sustainability of Forest Resources | 10% | | 10% | |
| 132 | Weather and Climate | 10% | | 10% | |
| 135 | Aquatic and Terrestrial Wildlife | 10% | | 10% | |
| 201 | Plant Genome, Genetics, and Genetic Mechanisms | 10% | | 10% | |
| 203 | Plant Biological Efficiency and Abiotic Stresses Affecting Plants | 10% | | 10% | |
| 212 | Pathogens and Nematodes Affecting Plants | 5% | | 5% | |
| 213 | Weeds Affecting Plants | 5% | | 5% | |
| 306 | Environmental Stress in Animals | 5% | | 5% | |
| 605 | Natural Resource and Environmental Economics | 15% | | 15% | |
| 610 | Domestic Policy Analysis | 5% | | 5% | |
| | **Total** | 100% | | 100% | |

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

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

| Year: 2012 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 5.6 | 0.0 | 14.0 | 0.0 |
| Actual Paid Professional | 1.6 | 0.0 | 6.9 | 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** |
| 723872 | 0 | 269130 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 1372599 | 0 | 1669583 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 218219 | 0 | 805648 | 0 |

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

### 1. Brief description of the Activity

- Conduct meetings, conferences, workshops
- Publish research and extension publications
- Establish web sites
- Organize field days
- Consultations
- Work with mass media

### 2. Brief description of the target audience

- Producers
- Consumers
- Youth
- Elected officials and policy makers
- Professionals involved in weather and climate

### 3. How was eXtension used?

eXtension was not used in this program

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

### 1. Standard output measures

| 2012 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Actual** | 1236 | 1250000 | 602 | 0 |

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

**Patent Applications Submitted**

| | |
|---|---|
| Year: | 2012 |
| Actual: | 0 |

**Patents listed**

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

**Number of Peer Reviewed Publications**

| 2012 | Extension | Research | Total |
|---|---|---|---|
| **Actual** | 0 | 24 | 24 |

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

**Output Target**

**Output #1**

**Output Measure**

- Number of Extension publications, written, new or revised

| Year | Actual |
|---|---|
| 2012 | 17 |

**Output #2**

**Output Measure**

- Number of research publications

| Year | Actual |
|---|---|
| 2012 | 24 |

**Output #3**

**Output Measure**

- Number of research projects

| Year | Actual |
|---|---|
| 2012 | 15 |

**Output #4**

**Output Measure**

- Number of consultations

| Year | Actual |
|---|---|
| 2012 | 66 |

**Output #5**

**Output Measure**

- Number of educational workshops or seminars conducted

| Year | Actual |
|---|---|
| 2012 | 33 |

**Output #6**

**Output Measure**

- Number of volunteers
  Not reporting on this Output for this Annual Report

## V(G). State Defined Outcomes

### V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Number of observers monitoring weather and climate |
| 2 | Number of reseach-based studies, publications, and reports for policy organization members and legislators on climate change |
| 3 | Number of participants who increase their knowledge about climate change |
| 4 | Number of participants who reduce pesticide, nutrient and water inputs while maintaining high quality turf |
| 5 | Number of participants who increase knowledge of pesticides, nutrients and water inputs for maintaining high quality turf |
| 6 | Number of participants who increase knowledge of management practices that maximize environmental stewardship |
| 7 | Number of participants who adopt management practices that maximize environmental stewardhip |
| 8 | Number of participants who increase their knowledge of opportunities and challenges for agriculture under carbon dioxide emissions policies to address climate change |
| 9 | Number of new tools, technologies, research programs or knowledge that can improve decision making regarding climate change. |

**Outcome #1**

1. **Outcome Measures**

Number of observers monitoring weather and climate

Not Reporting on this Outcome Measure

**Outcome #2**

1. **Outcome Measures**

Number of reseach-based studies, publications, and reports for policy organization members and legislators on climate change

2. **Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2012 | 0 |

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

**Issue (Who cares and Why)**
Corn producers can benefit from incorporating climate information into their strategic and tactical farm management planning. The Useful to Usable project seeks to enhance the usability of climate information for agricultural producers and advisors by developing decision support products that can assist with crop production tasks, infrastructure and equipment investments, and the use of conservation and climate adaptation practices. This is the 2nd year of 5 year project.

**What has been done**
A cyber-based framework for managing crop and climate model input and output data, model validation activities was created. A study was initiated to identify 15 agroclimatic trends for 15 locations from 1900-2011 plus a time series examining the relationship between field work days, weather, planting, etc. Baseline needs assessment surveys to understand climate change beliefs was conducted among producers and farm advisors to understand what it takes to incorporate climate into planning decisions.

**Results**

Surveys show that farmers and their advisors think similarly regarding climate issues, how climate risks are perceived, willingness to use climate info and who they trust for information. Model validation shows that a trend toward greater precipitation in the past 50-60 years resulted in more corn being grown. Increases in precipitation have resulted in higher crop yields beyond the effects of improved technology. While there are areas of dryness, long-term trends suggest a net reduction of drought-related risk for growers.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 132 | Weather and Climate |
| 203 | Plant Biological Efficiency and Abiotic Stresses Affecting Plants |
| 610 | Domestic Policy Analysis |

**Outcome #3**

**1. Outcome Measures**

Number of participants who increase their knowledge about climate change

Not Reporting on this Outcome Measure

**Outcome #4**

**1. Outcome Measures**

Number of participants who reduce pesticide, nutrient and water inputs while maintaining high quality turf

Not Reporting on this Outcome Measure

**Outcome #5**

**1. Outcome Measures**

Number of participants who increase knowledge of pesticides, nutrients and water inputs for maintaining high quality turf

Not Reporting on this Outcome Measure

**Outcome #6**

**1. Outcome Measures**

Number of participants who increase knowledge of management practices that maximize environmental stewardship

Not Reporting on this Outcome Measure

**Outcome #7**

1. **Outcome Measures**

Number of participants who adopt management practices that maximize environmental stewardhip

Not Reporting on this Outcome Measure

**Outcome #8**

1. **Outcome Measures**

Number of participants who increase their knowledge of opportunities and challenges for agriculture under carbon dioxide emissions policies to address climate change

Not Reporting on this Outcome Measure

**Outcome #9**

1. **Outcome Measures**

Number of new tools, technologies, research programs or knowledge that can improve decision making regarding climate change.

2. **Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2012 | 0 |

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

**Issue (Who cares and Why)**
Climate change poses threats to natural ecosystems and to human welfare. Responses of natural ecosystems are consequential for a variety of reasons. For instance, understanding whether climate change will lead to additional carbon storage in ecosystems is critical to estimating the expected rate of change. If warming leads to carbon release from ecosystems, then climate

change will accelerate. Any changes in the abundance of plant species or competition among plant species will have importance for the many species, including humans, that depend on those plants for food and other uses.

**What has been done**
The Boston-Area Climate Experiment (BACE), directed by Purdue, subjects grassland plots to different climatic regimes: four temperate treatments in each of three precipitation regimes. Seedlings of four tree species have been planted in each plot. The plots are warmed with the use of heater elements suspended above the plots, and precipitation is manipulated through the use of rainout shelters and sprinklers. The researchers describe it as a "time machine" that moves different plots of land into different futures based on precipitation and heat.

**Results**
Some early findings show that red maple leaves accumulate about twice as much tannin when exposed to hot, drought-like conditions. Tannins defend leaves from herbivores and pathogens and this abundance of tannins was shown to interfere with the function of common enzymes in soil. This can slow the decomposition process and impact soil quality, plant growth and nutrient uptake.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 112 | Watershed Protection and Management |
| 123 | Management and Sustainability of Forest Resources |
| 132 | Weather and Climate |
| 203 | Plant Biological Efficiency and Abiotic Stresses Affecting Plants |

## 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**

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

**Evaluation Results**

- Outcome 2 - baseline needs assessment, time series - agroclimatic trends 1900-2011
- Outcome 9 - treatment plots - grasslands subjected to 4 temperate treatments in each of 3 precipitation regimes

**Key Items of Evaluation**

- Outcome 2 - increased in precipitation results higher crop yields beyond effect of improved technology, and net reduction of drought-related risk for growers
- Outcome 9 - red maple leaves accumulate about twice as much tannin when exposed to hot, drought-like conditions