

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

**Program # 5**

**1. Name of the Planned Program**

Climate Change

**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%		20%	
104	Protect Soil from Harmful Effects of Natural Elements	50%		20%	
123	Management and Sustainability of Forest Resources	0%		20%	
132	Weather and Climate	25%		20%	
605	Natural Resource and Environmental Economics	25%		20%	
	<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	0.0	0.0	36.1	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
0	0	159394	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	1603132	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	3153198	0

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

## 1. Brief description of the Activity

While dramatic weather events in 2010 heightened interest in climate change, those same weather events were interpreted by some to discount the reality of climate change. Meanwhile, the stresses created by tumultuous weather patterns also distracted focus on the policy decisions needed to address this issue. MAES research and Extension outreach explained to agricultural audiences that local rapid swings of weather events are a mark of climate change. There is a lot that is not known about what are potential strategies to address the effects of climate change. Results of research is suggesting what might work, and, equally important, what doesn't work.

A sampling of MAES research progress on this issue In 2010:

- A study of the effects of climate warming on Minnesota trees showed that some boreal species are more sensitive to climate change.
- A conceptual framework was developed that shows how multiple environmental change drivers will interact with climate to influence Midwestern forests.
- An analysis of the limits to carbon sequestration potential alerted government agencies to the danger of attempting to build state greenhouse emissions reduction strategies on the back of forest sequestration.

2010, the Extension interdisciplinary climate change team engaged in two primary activities, both meant as a precursor to the eventual development of a logic model for Extension programming around climate change.

The team surveyed Extension staff across the organization, and especially within the Extension Food, Agriculture and Natural Resource Sciences program area, to learn about Extension staff's beliefs and knowledge regarding climate change. The survey is informing the team's understanding and decisions about: 1) who within Extension is able and willing to deliver education related to climate change; 2) which resources Extension staff trusts most when it comes to information about climate change; 3) how staff belief climate change is affecting and will affect Minnesota; and, 4) what internal staff education may be needed or desired and how to deliver it. The team is currently reviewing results of the survey, which is described in the "Evaluation Studies" section of this report. Results will be used in the development of future program and grant proposals.

The team delivered presentations at selected conferences to deliver some educational content and garner more partnerships for the work of climate change program development.

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garner more partnerships for the work of climate change program development.

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

Currently, the target audience for this program development stage is: 1) internal Extension program teams who may be able to integrate climate change education into workshops, consultation and materials development; and 2) potential partners in the state of Minnesota who can help Extension create a cohesive statewide effort..

Target audiences for MAES research also includes researchers in the fields of forest ecology, tree physiology and forestry professionals in industry; state and county agencies, climate, carbon, and water cycle scientists, farmers, landowners and citizens.

**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>	420	300	0	0

**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	24	24

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

**Output Target**

**Output #1**

**Output Measure**

- Research will give undergraduates and graduate students the opportunity to develop knowledge and experience in this issue.

<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	Weather monitoring will provide researchers, agricultural producers and policy makers with necessary information about climate change.
2	Research on carbon sequestration will provide policy makers with needed information for decision-making

## **Outcome #1**

### **1. Outcome Measures**

Weather monitoring will provide researchers, agricultural producers and policy makers with necessary information about climate change.

### **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}	0

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

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

The past four years of heavy rains and flash flooding have been difficult for Minnesota agriculture. To better respond to abrupt and dramatic weather events, and understand weather trends, careful and scientific climate monitoring is critical.

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

Monitoring networks using new measurement technologies that precisely characterize the spacial and temporal variability in climate, carbon, nitrogen, and water cycling processes have been established in the Minnesotal Agricultural Experiment Station Research and Outreach Center system. Also during 2010, researchers established carbon isotope measurements at a Minnsota peatland site in collaboration with the U.S. Forest Service.

#### **Results**

Over the past year the research has made significant contributions to understanding the greenhouse gas budget of agricultural ecosystems typical of the Upper Midwest. Weather monitoring data, which has provided farmers useful information over the years on early planting dates and other decisions, is now providing equally important information on climate change.

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

<b>KA Code</b>	<b>Knowledge Area</b>
132	Weather and Climate

## **Outcome #2**

### **1. Outcome Measures**

Research on carbon sequestration will provide policy makers with needed information for decision-making

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

- 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}	0

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

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

Plants take up carbon dioxide from the atmosphere to build leaf, stem, and root biomass, some of which is then transferred to soil, where it can reside for decades before eventually being broken down by soil organisms and returned to the atmosphere. Some policymakers and scientists view this process, known as carbon sequestration, as a possible way to combat global warming.

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

Researchers found, however, that the potential to offset substantial emissions is constrained by a lack of land. For example, if 10 percent of current cropland in the Upper Midwest were converted into a combination of new forests and grasslands, less than 5 percent of total carbon dioxide emissions for the region would be offset.

#### **Results**

Rather than convert land, researchers concluded implementing land use policies that would protect current carbon stores, such as peatlands and wetlands, would be more beneficial. The information was provided to policy makers. Minnesota has taken substantial steps to preserve existing forest, with eventually half a million forested acres under protection.

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

<b>KA Code</b>	<b>Knowledge Area</b>
605	Natural Resource and Environmental Economics

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

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

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

### **Brief Explanation**

While dramatic weather events in 2010 heightened interest in climate change, those same weather events were interpreted by some to discount the reality of climate change. Meanwhile, the stresses created by tumultuous weather patterns also distracted focus on the policy decisions needed to address this issue. Minnesota legislators have set a goal of a 15 percent decline in CO2 emissions; however, the annual greenhouse gas update showed that between 2005 and 2008 CO2 emissions only declined by 1.2 percent.

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

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

- Other (Pre-program assessment of Extension staff belief and knowledge)

## **Evaluation Results**

Over 200 Extension staff were surveyed in 2010 to assess knowledge and beliefs about climate change. Most staff surveyed were from the Extension Center for Food, Agricultural and Natural Resource Sciences. Others represented administrative units, the Center for Youth Development, the Center for Family Development and the Center for Community Vitality. The purpose of the survey was to identify opportunities and barriers in developing interdisciplinary approaches to climate change programming. The survey examined: 1) beliefs about climate change in Minnesota, 2) preferred information sources and needs related to climate change, 3) current personal confidence related to knowledge about climate change; 4) concerns of staff related to the impact of climate change on Minnesota, 4) the degree to which climate change is an issue of concern -- for staff and their audiences; and 5) disciplines and people within Extension most likely to help with climate change in Extension who are in the coming years.

The survey revealed that:

1. Staff of Extension hold diverse views regarding whether climate change is happening, and people tend to be very sure of their current beliefs.
2. There is a need for reliable information that is trusted, because people view much of the information available in the public to be skewed by opinion.
3. Views of whether change is happening should be treated separate from perceptions of human causation because there are commonly held concerns about changes that will occur due to climate change in coming years. These effects of climate change in

communities and for individuals can be addressed in Extension regardless of beliefs about causation.

4. There are opportunities to focus education on fundamental concepts of climate change within Extension first, because staff feel a need for better information.

5. Several most trusted resources of information were identified, which can guide Extension in identifying partners and seeking development of collaborative programs and initiatives.

6. Finally, most Extension staff do not currently feel comfortable delivering educational presentation about climate change. There is a need for materials that support staff in integrating climate change into presentations.

### **Key Items of Evaluation**

An internal assessment of Extension staff's attitudes, belief and comfort level regarding climate change was considered to be a prerequisite to program development. A survey of Extension staff identified factors that need to be addressed in order to integrate climate change into Extension education, and revealed that internal education should be a first course of action.