

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

**Program # 6**

**1. Name of the Planned Program**

Environmental and Water Quality Impacts

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%	26%	
112	Watershed Protection and Management	80%	80%	15%	
133	Pollution Prevention and Mitigation	0%	0%	15%	
135	Aquatic and Terrestrial Wildlife	0%	0%	10%	
136	Conservation of Biological Diversity	0%	0%	3%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	0%	3%	
212	Pathogens and Nematodes Affecting Plants	0%	0%	7%	
213	Weeds Affecting Plants	0%	0%	3%	
215	Biological Control of Pests Affecting Plants	0%	0%	3%	
402	Engineering Systems and Equipment	0%	0%	5%	
404	Instrumentation and Control Systems	0%	0%	6%	
721	Insects and Other Pests Affecting Humans	0%	0%	4%	
	<b>Total</b>	100%	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	0.0	0.0	25.0	0.0
Actual Paid Professional	4.0	1.0	34.9	0.0
Actual Volunteer	2.0	0.2	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
98271	28018	836846	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
346915	28018	3504353	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
50000	0	860608	0

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

### 1. Brief description of the Activity

We are developing economic and policy data by accessing existing sources, generating data from computer models, and surveying market participants. This data is analyzed using appropriate statistical and econometric methods. Watershed scale model assessments are conducted utilizing field-level estimates of alternative management practices (AMPs). Changes in water quality in impaired watersheds resulting from the evaluation of AMPs are measured. The cost of meeting different water quality standards at different points within a watershed and the potential impact of different environmental policies on Tennessee's agriculture are evaluated. A model used to project land use change estimates the probability of land development of individual parcels as a function of parcel-level attributes.

Soil research is fundamental to our environmental program. The erosion, sediment transport, and contaminant transport capabilities of the RUSLE2 soil erosion model continue to be refined as the model's use increases nationally and around the world. Soil samples are thoroughly characterized in terms of elemental composition, particle size, mineralogy, and other soil chemical and flow characteristics using standard techniques. New methods for decreasing the expense of measuring soil properties by agricultural producers and fellow researchers are developed.

As new waste treatment approaches are introduced, we provide research-based evaluation of appropriate technologies for Tennessee. Background information on the water quality is collected in various watershed areas, including one where baseline environmental data is being used to evaluate the impact of a dairy production unit on the area.

### 2. Brief description of the target audience

The vast majority of this program is currently research, so the target audience is weighted toward basic/applied research clients. Clients targeted by Extension efforts included landowners, construction workers, engineers, and regulators.

### 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
<b>Actual</b>	24178	315811	4421	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
<b>Actual</b>	19	45	0

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

**Output Target**

**Output #1**

**Output Measure**

- Field validation/demonstration of remotely-controlled acoustic monitoring system for monitoring grassland birds on no-entry zones in military installations (Buehler).  
 Not reporting on this Output for this Annual Report

**Output #2**

**Output Measure**

- Validate our vehicle terrain model for the U.S. Army. (Ayers)

Year	Actual
2012	1

**Output #3**

**Output Measure**

- The modified snorkelcam snorkel mounted underwater video-mapping system has been applied to salamander mapping within the US Forest Service. (Ayers)

Year	Actual

2012 0

**Output #4**

**Output Measure**

- Based on our C sequestration research program, a project has been funded to assist in developing the first large scale thermochemical process to generate liquid fuels and biochars for soil amendment from lignocellulosic biomass in Tennessee. (Labbe)

<b>Year</b>	<b>Actual</b>
2012	0

**Output #5**

**Output Measure**

- There has been a reduction in both the number of hours below freezing, and chilling units, at all locations in Tennessee over the past 30 years. Varieties of crops such as peach trees will have to be changed to adapt to these warmer conditions. In addition, threats from pests are likely to increase due to warmer winters. (Logan)

<b>Year</b>	<b>Actual</b>
2012	0

**Output #6**

**Output Measure**

- Our research concerning the retention of antimony by common soil minerals indicates that this toxin is strongly retained, particularly by iron minerals and in acidic environments. These findings suggest that antimony in acidic soils may have low bioaccessibility. The findings also indicate that antimony-contaminated acidic soils may be stabilized through the addition of ferric iron. (Essington)

<b>Year</b>	<b>Actual</b>
2012	0

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

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

O. No.	OUTCOME NAME
1	Percent of Tennessee major row-crop acreage under some form of no-till or conservation tillage (Tennessee Agriculture 2010 report).
2	Greenhouse and nursery crop use of bioactive natural products in place of conventional pesticide on tomato, percent of operators adopting (Gwinn).
3	Sustainability in Tennessee: Improving the Environment, Economy and Society
4	Native Grasslands as Wintering Habitat (Buehler)
5	Using GIS to Improve GPS Machine Control (Freeland)

### **Outcome #1**

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

Percent of Tennessee major row-crop acreage under some form of no-till or conservation tillage (Tennessee Agriculture 2010 report).

Not Reporting on this Outcome Measure

### **Outcome #2**

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

Greenhouse and nursery crop use of bioactive natural products in place of conventional pesticide on tomato, percent of operators adopting (Gwinn).

Not Reporting on this Outcome Measure

### **Outcome #3**

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

Sustainability in Tennessee: Improving the Environment, Economy and Society

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

- 1862 Extension
- 1890 Extension

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

Change in Condition Outcome Measure

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

<b>Year</b>	<b>Actual</b>
2012	0

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

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

Increasing sustainability will enable the world to meet present needs while continuously improving future generation's ability to meet their own needs. This can be done not only by lessening our environmental impacts, improving human health, and improving the economic and social well-being of Tennessee's communities, but also by increasing productivity to meet current as well as future food, fuel, and fiber demands. Water quality and quantity are issues that demand attention as excess nutrients and sediment are polluting surface and groundwater resources and aquifers are being depleted.

**What has been done**

An integrated, multi-disciplinary research, education, and outreach program has been established to develop and disseminate information pertaining to water quality and quantity issues in Tennessee. Presentations at one hundred and thirty-two field days, county and/or multi-county meetings, on-farm demonstrations, 19 newly-developed publications, developed the UT Extension Solar Energy website, mass media articles, and 8,790 personal contacts were used to promote the adoption of profitable and environmentally-conscious practices.

**Results**

\*Landowners reduced the amount of sediment and other nonpoint source pollutants entering Tennessee’s surface water resources by stabilizing streambanks, establishing buffer strips and/or fencing cattle access on 47 miles of rivers and streams.

\*Tennessee landowners planted native grasses on 2,400 acres to provide enhanced wildlife habitat, protect against soil erosion and stabilize the edges of fields.

\*150 landowners attending field days, workshops and county meetings increased their knowledge and skills on ecologically friendly landscaping techniques.

\*956 construction workers, contractors, engineers and regulators attending erosion prevention and sediment control workshops increased their knowledge on construction site stormwater best management practices that promote improved water quality in Tennessee’s urban and suburban areas.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management

**Outcome #4**

**1. Outcome Measures**

Native Grasslands as Wintering Habitat (Buehler)

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

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

**Issue (Who cares and Why)**

Birds are considered good indicators of environmental health, and are useful for evaluation of contemporary environmental issues, such as climate change. Effective monitoring tools are needed to be able to use birds as environmental indicators.

**What has been done**

We have developed a monitoring protocol for tracking grassland bird populations through our research in the Central Hardwoods Bird Conservation Region covering seven states.

**Results**

Through analysis of data collected based on our protocol, we have shown the linkage between USDA Farm Bill conservation practices and grassland bird populations.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
404	Instrumentation and Control Systems

**Outcome #5**

**1. Outcome Measures**

Using GIS to Improve GPS Machine Control (Freeland)

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

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

**Issue (Who cares and Why)**

Critical to obtaining the highest degree of accuracy and precision for reliable machine control are the initial acquiring of a solution (i.e., obtaining an RTK "fix" solution), the continuously maintaining of this fix, and if it is lost, rapidly reestablishing the fix.

### **What has been done**

A Geographic Information System (GIS) solution for mapping a model of sky-blockages surrounding agricultural fields across entire regions was developed. It employs spatial landform feature layers, such as terrain elevations (levies, ridges, side slopes), forecast satellite availability from Mission Planning software (MPS), and terrain coverage maps.

### **Results**

Using the GIS tool, a spatial risk illustration for targeted fields is provided for farmers that shows the impact of using additional multinational GNSS satellite constellations for improving auto-steer reliability, as opposed to using only the U.S. GPS satellite constellation.

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
402	Engineering Systems and Equipment
404	Instrumentation and Control Systems

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

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

- Public Policy changes
- Competing Public priorities

### **Brief Explanation**

In FY 2012, state appropriations in Tennessee were reduced across the board for all public agencies. For UT Extension, this was a \$2.5 million reduction from FY 2011 to FY 2012 in operating expenditures. Both UT and TSU Extension made programmatic changes to accommodate reductions. These changes included limiting postage, travel and printing.

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

### **Evaluation Results**

The Biosystems Engineering and Soil Science department's educational efforts to promote sustainability were evaluated through interviews, observations, and expert estimations. Evaluation results included the following:

1. Increased adoption of nutrient management tools by Tennessee livestock and row crop producers resulted in 32 stream sections totaling over 293 miles being removed from the state's 303d list of impacted streams and rivers for one or more pollutants due to animal and row crop agriculture.
2. 1,798 livestock and row crop producers attending field days, workshops and county meetings increased their knowledge and skills on nutrient management practices that promote sustainable production systems.
3. More than 80 secondary fuel containment structures, holding 410,000 gallons of fuel

and other oils regulated under the EPA's Oil Pollution Prevention, have been constructed, most with direct design input from the University of Tennessee Extension, significantly reducing producer liability and potential environmental contamination in the event of an oil spill.

4. More than 290 CAFOs have received state or federal CAFO permits and are now conducting nutrient management with regulatory approval of their Nutrient Management Plans, improving profitability, reducing liability for manure applications, and ensuring compliance with state and federal CAFO regulations.

### **Key Items of Evaluation**

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