## 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% | | 14% | |
| 103 | Management of Saline and Sodic Soils and Salinity | 0% | | 3% | |
| 104 | Protect Soil from Harmful Effects of Natural Elements | 3% | | 3% | |
| 111 | Conservation and Efficient Use of Water | 6% | | 3% | |
| 112 | Watershed Protection and Management | 27% | | 14% | |
| 123 | Management and Sustainability of Forest Resources | 6% | | 18% | |
| 124 | Urban Forestry | 0% | | 3% | |
| 131 | Alternative Uses of Land | 0% | | 3% | |
| 132 | Weather and Climate | 0% | | 3% | |
| 135 | Aquatic and Terrestrial Wildlife | 0% | | 6% | |
| 136 | Conservation of Biological Diversity | 0% | | 6% | |
| 205 | Plant Management Systems | 3% | | 6% | |
| 213 | Weeds Affecting Plants | 0% | | 3% | |
| 216 | Integrated Pest Management Systems | 3% | | 3% | |
| 403 | Waste Disposal, Recycling, and Reuse | 0% | | 3% | |
| 605 | Natural Resource and Environmental Economics | 0% | | 3% | |
| 608 | Community Resource Planning and Development | 24% | | 6% | |
| 903 | Communication, Education, and Information Delivery | 18% | | 0% | |
| | **Total** | 100% | | 100% | |

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

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

| Extension | Research |
|---|---|

| Year: 2012 | 1862 | 1890 | 1862 | 1890 |
|---|---|---|---|---|
| Plan | 11.6 | 0.0 | 13.4 | 0.0 |
| Actual Paid Professional | 2.3 | 0.0 | 0.4 | 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** |
| 197858 | 0 | 129368 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 197858 | 0 | 129368 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 1075562 | 0 | 1108649 | 0 |

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

### 1. Brief description of the Activity

We have approximately 30 ongoing research and extension programs at the University of Connecticut that address components of climate change. Many of these programs focus on helping communities become more resilient to the extreme climate related events impacting the state. Programs focus on promoting buffer strip planning and adoption for rivers and coastlines. Training focuses on the benefits of buffers and their critical role in protecting water quality and shoreline health. Nutrient management work by UCONN Extension focuses on creating economic opportunities for producers and protecting soil and water quality. UCONN Extension also is providing training on geospatial technologies that are critical to community planning and enhancing community resilience to extreme events. In this report, we highlight five extension activities in the state defined outcomes section of this report that address adaptation to changing climate. In addition 2 research projects are summarized below.

Climate extremes have become more frequent in many parts of the world and thus expected to disrupt many socio-economic activities. Hatch research project, "Climate extremes, climate change and agriculture in the Northeast United States," utilized high-resolution regional climate model data, generated under the North America Regional Climate Change Assessment Program (NARCCAP) to develop a comprehensive framework for analyzing impacts of climate extremes and future climate projections on Northeastern United States agricultural production. Study results will be used to refine strategies for climate change projections/scenarios and impact assessments on agricultural production.

Research project, "Potential of forest residue to offset coal use in co-fired coal power plants in the Northeastern United States," used Geographic Information Systems (GIS) to estimate the potential quantity of coal that could be offset by forest residue in the eastern US. Study analysis suggests that the use of forest residue in coal power plants has the potential to substantially reduce emissions from coal

consumptions. Assuming an 80 km transport distance, data analysis found that forest residue has the potential to reduce coal consumption by 22.3 million tons per year, greenhouse gas emissions would be reduced by 58 million tons per year, and NOx and SOx emissions would be reduced by 69.3 and 122.6 thousand tons respectively.

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

Elected municipal officials, municipal staff and volunteers, citizens, Soil Science Society of America, research scientist in the envionment field of study, arborists, urban forest managers, silviculture foresters, New England fisheries stakeholders, fisheries managers, conservation biologist and forest land owners.

**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** | 10385 | 23248 | 683 | 514 |

**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** | 27 | 14 | 41 |

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

**Output Target**

**Output #1**

**Output Measure**

- Face to face general group education sessions (workshops, etc.)

| Year | Actual |
|---|---|
| 2012 | 108 |

**Output #2**

**Output Measure**

- New or updated web page(s)

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

**Output #3**

**Output Measure**

- Training conferences or sessions hosted or conducted.
  Not reporting on this Output for this Annual Report

**Output #4**

**Output Measure**

- Fact sheets, bulletins and newsletters written or edited.

| Year | Actual |
|---|---|
| 2012 | 38 |

**Output #5**

**Output Measure**

- Individual Consultations

| Year | Actual |
|---|---|
| 2012 | 5137 |

**Output #6**

**Output Measure**

- Undergraduate and Graduate Students Supervised

| Year | Actual |
|---|---|
| 2012 | 80 |

## V(G). State Defined Outcomes

### V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Acres of land permanently protected and managed. |
| 2 | Adoption and/or revision of land use public policies by governmental agencies. |
| 3 | Consumers become knowledgeable about recommended environmental practices relating to forests, water quality and conservation, lawn care, well and septic systems, and/or shoreline buffers. |
| 4 | Understanding of basic forest ecology. |
| 5 | Increased use (%) of GIS and other technologies by local officials in making land use and other environmental decisions. |
| 6 | Increased awareness of recommended BMP by nursery industry, landscape architects and consumers. |
| 7 | Number of agricultural nutrient management plans adopted |
| 8 | Number trained in geospatial technologies |
| 9 | Number of students achieving pesticide certification. |

**Outcome #1**

1. **Outcome Measures**

Acres of land permanently protected and managed.

Not Reporting on this Outcome Measure

**Outcome #2**

1. **Outcome Measures**

Adoption and/or revision of land use public policies by governmental agencies.

Not Reporting on this Outcome Measure

**Outcome #3**

1. **Outcome Measures**

Consumers become knowledgeable about recommended environmental practices relating to forests, water quality and conservation, lawn care, well and septic systems, and/or shoreline buffers.

2. **Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2012 | 500 |

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

**Issue (Who cares and Why)**
Protection and management of riparian buffers are a proven method to protect and/or improve water quality. Riparian corridor protection and restoration is a climate change adaptation strategy. Buffers slow water runoff and increase filtration, trap pollutants and sediment, stabilize soil, and reduce bank erosion. Other benefits include storage of flood waters, increased aesthetics, wildlife habitat for terrestrial animals, as well as maintaining habitat for aquatic animals, and protection of sensitive coastal habitats.

**What has been done**
The Riparian Corridors in CT program, prepared numerous presentations on riparian corridors for CT municipalities. These presentations included town specific riparian corridor analyses showing changes in land cover between 1985 and 2006 within a 300 ft riparian corridor. Several plant lists were developed to encourage native plantings within riparian corridors and funding was secured to develop coastal riparian plant lists and cross sections to show homeowners and municipalities how these areas could be planted.

**Results**
Several towns incorporate language on the importance of riparian corridor protection in their POCD's. A grad student in UConn's Dept of PS/LSA and the Project Director developed a riparian corridor template for an inland pond site that could be used in numerous inland situations. The Town of Lebanon embraced the template and plans to proceed with on site work in 2013. Over 500 people downloaded the Coastal Planting Guide
http://web2.uconn.edu/seagrant/publications/coastalres/CTCoastal_planting.pdf
post Tropical Storm Irene. This guide encourages the planting of native plants and indicates which plants have soil salt or salt spray tolerances.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |
| 112 | Watershed Protection and Management |
| 132 | Weather and Climate |
| 135 | Aquatic and Terrestrial Wildlife |
| 205 | Plant Management Systems |
| 608 | Community Resource Planning and Development |
| 903 | Communication, Education, and Information Delivery |

**Outcome #4**

**1. Outcome Measures**

Understanding of basic forest ecology.

Not Reporting on this Outcome Measure

## Outcome #5

### 1. Outcome Measures

Increased use (%) of GIS and other technologies by local officials in making land use and other environmental decisions.

Not Reporting on this Outcome Measure

## Outcome #6

### 1. Outcome Measures

Increased awareness of recommended BMP by nursery industry, landscape architects and consumers.

### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Actual |
|---|---|
| 2012 | 25 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
The nursery industry is losing important ornamental crops due to emerging issues with invasiveness and plant bans. The nursery industry needs a broadened palette of versatile and adaptable native plants to meet the growing desire of landscapers and consumers to utilize native plants. The identification and development of new native plants for growers will help replace lost sales from invasive plants, and may generate sales beyond the levels produced by invasive shrubs. The identification and development of new native plants for growers will help replace lost sales from invasive plants, and may generate sales beyond the levels produced by invasive shrubs. New plant products are a major profit driver for the green industry.

**What has been done**
A combined extension and research program is developing native plants for the green industry. Eight Connecticut native shrub species were evaluated for landscape suitability. Propagation protocols were developed to allow nursery growers to efficiently propagate new native shrubs to add to their product line. Native plant education was provided to nursery professionals, landscape architects, and consumers through conference presentations, a native shrub column in the Home and Garden news, publications, and individual consultations.

**Results**
Five novel CT native shrub species were identified that can be used to directly replace invasive plants in landscapes. Three additional novel CT native shrub species were propagated at a rate similar to already successful native shrub crops that are widely grown by the green industry, indicating that these new natives can be propagated in sufficient quantities to serve the green industry. Twenty-five program participants report an increased awareness of recommended BMP approaches and ten reported they adopted recommended BMP approaches.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 131 | Alternative Uses of Land |
| 136 | Conservation of Biological Diversity |
| 205 | Plant Management Systems |
| 903 | Communication, Education, and Information Delivery |

**Outcome #7**

**1. Outcome Measures**

Number of agricultural nutrient management plans adopted

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2012 | 5 |

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

**Issue (Who cares and Why)**
Farmers are under increasing pressure to adopt BMP to improve their operations and protect the environment. Research has shown that manure and fertilizer applications can cause fields to become saturated with phosphorus (P.) When this happens P becomes soluble and can move with rain runoff in to streams, causing increased algae blooms and eutrophication of surface water. Also, in 2013 larger farms in Connecticut will need Nutrient Management Plans to comply

with CT DEEP's General Permit for Concentrated Animal Feeding Operations.

**What has been done**
Five Farms recorded baseline crop management data, then were presented with BMP to manage crop nutrients to meet the agronomic needs of the crop while minimizing the risk of environmental pollution. Plans consisted of field by field recommendations for nutrient applications, including timing of application or in cases where the fields already have sufficient nutrients to grow the crop, a prohibition on applying more nutrients, or to move manure off the farm; either because the farm doesn't need the nutrients, or because the farm chooses not to haul the manure to distant fields that could make use of the nutrients.

**Results**
The program was evaluated by measuring results. Detailed field by field records of actual nutrient applications, crop yield and soil test results were maintained by the farms. This allows comparison of actual nutrient applications to planned applications and calculates what fraction of the fields is being managed according to the plan. We were successful in proving to farmers that hauling liquid manure in tank trailers is cheaper than using the traditional solid manure spreader behind a tractor; 5,827 tons of solid manure and 13,499,867 gallons of liquid manure were applied according to the plans on 5,046 acres of cropland. Farms spent 8,703 dollars hauling manure, 3,429 miles ($2.54 per mile), 57.9% of crop field exceeded yield goals even with summer heat and drought, and spring's extremely wet conditions.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 112 | Watershed Protection and Management |
| 136 | Conservation of Biological Diversity |
| 403 | Waste Disposal, Recycling, and Reuse |
| 605 | Natural Resource and Environmental Economics |
| 608 | Community Resource Planning and Development |
| 903 | Communication, Education, and Information Delivery |

**Outcome #8**

**1. Outcome Measures**

Number trained in geospatial technologies

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Actual |
|---|---|
| 2012 | 350 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
The use of Geospatial technologies, geographic information systems (GIS), global positioning system (GPS), remote sensing and internet mapping technologies can be immensely powerful tools for individuals, communities, researchers, and outreach professionals for local land use planning. Land use change influences a wide variety of issues critical to Connecticut residents and communities, including impacts on economic viability, community character, and natural resource health.

**What has been done**
The Geospatial Training Program (GTP),conducted 7 GIS trainings and 5 specialized web mapping courses for over 210 participants on GPS and related technologies. In collaboration with the CT Department of Energy and Environmental Protection (DEEP), the CT Environmental Conditions Online (CT ECO) website was deployed to serve GIS maps and geographic data to the public. Additionally, GTP worked with the CT Sea Grant program to develop and deploy the CT Shellfisheries Mapping Atlas.

**Results**
More than 200 individuals were trained by the GTP in hands-on workshops in multiple states. More than 150 additional participants were exposed to geospatial technology via webinars. Post-training participant surveys indicated that 100% of participants would recommend the training to their colleagues. Survey results and follow-up communications have resulted in a large number of requests for additional training workshops throughout the country.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 111 | Conservation and Efficient Use of Water |
| 112 | Watershed Protection and Management |
| 136 | Conservation of Biological Diversity |
| 605 | Natural Resource and Environmental Economics |
| 608 | Community Resource Planning and Development |
| 903 | Communication, Education, and Information Delivery |

## Outcome #9

### 1. Outcome Measures

Number of students achieving pesticide certification.

### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

### 3a. Outcome Type:

Change in Action Outcome Measure

### 3b. Quantitative Outcome

| Year | Actual |
|---|---|
| 2012 | 9 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Turfgrass managers and landscapers are faced with the challenge of providing high quality turf while utilizing the least amount of inputs; including water, pesticides and fertilizers. In addition, Connecticut law prohibits the use of pesticides on public and private K through 8th grade school athletic fields, and when needed pesticide applicators must have a valid license to apply products. Turf managers need low input alternatives to maintain quality turfgrass in a non-pesticide environment.

**What has been done**
UCONN's turfgrass industry program conducted 3 educational seminars for 425 industry professionals, students and the public on BMP approaches to maintain sustainable, safe playing surfaces and quality turfgrass systems, while reducing pesticides, and fertilizer. Over 850 contacts were made through face to face meetings, telephone, e-mail, and written communication. A collaborative effort between the New England Universities developed a New England Weed Control Guide, and 19 individual site consultations help establish BMP programs.

**Results**
Turf managers and school boards throughout Connecticut have turned to UConn for information on how best to grow and maintain quality turf. A collaborative effort between the Connecticut Department of Energy and Environmental Protection (DEEP) and the University of Connecticut Turfgrass Science program was established to offer students the opportunity to take their pesticide applicators license, in school, before they enter the workforce; 39 students have received their pesticide certification over the last five years; 9 received certification this reporting period.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 104 | Protect Soil from Harmful Effects of Natural Elements |
| 111 | Conservation and Efficient Use of Water |
| 205 | Plant Management Systems |
| 213 | Weeds Affecting Plants |
| 216 | Integrated Pest Management Systems |

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

### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Public Policy changes
- Competing Public priorities

### Brief Explanation

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

### Evaluation Results

Through a variety of evaluation tools including pre-testing, time series and post-testing Extension Educators surveyed participants utilizing both written and internet based methods. Participants reported changed in attitude and increased knowledge following completion of programs.

### Key Items of Evaluation