

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

**Program # 3**

**1. Name of the Planned Program**

Human and Animal Health

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 |
|---------|--|-----------------|-----------------|----------------|----------------|
| 722     | Zoonotic Diseases and Parasites Affecting Humans |                 |                 | 85%            |                |
| 723     | Hazards to Human Health and Safety               |                 |                 | 15%            |                |
|         | <b>Total</b>                                     |                 |                 | 100%           |                |

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

1. Actual amount of FTE/SYs expended this Program

| Year: 2013               | Extension |      | Research |      |
|--------------------------|-----------|------|----------|------|
|                          | 1862      | 1890 | 1862     | 1890 |
| Plan                     | 0.0       | 0.0  | 10.0     | 0.0  |
| Actual Paid Professional | 0.0       | 0.0  | 7.3      | 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    |
| 0                   | 0              | 177867         | 0              |
| 1862 Matching       | 1890 Matching  | 1862 Matching  | 1890 Matching  |
| 0                   | 0              | 882656         | 0              |
| 1862 All Other      | 1890 All Other | 1862 All Other | 1890 All Other |
| 0                   | 0              | 198019         | 0              |

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

1. Brief description of the Activity

The main research objectives are to determine the primary mosquito vectors of encephalitis viruses, the sources of blood meals found in engorged mosquitoes, if biological control agents can effectively control mosquitoes and ticks, and to determine which vertebrate hosts serve as reservoirs for arthropod-transmitted pathogens. Significant advancements were made on all objectives. The expected outputs will benefit federal, state, and local public health officials, physicians, veterinarians, and the general public. The primary state-generated outputs include scientific publications, talks and interviews, identifying and testing ticks for the Lyme disease agent, and numbers of state residents directly served by answering inquiries. Specifically, staff members (1) conducted research on tick and mosquito control and disseminated information on research findings by giving talks and media interviews, (2) analyzed ticks and mosquitoes for disease agents, (3) answered public inquiries, and (4) informed public health officials on the success of control methods. All activities strongly emphasize public service and include traditional and non-traditional stakeholders. One open house events was held on Station property to allow the public to hear oral presentations on research findings and to offer comments directly to appropriate staff. Results of these activities have and/or will lead to specific outcomes, such as more efficient or environmentally sound methods of tick and mosquito control and prevention of human illnesses.

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

Research on human and animal health is of direct benefit to a broad range of stakeholders. Research findings were directly transferred to fellow scientists via peer-reviewed journal articles and professional conferences. The general public was reached and participated in events by means of agricultural fairs, open houses, TV, radio, and newspaper articles. Media reporters frequently requested information for stories. Oral presentations were given to public health officials in meetings and, as requested, to civic groups. Also, state residents were allowed to submit ticks through local health departments for identification and when the tick was engorged, analysis for the Lyme disease agent. Results were reported to public health officials who then informed the residents. General information on tick-related research was also provided to the public. Fact sheets and other information were posted on the CAES website and made available to everyone. Although these communication venues allowed for extensive contacts with the public, special efforts were made to reach underserved and under-represented groups. Information on ticks and mosquitoes was printed in Spanish. A fact sheet on bed bugs was printed in Spanish, Chinese, and French. Displays at agricultural fairs and open houses were designed to interest children as well as adults. There has been ongoing cooperation with the Yale Peabody Museum to provide new information on mosquitoes and ticks to develop science curricula for middle and high school students. The Yale program, funded by a \$1.3 million Science Education Partnership Award and supported by the National Institutes of Health, is expected to impact 18,000 students and hundreds of teachers by 2016. Public participation in agricultural fairs continued and was particularly effective in reaching non-traditional stakeholder groups.

## **3. How was eXtension used?**

eXtension was not used in this program

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

### **1. Standard output measures**

| 2013   | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|--------|------------------------|--------------------------|-----------------------|-------------------------|
| Actual | 3078                   | 4381                     | 50                    | 2519                    |

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

**Patent Applications Submitted**

Year: 2013

Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

| 2013   | Extension | Research | Total |
|--------|-----------|----------|-------|
| Actual | 0         | 16       | 0     |

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

**Output Target**

**Output #1**

**Output Measure**

- Total research papers

| Year | Actual |
|------|--------|
| 2013 | 27     |

**Output #2**

**Output Measure**

- # of talks and interviews

| Year | Actual |
|------|--------|
| 2013 | 170    |

**Output #3**

**Output Measure**

- # of responses to stakeholders' inquiries

| <b>Year</b> | <b>Actual</b> |
|-------------|---------------|
| 2013        | 3906          |

**Output #4**

**Output Measure**

- # of ticks identified or tested

| <b>Year</b> | <b>Actual</b> |
|-------------|---------------|
| 2013        | 2363          |

**Output #5**

**Output Measure**

- # mosquitoes identified and/or tested

| <b>Year</b> | <b>Actual</b> |
|-------------|---------------|
| 2013        | 192172        |

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

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

| O. No. | OUTCOME NAME  |
|--------|---|
| 1      | # of residents gaining knowledge of ticks, mosquitoes, bed bugs, and mold       |
| 2      | # of media reporters gaining knowledge of ticks, mosquitoes, bed bugs, and mold |

## **Outcome #1**

### **1. Outcome Measures**

# of residents gaining knowledge of ticks, mosquitoes, bed bugs, and mold

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

- 1862 Research

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

Change in Knowledge Outcome Measure

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

| <b>Year</b> | <b>Actual</b> |
|-------------|---------------|
| 2013        | 3128          |

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

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

Prevalence of Lyme disease, human granulocytic anaplasmosis (HGA), and human babesiosis cases continue to increase in the United States. There were 30,831 confirmed and probable cases of Lyme disease reported to the Centers for Disease Control and Prevention in 2012. In 2013, the CDC officially acknowledged that the true number of Lyme disease cases was probably around 300,000 human cases per year. Without antibiotic treatment, persons can suffer from dermatologic, joint, cardiac, or neurological disorders. The mean cost per Lyme disease patient is about \$1,965 (in year 2000 dollars). Pathogens for HGA and babesiosis attack white and red blood cells, respectively. The application of pesticides remains one of the primary methods for tick control in the residential landscape, and there is growing interest in biological, natural, and cultural methods in an integrated approach to reduce the risk of tick bite and disease.

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

Field research was initiated in 2013 on an integrated tick management project to determine if an IPM approach could reduce the abundance of the tick *Ixodes scapularis* and the entomological risk of tick-borne disease (TBD). This tick is the main vector for the Lyme disease, HGA, and human babesiosis agents. The strategies include spraying the entomopathogenic fungus *Metarhizium anisopliae*, rodent targeted bait boxes, and deer reduction.

#### **Results**

A reduction in tick abundance of 58% was obtained the first year in 2012 in this study from sites with the combined fungus and bait box treatment. Reduced abundance or activity of nymphal ticks is of paramount importance in reducing risk of human infections during May and June in CT. These studies will have impact as guidelines to an effective IPM approach to tick management are needed for residents and communities to respond to the increasing risk for TBD.

#### 4. Associated Knowledge Areas

| KA Code | Knowledge Area                                   |
|---------|--|
| 722     | Zoonotic Diseases and Parasites Affecting Humans |
| 723     | Hazards to Human Health and Safety               |

#### Outcome #2

##### 1. Outcome Measures

# of media reporters gaining knowledge of ticks, mosquitoes, bed bugs, and mold

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

| Year | Actual |
|------|--------|
| 2013 | 65     |

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

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

Reporters frequently sought information on mosquitoes, ticks, human pathogens, and associated diseases and were interested in new information gained from research on the spread of disease organisms in nature and the status of tick and mosquito population densities. West Nile and Eastern Equine Encephalitis (EEE) viruses constitute ongoing threats to human health by causing severe illness or death. Since its introduction into the United States in 1999, West Nile virus has sickened nearly 30,000 people resulting in over 1,500 deaths. During this reporting period, there were six human cases of West Nile virus in CT, but no deaths were reported. Public health officials have requested studies on the ecology of mosquitoes and viruses and biological control of mosquitoes.

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

There were at least 34 reporters who sought information on mosquitoes and encephalitis viruses and 18 on ticks and Lyme disease. More than 2 million mosquitoes were tested for viruses over 14 years. By interviewing scientists, who were conducting field and laboratory investigations, the reporters gained new knowledge of mosquitoes and the three main viruses (West Nile, Eastern Encephalitis, and Jamestown Canyon) that cause human illnesses. Viruses cultured from mosquitoes were identified by RNA analyses. Results were conveyed to the general public via press releases. Tens of thousands of stakeholders were kept informed of recent research findings and the significance of new scientific advances as they relate to the geographic areas they live in.

### **Results**

There were several dozen news stories on mosquitoes and viruses. Reporters and stakeholders learned that *Culex pipiens* is the main carrier of the West Nile virus and that this species is a complex of closely related subspecies of mosquitoes. Information on the overwintering ecology of a key mosquito species was published in the Journal of the American Mosquito Control Association. Stakeholders also learned about the key vector-host interactions in the occurrence of Eastern Equine Encephalitis through a publication in Vector Borne and Zoonotic Disease. These results had impact because mosquito control programs targeted the most important mosquito species and state residents took precautions to avoid mosquito bites. The long-term benefit is healthy human and domestic animal populations. Citations of published papers totaled in excess of 600 for the mosquito/encephalitis virus program.

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

| <b>KA Code</b> | <b>Knowledge Area</b>                            |
|----------------|--|
| 722            | Zoonotic Diseases and Parasites Affecting Humans |
| 723            | Hazards to Human Health and Safety               |

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

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

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges
- Other (Staff changes)

#### **Brief Explanation**

Grant funds were available to hire a Postdoctoral Research Scientist and there were shifts in scientists' work times from state projects to Hatch projects. Because of occasional delays in re-hiring temporary workers on grant funds, it is sometimes difficult to collect mosquitoes from field sites. The traps used require technical expertise and the use of dry ice (carbon dioxide attracts mosquitoes). The public would not be able to assist on mosquito collections. There were no changes in public policy, competing priorities, or competing programmatic challenges. A hiring freeze on state supported positions existed in 2013 but current plans are to hire an additional scientist for this program in 2014.

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

#### **Evaluation Results**

"During program" and "after only" evaluations were conducted to assess program effectiveness. The treatment of catch basins in areas where West Nile virus is prevalent was successful in reducing *Culex pipiens*. Surveys of stakeholders revealed positive responses to news releases to warn the public about infected mosquitoes, at least 46 of 52 persons

surveyed indicated that they closely followed advice to reduce exposure to mosquitoes.

### **Key Items of Evaluation**

Data were collected mainly by on-site evaluations conducted following talks to civic groups. A survey was conducted to assess changes in behavior regarding prevention of mosquito and tick bites, and there were face-to-face interactions with reporters and other stakeholders. During this reporting period, there were over 1000 citations for scientific articles written by staff scientists on ticks and mosquitoes for the entire planned program.