

# The Connecticut Agricultural Experiment Station



## *At a Glance*

**THEODORE G. ANDREADIS, Ph.D., *Director***

**Jason C. White, Ph.D., *Vice Director***

***Established – 1875***

***Statutory authority – CGS 22-79 – 22-118***

***Central office – 123 Huntington Street, New Haven, CT 06511***

***Number of employees – 95***

***Recurring operating expenses:***

**General Fund – \$ 7,547,088**

**Federal Funds – \$ 3,891,433**

**Other – \$ 403,901**

**Total – \$ 11,842,422**

***Organizational structure – Administration, Analytical Chemistry, Entomology, Environmental Sciences, Forestry & Horticulture, Plant Pathology & Ecology, Valley Laboratory (Windsor, CT), Griswold Research Center (Griswold, CT).***

## **Mission**

***The mission of The Connecticut Agricultural Experiment Station is to develop, advance, and disseminate scientific knowledge, improve agricultural productivity and environmental quality, protect plants, and enhance human health and well-being through research for the benefit of Connecticut residents and the nation. Seeking solutions across a variety of disciplines for the benefit of urban, suburban, and rural communities, Station scientists remain committed to “Putting Science to Work for Society, Protecting Agriculture, Public Health and the Environment” a motto as relevant today as it was at our founding in 1875.***

## **Statutory Responsibility**

Statutory responsibilities for The Connecticut Agricultural Experiment Station (CAES) focus on insects, ticks, plants and related diseases, and the development of methods to reduce pesticide use (i.e., integrated pest management). Within available resources, field and laboratory

studies are conducted, as determined by the agency's Board of Control, state residents (e.g., growers), or as requested by the General Assembly, pursuant to Connecticut General Statute (CGS Section 22-81). Scientists and technicians analyze food and other items at the request of any state agency; test ticks for the infectious agents that cause Lyme disease, Babesiosis and Anaplasmosis upon request of a state or municipal health officer or for scientific research purposes; test mosquitoes for public health threat from encephalitis viruses (CGS Sec 22-81a); oversee official control, suppression or extermination of insects or diseases, which are or threaten to become serious pests of plants; conduct research on integrated pest management (CGS Section 22-84a); inspect for diseases of honey bees and register beekeepers (CGS Sections 22-89, 22-90); and survey towns for gypsy moth, Asian longhorned beetle, Emerald ash borer, and other insect pests of economic or public health importance. In many instances, there are interactions with scientists or other officials in federal agencies. The Director is in charge of all matters pertaining to serious pests of plants and has regulatory authority (CGS Sections 22-84); responsibilities include the inspection and certification of nurseries, the registration of dealers of nursery stock, and enforcement of federal and state quarantines or regulations. Findings are reported to the public and scientific community by correspondence, lectures, media interviews, the agency's website, or published works. Emphasis is placed on submitting scientific manuscripts to peer-reviewed journals.

Station staff members provide prompt answers to routine and difficult but important agricultural, food safety, forestry, environmental, consumer protection, or public health questions by performing analyses; providing services to state residents; assisting small and large businesses, municipalities, state agencies and the scientific community; and by giving oral and written reports of research findings. Transferring new scientific information to the public and businesses is a high priority. The enhanced agency website ([WWW.CT.GOV/CAES](http://WWW.CT.GOV/CAES)) continues to be an efficient means of communicating research findings and reducing operating costs. There were 187,625 sessions, 406,441 page views and 120,121 users during this reporting period. The average session duration was 2 minutes. Social media is also being used to reach out to our constituents via Facebook [www.facebook.com/CT.CAES](http://www.facebook.com/CT.CAES), Twitter [www.twitter.com/CT\\_CAES](http://www.twitter.com/CT_CAES), and YouTube Channel [www.youtube.com/user/CTAGEXPSTATION](http://www.youtube.com/user/CTAGEXPSTATION). CAES also maintains a Wikipedia page [http://en.wikipedia.org/wiki/Connecticut\\_Agricultural\\_Experiment\\_Station](http://en.wikipedia.org/wiki/Connecticut_Agricultural_Experiment_Station). Staff members gave 992 talks and interviews to civic groups and the media. One open house event was held at our Lockwood Farm facility during the summer; more than 1,130 state residents had an opportunity to meet scientists, hear presentations on scientific progress, see experimental plots and laboratories, and to make comment on research and outreach programs. Tapings of the event at are available on the CTN, Connecticut Network, <http://www.ctn.state.ct.us/>

## **Public Service**

Public service remains a high priority. The CAES serves a diverse group of state residents, large and small businesses, municipalities, and the scientific community within its areas of expertise. More than 48,000 jobs in agriculture, wood-products industry, and other business sectors are supported by the services provided by CAES staff members. People bring or mail samples or call with questions to the New Haven or Windsor facilities. Extensive contacts with state residents are particularly important for the early detection of emerging insect or plant disease problems. Global marketing of plants and plant products increase the chances for the introduction of invasive pests, such as the Asian longhorned beetle and Emerald ash borer.

Boxwood blight, a fungal disease new to North America first described in Connecticut in October 2011, continues to threaten landscapes, production nurseries, and garden centers in the state. The emerald ash borer (EAB) was first detected in Connecticut on July 16, 2012 and has subsequently spread through a large portion of the state. The internal state quarantine for EAB was dropped in 2014 and all of Connecticut became part of the larger federal EAB regulated area. State regulations control the movement of wood and other regulated articles into Connecticut. More than 32,050 state residents received direct assistance from staff members at the CAES during the past year. Station scientists also visit farms when difficult or unique problems arise and provide information to growers and the media when asked. In addition, scientists served on advisory boards and provided information to about 187 stakeholder organizations. Employees of other state agencies, such as the Departments of Agriculture, Consumer Protection, Public Health and Energy and Environmental Protection, also requested help from Station staff members when they sent specific samples for chemical, biological or microscopic analyses. All of these activities helped identify emerging problems, facilitated prompt and accurate responses to state residents' inquiries, and ensured safe foods and other products. Receiving comments from citizens on evaluation or survey forms at public workshops, open house events, and other agency functions helps administrators gauge the effectiveness of research programs and services, and provides opportunities to realign program goals. In addition, there is an annual assessment of whether or not objectives listed in the agency's 5-year strategic plan are being achieved. This strategic plan and accomplishment reports are requirements for USDA funds. Both documents are reviewed annually by federal officials.

New testing procedures are developed as needed to improve analyses, particularly when samples require more sensitive and specific methods. Scientific research at the CAES involves identifying a problem, investigating existing published knowledge, and designing experiments which will provide new information to help solve the problem, enhance Connecticut's economy, or improve the well-being of state residents. In many instances, scientific results have impacts nationally.

Specific examples include the following:

- **Food Safety:** Connecticut General Statute [Sec. 22-81(c)] directs the CAES to conduct analyses as required by any state agency. In addition, CAES chemists work closely with the US Food and Drug Administration (FDA) in the Food Emergency Response Network (FERN). The CAES has recently successfully completed a 5-year, \$2 million grant from the FDA for the FERN, and was asked to seek an additional 5 years of funding (\$1.89 million) that will expand both state and federal food safety activities at the Station. Separately, CAES has a 5-year \$1.5 million FDA grant to achieve ISO Accreditation as described in the Food Safety Modernization Act (FSMA). Last, in conjunction with the CT Department of Agriculture, CAES has applied for a third 5 year FDA grant (\$750,000) to bring animal feed analysis under ISO accreditation as described in FSMA. Recent work with the FDA has centered on CAES staff validating new methods and instrument platforms for the detection of emerging contaminants in fresh and manufactured food. CAES chemists are not only applying these methods and analytical platforms to federal samples but also to our state programs. CAES chemists are currently participating in a FDA validation that will result in the adoption of a new analytical method for measuring arsenic in a wide range of foods; this method will be used by both the FDA and CT on food samples from foreign and domestic producers. CAES chemists are also participating in FDA Working Groups that are developing more robust and accurate methods to detect mycotoxins and antibiotics in food.

Last, as an indicator of the expertise that resides at CAES, two staff chemists have repeatedly served as primary instructors for FDA training courses that deploy FERN food safety methods to both federal and state laboratories across the country. With increased international food sources and more emphasis on large-scale food processing domestically, there is a greater potential for foods and beverages to be contaminated with toxic chemicals, such as pesticides, melamine, mycotoxins, pharmaceuticals and heavy metals. The CAES “Market-basket” program, which is run in conjunction with the CT Department of Consumer Protection and the FDA, serves as the sole chemical surveillance and monitoring effort in the state, assuring that the food supply within CT is free from adulteration and contamination. Chemists at the CAES continue to assist the Federal Bureau of Investigation (FBI) Weapons of Mass Destruction Directorate (WMDD), 14th Connecticut National Guard Civil Support Team, CT State Police Emergency Services Unit (ESU), and CT Department of Public Health Bioterrorism Coordinator as a part of state-wide counter-terrorism programs.

- **Lobster Pesticide Study:** CAES chemists have been asked to serve on the Lobster Pesticide Study 2014 Steering Committee. The CT Department of Energy and Environmental Protection initiated formation of the committee, which also includes the US Environmental Protection Agency and the Pyrethroid Working group, after investigators at the University of CT (UConn) reported preliminary findings of significant concentrations of synthetic pyrethroids in Long Island Sound (LIS) lobsters. Subsequent analysis by CAES was unable to confirm those findings. CAES and UConn are now participating in a full method validation, including the analysis of fresh LIS lobsters; results are anticipated before the end of the calendar year.
- **Mosquito-Borne Disease Surveillance:** Mosquito surveillance for eastern equine encephalitis (EEE) and West Nile virus (WNV) is integral to the public health response to these mosquito-transmitted diseases in Connecticut and provide an effective early warning system for citizens of the State (CGS Section 22-81a). CAES scientists and technicians monitor mosquito and encephalitis virus activity at 91 trapping sites from June through October. In 2014, a total of 229,097 mosquitoes representing 39 species were trapped and tested from 91 locations statewide. WNV was detected in 68 mosquito pools collected in 15 towns from Fairfield, Hartford, Litchfield, New Haven, and New London counties. The majority of WNV activity was detected in densely populated urban and suburban regions in southern Fairfield County. Six human cases of West Nile virus were locally acquired with no fatalities. Date of onset ranged from August 18 to October 6. Human cases were temporally and spatially consistent with virus detection from mosquitoes. EEE virus was not detected in field-collected mosquitoes, and there were no equine or human cases reported. CAES continues to closely monitor the expansion in Connecticut of two exotic mosquito species from Asia, *Aedes albopictus* (Asian tiger mosquito) and *Aedes japonicus* that are aggressive human biters and have been implicated in the transmission of several human pathogens, including dengue, chikungunya, EEE, and West Nile virus.
- **Invasive Aquatic Plants:** CGS Section 22-81(c) directs the CAES to perform experiments on plants. Invasive aquatic plants have been introduced in Connecticut from other parts of the world. With no natural enemies, they spread rapidly and threaten the ecological and recreational value of Connecticut’s lakes. Since 2004, the CAES Invasive Aquatic Plant Program (IAPP) has completed aquatic vegetation surveys of 206 Connecticut lakes and found 60% contain invasive plants. Government and local officials request CAES assistance in finding methods to protect their bodies of fresh water. In fiscal year 2013-14, CAES IAPP

surveyed 23 lakes and performed multifaceted research including; the effects of winter drawdown on Eurasian watermilfoil in Candlewood Lake (Danbury), the use of grass carp to control curly leaf pondweed in Grannis Lake (East Haven), and the efficacy of herbicide treatments of variable water milfoil in Bashan Lake (East Haddam) and Brazilian waterweed in Fence Rock Lake (Guilford). The CAES IAPP has extensive public outreach via workshops, speaking engagements and a comprehensive web site available at [www.ct.gov/caes/iapp](http://www.ct.gov/caes/iapp). Results are published the scientific journals, technical reports and in CAES bulletins.

- **Tick-Borne Disease Research:** Human cases of Lyme disease are prevalent and other tick-borne diseases are increasing. The third year of an integrated tick management project to reduce the abundance of the blacklegged tick and risk of disease using a natural entomopathogenic fungus product (*Metarhizium anisopliae*), mouse bait boxes, and deer management is being conducted in the town of Redding. The project is funded by the CDC. The combination of the fungus and mouse bait boxes reduced tick abundance on residential properties by 78% after the first two years of the study. A new project to evaluate rodent targeted Lyme disease vaccine bait was initiated at homes in the town of Redding.
- **Tick Testing Program.** Tick testing for infectious agents that cause human disease is freely available to State residents. The objectives are to: 1) examine ticks for evidence of infection in order to better understand the epidemiology of tick-associated diseases in Connecticut, 2) inform residents of any potential health risk, and 3) assist physicians and residents concerning treatment. In 2015 the tick testing laboratory was expanded to test blacklegged ticks, *Ixodes scapularis*, for the two additional pathogens. In the past, testing was limited to *Borrelia burgdorferi* the Lyme disease agent, but in view of increasing human cases of tick-related illnesses in the state, testing has been expanded to include *Anaplasma phagocytophilum*, the causative agent of Human Granulocytic Anaplasmosis, and *Babesia microti*, the causative agent of Babesiosis, for which 3.6% and 12.0% of ticks have tested positive, respectively. New molecular-based testing methods have additionally been implemented to reduce the average turnaround time to three days or less representing a significant enhancement of the tick testing services.

### **Improvements/Achievements 2014-2015**

New statutory authority (CGS 22-82a) permits the CAES to seek patents, trademarks, and licensing agreements. License agreements have been established for a new cultivar of strawberry and a disease-resistant tobacco cultivar. Portions of the royalties are being used for operating costs and reinvesting into the crop research programs.

Efforts continue to reduce energy and other operating expenses of the agency. The agency has converted to natural gas to heat our buildings on the New Haven Campus. The agency has actively participated in the Governor's Lead by Example energy efficiency program and replaced the exterior lighting on the New Haven Campus to LED technology. In the coming year we will be replacing the windows in three of our older laboratory buildings which will provide significant savings on energy and maintenance costs. The Griswold Research Center is fully operational with the addition of a 27 x 48 greenhouse to propagate experimental plants and trees. In January, 2015 Station staff moved into the newly renovated and new addition to the Jenkins-Waggoner Laboratory which is a LEAD certified and energy efficient building.

Plant pathologists at the CAES continued their research on boxwood blight, a disease caused by the fungus *Calonectria pseudonaviculata*. New to North America, the disease was first detected on boxwoods in nurseries in Connecticut in 2011 and on pachysandra in landscapes in 2012. This disease has continued to spread and is now found in 18 other states in addition to three provinces in Canada. Boxwood is an economically important crop for the Connecticut nursery industry and is a popular ornamental plant in landscapes. With input from the nursery industry, personnel at the CAES responded to industry concerns by researching and developing best management practices (BMPs) in the mitigation of boxwood blight; these BMPs are suitable for use by landscapers, commercial plant producers, as well as homeowners. Research programs at CAES have made advances in developing molecular tools for early detection in plants, soil, and water, understanding survival and longevity of the fungus on hard surfaces in nursery production, identifying effective sanitizers for disinfecting tools and equipment, identifying effective fungicides and spray programs to prevent new infections, and understanding the genetic mechanisms underlying the potential for fungicide resistance. Scientists have presented research results to stakeholders within the state and nationally. BMPs have been updated whenever new, science-based information from our ongoing research programs becomes available. BMPs and basic information on the fungus (including pictures of infected plants) are posted on the CAES website ([www.ct.gov/caes](http://www.ct.gov/caes)).

CAES scientists are increasing our knowledge and understanding of the appropriate selection, location, and maintenance of trees in urban and suburban spaces to increase utility reliability, public safety, public health, environmental benefits, and reduce costs and risks for municipalities. Roadside trees and branches that fall during severe weather often cause extended power outages and extensive road blockages. CAES foresters are collaborating with utilities, environmental groups, land owners, and other state agencies to develop practical, cost-effective protocols to proactively foster healthy, storm resistant roadside forests by integrating silvicultural and arboricultural practices. Eight demonstration areas including over 4,300 trees have been established throughout Connecticut. Lessons learned on tree selection and coordination from implementation at three areas are being incorporated into treatments scheduled at the remaining sites.

The CAES reaffirms its continuing policy of commitment to affirmative action and equal opportunity employment as immediate and necessary objectives and relies solely on merit and accomplishment in all aspects of the employment process and research programs. The CAES employed 16 white male, 24 white female, and 8 minority seasonal research assistants during the summer as a part of a mentoring program. The student intern program, designed to teach scientific methods in brief periods, was continued to include 29 persons. The goals of mentoring programs are to promote interest in science and provide specialized training. Station scientists also participated as judges in science fairs in New Haven and Hamden. Through these and other direct interactions, staff encouraged high school students to further their science education. The CAES continues to comply with diversity training requirements and is also participating in the University of Connecticut's Employee Assistance Program. The agency's goals in awarding contracts to small businesses and minority business enterprises were exceeded.

### **Information Reported as Required by State Statute**

Scientists and technicians performed chemical, seed, soil, fertilizer, pesticide, animal feed, mosquito, and tick tests; answered inquiries; conducted plant, nursery, and bee inspections; and surveyed for the gypsy moth and other insect pests as listed below.

<b>Service or Test Number</b>	<b>2014-2015</b>
Inquiries answered (all departments)	17,913
Field visits and diagnostic tests	525
Nematode diagnostics	198
<b>Soil Tests completed</b>	
New Haven and Windsor	15,395
<b>Samples Tested</b>	
Department of Agriculture	144
Department of Consumer Protection (DCP)	258
Department of Energy & Environmental Protection	156
CAES Departments	356
FDA, Municipal Health Departments, Cities/Towns, Misc. Foundations	59
UConn Cooperative Extension	21
University Research Collaborations	2,166
Seed Samples Tested (vegetable, lawn, field crop)	329
Plant Samples Tested (incl. more tests for DCP)	7
Food Samples Tested	317
<b>Nursery and Seed Inspections</b>	
Greenhouse plants	224
Nursery stock containers and bare root	34,627
Perennial plants	1,049
Nursery inspections	697
Tobacco (bales, boxes, bundles, and cartons)	112,152
Permits to move homeowner plants out of state	6
Seed (cartons and bags)	370
Acres of nursery stock inspected	5,000
<b>Gypsy Moth Survey</b>	
Forest acres surveyed for gypsy moth by air	1.8 million
<b>Bee Inspection</b>	
Beekeepers registered	1,080
Beehives examined for mites and foulbrood	914
<b>Tick Identification and Testing</b>	
Ticks identified	2,879
Ticks tested for Lyme disease spirochetes	1,950
Ticks infected with spirochetes	612 (31.4%)
<b>Mosquito Testing</b>	
Mosquitoes trapped, identified, and tested for EEE, West Nile, and other encephalitis viruses	229,097
Number of trapping sites	91