THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

Record of the Year

2013 - 2014

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

The Connecticut Agricultural Experiment Station, founded in 1875, was the first state agricultural experiment station in the United States. The Station has laboratories, offices, and greenhouses at 123 Huntington Street, New Haven 06511, Lockwood Farm for experiments on Evergreen Avenue in Hamden 06518, the Valley Laboratory and farm on Cook Hill Road, Windsor 06095, and a research center in Griswold and Voluntown. Station Research is conducted by members of the following departments: Analytical Chemistry, Biochemistry and Genetics, Entomology, Forestry and Horticulture, Plant Pathology and Ecology, and Soil and Water. The Station is chartered by the Connecticut General Statutes to experiment with plants and their pests, insects, soil and water and to perform analyses.

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BOARD OF CONTROL

The management of The Station is vested in a Board of Control as specified in Section 22-79 of the General Statutes of Connecticut.

The members of the Board of Control as of June 30, 2013 were:

Governor Dannel P. Malloy, President
Mr. Terry Jones, Vice President
Mr. Paul Larson, Secretary
Dr. Theodore G. Andreadis, Director
Commissioner Steven K. Reviczky
Dr. Stephen L. Dellaporta
Ms. Patti Maroney
Ms. Joan Nichols
Dr. Dana Royer

Dr. Theodore G. Andreadis was appointed the Director of The Station, effective October 4, 2013, after the death of Dr. Louis A. Magnarelli who died on July 11, 2013.

The Board of Control met on July 19, 2013 (special meeting to appoint a new Director), August 7, 2013, September 25, 2013 (special meeting to appoint a new Director), October 23, 2013, January 15, 2014, and April 9, 2013.

STATION STAFF

The Experiment Station exists to advance scientific knowledge, and that advance depends completely upon the quality and dedication of its staff. The following was the staff of The Connecticut Agricultural Experiment Station as of June 30, 2014.

ADMINISTRATION
Dr. Theodore G. Andreadis, Director
Dr. Jason C. White, Vice Director
Michael P. Last, Chief of Services
Dianne F. Albertini
Vickie-Bomba-Lewandoski
Joan Ives-Parisi
Lisa L. Kaczenski
Roberta Milano-Ottenbreit
Kathryn K. Soleski

ANALYTICAL CHEMISTRY
Dr. Jason C. White, Department Head
Terri Arsenault
Michael J. Cavadini
Roberto de la Torre Roche
Dr. Brian D. Eitzer
Dr. Lester Hankin, Emeritus
Joseph R. Hawthorne
Dr. Walter J. Krol
Dr. MaryJane Incorvia Mattina, Emeritus
Craig L. Musante
Kittipath Prapayotin-Riveros
John F. Ranciato
Dr. Christina S. Robb
Dr. Alia Servin

BIOCHEMISTRY & GENETICS
Dr. Neil A. McHale, Department Head
Dr. Douglas W. Dingman
Regan B. Huntley
Dr. Richard B. Peterson
Dr. Neil P. Schultes
Dr. Israel Zelitch, Emeritus

BUILDINGS AND MAINTENANCE
Bancroft C. Nicholson, Supervisor
Brian Hart
Ron A. LaFrazier
Gloria Mach
Michael A. Scott

ENTOMOLOGY
Dr. Kirby C. Stafford, III, Department Head
Dr. John F. Anderson, Distinguished Scientist
Tia M. Blevins
Mark H. Creighton
Katherine Dugas
Dr. Laura Estep Hayes
Morgan F. Lowry
Dr. Chris T. Maier
Dr. Gale E. Ridge
Dr. Claire E. Rutledge
Stephen J. Sandrey
Dr. Victoria L. Smith
Dr. Kimberly A. Stoner
Heidi R. Stuber
Peter W. Trenchard
Tracy A. Zarrillo

ENVIRONMENTAL SCIENCES
Dr. Joseph J. Pignatello, Department Head
Dr. Phillip M. Armstrong
Angela B. Bransfield
Gregory J. Bugbee
Michael J. Misencik
Dr. Goudarz Molaei
John J. Shepard
Dr. Blaire T. Steven
Michael C. Thomas
Michael P. Vasil
Dr. Sivakumar Vasireddy
Dr. Charles R. Vossbrinck
Feng Xiao
Peng Yi

FORESTRY AND HORTICULTURE
Dr. Jeffrey S. Ward, Department Head
Joseph P. Barsky
Joan L. Bravo
Dr. Martin P. N. Gent – Emeritus
Dr. David E. Hill, Emeritus
Dr. Abigail A. Maynard
Michael R. Short
Dr. Paul E. Waggoner, Distinguished Scientist
Dr. Scott C. Williams

GRISWOLD RESEARCH CENTER
Robert J. Durgy, Research Farm Manager

LOCKWOOD FARM
Richard M. Cecarelli, Research Farm Manager
Rollin J. Hannan, Jr.
Michael M. McHill

PLANT PATHOLOGY & ECOLOGY
Dr. Sharon M. Douglas, Department Head
Michael A. Ammirata
Dr. Sandra L. Anagnostakis, Emeritus
Dr. Donald E. Aylor, Emeritus
Sandra E. Carney
Dr. Wade H. Elmer
Dr. Francis J. Ferrandino
Dr. Yonghao Li
Dr. Robert E. Marra
Pamela Sletten
Peter W. Thiel

VALLEY LABORATORY
Dr. James A. LaMondia, Department Head
Jane Canepa-Morrison
Dr. Carole A. Cheah
Nathaniel R. Child
Dr. Richard S. Cowles
Jeffrey M. Fengler
Rose T. Hiskes
Dr. Dewei Li
Dr. Todd L. Mervosh
James J. Preste, Research Farm Manager
Thomas M. Rathier, Emeritus
Diane Riddle
Michelle R. Salvas

PLANT SCIENCE DAY

2013

Pleasantly warm temperatures and partly sunny skies greeted visitors to Lockwood Farm on Plant Science Day 2013.

More than 926 visitors, 119 of which were children, attended the annual Open House on August 7, 2013.

Short Talks that were held under the Main Tent were very well attended. Short talks given were:

Dr. Jason C. White	Food Safety Research in the Department of Analytical Chemistry: Surveillance of Fresh and Manufactured Foods for Chemical Contamination
Dr. Robert E. Marra	Tropical Storms, Hurricanes, and Superstorms: Their Impact and Influence on Tree Diseases
Dr. Abigail A. Maynard	The New Crops Program: Helping Connecticut's Vegetable Growers
Dr. Richard S. Cowles	Spotted Wing Drosophila Biology and Management

The **Demonstration Tent** was busy throughout the day. Demonstrations were:

Mark H. Creighton	Beekeeping Basics
Gregory J. Bugbee	Soil Testing to Improve Plant Growth

Pesticide Credits were available for interested participants. **Dr. Robert E. Marra** conducted a one-hour guided tour of selected field plots where visitors discussed experiments and topics with scientists at the different stops. The stops on the tour included:

Dr. Sandra L. Anagnostakis	Asian Chestnut Gall Wasp on Chestnut
Drs. Wade H. Elmer and Jason C. White	Use of Nanoparticles of Copper, Manganese, or Zinc to Suppress Soil Borne Diseases of Eggplants and Tomatoes
Dr. Francis J. Ferrandino	Powdery Mildew on Chardonnay Wine Grapes

Dr. Jeffrey S. Ward conducted a **Tour of Native Woody Shrubs**. During the half-hour tour he talked about using native shrubs for naturalizing landscapes without the use of pesticides and fertilizers.

A **Walking Tour** of Lockwood Farm was conducted by **Dr. Robert E. Marra**. The one-hour tour of selected field plots gave participants an opportunity to discuss experiments and topics with scientists at 44each station on the tour. Stops on the tour included:

Dr. Abigail A. Maynard	Beach Plum, Paw-Paw, and Japanese Plum Trials
Dr. Sandra L. Anagnostakis	Hybrid Elm Trees
Dr. Kimberly A. Stoner	Pumpkin Pollination

A **Butterfly Identification Walk** was conducted by **Jeffrey M. Fengler**. One hour tours were given, on the hour, of the Bird and Butterfly Garden.

The six **Barn Exhibits** were very popular. The exhibits included:

Transporters are "Gatekeepers" in Plant Biochemistry. Investigator: **Dr. Neil P. Schultes** – Assisted by **Regan B. Huntley** and **Carol R. Clark**

Emerald Ash Borer in Connecticut. Investigator: **Dr. Claire E. Rutledge** – Assisted by **Mioara Scott**

Saving Our Lakes from Invasive Plants. Investigator: **Gregory J. Bugbee** – Assisted by **Jordan Gibbons**, **Samantha Wysocki**, and **Adam Hawkes**

Crop Tree Release at Canopy Closure Benefits Oak. Investigator: **Dr. Jeffrey S. Ward** – Assisted by **Joseph Barsky**

Sudden Vegetation Dieback in Connecticut's Salt Marshes. Investigators: **Dr. Wade H. Elmer, Dr. Robert E. Marra**, and **Dr. James A. LaMondia** – Assisted by **Peter W. Thiel**

Strategies to Reduce Fungicide Residues on Tobacco. Investigators **Dr. James A. LaMondia** and **Dr. Brian D. Eitzer –** Assisted by **Michelle R. Salvas**

Throughout the day, hundreds of questions were answered by the staff under the Question and Answer Tent. The Tent was manned by **Rose Hiskes, Mary Inman, Dr. Yonghao Li, Dr. Todd Mervosh, Diane Riddle, and Dr. Gale E. Ridge**

Visitors were able to visit the following 78 **Field Plots**:

CHINESE CHESTNUT TREES	Dr. Sandra Anagnostakis, assisted by Pamela Sletten
SPECIALTY PEPPER TRIALS	Dr. Abigail Maynard and Dr. David Hill
SHEET COMPOSTING WITH OAK AND MAPLE LEAVES	Dr. Abigail Maynard and Dr. David Hill
SWEET POTATO TRIALS	Dr. Abigail Maynard and Dr. David Hill
NUT ORCHARD	Dr. Sandra Anagnostakis, assisted by Pamela Sletten
SPECIALTY MELON TRIALS	Dr. Abigail Maynard and Dr. David Hill
BUTTERNUTS AND HEARTNUTS	Dr. Sandra Anagnostakis, assisted by Pamela Sletten
USE OF EARTHWORMS AND BIOCHAR TO SUPPRESS ROT OF ASPARAGUS	Dr. Wade Elmer, assisted by CROWN Peter Thiel

COMMERCIAL CHESTNUT CULTIVARS	Dr. Sandra Anagnostakis, assisted by Pamela Sletten
PROTECT OUR TREES FROM EXOTIC BEETLES	Rose Hiskes, assisted by Katherine Dugas
REMOTE ACCESS WEATHER STATIONS	Dr. Francis Ferrandino
NANOPARTICLE INTERACTIONS WITH AGRICULTURAL CROPS	Dr. Roberta De La Torre-Roche, Craig Musante, Joseph Hawthorne, and Dr. Jason White, assisted by Michael Torselli
NEW HYBRID CHESTNUT ORCHARD	Dr. Sandra Anagnostakis, assisted by Pamela Sletten
CONTROL OF BLIGHT ON AMERICAN CHESTNUT	Dr. Sandra Anagnostakis, assisted by Pamela Sletten
TABLE GRAPE DEMONSTRATION	Dr. Francis Ferrandino, assisted by Joan Bravo
ENVIRONMENTALLY FRIENDLY CONTROL OF POWDERY MILDEW ON LANDSCAPE PLANTS	Dr. Francis Ferrandino
USE OF NANOPARTICLES OF COPPER, MANGANESE, OR ZINC TO SUPPRESS SOIL-BORNE DISEASES OF EGGPLANTS AND TOMATOES	Dr. Wade Elmer and Dr. Jason White, assisted by Peter Thiel
TECHNICAL DEMONSTRATION TENT	Multiple exhibits
QUESTION & ANSWER TENT	Dr. Yonghao Li, Rose Hiskes, Mary Inman, Dr. Todd Mervosh, Dr. Gale Ridge, and Diane Riddle
WILD CHESTNUTS FROM TURKEY	Dr. Sandra Anagnostakis and Dr. Serap Acikgoz, assisted by Pamela Sletten
SEEDLINGS OF OLD SURVIVING AMERICAN CHESTNUTS	Dr. Sandra Anagnostakis, assisted by Pamela Sletten
COMPARISON OF GRAFT UNION HEIGHT ON CHARDONNAY GRAPEVINES	Dr. Francis Ferrandino, assisted by Joan Bravo
FIG PRODUCTION IN SELF-WATERING CONTAINERS	Dr. Charles Vossbrinck, assisted by Richard Cecarelli

GROWTH AND CONTROL OF NON-NATIVE BAMBOOS (*Phyllostachys SPP*.)	Dr. Jeffrey S. Ward, assisted by Joseph Barsky
POWDERY MILDEW ON CHARDONNAY WINE GRAPES	Dr. Francis J. Ferrandino
RETURN OF THE 17-YEAR PERIODICAL CICADA, THE 2013 EXPERIENCE	Dr. Chris Maier, assisted by Tracy Zarrillo, Morgan Lowry and many citizen scientists
HANDS-ON CHEMISTRY	Dr. Christina Robb, Kittipath Prapayotin-Riveros, Dr. Walter Krol, Terri Arsenault, Michael Cavadini, Dr. Brian Eitzer, and Dr. Jason White
INVASIVE AQUATIC PLANT PROGRAM	Gregory Bugbee, assisted by Jordan Gibbons, Adam Hawkes, and Samantha Wysocki
COMPOSTING LEAVES USING THE STATIC PILE METHOD	Dr. Abigail Maynard and Dr. David Hill
EVALUATION OF EIGHT REPELLENTS IN DETERRING EASTERN COTTONTAIL HERBIVORY IN CONNECTICUT	Dr. Scott Williams, assisted by Michael Short and Megan Floyd
SELF-GUIDED ACTIVITY FOR ALL CHILDREN, INCLUDING GIRL SCOUTS	Terri Arsenault
KIDS' KORNER	Roberta Milano-Ottenbreit, Kathryn Soleski, Lisa Kaczenski, and Tracy Zarrillo
THE FARMER'S COW	Kathy Smith
VERIZON TELEPHONE TRANSMISION SILO	
BIOLOGICAL CONTROL OF HEMLOCK WOOLY ADELGID AND MILE-A-MINUTE WEED IN CONNECTICUT	Dr. Carole Cheah
MANAGEMENT OF BOXWOOD BLIGHT, A NEW DISEASE OF THE BUXACEAE IN CONNECTICUT AND THE UNITED STATES	Dr. James LaMondia, assisted by Michelle Salvas and Nathaniel Child
USING LEAF COMPOST IN HOME GARDENS	Dr. Abigail Maynard and Dr. David Hill

ENVIRONMENTALLY FRIENDLY CONTROL OF POWDERY MILDEW ON VEGETABLE PLANTS	Dr. Francis Ferrandino
TRAPPING SPOTTED WING DROSOPHILA FOR HOME FRUIT GROWERS	Dr. Richard Cowles, assisted by Elizabeth Young
COMMON INDOOR MOLDS	Dr. DeWei Li
EXPERIMENT STATION ASSOCIATES	Richard Bergmann
PUBLIC HEALTH AND ENTOMOLOGY: LYME DISEASE IN TICKS FROM CT CITIZENS	Dr. John Anderson, assisted by Bonnie Hamid, Elizabeth Alves, And Micaela Ferreira
SERUM ANTIBODIES TO *BORRELIA BURGDORFERI*, *ANAPLASMA PHAGOCYTOPHILUM*, AND *BABESIA MICROTI* IN RECAPTURED WHITE-FOOTED MICE	Dr. Scott Williams, assisted by Tia Blevins
THE DEER TICK, *IXODES SCAPULARIS*	Dr. Kirby Stafford, assisted by Heidi Stuber
INTEGRATED TICK MANAGEMENT	Dr. Kirby Stafford, Dr. Scott Williams, Dr. Goudarz Molaei, Dr. Laura Estep, assisted by Heidi Stuber, Megan Floyd, Benjamin DeMasi-Sumner, and Mark Morris
MOSQUITO TRAPPING AND TESTING PROGRAM FOR WEST NILE AND EASTERN EQUINE ENCEPHALITIS	Dr. Theodore Andreadis and Dr. Philip Armstrong, assisted by John Shepard, Michael Thomas, Angela Bransfield, Michael Misencik, Edward Calandrella, Joshua Dickman, Emilie Frank, Demerise Johnston, Michael Olsen, Tanya Petruff, Gerald Piscitelli, Shannon Thibodeau, Rebecca Wright, and Eric Zagorski
FIDDLEHEAD TRIALS	Dr. Abigail Maynard and Dr. David Hill
NATIVE WOODY SHRUBS	Dr. Jeffrey Ward, assisted by Joseph Barsky
BIRD AND BUTTERFLY GARDEN	Jane Canepa-Morrison and Jeffrey Fengler
DATING HERBACEOUS ROOTS	Dr. Jeffrey Ward

CHESTNUT SPECIES AND HYBRIDS	Dr. Sandra Anagnostakis, assisted by Pamela Sletten
HEALTHY PLANTS – HEALTHY BUSINESS: SUPPORT OF THE GREEN INDUSTRY BY INSPECTION	Tia Blevins, Mark Creighton, Jeffrey Fengler, Stephen Sandrey, Dr. Victoria Smith, and Peter Trenchard
SWEET CORN TRIALS	Dr. Abigail Maynard and Dr. David Hill
HOP DEMONSTRATION PROJECT	Victor Triolo
SOUND SCHOOL AGRICULTURAL SCIENCE PROGRAM	Chaz Mavrelion and students of the Sound School
PUMPKIN POLLINATION	Dr. Kimberly Stoner, assisted by Tracy Zarrillo, Morgan Lowry, Erica Carbone, Jessica Gambel, and Amelia Tatarian
HYBRID AND VINIFERA WINEGRAPE CULTIVAR TRIAL	Dr. Francis Ferrandino, assisted by Joan Bravo
ROCKY HILL AMERICAN CHESTNUT TREES	Dr. Sandra Anagnostakis, assisted by Pamela Sletten
PINOT GRIS CULTURAL TRIALS	Dr. Francis Ferrandino, assisted by Joan Bravo
ASIAN CHESTNUT GALL WASP ON CHESTNUT	Dr. Sandra Anagnostakis, assisted by Pamela Sletten
BEACH PLUM TRIALS	Dr. Abigail Maynard and Dr. David Hill
PAWPAW TRIALS	Dr. Abigail Maynard and Dr. David Hill
JAPANESE PLUM VARIETY TRIALS	Dr. Abigail Maynard and Dr. David Hill
HYBRID ELM TREES	Dr. Sandra Anagnostakis, assisted by Pamela Sletten
CONNECTICUT PROFESSIONAL TIMBER PRODUCERS ASSOCIATION	Joan Nichols
CONNECTICUT INVASIVE PLANT WORKING GROUP	Donna Ellis and Penni Sharp, Cochairs
CONNECTICUT DEPARTMENT OF LABOR/ CONN-OSHA	Catherine Zinsser

CONNECTICUT FARMLAND TRUST	Collette Roy
CONNECTICUT ENVIRONMENTAL COUNCIL	Erica Fern
THE CONNECTICUT DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION: DIVISION OF FORESTRY	Chris Donnelly
CONNECTICUT DEPARTMENT OF AGRICULTURE	Ronald Olsen
CONNECTICUT NORTHEAST ORGANIC FARMING ASSOCIATION	Deb Legge
USDA, ANIMAL AND PLANT HEALTH INSPECTION SERVICE, PLANT PROTECTION AND QUARANTINE	Kate Aitkenhead and Ken DiVito
USDA, FARM SERVICE AGENCY	Debbie Castle
USDA, NATURAL RESOURCES CONSERVATION SERVICE	Carol Donzella
CONNECTICUT TREE PROTECTIVE ASSOCIATION	Rita Smith
U.S. DEPARTMENT OF LABOR/OSHA	Leona May
UCONN MASTER GARDENER PROGRAM	Jude Hsiang
CONNECTICUT GREEN INDUSTRIES	Bob Heffernan, Executive Director
USDA NATIONAL AGRICULTURAL STATISTICS SERVICE	Gary Keough
THE SLEEPING GIANT PARK ASSOCIATION	Chuck Schall
buyCTgrown	Ashley Kremser

Lockwood Farm looked its best due to the hard work of Richard M. Cecarelli, Farm Manager, Rollin J. Hannan, Jr., and Michael M. McHill, who worked on the plots, grass, trimming and set up. The barns, buildings, and grounds were cleaned by the Maintenance crew – Bancroft Nicholson, Supervisor, Ronald A. LaFrazier, and Michael A. Scott, assisted by Brian Hart. They also made sure that all items needed at the farm were delivered. Tent setups were done by Vickie Bomba-Lewandoski, Tia M. Blevins, Steven J. Sandrey, Peter W. Trenchard, and Roberta M. Ottenbreit, also helped by the Maintenance crew. Students from the Sound School, under the direction of Chaz Mavrelion, helped set up the main tent by washing tables and chairs and putting them in place.

At 11:15 Vice-Director Kirby C. Stafford, III welcomed all to Plant Science Day 2013. He then introduced the Holmberg family members as the recipients of the 2013 Century Farm Award. The

Connecticut Agricultural Information Council gives out this award every year at Plant Science Day to farms who have been in family operation for more than 100 years.

Holmberg Orchards, located in Gales Ferry, Connecticut, was originally purchased in 1896 as a family farm by Adolph and Hulda Holmberg, who came to Connecticut from Sweden. Since that start, there have been four generations of Holmbergs, and each has made his or her own mark on the farm. Initially, the farm produced high quality vegetable crops. Second-generation sons Harold and Henry planted apple, peach, and pear trees starting in 1935, and also raised chickens as a source of income while the trees were maturing. Harold's son Richard and his wife Diane expanded the orchard into pick-your-own and retail enterprises, adding a bakery and greenhouse tomato production. The fourth generation on the farm, Amy and Russell, each added their own new direction – Amy further expanded the farm market, adding locally produced gourmet specialty foods. Russell planted wine grapes and produces hard cider, fruit wines, and wine. For over a century, comprising four generations, Holmberg Orchards has maintained an expanded upon a reputation for quality in fruits and vegetables and a commitment to excellence and dedication to their customers.

After the presentation of the Century Farm Award, Mr. Richard Bergman, President of the Experiment Station Associates, described the work done by the Associates and invited all interested parties to join the Association.

At 11:55 the Samuel W. Johnson Memorial Lecture was delivered by Captain Michael A. McLaughlin, Acting Director of Food and Feed Scientific Staff, USFDA. The title of his talk was "The Food Emergency Response Network: FERN 101 and The Connecticut Agricultural Experiment Station". After his talk, Captain McLaughlin was presented with a certificate naming him the 2013 Samuel W. Johnson Memorial Lecturer. The certificate was signed by Governor Dannel P. Malloy, President of the Board of Control of the Station, Terry Jones, Vice-President of the Board, and Vice Director Kirby C. Stafford, III.

Plant Science Day 2013 was a very successful day that was enjoyed by many due to the hard work of the entire Station staff.

EVENTS HELD AT THE STATION

Three Classes Sponsored by the Mosquito Testing Program

In collaboration with the Yale-Peabody Fellows SEPA NIH Program on Mosquito Biology, Dr. Philip Armstrong, John Shepard and Michael Thomas hosted two classes from Co-op Arts and Humanities High School in New Haven (November 13, January 28,) and a class from Park City Prep Charter School in Bridgeport (March 21). Students were provided overviews of West Nile Virus, Eastern Equine Encephalitis, and the Mosquito Trapping and Testing Program. Additionally, the students participated in hands-on activities in the Mosquito Research Laboratory which allowed them to observe many aspects of the biology of mosquitoes.

EVENTS HELD AT LOCKWOOD FARM

2013 Connecticut-FFA Forestry Career Development Event

On November 6th, Lockwood Farm was the site of the 2013 Connecticut-FFA Forestry Career Development Event. This marks the 2nd year the event has been hosted by the Department of Forestry and Horticulture at Lockwood Farm. The Forestry Career Development Event evaluates students' knowledge of forest management practices, tree and wood products identification, forest mensuration, map reading skills and industry safety standards.

Thirty five students from 9 State FFA Chapters participated in this year's event. The students took a 50 question exam, testing their general knowledge of forestry and the forest. They then had to identify 25 pieces of forestry related tools and equipment, followed by a 20 specimen tree identification exam and finally a timber cruising practicum. The students were then allowed to participate in two team events; a map interpretation practicum and a chainsaw parts and troubleshooting practicum. The 4-student team from EO Smith High School Agriculture Education Program finished in first place and will represent the State of Connecticut in regional and national competitions at the 2014 Eastern States Exposition and National FFA Convention in Louisville, KY.

Dr. Scott Williams, Michael Short, J. P. Barsky, and Megan Floyd, all in the Department of Forestry & Horticulture, organized and oversaw the event. Former Station staff members Geoffrey Picard, Emily Picard, Vikki Christian and Lauren Bespuda were on hand as teachers. Richard Cecarelli, Research Farm Manager, opened the farm to the group.

EVENTS HELD AT THE VALLEY LABORATORY

Christmas Tree Twilight Meeting

The annual Christmas Tree Twilight Meeting was held at the Valley Laboratory on the evening of July 23, 2013 in cooperation with the Connecticut Christmas Tree Growers Association. Forty-five growers attended the meeting which featured CAES scientists presenting talks and answering questions at Christmas tree plantings on the farm. Speakers and topics were the following: Dr. Sharon Douglas, "Christmas tree diseases 2013"; Dr. Richard Cowles, "Genetic improvement of true firs"; Dr. Todd Mervosh, "Weed control options in the summer"; and Thomas Rathier, "Impact of weather extremes on conifers". Dr. Mervosh also presented tributes in memory of Dr. John Ahrens and Dr. Louis Magnarelli. Growers having pesticide applicator licenses received 2 hours of re-certification credits for attending this meeting. Jim Preste helped with preparations for the meeting.

Nursery and Landscape Research Tour

A Nursery and Landscape Research Tour was held on September 10, 2013 at the CAES Valley Laboratory in Windsor. After welcoming remarks from Dr. James LaMondia and Dr. Todd Mervosh, the following talks were presented outdoors: "Boxwood blight: research and management options" by Dr. LaMondia, "Water use: best management practices" by Thomas Rathier, and "Spread and containment of running bamboo" by Dr. Jeffrey Ward. After Dr. Mervosh presented tributes to Dr. Louis Magnarelli and Dr. John Ahrens, the following talks were presented in the Gordon S. Taylor Conference Room: "New weeds and herbicide issues" by Dr. Mervosh, "Disease update for 2013" by Dr. Yonghao Li, "Regulatory status of boxwood blight" by Dr. Victoria Smith, "Insect update for 2013" by Rose Hiskes, "Emerald ash borer (EAB) biology, distribution, biocontrol" by Dr. Claire Rutledge, and "Protecting ash trees from EAB" and "Management of armored scales" by Dr. Richard Cowles. Twenty-eight nurserymen and landscapers attended the meeting, and the total attendance, including CAES personnel, was 45 people. James Preste, Valley Laboratory's farm manager, prepared the grounds and conference room for this meeting.

Tobacco Research Meetings Held at the Valley Laboratory

On February 18, 2014, despite seven inches of snow throughout the day, 100 people attended morning or afternoon sessions of the Connecticut Agricultural Experiment Station's annual Tobacco Research Meeting held at the Valley Laboratory in the Gordon Taylor Conference Room. Dr. James LaMondia and Director Theodore Andreadis welcomed growers and spoke about research topics and recent developments at the Station. The meeting addressed a wide variety of issues of concern to growers. Dr. LaMondia spoke about the CORESTA pesticide residue program and strategies to reduce pesticide residues in wrapper leaves and research on management of tobacco pathogens including poty viruses, black shank, target spot and blue mold fungicide resistance. Thomas Rathier spoke about soils and nutrient losses in tobacco. Dr. LaMondia spoke about Connecticut grown labeling and CT DoAg Venture grant opportunities. Gary Keough of the New England Agricultural Statistics Service provided updates on the CT Valley tobacco crop statistics. Ross Eddy of the Farm Services Administration provided updates on FSA services to growers. Jane Canepa-Morrison, Michelle Salvas, Nathaniel Child and James Preste assisted with much of the behind the scenes work for the meeting. The meeting qualified for pesticide applicators re-certification credit in Connecticut and Massachusetts and 53 persons received credit.

DONATIONS MADE TO THE COMMUNITY

Lockwood Farm

A total of 28,854 pounds of fresh produce, including cantelope, cucumbers, eggplant, grapes, peppers, pumpkins, sweet corn, tomatoes, summer squash and winter squash grown at Lockwood Farm were donated to the Albert J. Solnit Center (Riverview Hospital), Brooksvale Park in Hamden; the Connecticut Foodbank in East Haven, Cub Scouts Pack 472 in North Guilford, and Waverly House in New Haven. Farm Manager Richard Cecarelli arranged for the distribution of the produce.

Valley Laboratory

A total of 7,523 pounds of fresh produce, including bok choi/Chinese cabbage, tomatoes, squash,

muskmelon, pumpkins, and watermelon grown at the Valley Laboratory were donated to Foodshare of Hartford. Mr. Preste, Drs. Abigail Maynard, David Hill, and James LaMondia generated the fresh produce, and James Preste and Dr. LaMondia organized the distribution effort. The Valley Laboratory also loaned irrigation equipment to the Connecticut Epilepsy Foundation in support of their Mud Volleyball Tournament Fundraiser. Mr. Preste coordinated the distribution of the irrigation equipment.

AWARDS GIVEN TO STATION STAFF IN 2012-2013

On September 22, 2013, Richard M. Cecarelli, Lockwood Farm Manager, received a Hunger Action Hero Award from the Connecticut Food Bank. The award read "Each growing season Lockwood Farm, located at the Connecticut Agricultural Experiment Station in Hamden, donates its entire harvest to Connecticut Food Bank. Donating everything from acorn squash to zucchini, more than 102,000 pounds of fresh fruits and vegetables have made it to the dinner plates of low-income Connecticut families over the last 10 years. It is through generous donors like Lockwood Farm that Connecticut Food Bank is able to increase the distribution of fresh produce which is often too expensive and is most lacking from the diets of people who struggle with hunger. We are grateful for our partnership with Lockwood Farm and value the dedication and generosity of its Farm Manager, Rich Cecarelli."

On February 18, 2014, Dr. Theodore G. Andreadis and Dr. Joseph J. Pignatello were elected to the Connecticut Academy of Science and Engineering

On May 21, 2014, Dr. Sandra L. Anagnostakis received the Garden Club of America Zone II "Horticultural Commendation" for her career of work with chestnut trees.

SCIENTIFIC OFFICERSHIPS AND MEMBERSHIPS ON STATE, NATIONAL, OR REGIONAL COMMITTEES

DEPARTMENT OF ANALYTICAL CHEMISTRY

DR. JASON C. WHITE

- President, International Phytotechnology Society
- Managing Editor, *International Journal of Phytoremediation*
- Editorial Board, *Environmental Pollution*
- Editorial Advisory Board, *Environmental Science & Technology*
- Editorial Advisory Board, *Environmental Science & Technology Letters*
- Science Advisory Board, Annual International Conference on Soils, Sediments, Water, and Energy, University of Massachusetts Amherst
- Advisor, Nanotechnology Advisory Group, Society of Environmental Toxicology and Chemistry (SETAC)
- Member, USDA "Nanotechnology Risk Assessment" Multistate Research Coordinating Committee
- Member, Representative, Association of Public Health Laboratories (APHL)
- Member, CT DEEP Lobster Pesticide Study 2014 Steering Committee
- Member, Sustainable Nanotechnology Organization

DR. BRIAN EITZER

- Member, Conservation Commission for the Town of Bethany
- Judge, Connecticut Science Fair held at Quinnipiac University
- Member, Organizing Committee for the North American Chemical Residue Workshop (Conference Co-chair for the 2016 meeting)
- Member, Sigma Xi

DR. WALTER KROL

- Member, CT DEEP Lobster Pesticide Study 2014 Steering Committee

DR. CHRISTINA ROBB

- Board Member, Eastern Analytical Symposium
- Member Associate, Association of Public Health Laboratories (APHL)

DEPARTMENT OF BIOCHEMISTRY AND GENETICS

DR. NEIL MCHALE

- Chairman, Institutional Biosafety Committee

DR. DOUG DINGMAN

- Member, Sigma Xi Programs Committee (Quinnipiac Chapter)
- Member, International Bee Research Association
- Member, Connecticut Beekeepers Association
- Member, CAES Institutional Biosafety Committee
- Alternate Responsible Official for Select Agents (CAES)

DR. RICHARD PETERSON
- Vice President and voting delegate, Quinnipiac Chapter Sigma Xi
- Radiation Safety Officer
- Member, Editorial Board, ISRN Botany journal

DR. NEIL SCHULTES
- Member, Steering Committee Yale University Bioethics Section, Institute for Social and Policy Studies
- Member, Masters Research Committee, University of Indiana/Purdue
- Fellow, Linnaean Society of London
- Member, CAES Institutional Biosafety Committee
- Member, CAES Institutional Animal Care and Use Committee
- Member, CAES Health and Safety Committee
- Member, Sigma Xi Executive Committee
- Member, Thesis Advisory and Defense Committee, Indiana – Purdue Ft. Wayne University Department of Biology

DEPARTMENT OF ENTOMOLOGY

DR. KIRBY C. STAFFORD III
- Member, Board, Connecticut Coalition Against Bed Bugs
- Member, U.S. EPA Network for Lyme Disease Prevention
- Member, Tick IPM Working Group

DR. JOHN F. ANDERSON
- Member, Selection Committee, Connecticut Century Farm Award
- Member, Nominating Committee, Connecticut Academy of Science and Engineering

DR. LAURA ESTEP HAYES
- Member, Tick IPM Working Group

DR. CHRIS T. MAIER
- Curatorial Affiliate in Entomology, Peabody Museum of Natural History, Yale University
- Member, Advisory Committee, Cooperative Agricultural Pest Survey, USDA
- Member, Connecticut Endangered Species Committee, Invertebrate Subcommittee
- Member, Program Committee, Connecticut Pomological Society
- Research Associate, Division of Plant Industry, Florida Department of Agriculture and Consumer Services
- Research Associate, Mohonk Preserve, New Paltz, New York

DR. GALE E. RIDGE
- Chair, The Connecticut Coalition Against Bed Bugs
- Member, Rapid Response Research Activity Working Group for Bed Bugs (Series 500)
- Member, EPA FIFRA Scientific Advisory Panel

DR. VICTORIA SMITH
- Member and Past President, Eastern Plant Board
- Member, National Plant Board Systems Approach to Nursery Certification Committee
- Member, New England Wildflower Society, Connecticut Task Force
- New Pest Advisory Group, Eastern Plant Board Liaison
- Member, Northeast Area Association of State Foresters Firewood Working Group
- Member, USDA-APHIS-PPQ Early Detection-Rapid Response Committee
- Authorized Certifying Official; certificate number 20080160

DR. KIMBERLY STONER
- Member, Multi-State Research Project NC1173 – Sustainable Solutions to Problems Affecting Bee Health
- Member, Working Party on Urban Agriculture, New Haven Food Policy Council

TIA M. BLEVINS
- Treasurer, Horticultural Inspection Society, Eastern Chapter

DEPARTMENT OF ENVIRONMENTAL SCIENCES

DR. THEODORE G. ANDREADIS
- Adjunct Professor, Department of Pathobiology, University of Connecticut
- Administrative Advisor, Multi-State Research Project NE-1043: Biology, Ecology & Management of Emerging Disease Vectors
- Council Member for Agriculture, Connecticut Academy of Science and Engineering
- Member, Connecticut Invasive Plant Council
- Member, Peabody Fellows Biodiversity and Human Health Program, Yale University
- Member, State of Connecticut Mosquito Management Program
- Subject Editor, *Journal of Medical Entomology*
- Visiting Research Scientist, Epidemiology of Microbial Disease Division, Yale University School of Public Health

DR. JOSEPH J. PIGNATELLO
- Associate Editor, *Journal of Environmental Quality*
- Editorial Board, *Environmental Engineering Science*
- Chair, USDA-NIFA Multistate Research Project W-2082
- Member, International Biochar Initiative Advisory Committee
- Member, Scientific Advisory Board, International Humic Substances Society 17th International Conference.
- Reviewer, Food and Agriculture In-Briefs, Connecticut Academy of Science and Engineering

DR. PHILIP ARMSTRONG
- Visiting Research Scientist in Epidemiology of Microbial Disease Division, Yale School of Public Health
- Member, Multi-State Research Project NE-1042: Biology, Ecology, and Management of Emerging Disease Vectors
- Councilor, Executive Council of the American Committee on Medical Entomology

DR. GOUDARZ MOLAEI
- Member, Northeastern Multistate Research Project on Biology, Ecology & Management of Emerging Disease Vectors
- External Advisor, MPH student, Downs Fellowship project, Yale School of Public Health.

DR. CHARLES R. VOSSBRINCK
- Visiting Assistant Professor, Department of Pathology, Albert Einstein College of Medicine, Yeshiva University.
- Member, Multi-State Research Project NE-1043: Biology, Ecology & Management of Emerging Disease Vectors.

GREGORY J. BUGBEE
- Member, PA 12-155 State of Connecticut Nonpoint Source Phosphorus Workgroup
- Member, Government Affairs Committee, New England Aquatic Plant Management Society
- Editor, *Journal of Aquatic Plant Management*
- Editor, *Lake and Reservoir Management*
- Director, Clear Lake Improvement Association

JOHN SHEPARD
- Board of Directors, Northeastern Mosquito Control Association

MICHAEL THOMAS
- Member, CT Taxonomic Advisory Committee for Rare and Endangered Insects
- Committee Member, CT Comprehensive Wildlife Conservation Action Plan

DEPARTMENT OF FORESTRY AND HORTICULTURE

DR. JEFFREY S. WARD
- Secretary, Connecticut Tree Protection Examination Board
- Executive Board Member, Connecticut Urban Forest Council
- Chair, New England Society of American Foresters Silviculture Working Group
- Member, Audubon Connecticut Science Committee
- Member, USDA Natural Resources Conservation Service Wildlife Subcommittee
- Member, Governor's Council for Agricultural Development, Research Subcommittee
- Member, Connecticut Forest Stewardship Committee
- Member, Endangered Species Taxonomic Advisory Committee for Plants
- Ex-Officio Member, Goodwin Scholarship Committee
- Reviewer, Northern Journal of Applied Forestry, Ecological Applications, Invasive Plant Science and Management, Human-Wildlife Interactions

DR. MARTIN .P.N. GENT
- Official representative, NE1035 Regional Research Committee
- Associate Editor, Journal of Plant Nutrition
- Reviewer for 25 manuscripts in 6 different Scientific Journals

DR. ABIGAIL A. MAYNARD
- Ex-Officio Member, Connecticut Council on Soil and Water Conservation

- Member, State Technical Committee
- Editorial Board, Compost Science & Utilization

DR. SCOTT C. WILLIAMS
- Adjunct Professor, Department of Natural Resources and the Environment, University of Connecticut, Storrs
- Adjunct Professor, Department of Biology and Environmental Science, University of New Haven
- Executive Treasurer, Connecticut Urban Forest Council
- Executive Treasurer, Wildlife Society, Northeast Chapter
- Certified Wildlife Biologist, The Wildlife Society
- Commissioner, The Connecticut Agricultural Experiment Station Institutional Animal Care and Use Committee
- Scientific Advisor, Fairfield County Municipal Deer Management Alliance
- Wildlife Management Advisor, Northeast Organic Farming Association
- Chair, Town of Guilford Inland Wetlands Commission
- Commissioner, Town of Guilford Land Acquisition Commission
- Graduate Advisor, Acima Cherian, University of Connecticut, Storrs
- Graduate Advisor, Megan Floyd, University of Connecticut, Storrs

J.P. BARSKY
- Member, Consulting Committee, Vernon E. Cleaves Agricultural Science and Technology Programs
- Member, Governor's Advisory State Counseling Committee for Vocational Agriculture

DEPARTMENT OF PLANT PATHOLOGY AND ECOLOGY

DR. SHARON M. DOUGLAS
- Member, Local Arrangements Committee (2013), Northeastern Division of American Phytopathological Society
- Member, USDA-APHIS-PPQ Cooperative Agricultural Pest Survey Committee (CAPS) for Connecticut
- Member, Institutional Biosafety Committee, The Connecticut Agricultural Experiment Station
- Member, Board of Directors, Connecticut Tree Protective Association
- Chair, Education Committee, Connecticut Tree Protective Association

DR. SANDRA L. ANAGNOSTAKIS
- Park Naturalist and Board Member, Sleeping Giant Park Association
- International Registrar for Cultivars of *Castanea*, International Society for Horticultural Science
- Member, Board of Directors, The Northern Nut Growers Association, Inc.

DR. WADE H. ELMER
- Senior Editor *Phytopathology*
- Associate Editor *Crop Protection*
- Senior Guest Editor for *Crop Protection's* special issue on Management of Fusarium Diseases
- Member, Widely Prevalent Fungi List Committee, American Phytopathological Society
- Member, Connecticut State Consulting Committee for Agricultural Science and Technology
- Member, Northeast Research, Extension and Academic Programs Committee for IPM
- Member, Program Committee, Connecticut Greenhouse Growers Association

DR. FRANCIS J. FERRANDINO
- Member, CT Wine Council
- Vice-President, Northeastern Division of the American Phytopathological Society

DR. ROBERT E. MARRA
- Chair, Local Arrangements Committee (2013), Northeastern Division of American Phytopathological Society
- Book Review Editor, Mycological Society of America
- Member, Phytopathology Committee, Mycological Society of America
- Member, USDA-APHIS-PPQ Cooperative Agricultural Pest Survey Committee (CAPS) for Connecticut

VALLEY LABORATORY

DR. JAMES A. LAMONDIA
- Chair, Northeast Regional Project NE-1040, "Plant-parasitic Nematode Management as a Component of Sustainable Soil Health Programs in Horticultural and Field Crop Production Systems"
- Senior Editor, *Journal of Nematology*
- Member, Society of Nematologists Extension and Ecology Committees
- Member, Connecticut Agricultural Information Council
- Member, Ex-Officio Member, Connecticut Tree Protection Examining Board
- Member, North American Blue Mold Forecast Center State Coordinator
- Member, CT Vegetable & Small Fruit Growers' Conference Steering Committee

DR. CAROLE CHEAH
- Fellow, Cambridge Philosophical Society, UK

DR. DEWEI LI
- Member, Environmental Microbiology Proficiency Analytical Testing task force of American Industry Hygiene Association.
- Editor of "Biology of Microfungi" for Springer
- Member, Editorial Board of *Aerobiologia*
- Member, Editorial Board of *Fungal Biology and Biotechnology*

DR. TODD L. MERVOSH
- Public Relations Representative and Student Research Poster Judge, Northeastern Weed Science Society
- Member, Weed Alert Committee, Weed Science Society of America
- State Liaison for Connecticut, IR-4 Program for Specialty Crops
- Member, Steering Committee & Symposium Planning Committee, Chair of Stewardship Committee, Connecticut Invasive Plant Working Group
- Member, Scholarship Committee, Connecticut Nurserymen's Foundation

THOMAS M. RATHIER
- Vice President, Member of the Program, Tree Improvement and Merit Award Committees, The Connecticut Christmas Tree Growers Association
- Member, Steering Committee, Connecticut Invasive Plant Working Group

- Member, Cooperative Agricultural Pest Survey
- Member, Water Use and Conservation Committee, Connecticut Nursery and Landscape Association

LECTURES, SEMINARS AND INTERVIEWS

During the year, staff members present formal lectures and seminars to organized groups outside The Station. They also describe their research to organized groups visiting The Station. Occasionally they report their research to elected officials. At still other times, newspapers, radio and television reporters interview our staff. These occasions are listed below.

ALVES, ELIZABETH E.

- Gave the presentation "Tick Identification: Common Hard-Bodied Ticks of Connecticut" and provided an opportunity to e xamine ticks by microscope to three technicians from the Stamford Health Department that she hosted at the Station *February 6, 2014*
- Explained the basics of tick identification to Linda Kapitan of Stamford Hospital *May 2*

ANAGNOSTAKIS, SANDRA L.

- With Mary Inman, answered general gardening questions and one question about chestnut trees, and discussed Plant Science Day on "Garden Talk" with Len and Scott on WTIC Radio *July 27, 2013*
- Gave a report on Experiment Station chestnut research at the annual meeting of the northern Nut Growers Association in East Lansing, MI *August 10-14*
- Reported on CAES chestnut research at the annual meeting of the Northeast Regional Project on chestnuts (NE-TEMP-2010) held in Berea, KY *September 5-8*
- Participated in the board meeting at the Greentree Foundation (Manhasset, Long island, NY) by updating them on the status of their Chestnut arboretum – the first in the country. They are supporting CAES research with occasional financial donations, and space for experiments on 500 acres where there are no deer. The Arboretum at Greentree will have all of the species of chestnut planted along a handicapped-accessible path across from the building where the UN holds special meetings. The trees are well labeled, and visitors who come for the UN meetings will be able to go for a short walk and see chestnut trees from their homelands, and compare them with other species. An informative sign at the beginning of the path says that this was established with trees and help from CAES *September 28*
- Gave the talk "The History of Chestnut Work at The Connecticut Agricultural Experiment Station" at the 30th Annual Meeting of The American Chestnut Foundation held in Herndon, VA *October 19*
- Gave the talk "Old Chestnut Trees in England" to the New Haven Garden Club in New Haven (40 attendees) *November 4*
- Served as a judge for the Edible Nut Division at the Pennsylvania Farm Show in Harrisburg, PA *January 2-4, 2014*
- Gave the talk "Chestnut Gall Wasp" at the annual Forest Health Monitoring Workshop held at Fort Trumbull State Park in New London (60 attendees) *March 4*
- Gave the talk "Gall Wasp on Species and Hybrid Chestnuts in Connecticut" at the Chestnut Growers of America meeting in Gibsonville, NC (50 attendees) *June 20-22*
- Gave the talk "Timber Chestnuts for Connecticut" at Whitney Center, Hamden (20 attendees) *June 23*

ANDREADIS, THEODORE G.

- Was interviewed about the impact of the heavy rainfall events on mosquito populations, West Nile virus and Eastern Equine Encephalitis by Cynthia Druman of the Westerly Sun *July 7*
- Was interviewed about the impact of the heavy rainfall events on mosquito populations, West Nile virus and Eastern Equine Encephalitis by Diane Orsan of National Public Radio *July 8*
- Was interviewed about the Mosquito Trapping and Testing Program by Judy Benson of The Day *July 8*

- Was interviewed about the impact of the heavy rainfall events on mosquito populations, West Nile virus and Eastern Equine Encephalitis by Bob Miller of the Danbury News Times *July 8*
- Presented the lecture "Impact of Global Climate Change on Mosquito-Borne Diseases to a group of Connecticut high school science teachers as part of the NIH SEPA Peabody Fellows Program at Yale University *July 10*
- Was interviewed about the first detection of West Nile Virus in mosquitoes this season in Norwalk by Steve Coulter of the Ridgefield Press *July 11*
- Was interviewed about the detection of West Nile virus in mosquitoes in Norwalk and the impact of rainfall on mosquitoes by Marc Sims of Connecticut Public Radio *July 12*
- Was interviewed about Dr. Louis Magnarelli by Amanda Cuda of the Connecticut Post *July 15*
- Was interviewed about Dr. Louis Magnarelli by William Weir of the Hartford Courant *July 15*
- Was interviewed about West Nile virus activity this summer by Angela Carrila of the Stamford Advocate *July 15*
- Was interviewed about the state mosquito and trapping program, West Nile virus and Eastern Equine Encephalitis by Kate Rayner of WFSB TV 3 *July 16*
- Was interviewed about Dr. Louis Magnarelli by Ed Stannard of the New Haven Register *July 16*
- Was interviewed about the detection of Eastern Equine Encephalitis from mosquitoes in Voluntown by WTIC Radio *July 16*
- Was interviewed about mosquitoes, West Nile virus and Eastern Equine Encephalitis virus by Kelly Glista of the Hartford Courant *July 16*
- Was interviewed about the detection of Eastern Equine Encephalitis from mosquitoes in Voluntown by Brian Blessing of the Norwich Bulletin *July 16*
- Was interviewed about the 2013 mosquito season and the early detection of Eastern Equine Encephalitis and West Nile virus in mosquitoes by Jocelyn Maminta of WTNH TV8 *July 30*
- Participated in a special teleconference call on the current status of mosquitoes and mosquito-borne illness in Connecticut with Dr. Jewel Mullen, Commissioner of the Connecticut Department of Public Health, Daniel C. Esty, Commissioner of the Connecticut Department of Energy and Environmental Protection, and local state health directors *July 31*
- Was interviewed about the detection of Eastern Equine Encephalitis virus in Plainfield by Denise Coffey, Staff Writer Reminder News *August 1*
- Was interviewed for a feature story on the Station's Mosquito and Arbovirus Surveillance and Research Programs by William Weir of the Hartford Courant *August 1*
- Was interviewed about the detection of West Nile virus in Mosquitoes from twelve towns in Connecticut by Jeff Valin, WTNH TV8 New Haven *August 7*
- Was interviewed about West Nile virus and Eastern Equine Encephalitis on the Mary Jones Show, WDRC AM Radio *August 8*
- Was interviewed about the current status of West Nile virus and Eastern Equine Encephalitis virus in Connecticut this summer by Jan Speigel of the Connecticut Mirror *August 15*
- Was interviewed about the current status of West Nile virus and Eastern Equine Encephalitis virus in Connecticut by Marc Sims of Connecticut Public Radio *August 20*
- Met with State Representative Patricia Dillon, Robert Klee, DEEP Chief of Staff and New Haven Community Organizer Stacy Spell to discuss the implementation of community mosquito and West Nile virus workshops *August 20*
- Was interviewed about the application of insecticides to kill mosquitoes infected with Eastern Equine Encephalitis in the Pachaug State Forest in Voluntown by Janice Steinhagen, Reminder News and Ken Market of WTNH TV8 *August 27*
- Was interviewed about the closing of the campgrounds for the application of insecticides to kill mosquitoes infected with Eastern Equine Encephalitis in the Pachaug State Forest in Voluntown by William Weir of the Hartford Courant *August 28*

- Was interviewed about the first human case of West Nile virus in Stratford, CT for the 2013 season by Amanda Cuda of the Connecticut Post *August 28*
- Was interviewed about the first human case of West Nile virus in Stratford, CT for the 2013 season by Fran Schneidau of CBS Radio *August 28*
- Was interviewed about the first human case of West Nile virus in Stratford, CT for the 2013 season by Sameea Kamal of the Hartford Courant *August 28*
- Was interviewed about the first human case of West Nile virus in Stratford, CT for the 2013 season by Steven Singer of the Associated Press *August 28*
- Was interviewed about the current status of eastern equine encephalitis and West Nile virus in Connecticut by Amanda Cuda, Connecticut Post *September 6*
- Was interviewed about the possible impact of climate change on the resurgence and expansion of eastern equine encephalitis virus in the northeastern US by Henry Gass, ClimateWire, an environmental newswire in Washington, D.C. *September 24*
- Participated in the Invasive Plant Council meeting held at the Department of Agriculture in Hartford *October 29*
- Presented an invited seminar entitled "West Nile Virus: The Emergence and Spread of an Exotic Mosquito-Borne Disease in the Western Hemisphere, at the New Haven County Cooperative Extension Center in Hamden (12 attendees) *October 30*
- Participated in the 62nd Annual Meeting of the American Society of Tropical Medicine and Hygiene held in Washington, DC and presented a poster display entitled "Eastern Equine Encephalitis Virus: Reemergence and Expansion in the Northeastern United States" *November 12-15*
- Met with US Representatives Rosa DeLauro and Joe Courtney and legislative aides from US Senators Richard Blumenthal and Chris Murphy, Representatives Elizabeth Esty, Jim Hines and John Larson in Washington, DC and presented an overview of current research activities at the Experiment Station *November 14, 15*
- Gave an update on Station activities and presented the talk "West Nile Virus: The Emergence and Spread of an Exotic Mosquito-Borne Disease in the Western Hemisphere" at the annual meeting of the Connecticut Environmental Council in Southington (200 attendees) *November 26*
- Participated in an Invasive Council Meeting in Hartford *December 10*
- Met with Federated Garden Club Board officers and was presented with a donation to the Experiment Station *December 11*
- Participated in a Connecticut Wine Council Meeting in Hartford *December 12*
- Participated in the USDA Aphis Cooperative Agricultural Pest Survey Program state meeting held in Wallingford *December 13*
- Was interviewed about testing of medical marijuana by Greg Hladky of the Hartford Advocate *January 7, 2014*
- Participated in a meeting of the Board of the Experiment Station Associates held at the Station *January 7*
- Was interviewed about the potential impact of this winter's extreme cold temperatures on a variety of insect pests by Jane Speigel of the Connecticut Mirror *January 8*
- With Dr. Jason White, attended a regular meeting of the State Commission on Human Rights and Opportunities held in Hartford, where the Station's Affirmative Action Plan was approved *January 14*
- Presided over a quarterly meeting of the Station's Board of Control held in Hartford *January 15*
- Presented an update on building and research activities at the Annual Meeting of the Connecticut Tree Protective Association held in Southington *January 16*
- Was interviewed about current and future Station research initiatives on global climate change and agriculture, the environment and public health by Eric Ellman, Communications Director, Yale Climate and Energy Institute *January 22*

- With Dr. Jason White attended a meeting with Dr. Gregory Weidman, Dr. Cameron Faustman, and Dr. Michael O'Neil of the University of Connecticut's College of Agriculture and Natural Resources to discuss the 2015 Plan of Work *January 23*
- Discussed upcoming issues in the 2014 Legislative Session with representatives from the Connecticut Farm Bureau and Connecticut's Nursery and Landscape Industry *January 24*
- Participated in a meeting of the Governor's Council for Agricultural Development held in Hartford *January 29*
- Presented an update on Station activities at a "Meet and Greet" meeting of the New Haven Farm Bureau held in Wallingford (15 attendees) *February 4*
- Discussed research on chemical bed bug attractants and repellents with representatives from Bedoukian Research *February 6*
- Presented an update on Station activities at the annual meeting of the Tobacco Growers held at the Valley Laboratory in Windsor (100 attendees) *February 18*
- Hosted Department of Agriculture Commissioner Stephen Reviczky and Board of Control Vice President Terry Jones and gave a tour of Station facilities and discussed research and regulatory activities *February 19*
- Met with representatives from the Frank Netter School of Medicine at Quinnipiac College to discuss their capstone student internship/mentor program *February 24*
- Participated in a meeting of the Northeast Regional Association of Experiment Station Directors held in Baltimore, MD *March 10-12*
- Gave a tour of CAES facilities and reviewed current research programs for Mathew LaBeau, Research Aide and Outreach Organizer to Senator Richard Blumenthal *March 18*
- Presented an update on Station activities at the annual meeting of State Tree Wardens held in Glastonbury *March 20*
- Organized and presided over a speaker program for the annual meeting of the Experiment Station Associates held in Hamden (40 attendees) *March 26*
- Gave a tour of laboratories at the Station to members of the "Food Corps" (10 attendees) *April 9*
- Presented an invited seminar entitled "Global Climate Change and Mosquito-Borne Diseases" to clinical fellows from the Yale Occupational and Environmental Medicine Program at Yale University (15 attendees) *May 6*
- Was interviewed about West Nile virus, Eastern Equine Encephalitis and the Mosquito and Arbovirus surveillance Program by Lauren Victory, Fox 61 News *June 3*
- Was interviewed about the first human case of Eastern Equine Encephalitis in Connecticut by John Charlton, Fox 61 News *June 12*
- Was interviewed about the outbreak of Chickungunya virus in the Caribbean and prospects for introduction into Connecticut by Amanda Raus, NBC 30 *June 17*
- Was interviewed about the outbreak of Chickungunya virus in the Caribbean and prospects for introduction into Connecticut by John Charlton, Fox 61 News *June 17*
- Was interviewed about the outbreak of Chickungunya virus in the Caribbean and prospects for introduction into Connecticut by Amanda Cuda, Connecticut Post *June 23*
- Presented welcoming remarks about the history and current research activities of the Station to a group of students and teachers from Southern and Central Connecticut State Universities *June 25*

ARMSTRONG, PHILIP M.

- Was interviewed about the abundant mosquito populations in Connecticut by the New London Day *July 1, 2013*
- Was interviewed about the abundant mosquito populations in Connecticut by the Hartford Currant *July 1*
- Was interviewed about the record high number of mosquitoes trapped in 2013 by Fox News *July 2*

- Was interviewed about increases in mosquitoes collected during the statewide trapping program by WCBS Radio *July 3*
- Was interviewed about increases in mosquitoes collected during the statewide trapping program by WTIC Radio *July 3*
- Presented the talk "A New Insect-Specific Flavivirus Infecting *Culiseta melanura* mosquitoes" at the Annual Meeting of the American Society of Tropical Medicine and Hygiene in Washington, DC *November 15*
- With Michael Thomas, gave a presentation to a group of high school students from the Norwich Free Academy about the Mosquito Surveillance Program *December 11*
- Spoke to a group of students from Co-op Arts and Humanities High School in New Haven about the mosquito surveillance program, as part of the Yale-Peabody Fellows SEPA NIH Program on Mosquito Biology (15 students, one teacher) *January 28, 2014*
- Gave a lecture on arthropod-borne viral diseases as a part of the Principles of Infectious Diseases Course at the Yale School of Public Health (26 attendees) *February 6*
- Was interviewed on mosquitoes and mosquito-borne illnesses for WIHS, Healthline Radio Show *March 11*
- Spoke on the CAES's mosquito surveillance Program to a group of students from Park City Prep Charter School, Bridgeport as part of the Yale-Peabody Fellows SEPA NIH Program on mosquito biology (24 participants) *March 12*
- Spoke about the history and impact of West Nile virus in Connecticut to the Granby Land Trust in East Granby *March 18*
- Gave a radio interview on mosquitoes and mosquito-borne illnesses on WTIC, West Hartford *May 14*
- Was interviewed about mosquitoes and mosquito-borne diseases for the CT Radio Works Program *June 2 and June 5*
- Was interviewed by the Danbury News Times about the introduction of the Asian Tiger Mosquito in Connecticut *June 10*
- Spoke to Southern Connecticut State University and Central Connecticut State University students about the statewide mosquito trapping and testing program (40 attendees) *June 25*

ARSENAULT, TERRI
- Participated in the annual FDA FERN cCAP Technical Meeting, St. Paul, MN *September 17-19, 2013*
- Was an instructor for the FDA LB508 FERN training class entitled "Drug and Poisons Screen Using Acidic and Basic Extraction with Gas Chromatography and Mass Selective Detection" in Richmond, VA (10 attendees) *October 28-31*
- Was an Instructor for LB508 FDA/Food Emergency Response Network course entitled "Drug and Poison Screen Using Acidic and Basic with GC/MS" in Shoreline, WA (8 attendees) *April 22-24*

AYLOR, DONALD E.
- Participated as a judge for the Finalist High School Physical Sciences Projects at the Connecticut Science Fair held at Quinnipiac University (20 students, 10 adults) *March 13, 2014*

BARSKY, JOSEPH P.
- Participated in a "Foresters are for the Birds" planning session with staff from the Audubon, CT, CT-DEEP, USDA-FS, and Audubon, VT in the State Board Room *July 29, 2013*
- Participated in a planning meeting for Project StormWise at the UCONN Cooperative Extension Center in East Haddam *September 3*
- Met with James Fisher and Lucas Hyder of the White Memorial Foundation to discuss invasive species control methods *September 6*

- Co-organized and led a workshop entitled “ABC’s of Tree ID” to area high school students and teachers at Connecticut Forest and Park Association, Middlefield (10 students and 3 teacher participants) *September 21*
- Participated in a “Foresters are for the Birds” training workshop at the University of New Hampshire in Durham, NH *September 27*
- Staffed a CAES display of current research programs at the Brooksvale Fall Festival, Hamden (1,000 attendees) *September 28*
- Met with officials of the Guilford Conservation Land Trust to assess native habitat restoration efforts and invasive plant species control measures *October 25*
- Discussed roadside forest management with an official from Northeast Utilities and employees of Lewis Tree Company in Litchfield (9 attendees) *December 20*
- Provided an overview of the Roadside Forest Management Research Project to participants in the Department of Energy and Environmental Protection Chainsaw Certification Course in Portland (24 participants) *January 6, 2014*
- Participated in the annual meeting of the Connecticut Tree Protective Association in Southington *January 16*
- Lead a presentation on tree identification during a nature workshop for children at Great Mountain Forest in Norfolk (8 attendees) *January 25*
- Participated in the Annual Winter Meeting of the Connecticut Chapter, Society of American Foresters in Middlefield *February 25*
- Presented a research poster and abstract “Integrating Forest and roadside Management Objectives to Create Storm Resilient Forests” at the 94th Annual Winter Meeting of the New England Society of American Foresters in Nashua, NH (400 attendees) *March 25-27*
- Participated in Adult First Aid/CPR/AED training conducted by The American Red Cross in New Haven *April 1*
- Participated in an Environmental Science Career Forum at Cheshire High School (60 students) *April 8*
- Staffed a Station booth featuring the Roadside Forest Management Project at the Hamden Earth Day event (3,000 attendees) *April 12*
- Participated in an inter-agency planning meeting for the “Foresters are for the Birds” research project at the Salisbury Town Hall *April 24*
- Participated in a “Forests are for the Birds” field workshop in Salisbury *May 3*
- Served as a panel judge at the Future Farmers of America Agri-science Fair at Southington High School *May 8*
- Staffed a CAES exhibit at the Connecticut Tree Festival at Cranbury Park in Wilton (1,000 attendees) *May 17*
- Spoke on “Invasive Plant Issues” to residents of the Whitney Center in Hamden (35 attendees) *May 22*
- Staffed an exhibit highlighting careers in Environmental Sciences to students at North Branford High School (25 students) *May 23*
- Participated in a “Forests are for the Birds” workshop at the Yale-Myer’s Research Forest in Ashford (35 attendees) *June 7*
- Participated in the Connecticut Society of American Foresters’ Field Meeting at Sessions Woods Wildlife Management Area in Burlington *June 24*

BLEVINS, TIA M.

- Participated in the Understanding Audit training course provided by the USDA APHIS PPQ at their eastern regional office in Raleigh, NC *August 27-30, 2013*
- Participated in a Systems Approach to Nursery Certification Exercise, in cooperation with the

Horticultural Inspection Society – Eastern Chapter in Chatsworth, New Jersey. Inspectors from eight northeastern states participated *October 15-17*
- Participated in the CNLA/CGGA Winter Symposium held at Manchester Community College *January 14, 2014*
- Participated in the annual Forest Health Workshop, held at Fort Trumbull State Park Conference Center, New London *March 4*
- Participated in a workshop on the new Federal Order concerning *Phytophthora ramorum*, held at the USDA-APHIS-Plant Protection and Quarantine Office in Wallingford *March 26*
- Participated in a joint meeting of the Cooperative Agricultural Pest Survey, the Eastern Plant Board, and the Horticultural Inspection Society. Presented the HIS Treasurer's Report to the membership during their business meeting *April 7-10*
- Participated in an Aerial Survey Aviation Safety Workshop, sponsored by the US Forest Service, at Granite Air in West Lebanon, New Hampshire *June 2*

BRANSFIELD, ANGELA
- Talked about the virus isolation work done in the Biosafety Level 3 Laboratory to students from Norwich Free Academy *December 11, 2013*

BRAVO, JOAN L.
- Spoke with a visiting Rhode Island viticulturist about trellising and pruning techniques at Lockwood Farm *April 16, 2014*

BUGBEE, GREGORY J.
- Was interviewed about invasive aquatic plants in Connecticut lakes by Bob Miller of the Danbury News Times *July 16, 2013*
- Provided information to residents and legislators on use of glyphosate to control weeds in Moodus Reservoir at a public meeting of the East Haddam Board of Selectmen (60 attendees) *July 17*
- Spoke at a meeting of the Bashan Lake Association on Control of Variable Milfoil and Fanwort (50 attendees) *July 27*
- Spoke on Invasive Plants in Moodus Reservoir at a Town meeting held at the Moodus Sportsmans Club (75 attendees) *August 1*
- Spoke on "Control of Brazilian waterweed with herbicides, grass carp and drawdown" at a meeting of the Fence Rock Lake Association in Guilford (30 attendees) *October 10*
- With Jordan Gibbons, gave an Invasive Aquatic Plant Identification Seminar at the Connecticut Envirothon at Eastern Connecticut State University in Willimantic (75 attendees) *November 9*
- With Jordan Gibbons, spoke to a 2nd grade class at the Beecher Magnet School in New Haven on "Soil and Plants" (25 attendees) *November 29*
- With Jordan Gibbons, give a seminar on "Connecticut Soils and Soil Testing" at the Cooperative Arts and Humanities High School in New Haven (20 attendees) *December 4*
- With Jordan Gibbons, presented a talk entitled "Invasive Plants in Tyler Lake and Dog Pond" at the Goshen Town Office at a meeting organized by State Representative Roberta Willis (50 attendees) *December 9*
- Participated in the PA-12-155 Nonpoint Source Phosphorus Sub-committee meeting at CT DEEP headquarters in Hartford *January 6, 2014*
- Was the guest on the Connecticut Outdoors Radio Show (WMRD/WLIS) hosted by Suzanne Thompson on the topic of invasive aquatic plants *January 7*
- With Jordan Gibbons, administered the supervisory aquatic license recertification program at the Northeast Aquatic Plant Management Society Annual Conference in Westbrook, CT *January 21-23*
- Gave the talk "Connecticut's Invasive Aquatic Plant Problem: Searching for Solutions" before a

special meeting of the Environment Committee at the Legislative Office Building in Hartford *January 28*

- Gave the seminar "Soil Science for Arborists" at the Bartlett Arboretum in Stamford (12 attendees) *February 6*
- Participated in the PA-12-155 Nonpoint Source Phosphorus subcommittee meeting at CT DEEP in Hartford *February 10*
- Spoke to the Caudatowa Garden Club on "Improving Soil in the Home Garden and Landscape" in Ridgefield, CT (50 attendees) *February 11*
- With Jordan Gibbons, gave an Invasive Aquatic Plant Workshop to an Environmental Science Class at Three Rivers Community College in Norwich (50 attendees) *February 19*
- With Jordan Gibbons, gave a seminar entitled "Identification of Banned Aquatic Plants in the Aquarium Trade" to Department of Agriculture inspectors at the DOAg Building in Hartford (5 attendees) *March 5*
- Gave a talk entitled "The Battle for Candlewood Lake: Can the Invaders be Stopped?" at the Connecticut Conference on Natural Resources at the UConn Campus in Storrs (40 attendees) *March 17*
- Gave a talk entitled "Improving Soil in the Home Garden" to the Bridgeport Men's Garden Club in Stratford (20 attendees) *March 16*
- Participated in the Northeast Lake Classification Steering Committee online meeting *March 20*
- With Michael Cavadini, proctored the Entomology event at the Connecticut Science Olympiad in Farmington (50 attendees) *March 22*
- Participated in the PA-12-155 Nonpoint Source Phosphorus Subcommittee Meeting at CTDEEP headquarters in Hartford *March 24*
- Spoke to the Experiment Station Associates on "Connecticut's Invasive Aquatic Plant Problem – Searching for Solutions" at the Whitney Center in Hamden (50 attendees) *March 26*
- Gave the talk "Container Gardening Indoors and Out" as part of the "People Enjoying People" program at the Calvary Presbyterian Church in Enfield (50 attendees) *April 15*
- Gave the seminar "Soil Testing" to a Soil Science class from Southern Connecticut State University (20 attendees) *April 16*
- With Jordan Gibbons, gave an Invasive Aquatic Plant Workshop at the Middlefield Community Center (45 attendees) *April 22*
- Participated in the PA-12-155 Nonpoint Source Phosphorus Subcommittee meeting at CT DEEP in Hartford *May 6*
- Gave the talk "Soil Testing" to the Whitneyville Civic Association in Hamden (25 attendees) *May 8*
- Gave the talk "Lawn Care" to the Bethany Garden Club at the Bethany Community Center (20 attendees) *May 12*
- Spoke at a meeting of the Fence Rock Lake Association in Guilford on "CAES IAPP Research to Control Brazilian Waterweed in Fence Rock Lake" at the Guilford Community Center (25 attendees) *May 13*
- Gave the talk "Improving Soil in the Home Garden – an Organic Approach" to the Institute of Learning in Retirement at Albertus Magus College (12 attendees) *May 14*
- With Jordan Gibbons, presented a display and answered questions on "Connecticut Soils and Soil Testing" at the North Branford High School Career Fair (200 attendees) *May 24*
- Gave the talk "The Battle for Candlewood Lake: Can the Invaders be Stopped?" at the annual meeting of the Northeast Lake Management Society at University of Connecticut, Storrs (75 attendees) *June 14*
- With Jordan Gibbons, gave an Invasive Aquatic Plant Workshop in East Haddam to the Lake Hayward Association and other interested parties (35 attendees) *June 21*

CAVADINI, MICHAEL J.

- Participated in the annual FDA FERN cCAP Technical Meeting in St. Paul, MN *September 17-19, 2013*
- Met with CT DCP officials at the MFRA conference in Fort Worth, TX *March 10, 2014*
- With Greg Bugbee, participated in the 2014 CT Science Olympiad in Farmington, CT and proctored three sessions of Entomology exams *March 22*
- Participated in an ICP-MS/ICP-OES seminar in Farmington, CT run by Thermo Scientific *April 17*
- Presented information about the Station and its Analytical Chemistry Department at North Branford's High School Science Fair *May 23*
- Assisted with leading a Station tour consisting of a group of SCSU students and two students from North Branford High School *June 25*

CHEAH, CAROLE A.

- Conducted a webinar titled "Biological control of hemlock woolly adelgid: a Connecticut perspective" as part of the 2013 New York Statewide Invasive Species Series (30 attendees) *June 26, 2013*
- Was interviewed, together with Donna Ellis of the University of Connecticut, by the Ridgefield Patch and by The Voice in Woodbury during the releases of the imported weevil, *Rhinoncomimus latipes* on town lands in Ridgefield and Woodbury, for biological control of the invasive mile-a-minute weed *July 18*
- Was interviewed about the status of hemlocks and resurgence of hemlock woolly adelgid in Connecticut by Robert Miller of the Danbury New Times *September 5*
- Spoke to 6th graders and their science teacher from the Independent Day School, Middlefield, on biological control of the invasive mile-a-minute weed during weevil activity monitoring at the 2012 release site *September 12*
- Gave a talk on the effects of the polar vortex on hemlock woolly adelgid and elongatehemlock scale at the 2014 Forest Health Monitoring Workshop at Fort Trumbull State park, New London March 4
- Was interviewed on the effects of the 2014 cold winter on the status of hemlock woolly adelgid in Connecticut by Patrick Skayhill for WNPR Radio *March 6*
- With Elizabeth Young, manned a booth on insect pests for the CAES Valley Laboratory, for the Town of Windsor at the Windsor Earth Funtastic Event *April 17*
- Was interviewed about the effects of the 2014 cold winter weather on the status of hemlock woolly adelgid in Connecticut by Robert Miller of the News Times of Danbury *April 25*

COWLES, RICHARD S.

- Gave the talk "Minimizing Side Risks of Insecticides" at the Connecticut Nursery and Landscape Growers' Association summer meeting, Madison (30 attendees) *July 17, 2013*
- Reviewed progress on "Genetic Improvement of True Firs" for the CT Christmas Tree Growers' Association, Windsor (40 attendees) *July 23*
- Taught "Systemic Insecticides and Risks to Bees" and "Facts and Fallacies of Organics" to the Massachusetts Association of Lawn Care Professionals, Boylston, MA (40 attendees) *July 24*
- Participated in a spotted wing drosophila update for the Cooperative Extension Fruit Specialist Berry conference call (15 participants) *August 5*
- Presented a tent talk "Spotted wing drosophila management for home gardeners" and the related field exhibit "Trapping spotted wing drosophila" at Plant Science Day, Hamden *August 7*
- Discussed "Christmas tree insect pests" at the CCTGA twilight meeting, Durham (40 attendees) *August 1*
- Spoke about "How to apply insect pathogenic nematodes to manage white grubs" at a workshop for school grounds maintenance staff sponsored by UConn, East Haddam, CT (50 attendees) *August 15*

- Participated in a town forum on pesticides by presenting "The pesticide ban on school grounds: Has the ban been a good idea:" (20 attendees plus public access TV) North Haven *October 23*
- Presented the talk "Insect pests: Choosing appropriate management tools" to an American Phytopathological Society Northeast Division Workshop (1023 attendees) Southbury *October 25*
- Spoke about "Trap improvements, phagostimulants, and behavioral control" at the Regional Spotted Wing Drosophila Research and Extension Workshop (30 attendees) Bridgeton, NJ *October 30*
- Spoke on "Annual bluegrass weevil: Is it time to change your perspective?" at Harrell's Turf Supply educational seminar, West Boyleston, MA, (200 attendees) *November 12*
- Participated in a phone conference with the Red Tomato Marketing Group about neonicotinoids and other pesticide impacts on bees, (10 attendees) *November 12*
- Gave the presentation "Spotted wing drosophila: Practical chemical ecology" as the Plant, Soil, and Insect Sciences Departmental Seminar at the University of Massachusetts, Amherst, MA (25 attendees) *December 2*
- Spoke on "Trap improvements, behavioral control challenges and insecticide update" to the CT Pomological Society meeting, Glastonbury (100 attendees) *December 3*
- Participated in an EcoBerry protocol review conference call with Red Tomato *December 10*
- Led a workshop on "Emerald ash borer biology and management" for the CT Municipal Tree Warden's Association, Rocky Hill (100 attendees) *December 12*
- Gave the Presentation "SWD IPM: Are we there yet?" for a general session on SWD at the New England Vegetable and Berry Growers' Association annual meeting, Manchester, NH (100 attendees) *December 17*
- Gave the presentation "SWD in grapes: How much of a problem?" to a viticulture session at the New England Vegetable and Berry Growers' Association annual meeting, Manchester, NH (30 attendees) *December 19*
- Was interviewed by and assisted Lisa Foderaro of the New York Times to prepare an article on the effect of cold winter temperatures on the survival of exotic pests, which was published *on January 9, 2014*
- Gave the talk "Prepare for EAB" to the Massachusetts Tree Wardens and Foresters Association, Sturbridge, MA (175 attendees) *January 15*
- Gave the presentation "White grubs: Time to change our control methods?" at the Connecticut Grounds Keepers Association Meeting, Cromwell (200 attendees) *January 22*
- Presented "SWD in grapes" How much of a problem?" to the Connecticut Grape Growers Association, Windsor, (15 attendees) *January 27*
- Spoke on "Spotted wing drosophila: Practical chemical ecology" at the Plant and Soil Sciences Departmental Seminar at the University of Vermont, Burlington, VT (40 attendees) *January 31*
- Presented "Practical chemical ecology of SWB" in a meeting with participants from the Buiolberica Company, along with visitors from University of Rhode Island and Cornell University, to review our current status in efforts to improve attractants for spotted wing drosophila, at the Valley Laboratory (6 participants) *February 10*
- Spoke about "Neonicotinoids and bees" at Prides Corner Nurseries, Lebanon, CT (28 attendees) *February 11*
- Discussed "Spotted wing drosophila: Practical chemical ecology" via WebEx to a fruit extension and growers' meeting in Quebec (40 participants) *February 18*
- Spoke about "Insect management and the role of pyrethroids" to golf course superintendents at a John Deere landscaping seminar, Taunton, MA (40 participants) *February 26*
- Discussed "Climate change and insects in the landscape" in a panel discussion for the Ecological Landscaping Association, Springfield, MA (20 participants) *February 27*
- Gave the talk "Managing Root Rots in Christmas Trees" to the annual meeting of the Connecticut Christmas Tree Growers Association, Middletown (100 participants) *March 1*

- Talked about “Annual bluegrass weevils and white grubs in turf: Time to change your strategies?” to the New England Regional Turf Association meeting, Providence RI (100 attendees) *March 5*
- Talked about “Choosing appropriate turf insecticides” to the New England Regional Turf Association meeting in Providence, RI (30 attendees) *March 6*
- Gave the talk “Why mass trapping SWD Fails” at the Eastern Branch Meeting of the Entomological Society of America meeting, Williamsburg, VA (60 attendees) *March 16*
- Talked on “Neonicotinoids and management of SWD” at a Red Tomato (a produce cooperative) meeting in Annandale-on-Hudson (25 attendees) *March 19*
- Participated in a meeting with Mr. McCleary, Deputy Commissioner of DEEP, Dr. Theodore G. Andreadis, and others regarding the use of neonicotinoid insecticides and their associated risks to pollinators, Hartford (5 attendees) *March 20*
- Presented the talk “Managing White Grubs in School Turf” to the CT School Building and Grounds Association (25 participants) *April 16*
- With Dr. Todd Mervosh, staffed the CAES display at the State Capitol Corridor *April 22*
- Was interviewed about neonicotinoids and their risks to bees by Jon Entine of Forbes Magazine *May 20*

CREIGHTON, MARK H.

- Manned a booth at Plant Science Day and provided two technical demonstration talks to 172 people at Lockwood Farm in Hamden *August 7*
- Was interviewed and did a photo shoot with The Day (New London) on the duties of the apiary Inspector *August 15*
- Manned a booth and spoke about beekeeping and beekeeping challenges in Connecticut at the Wolcott County Fair *August 16-18*
- Spoke at the CAAE Professional Day at Southington High School about beekeeping, followed by a field component at the apiary at Lockwood Farm *August 21*
- Was interviewed for an article on beekeeping by Kathryn Boughton of the Litchfield County Times *August 22*
- Set up a booth with his observation hive and spoke about honey bees and beekeeping at Harkness State Park Family Day in Waterford (538 attendees) *September 8*
- Gave a talk on “The History of Beekeeping in Connecticut” at the East Hampton Public Library (30 attendees) *September 12*
- Set up a public education booth on the honey bee and an observation hive and spoke to 1498 people about honey bee topics and beekeeping in the Connecticut Building at the Big E in West Springfield, MA *September 24*
- As the keynote speaker, gave the presentation ‘The History of Beekeeping in Connecticut, Past and Present” for the Middlesex County Farm Bureau (45 attendees) *October 9*
- Spoke at the Backyard Beekeepers Association meeting in Weston, making contact with (75 attendees) *March 25*
- Spoke about starting a beekeeping program to Ag students at Northwestern Regional High School in Winsted (25 students) *March 26*
- Spoke about the role that honey bees play with pollination in Connecticut to third-grade students at East Conn in Columbia (90 students) *April 1*
- Gave a PowerPoint presentation about the value of honey bee hive registration in Connecticut to members of the Connecticut Beekeepers Association in Woodbury (120 Attendees) *April 2*
- Spoke about honey bees and pollination to third-grade students at Lake Street School in Vernon (18 students) *April 21*
- Staffed a table and presented information on honey bees and pollination for Earth Day at Quinnipiac University (250 visitors) *April 22*

- Gave a Power Point presentation on "The History of Beekeeping in Connecticut – Past and Present" at the East Hampton Public Library in East Hampton (25 attendees) *April 24*
- Spoke about honey bees and pollination to students at the Middlesex YMCA; and also brought his observation hive and honey bee puppet for the students to view (22 attendees) *May 13*
- Provided a PowerPoint presentation on the history of beekeeping past and present in Connecticut at the Beardsley Library in Winsted, and displayed live honey bees in the observation hive (40 attendees) *May 17*
- Provided a PowerPoint presentation on the history of beekeeping past and present in Connecticut at Stone Ridge Senior Complex in Mystic (25 attendees) *May 22*
- Was interviewed on honeybees and pollination on WPLR's "For the People" with John Voket *June 6*
- Gave the presentation "The History of Beekeeping in Connecticut: Past and Present" at the Kellogg Environmental Center in Derby (40 attendees) *June 14*
- Spoke about summer management of honeybees at Massaro Community Farm in Woodbridge (25 attendees) *June 21*
- Spoke about honeybees and beekeeping at Edward Smith Library in Northford (35 attendees) *June 26*

DE LA TORRE ROCHE, ROBERTO

- Gave the lecture "Engineered nanomaterials and agricultural crops: Co-contaminant interactions and trophic transfer" (35 attendees) *March 17, 2014*

DINGMAN, DOUGLAS W.

- Participated in the Backyard Beekeepers Association's monthly meeting and discussed beekeeper input regarding a honey bee genetics study *September 24, 2013*
- Presented a teaching seminar to Dr. Ian Dawson's biology students (Yale University) on migration and evolution of honey bees. The Yale students then helped to analyze and map mitochondrial DNA diversity of Connecticut honey bees *November 18-19*
- Participated in the CT Beekeepers Association quarterly meeting in Woodbury, CT *April 12, 2014*
- Participated as a judge in the FFA AgriScience Fair held at the Southington High School Vo Ag Department, Southington, CT *May 8*
- Hosted a hands-on workshop at CAES for the Backyard Beekeepers Association focusing on identification of Nosema infestation by light microscopy *May 10*

DOUGLAS, SHARON M.

- Was interviewed about the wet June and humid, hot July and their impact on plant diseases, particularly the downy mildews, by Steve Grant of the Hartford Courant *July 10, 2013*
- Gave the presentation "Boxwood blight, downy mildews, and other diseases of 2013" at the CNLA Summer Meeting held at Summer Hill Nursery in Madison (125 attendees) July 17
- Assisted with organizing and moderating oral presentations at the CTPA Summer Meeting at the Farmington Club (800 attendees) *July 18*
- Gave a presentation on current diseases in Christmas tree plantations for 2013 at the CT Christmas Tree Growers Association twilight meeting at the Valley Lab in Windsor (45 attendees) *July 23*
- Was interviewed about late blight of tomato and potato and its potential threat to these crops in Connecticut for 2013 by Bob Miller of the Danbury News Times *July 24*
- Presented a poster titled "Efficacy of sanitizing agents to refine best management practices for the boxwood blight pathogen, "*Calonectria pseudonaviculata*", met with members of the Boxwood Blight Working Group, and participated in a meeting of NPDN laboratories at the Annual Meeting of The American Phytopathological Society held in Austin, TX *August 1—15*
- Was interviewed about premature fall color and why many trees are stressed by weather events by Steve Grant of the Hartford Courant *August 27*

- Was interviewed about fall foliage and premature color in some Connecticut trees by Kate Rayner of WFSB Channel 3 *September 4*
- Participated in the CAES Nursery and Landscape Tour at the Valley Lab and answered questions about boxwood blight *September 10*
- Participated in the monthly Board of Directors meeting for the CTPA *September 10*
- Participated in the September meeting of the CT Tree Protective Examining Board and helped administer the oral exam to candidates for the arborist license *September 11*
- Participated in a conference call of the Boxwood Blight Working Group *September 24*
- Participated in the Extension/Industry Meeting and assisted with judging the Graduate Student Research Award at the annual meeting of the Northeastern Division of The American Phytopathological Society held at the Heritage Resort in Southbury (64 attendees) *October 23-25*
- Participated in a research update conference call of the Boxwood Blight Working Group *November 1*
- Participated in the monthly meeting of the Board of Directors of the CTPA (12 participants) *November 12*
- Organized and chaired a meeting of the CTPA Education Committee to review topics for workshops for 2014 (8 participants) *November 18*
- Was interviewed about Phytophthora root rot of conifers and how this disease might impact Connecticut Christmas tree growers and consumers this holiday season by Bridgette Ruthman of the Waterbury Republican-American *December 9*
- Gave the presentation "Update on Key Diseases for 2014" and answered questions about plant diseases at the CNLA/CGGA Winter Symposium held at Manchester Community College (100 attendees) *January 14, 2014*
- Participated and organized the CTPA Annual Meeting and coordinated the CAES Booth at the Aqua Turf in Plantsville (790 attendees) *January 16*
- Gave the invited presentation "Plant Health Care; The Latest Disease Management Strategies" at New England Grows 2014 held at the Boston Convention Center in Boston, MA (2,500 attendees) *February 7*
- Participated in the monthly meeting of the CTPA Board of Directors in Wallingford *February 11*
- Was interviewed about the impact of this winter's weather on plants by John Burgeson of the Connecticut Post *February 20*
- Was interviewed about how snow and this winter's weather impact plants and agriculture by Robert Miller of the Danbury News-Times *February 21*
- Gave the presentation "Key Root Rot Diseases of Christmas Tree Plantations" and participated in the Annual Meeting of the CT Christmas Tree Growers Assn., Middletown (120 attendees) *March 1*
- Participated in the March meeting of the CT Tree Protection Examining Board and helped administer the oral exam to candidates for the arborist license *March 12*
- Gave the presentation "Recognition and Management of Common Diseases in the Perennial Garden" to the Burlington Garden Club in Burlington, CT (26 attendees) *April 10*
- Was interviewed about poor planting practices and tree health by Rick Harrison of the Waterbury Republican-American *April 25*
- Gave the presentation "Eco-friendly Management of Diseases of Perennials" for the Cheshire Garden Club (32 attendees) *May 5*
- Was an invited participant and speaker at the 2nd International Boxwood Summit held at the National Agricultural Library at the USDA-ARS facility in Beltsville, MD *May 13*
- Organized and moderated the 2014 International Boxwood Blight Summit and led a breakout session on the biology and epidemiology of the boxwood blight pathogen. The summit was held at the USDA National Agricultural Library on the USDA campus in Beltsville, MD (85 attendees) *May 13*
- Was interviewed about winter and weather issues with woody plants in Connecticut by Jan Spiegel of the Connecticut Mirror *May 20*

- Participated in the spring CAPS meeting held at the USDA-APHIS-PPQ headquarters in Wallingford (10 attendees) *May 30*
- Organized, moderated, and participated in an evening seminar titled "Oak Wilt: History, Hosts, and Management" held by the CTPA Education Committee in Wallingford (45 attendees) *June 3*
- Participated in the June meeting of the CTPA Board of Directors, which was held at the Farmington Club in Farmington *June 10*
- Participated in the June meeting of the CT Tree Protection Examining Board and helped administer the oral exam to candidates for the arborist license *June 11*

DUGAS, KATHERINE

- Spoke about good and bad insects and forest pests to Cub Scouts at Camp Cedarcrest in Orange *July 18, 2013*
- Spoke about beneficial insects and invasive forest pests to the day camp at East Shore Park *July 22*
- Spoke about beneficial insects and invasive forest pests to the day camp at Edgewood Park *July 23*
- Spoke about beneficial insects and invasive forest pests to the day camp at Clinton Avenue School *July 26*
- With Rose Hiskes, staffed a Forest Pest display table at the Bridgeport Farmer's market July 25
- With Rose Hiskes, staffed a forest pest table at the Downtown Bridgeport Farmer's Market in Bridgeport (86 visitors to booth) *August 22*
- With Rose Hiskes, staffed a forest pest table at the New London Farmer's Market in New London (86 visitors to booth) *August 28*
- Staffed a forest pest table at the Hebron Harvest Fair in Hebron (645 visitors) *September 5-8*
- Participated in the Connecticut Tree Protective Association Emerald Ash Borer Tour Day in Middlebury (46 attendees) *September 12*
- With Rose Hiskes and Mark Creighton, staffed a forest pest booth at the Big E in West Springfield, MA (605 visitors) *September 24*
- Staffed a forest pest table at the New London Farmer's Market (20 attendees) *September 25*
- With Dr. Gale E. Ridge, participated in the Bridgeport Health Fair at the University of Bridgeport, educating citizens about human bed bugs (over 500 visitors) *October 31*
- With Rose Hiskes, presented Connecticut's Forest Pest Outreach and Survey Program during the multi-state review webinar conducted by USDA APHIS PPQ (17 states participated) *November 6*
- With Rose Hiskes, put on a luncheon for the UConn Master Gardener coordinators who volunteer for us in the Forest Pest Outreach and Survey Program at the UConn West Hartford campus (8 attendees) *November 20*
- With Rose Hiskes and Dr. Claire Rutledge, assisted Dr. Joe Elkinton of UMass with placement of winter moth traps at high risk sites in Shelton, Milford, and Mystic *November 26*
- With Rose Hiskes, submitted a Forest Pest Outreach Suggestion to USDA for Farm Bill funding consideration *December 30*
- Spoke to the town tree warden about Emerald ash borer at Stratford Public Works, and gave him outreach materials to be distributed to the rest of the Public Works Department *April 1, 2014*
- Was invited by the Clinton Tree Committee to attend the Clinton Expo at Andrews Memorial Town Hall in Clinton and distribute Asian longhorned beetle and Emerald ash borer information (150 attendees) *April 5*
- Gave a talk on Emerald ash borer and Asian longhorned beetle to the American Chestnut Foundation's Connecticut Chapter, Yale School of Forestry, New Haven (40 attendees) *April 19*
- Spoke about the Emerald ash borer and its impending impact on Connecticut's ash trees to students of UConn's Eco House (10 attendees) *May 1*
- Spoke about winter moths with Judy Benson, a journalist for The New London Day newspaper, and brought her to Beebe Pond Park to show her the presence of feeding caterpillars *May 13*

- Staffed a table with Station and forest pest information at the Connecticut Tree Festival held at Cranbury Park in Norwalk *May 17*
- Was interviewed about winter moths and forest pests on the 1400 WELI morning radio show with DEEP Forester Chris Martin *May 29*
- Organized and ran the Statewide CAPS Community Meeting at the USDA-APHIS-PPQ office in Wallingford (12 attendees) *May 30*

DURGY, ROBERT

- Gave the talk "Effect of Increasing Population on Ear Size of SE Synergistic Sweet Corn, var. Montauk" at the New England Vegetable and Fruit Conference in Manchester, New Hampshire (67 attendees) *December 17*
- Attended as a member of the Steering Committee and ran the audio-visuals at the Connecticut Vegetable and Small Fruit Growers' Conference in Windsor (260 attendees) *January 16, 2014*
- Taught a University of Connecticut Master Gardener Program class on vegetables in Stamford (30 attendees) *February 17*
- Taught a University of Connecticut Master Gardener Program class on vegetables in Vernon (52 attendees) *February 21*
- Taught a University of Connecticut Master Gardener Program class on vegetables in North Haven (47 attendees) *March 13*
- Taught Math Calculations and Calibration for Pesticide Applicator's Training in East Haven (28 attendees) *February 6*
- Taught Math Calculations and Calibration for Pesticide Applicator's Training in West Hartford (31 attendees)

EITZER, BRIAN D.

- Participated in a conference call on the planning of the North American Chemical Residue Workshop *July 11, 2013*
- Presented a talk on the Connecticut Market Basket Survey for Pesticide Residues in Produce at the 50th annual North American Chemical Residue Workshop in St. Petersburg Beach, FL (175 attendees) *July 21-24*
- Participated in a conference call on planning the annual FDA FERN cCAP meeting for this year *July 26*
- Along with Dr. Walter Krol, Dr. Christina Robb, Dr. Roberto De La Torre-Roche, Craig Musante, Michael Cavadini, Terri Arsenault, and Joseph Hawthorne, participated in an on-site ISO17025 Accreditation Training provided by Mettler-Toledo *July 31*
- Presented the talk "Analysis of Pesticides in Corn Planter Exhaust Dust and Dosimeters Surrounding Corn Fields During Planting" at the 246th ACS National Meeting held in Indianapolis, Indiana (75 attendees) *September 8-12*
- Participated in the on-site assessment and gap analysis by the FDA/ORA for our ISO Accreditation 17025 funding *September 10*
- Participated in the monthly call of the North American Chemical Residue Workshop Organizing Committee *September 12*
- Presented the talk "Testing and Validation of T022 using High Resolution Mass Spectrometry" and helped lead a discussion group on instrumentation platforms at the FDA FERN cCAP annual meeting in St. Paul, MN (50 attendees) *September 17-19*
- Participated in a conference call of the North American Chemical Residue Workshop Organizing Committee *October 10*
- Attended the monthly Laboratory Preparedness Advisory Group Meeting at the CT Department of Public Health Laboratory in Rocky Hill, CT *November 4*

- Participated in a conference call of the NACRW Organizing Committee *November 14*
- Participated in the FDA FERN mycotoxin working group conference call *December 5*
- Gave a talk on the determination of organic contaminants in foods to the Yale Occupational and Environmental Medicine Group (15 attendees) *December 10*
- Participated in a conference call for the North American Chemical Residue Workshop organizing committee *December 12*
- Gave the talk "Analysis of Pesticides in Planter Exhaust dust and Dosimeters Surrounding Fields During Planting" at the American Bee Research Conference in San Antonio, TX (50 attendees) *January 10-11, 2014*
- Participated in the annual meeting of the multi-state hatch grant on "Sustainable solutions to Problems Affecting Bee Health" (NC1173) *January 10*
- With Dr. Christina Robb, participated in the FDA FERN Northeast Teleconference Call *January 14*
- Spoke to an environmental chemistry class (12 students), and presented a seminar entitled "The Use of Mass Spectrometry in the Analysis of Foods and Other Matrixes" in the Chemistry Department of Union College in Schenectady, NY (50 attendees) *January 30*
- Participated in the FERN cCAP mycotoxin working group phone call (20 participants) *February 6*
- With Dr. Kim Stoner and Tracy Zarrillo, attended the principal investigator meeting of the SCRI funded grant on "Pollination Security for Fruit and Vegetable Crops in the Northeast" at the University of Massachusetts (15 participants) *February 10*
- With Dr. Christina Robb, Dr. Walter Krol, Dr. Alia Servin and Dr. Jose Angel Hernandez-Viezcas received training on the new Velos LC/MS system and Tracefinder software from Christa Feasley of Thermo Fisher scientific *February 11*
- Judged the Connecticut Science and Engineering Fair held at Quinnipiac University *March 12-13*
- Helped man the Agricultural Experiment Station booth in the corridor at the Legislative Office Building on Ag Day at the Capitol *April 22*
- Gave a presentation on "Pesticides and Honey Bees" at the Darien Nature Center (50 attendees) *April 28*
- Participated in the monthly teleconference call of the organizing committee of the North American Chemical Residue Workshop *May 8*
- Gave a webinar on the analysis of aflatoxin M1 in milk using a Thermo Velos to the FERN cCAP Mycotoxin Working Group (20 attendees) *June 5*
- Presented a proposal to the FERN cCAP groups to help lead a multi-laboratory validation of a FERN method for the analysis of toxins in food (15 attendees) *June 10*
- With Dr. Jason White and Dr. DeWei Li, gave a presentation on detection of aflatoxins in milk at the monthly Toxi-Rounds at the Department of Health Laboratory in Rocky Hill (15 attendees) *June 26*

ELMER, WADE H.

- Presented the paper "Comparison of the *Fusarium* species composition between a New England and Chinese salt marsh affected by dieback and climate change" (34 attendees), attended and participated in the divisional Forum or APS, and the Widely Prevalent Fungi Committee where he serves as the Northeast regional representative at the annual meeting of the American Phytopathological Society held in Austin, TX *August 11-14, 2013*
- Moderated a new APS symposium that he helped develop and sponsor titled "Showcasing the Outstanding Graduate Student from the divisions". Megan McConnell, a past sumer assistant who worked in the PDIO, was chosen by the Potomac Division of APS as one of the best Graduate student presentations. She is pursuing her Ph.D. and the University of Maryland *August 13*
- Presented the seminar "Sudden Vegetation dieback: A Tripartite Interaction Between a Plant, Fungus, and Crab" to the Biology Department at Southern CT State University in New Haven as part of their seminar series (21 attendees) *October 9*

- Presented the talk “Biochar, Earthworms, and Soil Health” at the annual meeting of the International Biochar Institute held at the University of Massachusetts in Amherst, MA (28 attendees) *October 15*
- Participated in the Extension/Industry Meeting at the Annual Meeting of the Northeastern Division of The American Phytopathological Society held in Southbury *October 23*
- Co-sponsored a joint NED-APS/UCONN Landscape Management and Care Symposium (120 + grower attendees) *October 25*
- Gave the presentation “Comparison of *Fusarium* spp. composition between stressed and healthy *Spartina* spp. in Atlantic marshes in North and South America” at the biennial meeting of the Coastal Estuarine Research Foundation in San Diego, CA (32 attendees) *November 3-6*
- Met with Sarah Hale and Gerard Cornelissen from the Norwegian Geotechnical Institute, Oslo, Norway, to discuss biochar research *November 25*
- Participated in a meeting of the State Consulting Committee for Agricultural Science and Technology Education held at the Glastonbury High School AgriScience and Technology Center (7 student and 8 adult attendees) *December 4*
- Hosted a high school class from the Digital Arts Academy of East Haven High School and presented information on salt marsh dieback (10 student, 2 teacher attendees) *January 9, 2014*
- Participated in the annual meeting of the Connecticut Greenhouse Growers Association at Manchester Community College and accepted a memorial award for Dr. Louis Magnarelli, along with a pledge to purchase a tree to be planted on the grounds in honor of Dr. Magnarelli *January 14*
- Gave the talk “Cover Crops for Strawberry Disease Management” at the CT Vegetable and Small Fruit Conference in South Windsor (225 attendees) *January 16*
- Met with Andrew Lim, a 10th grade high school student from Greenwich High School, to discuss his project on soilborne diseases on grafted pepper plants *February 11*
- Gave the presentation titled “Fighting Fusarium in Flowers” at the CT Flower Show held in the Connecticut Convention Center in Hartford (5 attendees) *February 20*
- Co-organized and spoke on “Root Rot Diseases” at the UConn-CAES Spring Bedding plant meeting in Vernon (45 attendees) *February 25*
- Co-organized and spoke on “Root Rot Diseases” at the UConn-CAES Spring Bedding Plant meeting in Torrington (37 attendees) *February 27*
- Mentored Ann Merrill, a senior at Greenwich High School, on her project “The role of earthworms and biochar in suppression of plant diseases”. Her project advanced to the finals of the Intel Science Talent Search and she was the only student in the state to reach that stage of the research competition this year. February
- Mentored a high school class from East Haven in the Academy of Digital Arts and Sciences Program on the use of biochar in remediating salt marshes affected by Sudden Vegetation Dieback. Their ninth-grade proposal titled “The Effects of the Fusarium Fungus on Coastal Marsh Grasses” won first place at the Center for 21st Century Skills at Education Connection. February
- Presented the paper “Influence of Nitrogen and Silicon on *Spartina alterniflora* and Its Possible Role in Marsh dieback” at the Connecticut Conference on Natural Resources at UConn in Storrs *March 17*
- Mentored Andrew Lim on his 10th grade project titled “Bioengineering of Popular Peppers to Create a Disease-Resistant Hybrid with Prolonged Shelf-Life, Increased Biomass, and Capsaicin Content” for which he won an award at the Connecticut Science & Engineering Fair at Quinnipiac University in Hamden *March*
- Participated in the Governor’s Advisory Committee for Vocational Agriculture at Jones Family Tree Farm in Shelton (9 attendees) *April 11*
- Served as a judge for the 2014 Connecticut State Agriscience Fair held at the Southington High School Agriculture Center *May 8*
- Met with Hammonasset Beach State Park Superintendent, Henry Alwes, in Madison to discuss remediation strategies for Sudden Vegetation Dieback *May 8*

- Presented a talk on “Sudden Vegetation Dieback” to visiting students from the Sound School (12 students and 1 teacher attendees) *June 4*
- Spoke about Sudden Vegetation Dieback” to visiting students and teachers from Southern CT State University and Central CT State University (27 attendees) *June 25*

FERRANDINO, FRANCIS J.
- Has replaced Dr. William Nail as a member of the CT Wine Council and participated in his first meeting at the Department of Agriculture in Hartford *September 4*
- Delivered the paper “Epidemiological Time Scales: A Self-Similar Approach” at the Annual Meeting of the Northeastern Division of The American Phytopathological Society held in Southbury (30 attendees) *October 23-25*
- Delivered a report on the progress made in viticulture and enology in the past year in Connecticut at the Annual Meeting of NE-1020, “Improved Grape and Wine Quality” in Nebraska City, NE *November 5-7*
- Participated in the quarterly meeting of the Connecticut Wine Council held in Hartford *December 12*
- Gave the presentation “Winegrapes in New England: Culture, Cultivars, Weather and Disease” to the Orange Garden Club at the Case Memorial Library in Orange (32 attendees) *January 14, 2014*
- Participated in the CT Wine Council Meeting held in Hartford *March 21*
- Gave the talk “Growing Grapes in Connecticut” to the Caudatowa Garden Club in Ridgefield (37 attendees) *April 8*
- Participated in a meeting of the Connecticut Wine Council as the representative of The Connecticut Agricultural Experiment Station *June 12*

GENT, MARTIN P. N.
- Spoke with staff at Agrivolution, a company developing vertical farming techniques at the University of Connecticut Avery Point Campus to discuss various technical aspects for production of hydroponic lettuce *August 6*
- Gave a talk on “Extending the Growing Season” at the Colchester Public Library (20 attendees) *September 19*

GIBBONS, JORDAN
- With Samantha Wysocki, gave a table demonstration on how to identify invasive aquatic plants in Connecticut at the “Last Green Valley” volunteer appreciation event at the Audubon Society in Pomfret (40 attendees) *March 7, 2014*
- Spoke on government career opportunities in the field of environmental science at Westfield State University’s Environmental Science Career Networking Night in Westfield, MA (75 attendees) *March 19*
- Presented the talk “Using GIS in the Surveillance and Management of Invasive Aquatic Plants” at the Spring Northeast Arc Users Conference at the University of Massachusetts, Amherst, MA (20 attendees) *May 13*

HAWTHORNE, JOSEPH R.
- Participated in a webinar hosted by Chemical and Engineering News entitled “The Analysis of Nanoparticles by Liquid Chromatography Mass Spectrometry” *September 3, 2013*
- Gave a poster presentation entitled “Trophic Transfer Potential of Cerium Oxide Nanoparticles Through a Terrestrial Food Chain at the 10th International phytotechnologies Conference in Syracuse NY *October 1-4*
- Participated in the FDA Training Course LB401: “Mobile Laboratory Training for Chemists, Jefferson, Arkansas. Upon course completion, he is now a member of the FDA’s Mobile Laboratory

Deployment Cadre made up of state and FDA employees that can be deployed nationwide for scheduled or emergency testing of food and/or drug materials for chemical contaminants *November 17-23*

HAYES, LAURA ESTEP

- Gave the talk "Lyme Disease in Connecticut: Epidemiology and Control" at the Cheshire Library in Cheshire (9 attendees) *November 17*
- Gave the talk "A Field Trial to Quantify the Effectiveness of Individual and Integrated Control Measures in Reducing Tick-borne Pathogen Exposure Risk" at the Northeastern Mosquito Control Association Annual Meeting in Hull, MA (100 attendees) *December 10*
- With Dr. Kirby C. Stafford, III, participated in a conference call for the Public Tick Integrated Pest Management working Group *December 11*
- With Drs. Kirby C. Stafford, III, Dr. Scott C. Williams, and Dr. Goudarz C. Molaei, participated in a conference call with U.S. Biologic to discuss new technologies for control of tick-associated disease *December 17*
- With Drs. Kirby C. Stafford, III and Dr. Scott C. Williams, attended a meeting in Redding, CT to discuss with township representatives the objectives and progress of the Integrated Tick Management project currently underway there *December 17*
- With Dr. Kirby C. Stafford, III and Dr. Scott C. Williams, participated in a meeting in Redding to discuss the Integrated Tick Management Project currently underway there with township representatives, CT DEEP representatives, and interested Redding residents *January 9, 2014*
- With Dr. Kirby C. Stafford, III, participated in a conference call with U.S. Biologic to discuss new technologies for control of tick-associated diseases *January 21*
- With Dr. Kirby C. Stafford, III, met with the First Selectman and Health Officer in Redding, CT to discuss a new tick management study (5 attendees) *March 12*
- With Dr. Kirby C. Stafford, III, participated in a conference call for the Public Tick Integrated Pest Management Working Group *April 9*

HISKES, ROSE

- Volunteered as a Wasp Watcher for the CAES Cerceris Biosurveillance Program at Center Road School in Vernon July 6, 7, 14, and 15, 2013
- Participated in a moth identification training for the Cooperative Agricultural Pest Survey Program at the University of Massachusetts in Amherst, MA July 16
- Discussed winter moth in Connecticut with staff at the University of Massachusetts *July 16*
- Staffed a CAPS and forest pest table at the Connecticut Nursery and Landscape Association's summer meeting held at Summer Hill Nursery in Madison and answered questions about longhorned beetle and emerald ash borer (30 visitors to the table) *July 17*
- Staffed a CAPS and forest pest table at the Connecticut Tree Protective Association's summer meeting in Farmington and answered questions about Asian longhorned beetle and emerald ash borer (180 visitors to the table) *July 18*
- With Katherine Dugas, staffed a forest pest table at the Downtown Bridgeport Farmer's Market in Bridgeport (68 visitors to the table) *July 25*
- Staffed a forest pest table at the North End Hartford Farmer's Market in Hartford (57 visitors to the booth) *August 21*
- With Katherine Dugas, staffed a forest pest table at the Downtown Bridgeport Farmer's Market in Bridgeport (86 visitors to the booth) *August 22*
- With Katherine Dugas, staffed a forest pest table at the New London Farmer's Market in New London (86 visitors to the booth) *August 28*

- Staffed a forest pest table at the North End Hartford Farmer's Market in Hartford (52 visitors) *September 4*
- Staffed a forest pest table at the Hebron Harvest Fair in Hebron (645 visitors) *September 5-8*
- Organized and led 12 volunteers looking for the Emerald ash borer and Asian longhorned beetle in 708 host trees along the Rail Trails of Vernon *September 7*
- Gave the "Insect Yearly Report" and an Asian longhorned beetle update at the Nursery and Landscape Research Tour at the Valley Lab in Windsor (21 attendees) *September 10*
- Gave a short introduction to the Forest Pest Program and handed out Connecticut identification cards at the Emerald Ash Borer Tour Day, organized by the Connecticut Tree Protective Association, in Middlebury (46 attendees) *September 12*
- With Stephen Sandrey, staffed a forest pest table at the Somers 4 Town Fair in Somers (765 visitors) *September 13-15*
- Gave a talk on "Insect Pests of Vegetables and Landscapes" and a forest pest update at the heritage River Garden Club in Southbury (43 attendees) *September 18*
- Participated in a CAPS conference call *September 19*
- Hosted the Connecticut Nursery and Landscape Association's Plant Identification Workshop for students in the Connecticut Accredited Nursery Professional Course at the Valley Lab in Windsor (21 attendees) *September 21*
- With Katherine Dugas and Mark Creighton, staffed a forest pest booth at the Big E in West Springfield, MA (605 visitors) *September 24*
- Gave a talk on Butterfly Gardening and Forest Pests to the Burlington Garden Club in Burlington (31 attendees) *October 10*
- Participated in the Cooperative Agricultural Pest Survey Regional State Survey Coordinators conference call *October 17*
- Staffed a forest pest table and gave a brief talk on the Asian longhorned beetle, the Emerald ash borer, and Don't Move Firewood at the Knox Park Tree Planting at Colt Park in Hartford (52 attendees) *October 19*
- Gave a talk on the Asian longhorned beetle, Emerald ash borer, and Don't Move Firewood to the Insect Pests of Turf and Ornamentals Class at Naugatuck Valley Community College in Waterbury (17 attendees) *October 23*
- Participated in the Connecticut Invasive Plant Working Group Steering Committee meeting at the Connecticut Forest and Park Association in Middlefield *October 24*
- Staffed a forest pest table at the Connecticut Urban Forest Council Conference in Southington (37 attendees) *October 30*
- Updated the Connecticut Maple Syrup Producers on the Asian longhorned beetle and Emerald ash borer situation via e-mail *November 1*
- With Katherine Dugas, presented Connecticut's Forest Pest Outreach and Survey Program during the multi-state review webinar conducted by USDA APHIS PPQ (17 states participated) *November 6*
- With Katherine Dugas, put on a luncheon for the UCONN Master Gardener Coordinators who volunteer for us in the Forest Pest Outreach and Survey Program at the UConn West Hartford campus (8 attendees) *November 20*
- Participated in the Connecticut Invasive Plant Working Group Symposium Planning Committee meeting at the Valley Lab in Windsor *November 20*
- With Katherine Dugas and Dr. Claire Rutledge, assisted Dr. Joe Elkington, UMass with placement of winter moth traps at high risk sites in Shelton, Milford, and Mystic *November 26*
- With Dr. Claire Rutledge, staffed a Forest Pest Outreach table at an Emerald Ash Borer Management Workshop of the Connecticut Tree Wardens Association in Rocky Hill (163 attendees) *December 12*
- Organized and ran the Statewide CAPS committee meeting at the USDA Offices in Wallingford (16 attendees) *December 13*

- Participated in a regional CAPS state survey coordinator conference call *December 19*
- With Katherine Dugas, submitted a Forest Pest Outreach Suggestion to USDA for Farm Bill funding consideration *December 30*
- Was interviewed about insects and what effects the very cold weather has on them by Bob Miller of the Danbury News Times *December 30*
- Staffed the Connecticut Invasive Plant Working Group display table at the Hartford Flower and Garden Show in Hartford *February 23*
- Gave the talk "Invasive Plants" to the Redding Garden Club and Conservation Commission in Redding, CT (52 attendees) *March 10*

INMAN, MARY K.
- With Dr. Sandra Anagnostakis, answered general questions about gardening and discussed Plant Science Day on "Garden Talk with Len and Scott" on WTIC Radio *July 27, 2013*
- Spoke on "Fruit Trees in the Home Garden" to the Caudatowa Garden Club of Ridgefield (30 attendees) *October 8*
- Gave the talk "Fruit Trees in the Home Garden" to the Burlington Garden Club in Burlington (26 attendees) *November 14*
- Gave the talk "Maintaining Healthy Perennials" to the Portland River Valley Garden Club in Portland (23 attendees) *November 20*
- Gave the talk "Pruning Woody Ornamentals" to the Guilford Garden Club at the Guilford Community Center (40 attendees) *January 15*

KROL, WALTER J.
- Participated in an FDA 50-state conference call concerning new proposed rules that were released under the Food Safety Modernization Act (FSMA) for the Foreign Supplier Verification Programs (FSVP) and Accreditation of Third-Party Auditors *July 26, 2013*

LaMONDIA, JAMES A.
- Was interviewed about the effects of wind damage on shade tobacco and the status of blue mold in the US by Dana Whalen of WTIC News *July 1, 2013*
- Was interviewed about the Station and tobacco research by Dr. Helen Newton for the Health Services Commission *July 9*
- Attended the annual meeting of the Society of Nematologists in Knoxville, TN where he participated as Past-President in the Executive Board meeting, participated in the Journal of Nematology Editorial Board meeting and the Finance Advisory Committee meeting, and presented a paper co-authored with Wade Elmer titled "Salt Tolerance of *Melodogyne spartinae* and *M. hapla*" (65 attendees), and presented the workshop "Publishing in the Journal of Nematology" (50 people) *July 14-17*
- Conducted a tour of the Valley Laboratory research plots and discussed plant pathology research with Keith Burnell, R&D Scientist for Syngenta *August 2*
- Was interviewed about the current status of the shade and broadleaf tobacco crops by Robin Helrich of the New England Agricultural Statistics Service *August 13*
- Led a tour of the Valley Laboratory and Research Farm and discussed CAES and Valley Laboratory research and service to agriculture for Bryan Hurlburt, State Executive Director of the USDA Farm Service Agency, and Ross Eddy and Devon Marsden of the FSA *August 21*
- Conducted a tour of Valley Laboratory research plots and discussed Station research with delegates from the Zhongkai China University of Agriculture and Engineering (3 participants) *September 3*
- Welcomed participants, gave a Station update and spoke about Boxwood blight research and management options during the Nursery and Landscape Research Tour held at the Valley Laboratory (40 attendees) *September 10*

- Examined candidates for the Connecticut arborist license and participated in the quarterly meeting of the Connecticut Tree Protection Examining Board in New Haven *September 11*
- Participated in a boxwood blight research group conference call to present research results and future objectives (12 attendees) *September 24*
- Taught a class on identification, biology and management of tree diseases to students in the Connecticut Tree Protective Association's arboriculture 101 class, New Haven (40 attendees) *September 25*
- Spoke about research results at the annual meeting of the Northeast Regional Multistate Nematology Technical Committee (NE-1040) held in Geneva, NY (15 attendees) *October 2-4*
- Discussed Station research and services with the Environmental Planner and Wetlands agent for the Town of Windsor *December 10*
- Examined candidates for the Connecticut arborist license and participated in the quarterly meeting of the Connecticut Tree Protection Examining Board in New Haven *December 11*
- Spoke on "Strategies to control blue mold and reduce fungicide residues in cigar wrapper tobacco" and participated in the Tobacco Disease Council planning session during the 46th Tobacco Workers Conference held in Pinehurst, NC *January 13-16, 2014*
- Participated in a meeting of the Connecticut Agricultural Information Council to plan for the Connecticut Outstanding Young Farmer Award and prepare for Ag Day at the Capitol *January 22*
- Participated in a conference call with Dr. Victor Triolo and Alison Capper of the British Hop Association to discuss hops research and potential collaboration *January 31*
- Spoke about "Strawberry black root rot and soil health" to the New England Vegetable and Berry Growers Association in Hudson, MA (115 attendees) *February 1*
- Was interviewed about patents and licensing efforts at the Valley Lab by Greg Ladky of CTnow.com *February 6*
- Spoke about diagnosis and control of boxwood blight and diseases of nursery crops at Summer Hill Nursery (6 attendees) *February 10*
- Met with Barry Labendz and John Suscovich to discuss hops and barley research and farm brewery support *February 11*
- Welcomed growers to the annual tobacco Research Meeting and spoke about research topics and recent developments at the Station – he spoke on research on management of tobacco pathogens including poty viruses, black shank, target spot and blue mold fungicide resistance, and about the CORESTA pesticide residue program and strategies to reduce pesticide residues in wrapper leaves and discussed CT grown labeling for tobacco and CT DOAg Venture grant opportunities (100 attendees) *February 18*
- Participated in a meeting of the Connecticut Agricultural Information Council in East Windsor to select the Connecticut Outstanding Young Farmer Award winner and prepare for Ag Day at the Capitol *February 19*
- Spoke to a joint meeting of the Windsor Locks and East Windsor Lions Club in Windsor Locks about research conducted and services provided by the Experiment Station in New Haven and Windsor (72 attendees) *February 20*
- Taught a class on identification, biology and management of tree diseases to students in the Connecticut Tree Protective Association's arboriculture 101 class from the Suffield High School Agriscience Program (11 attendees) *February 27*
- Spoke about research and services at the Station and Valley Laboratory summer employment opportunities at the Central Connecticut State University Biology Department Career Fair (70 attendees) *March 10*
- Examined candidates for the Connecticut arborist license and participated in the quarterly meeting of the Connecticut Tree Protection Examining Board in New Haven *March 12*

- Participated in Agriculture Day at the Capitol, speaking about the 2013 Century Farm Award and Holmberg Orchards (100 visitors) *March 19*
- Participated in a meeting of the Connecticut Agricultural Information Council at the Valley Lab in Windsor *April 2*
- Spoke about strategies to reduce pesticide residues and manage diseases and insect pests of cigar wrapper tobacco to members of Windsor Shade Tobacco (10 attendees) *April 9*
- Welcomed participants in the USDA Farm Services Agency Loss Adjuster Training Program and spoke about research and services available at the Station and Valley Lab (30 attendees) *May 13*
- Conducted a tour of the Valley Laboratory Farm for the participants in the USDA Farm Services Agency Loss Adjuster Training Program and explained ongoing researchrojects (30 attendees) *May 14*
- Participated in the quarterly meeting of the Connecticut Tree Protection Examining Board and examined candidates for the Connecticut arborist license in New Haven *June 11*
- Was interviewed about nematode diseases of fruit and vegetable crops and management options for growers by Dorothy Noble for Growing Magazine *June 13*

LI, DEWEI

- Participated in the annual meeting of the Pan-American Aerobiological Association and Spore Camp held from July 28-31 in Toronto. He made an oral presentation "Five noteworthy airborne fungi from indoor environments" (20 attendees). During the meeting the participants toured the facilities of the Southern Ontario Centre for Atmospheric Aerosol Research at the University of Toronto *July 28-31, 2013*
- Hosted a four-member delegation from Zhongkai University of Ariculture and Engineering and Guangdong Ocean University, China *September 3*
- Hosted a visit by Dr. Haisheng Yuan, Associate Professor of State Key Laboratory of Forest and Soil Ecology, Institute of Applied Ecology, Chinese Academy of Sciences *September 3-4*
- Gave the presentation "Principles of Research Paper Writing and Publication" at Nanjing Forestry University, China during a sabbatical leave from *September 21-October 20.*
- Participated in an Occupational Health Forum: Building Partnerships Towards Healthy Connecticut Workers, Manor Inn, Plantsville, CT *March 27*
- Participated in a meeting of the Advisory Board and Research Team for "Recovery from Catastrophic Weather – Hurricane Sandy: Mold Exposure and Health-Related Training Project" at the UCONN Health Center, Center for Indoor Environments and Health, Farmington, CT *March 28*

LI, YONGHAO

- Staffed the CAES booth and answered questions about tree diseases at the CTPA Summer Meeting held at the Farmington Club (800 attendees) *July 18, 2013*
- Gave the talk "Disease Update for the 2013 Season" at the CAES Nursery and Landscape Research Tour at the Valley Lab in Windsor (28 attendees) *September 10*
- Gave the talk "Needlecast Diseases of Christmas Trees" at the annual fall meeting of the CT Christmas Tree Growers Association in Brooklyn (45 attendees) *September 21*
- Presented the talk "Disease Update for the 2013 Season" at the Extension/Industry Meeting at the Annual Meeting of the Northeastern Division of The American Phytopathological Society in Southbury (30 attendees) *October 23-25*
- Staffed the "hands-on" table on tree diseases for Arboriculture 101, Hamden (25 attendees) *October 30*

- Was interviewed about Phytophthora root rot of Christmas trees by Courtney Zieller of WFSB Channel 3 *December 4*
- Participated in the CNLA-CGGA Winter Symposium in Manchester, CT *January 14, 2014*
- Staffed the CAES booth at the CTPA Annual Meeting held at the Aqua Turf in Plantsville *January 16*
- Gave the talk "Organic Vegetable Disease Management" at the CT NOFA's 32nd Annual Winter Conference in Danbury (60 attendees) *March 1*
- Gave the talk "New Strain of White Pine Blister Rust: Increased Threat to CT Forests?" at the annual Forest Health Workshop held at Fort Trumbull State Park in New London (60 attendees) *March 4*
- Staffed the "hands-on" table with tree diseases for the Arboriculture 101 course in Wallingford (40 attendees) *March 5*
- Gave the talk "Common Garden Diseases and their Control: What is Happening in Your Yard?" for the 2014 Hollandia Spring Garden Expo in Bethel (30 attendees) *April 12*
- Gave the talk "What's Wrong with My Plants?" for Benson-Crump Memorial Community Gardens Program in Milford (62 attendees) *April 14*
- Gave the talk "Disease Management in Organic Gardens" for the 2014 Study Group of the Institute for Learning in Retirement in Woodbridge (7 attendees) *June 18*
- Gave the talk "Common Foliar Diseases of Christmas Trees and Their Management" at the CCTGA twilight meeting in Newtown (35 attendees) *June 19*
- Spoke about the role of the Plant Disease Information Office to visiting students and teachers from Southern CT State University and Central CT State University (40 attendees) *June 25*

MAIER, CHRIS T.

- Was interviewed about the survey for the 17-year periodical cicada by John Burgeson of The Connecticut Post *August 7, 2013*
- Participated in a meeting of the Connecticut Entomological Society at the University of Connecticut in Storrs by exhibiting a species of periodical cicada found in Connecticut for the first time and several new entomological publications *September 20*
- Was interviewed about the brown marmorated stink bug by Nancy Crevier of the Newtown Bee *October 18*
- Was interviewed about research on 17-year periodical cicadas by Steve Grant, freelance writer and contributor to the Hartford Courant *October 28*
- Was interviewed about a new periodical cicada in Connecticut by Patrick Skahill of WNPR radio *November 15*
- Presented a display on apple damage cause by stink bugs and spoke about Lou Magnarelli's career and interaction with fruit growers at the Annual Meeting of the Connecticut Pomological Society in Glastonbury *December 3*
- Spoke about the brown marmorated stink bug at an advisory committee meeting of the Cooperative Agricultural Pest Survey, Animal Plant Health and Inspection Service, USDA, in Wallingford *December 13*
- Gave the talk "The 2013 Emergence of Periodical Cicadas in Connecticut" at the Forest Health Workshop at Fort Trumbull in New London (60 attendees) *March 4, 2014*
- Exhibited arthropod fossils at a meeting of the Connecticut Entomological Society in Storrs (30 attendees) *March 21*
- Presented a display and answered questions about exotic fruit and forest insects at the science fair at North Branford High School in North Branford *May 23*
- Spoke about the distribution of the periodical cicada in Connecticut and distributed a manual on conifer-feeding caterpillars at a twilight meeting of the Connecicut Pomological Society at Belltown Hill Orchards in South Glastonbury (65 attendees) June 10

MARRA, ROBERT E.

- Participated in a phone conference with other members of the Boxwood Blight Working Group *July 12, 2013*
- Presented the talk "Tropical Storms, Hurricanes, Superstorms: Their Impacts and Influence on Tree Diseases" twice during the day at the CTPA Annual Summer Meeting held at the Farmington Club (800 attendees) *July 18*
- Participated in a workshop titled "Comparative Fungal Genomics with MycoCosm", was the lead author on a poster titled "Molecular diagnostics for the boxwood blight fungus, *Calonectria pseudonaviculata*: strategies for early detection", and was an author on an oral presentation titled "Population genomic RAD-SEQ characterization of the boxwood blight fungus, *Calonectria pseudonaviculata*" at the joint annual meetings of the American Phytopathological Society and the Mycological Society of America held in Austin, TX *August 10-14*
- Discussed current and best practices in planting street trees at a meeting of the West Haven Tree Commission *September 9*
- Gave the talk "Dutch Elm Disease, Elm Yellows, and Boxwood Blight" at the New York Botanical Garden in New York, NY (80 attendees) *September 13*
- Participated in a conference call of the Boxwood Blight Working Group to present updates on research and review research topics for the coming fiscal year *September 24*
- Participated in a conference call to plan the upcoming 2014 Connecticut Conference on Natural Resources in March *October 7*
- Hosted and attended the Annual Meeting of the Northeastern Division of The American Phytopathological Society in Southbury (64 attendees) *October 23-25*
- Gave the lecture "Tropical Storms, Hurricanes, and Superstorms: Impacts and Influences on Tree Diseases" to the Federated Garden Club's Environmental Studies School at the Kellogg Environmental Center in Derby (40 adult attendees) *November 7*
- Helped staff the CAES booth at the CTPA Annual meeting at the Aqua Turf in Plantsville *January 16, 2014*
- Reviewed planting specs for street trees with fellow commissioners on the West Haven Tree Commission *January 21*
- Gave the talk "Elm Yellows Diagnostics: Challenges and Capabilities" at the Forest Health Workshop held at Fort Trumbull State Park in New London (60 attendees) *March 4*
- Presented the talk "Nondestructive Quantification of Internal Decay in Living Trees" at the annual meeting of the Experiment Station Associates held at Whitney Center in Hamden (40 participants) *March 26*
- Presented the invited talk "Diagnostics and Detection" at the International Boxwood Blight Summit held at the USDA National Agricultural Library in Beltsville, MD (85 attendees) *May 13*
- Demonstrated the use of Sonic and Electrical Resistance Tomography at the Connecticut Tree Festival in Norwalk, CT, (over 2,000 attendees) *May 17*
- Was interviewed about the use of Sonic and Electrical Resistance Tomography for the television program "It's Relevant" at the Connecticut Tree Festival *May 17*

MAYNARD, ABIGAIL A.

- Was an invited guest on WTIC AM-1080 radio talk show "Garden talk" to talk about the New Crops Program *July 27, 2013*
- Judged fruits and vegetables at the North Haven Fair September 5
- Assisted biology students with the projects at Hamden Hall Country Day School (15 students, 1 adult) *October 10*
- Talked to Pre-Kindergarten and Third grade students about farming at Lockwood Farm at Hamden Hall Country Day School (32 students, 4 adults) *October 15*

- Reported on Station activities at a quarterly meting of the Council on Soil and Waer Conservation in Windsor (16 attendees) November 14
- Judged AP Biology projects at Hamden Hall Country Day School (15 students, 1 adult) *November 21*
- Attended the annual meeting of the Connecticut Pomological Society in Glastonbury *December 3*
- Reported on Station activities at a meeting of the State Technical Committee in Tolland *December 5*
- Described the Experiment Station and the New Crops Program to a 7th grade science class at Hamden Hall Country Day School (15 students, 1 teacher) *December 12*
- Participated in a meeting of the Producer Education and Innovation working group of the Governor's Council for Agricultural Development in Hartford *January 9, 2014*
- Participated in the Connecticut Vegetables and Small Fruit Conference in South Windsor *January 16*
- Served on a panel of the Producer Education and Innovation working group at an agricultural town meeting in Hartford *January 29*
- Spoke about "Unusual Garden Vegetables" to the Long Hill Garden Club in Trumbull (87 attendees) *February 24*
- Participated in a meeting of the Producer Education and Innovation working group , Governor's Council on Agricultural Development *February 27*
- Spoke on "Unusual Garden Vegetables" as part of the Spring Gardening Lecture Series at the Milford Public Library (72 attendees) *March 24*
- Assisted with the set up of a composting operation at Hamden Hall Country Day School *April 17*
- Spoke about Station activities at a quarterly meeting of the Council on Soil and Water Conservation in Windsor *April 24*
- Spoke about Station activities at a meeting of the State Technical Committee in Tolland (26 attendees) *May 1*
- Gave the talk "Unusual Garden Vegetables" at the Branford Garden Club (42 attendees) *May 12*
- Spoke on "Unusual Garden Vegetables" as part of the "Down the Garden Path", Institute of Learning in Retirement series at the Massaro Community Farm in Woodbridge (7 attendees) *June 4*

MERVOSH, TODD L.

- Spoke about invasive plants and led a nature hike at the Housatonic Council Cub Scout Day Camp in Orange, CT (65 youth and 12 adult participants) *July 9, 2013*
- Displayed a poster on biological control of mile-a-minute weed (co-authored with Dr. Carole Cheah and Donna Ellis) at the Connecticut Nursery and Landscape Association field day in Madison, CT *July 17*
- Presented a talk on summer weed management options, and gave tributes to Dr. John Ahrens and Dr. Louis A. Magnarelli at the Christmas Tree Twilight Meeting at the Valley Laboratory in Windsor (45 attendees) *July 23*
- Participated in tree inventory training sessions as part of the Master Tree Plan for Main Street in Suffield *August 14 and 28*
- Participated in an IR-4 Project Regional Priority Setting meeting for pest management needs in specialty food and ornamental crops in Albany, NY *August 20*
- Organized the meeting and gave the talk "New weeds and herbicide issues" at the Nursery & Landscape Research Tour at the Valley Laboratory in Windsor (35 attendees) *September 10*
- With Diane Riddle was interviewed about soil testing, lawn fertilization, and control of weeds and grubs by Geof Fowler, a freelance writer, for his article "Lawn care tips: soil testing" posted on the TRACTOR.COM website *September 19*
- Spoke about management of swallowworts and other weeds at the fall meeting of the Connecticut Christmas Tree Growers Association in Brooklyn (50 attendees) *September 21*
- Talked about invasive plants at a National Public Lands Day event at Hilltop Farm in Suffield (10 adults and 10 children) *September 28*

- Participated in a Board meeting of the Northeastern Weed Science Society in Philadelphia, PA *October 14-15*
- Participated in a Connecticut Invasive Plant Working Group Steering Committee meeting in Middlefield *October 24*
- Presented an invasive plants display at the Suffield Garden Club's flower show in Suffield *October 25-26*
- Talked about soil fertility to Mrs. LaFlamme's class at Suffield High School Agriscience Program and directed the collection of soil samples in preparation for planting trees next spring on the Suffield Town Green (4 students, 1 teacher) *November 20*
- Participated in a general meeting and symposium planning meeting for the CT Invasive Plants Working Group at the Valley Laboratory *November 20*
- Presented two, 1-hour talks on identification, biology, and management of invasive plants and on the efficacy and environmental properties of herbicides at a DEEP training program in Wallingford for pesticide applicators with rights-of-way licenses (45 attendees) *December 3*
- Participated in the annual meeting of the Northeastern Weed Science Society (NEWSS) in Philadelphia, PA , where he is the public relations representative/newsletter editor. He also served as a judge of the student research poster contest *January 6-9, 2014*
- Participated in a symposium planning meeting for the Connecticut Invasive Plant Working Group *January 30*
- Participated in a scholarship committee meeting for the Connecticut Nurserymen's Foundation *January 30*
- Participated in a symposium planning meeting for the Connecticut Invasive Plant Working Group at the Valley Laboratory *February 11*
- Participated in a symposium planning meeting for the Connecticut Invasive Plant Working Group
- Spoke about the biology and management of invasive plants to the Easton Garden Club (25 attendees) *March 12*
- Participated in a meeting of the Connecticut Nurserymen's Foundation Scholarship Committee, at which three students were interviewed and one was selected to receive a scholarship to study horticulture at UConn *April 2*
- Met with students from Suffield High School Agriscience Program to collect soil samples in preparation for a tree planting project (10 participants) *April 10*
- Participated in symposium planning meetings for the Connecticut Invasive Plant Working Group at the Valley Laboratory *April 10 and 23*
- With Dr. Richard Cowles, spoke with legislators and visitors at a CAES display at Ag Day at the Capitol in Hartford *April 22*
- Participated in a symposium planning meeting for the Connecticut Invasive Plant Working Group at the Valley Laboratory *May 5*
- Was interviewed by Pamela Weil about the worst garden weeds for her "Eye on Horticulture for June" article on the Federated Garden Clubs of Connecticut website *May 15*
- Participated in a symposium planning meeting for the Connecticut Invasive Plant Working Group at the Valley Lab *June 3*
- Spoke about weed management at a twilight meeting of the Connecticut Christmas Tree Growers Association at a farm in Newtown (35 attendees) *June 19*

MOLAEI, GOUDARZ

- Presented the invited talk "*Culex pipiens complex* Mosquitoes and Transmission of West Nile Virus in the USA" at the Thirteenth International Congress on Invertebrate Reproduction and Development held in Detroit, MI *July 14-19, 2013*

- Gave the presentations: “Eastern Equine Encephalitis: Knowns and Unknowns,” co-authored with Dr. Theodore G. Andreadis and others; “Host Feeding Patterns of Mosquitoes in a Focus of Eastern Equine Encephalitis Virus in Vermont and Their Roles in Transmission,” co-authored by Dr. Theodore G. Andreadis, Dr. Philip M. Armstrong, and others; and “A Field Trial to Quantify the Effectiveness of Individual and Integrated Control Measures in Reducing Tick-Borne Pathogen Exposure Risk,” co-authored by Dr. Laura E. Hayes, Dr. Scott C. Williams, and Dr. Kirby C. Stafford, III *December 10*
- Presented an invited talk titled “Eastern Equine Encephalitis virus: Knowns and Unknowns” to the New Jersey Mosquito Control Association, Atlantic City *March 5*
- Was interviewed by telephone by Santa Clara University on his research on West Nile and other mosquito-borne arboviruses to prepare a podcast *March 11*
- Presented the invited talk “Dynamics of Vector-Host Interactions in Eastern Equine Encephalitis Virus Foci in Northeastern USA”, and discussed regional collaborations at the Northeastern Eastern Equine Encephalitis Conference in Concord, NH *May 9*
- Met with Dr. Gregory Kelly of the Simon Fraser University to discuss a coordinated multi-state, multi-partner study on West Nile virus *May 15*
- Hosted a group of students from the Sound School, and presented three short talks on research projects currently underway *June 4*

PETERSON, RICHARD B.
- Delivered a lecture entitled “C4 Photosynthesis” at Quinnipiac University, sponsored by the Quinnipiac Chapter of Sigma Xi *September 17, 2013*

PIGNATELLO, JOSEPH J.
- Gave an invited seminar on novel interactions of organic molecules and ions at the interfaces of environmental solids at the Department of Civil and Environmental Engineering, University of Connecticut, Storrs *October 11, 2013*
- Presented a lecture on Catalyzed Combustion of CH3Br: Mechanism and Dry Scrubbing of Br Byproducts at the Methyl Bromide Outreach and Alternatives annual conference in San Diego *November 4-6*
- Gave a lecture on “Influence of Molecular Structure and Adsorbent Properties on Sorption of Organic Compounds to a Temperature Series of Wood Chars” at the annual meeting of the North American Chapter of the Society for Environmental Toxicology and Chemistry in Nashville, TN *November 21*
- Hosted visitors, Professor Gerard Cornelissen and Dr. Sarah Hale, from the Norwegian Geotechnical Institute, Oslo to discuss collaborative research (50 attendees) *November 25-26*
- Presented a poster “Nanoscale Interactions Between Engineered Nanomaterials and Black Carbon (Biochar) in Soil 2013 (co-authored by Jason C. White and others) at the NSF Nanoscale Science and Engineering Grantees Conference: Future Trends in Nanotechnology and Environment and Nanomanufacturing in Arlington, VA *December 4-6*
- Hosted Professor Jun Ma, State Key Laboratory of Urban Water Resource and Environment, Harbin Institute for Technology, China to discuss mutual research interests *January 27, 2014*
- Was interviewed by Greg Ladke of CTNow.com about seeking patents at the CAES February 4
- Presided over the annual Multistate Research Project annual meeting in Minneapolis and gave the Experiment Station report on bioaccessibility of polycyclic aromatic hydrocarbon contaminants in in vitro human gastrointestinal model systems *May 11*
- Attended the Gordon Research Conference on Environmental Sciences: Water in Plymouth, New Hampshire, and co-authored three posters: “Interactions between Cerium Oxide Nanoparticles and Biochar Nanoparticles”; “The Exceptionally Strong, ‘Low-Barrier’ Hydrogen Bond: An Overlooked

Driving Force for Adsorption of Weak Acids to Pyrogenic Carbonaceous Surfaces"; and "Black Carbon-Mediated Destruction of Adsorbed Contaminants by Sulfides in Marine Sediments"

PRAPAYOTIN-RIVEROS, KITTIPATH

- Participated in a conference call with the Association of Public Health Laboratories about data transmission to FDA eLEXNET *July 9, 2013*
- Participated in the Ad Hoc Laboratory Accreditation webinar from the North Carolina Department of Agriculture and Consumer Services Laboratory on ISO Accreditation and document control *July 18*
- Participated in a conference call with the Connecticut State Department of Consumer Protection and FDA audit team for the Manufactured Food Regulatory Program Standard *November 13*
- With Vickie Bomba-Lewand oski, participated in a seminar on PC and Mobility Symposium at Bureau of Enterprise Systems and Technology in Hartford *November 20*
- With Terri Arsenault, Dr. Walter Krol, Dr. Brian Eitzer, and Craig Musante, participated in the webinar training on Proficiency Testing – compliance with the ISO/IEC:17025 Standard *February 20*

RIDDLE, DIANE

- Spoke about soil testing and demonstrated the soil testing process to an Arboriculture class from the Suffield High School Agriscience Program (11 attendees) *February 27*

RIDGE, GALE E.

- Spoke about bed bugs to senior citizens at the Woodview Apartments, East Haven (45 attendees) *July 9, 2013*
- Presented a talk about the Emerald ash borer and Asian longhorned beetle to the West Haven Land Trust (25 attendees) *August 14*
- Conducted a collecting field trip to a chicken coop in Watertown where the birds were infested with bird mites, a species of predatory Heteroptera on the mites, and the Common bed bug (*Cimex lecturlarius)*. Additionally, the owner had a population of *C. lectularius* living in her bed which Dr. Ridge collected *August 18*
- Presented a talk about management and self-protection against bed bugs to numerous social agencies serving over 4,000 citizens in Connecticut at the Connecticut Valley Hospital in Middletown (49 attendees) *August 21*
- Was interviewed about West Nile virus on the Chaz and A. J. Radio Show on Star 99.9 Radio *August 30*
- Advised on bed bug management practices and pesticide treatment lists for the Mercy Housing and Shelter Corporation, an organization that provides housing and supportive services for the homeless and at-risk homeless in Connecticut and nationally *September*
- Was interviewed about bed bugs by staff at the Yale Daily News *September 18*
- Presented a talk demystifying the human bed bug to staff at the Connecticut Mental Health Center in New Haven (40 attendees) *September 19*
- Delivered a lecture on bed bugs as a visiting scholar to the Department of Biological and Environmental Sciences, Western Connecticut State University, in Danbury (80 attendees) *September 25*
- Spoke about bed bugs to teachers, maintenance staff, and students at Quinnipiac University, Hamden (60 attendees) *October 17*
- Spoke about the behavior and biology of bed bugs and the psychological price of dealing with them to teachers, maintenance staff, and students at the New Haven Jobs Corps Center (more than 200 attendees) *October 30*
- Participated in the Bridgeport Health Fair with Katherine Dugas at the University of Bridgeport, educating citizens about human bed bugs (> 500 visitors) *October 31*

- Spoke about bed bugs at the Connecticut Environmental Health Association Fall Conference in East Haven (120 attendees) *November 1*
- Gave the talk "The Complete Life Reproduction Study of the Common Bed Bug, *Cimex lectularius* L. (Heteroptera: Cimicidae), including Behavior, Fecundity, and Longevity" at the Annual Meeting of the Entomological Society of America, Austin, TX *November 9-14*
- Was the presenter in a Canadian Broadcasting Corporation documentary film titled "Bite Me: The Bed Bug Invasion" which aired in Canada *November 14*
- In partnership with Diane Jorsey and Sherill Baldwin of DEEP, conducted a bed bug training program for the recycling and refurbishing industries in Connecticut, Massachusetts, and Rhode Island, Middlesex Community College, Middletown (25 attendees) *November 21*
- Trained mattress recyclers and refurbishers at Green Park Recycling in Bridgeport on self-protection against bed bugs (20 attendees) *December 4*
- Spoke about bed bug biology and behavior to students from the Norwich Free Academy *December 11*
- Presented a talk about bed bugs and self-protection to the staff at the Miller Library, Hamden (30 attendees) *December 12*
- Spoke about bed bugs to the Village for Families and Children, Hartford (40 attendees) *January 29, 2014*
- Was interviewed about the services of the Insect Inquiry Office with Katherine Dugas by Jennifer Gersten for an article entitled "The Sleuths Will See You Now" which was published in the Yale Daily News Magazine on *January 30, 2014*
- Spoke about bed bugs and community response to them to the Southwest Connecticut Mental Health Systems at Bridgeport Hospital, Bridgeport (70 attendees) *February 26*
- Met with Dr. Osvaldo Di Iorio in Buenos Aires, Argentina, to collaborate with Cimicid taxonomy. She is close to confirming a South American line of the species complex of *Cimex lectularius* L. *February 26-March 9*
- Spoke about bed bugs and situations of social stress to the Connecticut Coalition Against Domestic Violence in Wethersfield (60 attendees) *March 19*
- Presented a two-hour workshop on bed bugs and management in institutions to the Bethesda Community, Norwich (25 attendees) *March 26*
- Gave a talk on bed bugs at Southern Connecticut State University, New Haven (55 attendees) *March 26*
- Gave a talk about bed bugs at the Child Guidance Clinic for Central Connecticut, Meriden (30 attendees) *April 17*
- Gave a talk focusing on managing bed bugs that are accidentally introduced into the United States by refugees, particularly those that are being processed through Gibraltar from the Middle East, Syria, and Africa, to staff at Integrated Refugee and Immigration Services in New Haven *April 24*
- Spoke on bed bug biology, cultural response to the insect, and its management, at a conference sponsored by the EPA in North Chelmsford, MA for Northeastern Indian Tribes (60 attendees) *May 1*
- Spoke about bed bug behavior and how this can affect management of the insect in schools to the South Central Connecticut Regional School Nurse Supervisory Group at ACES, Hamden (40 attendees) *May 21*
- Delivered a major speech to the Commissioner's Semiannual Directors of Local Health Meeting held at Central Connecticut State University in New Britain. She talked about the historic relationship between capitalism and the human bed bug – how it has inadvertently been influenced by commerce, which has contributed to, amongst other things, hybrid vigor. She also discussed how the current economic downward pressure on the American middle class has put greater pressure on the services of state and local health departments in regard to bed bug management (100+ attendees) *May 28*
- Was interviewed about the Emerald ash borer, winter moth, ground nesting bees, and the brown marmorated stink bug by Harold Harlan from the Journal Courier *June 2*

- Was interviewed about winter moth and Emerald ash borer by Judy Benson from The Day *June 2*
- In collaboration with the Director of the Norwalk Health Department, public transportation posters, "Give Bed Bugs the Boot", were published and installed onto over 500 buses throughout Connecticut *June 9*
- Collaborated with the First Selectwoman of Bethany to do a mass mailing alert about the Emerald ash borer that was sent out with tax bills to town residents *End of June*
- Collaborated with the West Haven Tree Commission, sending out an alert to town residents about the emerald ash borer, recently discovered in West Haven *End of June*

ROBB, CHRISTINA S.

- Participated in the on-site assessment and gap analysis by the FDA/ORA for our ISO Accreditation 17025 funding *September 10, 2013*
- Participated in a Board Meeting of the Eastern Analytical Symposium in Somerset, NJ *September 20*
- Viewed an FDA/CFSAN Food Defense Symposium Webinar *September 30*
- Participated in the webinar training course "2013 Select Agent Webinar from CDC and APHIS" *November 15*
- Participated in the 2013 Eastern Analytical Symposium in Somerset, NJ as a Board member, and also participated in a program planning meeting, board meetings and chaired the Technical Session entitled "What's in the Cabinet? Looking at Everyday Items in a New Light" *November 17-20*
- Participated in the Eastern Analytical Symposium board meeting by web conference *February 14, 2014*
- Gave the presentation "Screening the Food Supply" at the Yale Occupational Emergency Medicine Program at the Yale School of Medicine (20 attendees) *April 22*
- Participated in a Board meeting and program planning meeting for the Eastern Analytical Symposium 2014, in Somerset, NJ *May 17*
- Gave an overview of the Analytical Chemistry Department to students and faculty from the Sound School *June 4*

RUTLEDGE, CLAIRE E.

- Carried out numerous trainings in July for the Wasp Watcher Program throughout the state, including trainings at White Memorial Conservation Center in Litchfield, Orange, Hampton, and Wilton *July, 2013*
- Was interviewed about the Station's discovery of Emerald ash borer in Sherman by the Danbury News Times *July 26*
- Gave the talk "Emerald ash borer in Connecticut" at the Nursery and Landscape Research Tour at the Valley Laboratory in Windsor (25 attendees) *September 10*
- Gave the talk "Emerald ash borer in Connecticut" at the Emerald Ash Borer Tour hosted by the Connecticut Tree Protective Association in Middlebury (50 attendees) *September 12*
- Gave the talk "Biosurveillance: using a native wasp to find an invasive beetle" at the weekly seminar of the Department of Entomology, University of Arkansas, in Fayetteville, AR (30 attendees) *September 20*
- Taught the "Insects that Attack Trees" class for the CTPA's Arboriculture 101 course in New Haven (35 attendees) *October 2*
- Gave a guest lecture on the Emerald ash borer to an Ecology Class at Middlesex Community College in Middletown (25 attendees) *October 9*
- Gave a guest lecture on the Emerald ash borer for the Invasive Species symposium at Wesleyan University in Middletown (24 attendees) *October 17*
- Taught the "Tree Conditions Laboratory" for the CTPA;s Arboriculture 101 course in New Haven (35 attendees) *October 30*

- Gave an interview about biological control of Emerald ash borer to Gregory Hladky of the New Haven Advocate, which resulted in an article in the November 14 issue titled “Insect Wars” *November 6*
- Gave the talk “Emerald Ash Borer in Connecticut” to the Oxford Land Trust in Oxford (23 attendees) *November 18*
- Gave the talk “Emerald Ash Borer’ to the national meeting of the American Association of Consulting Arborists in Montville (120 attendees) *December 5*
- With Rose Hiskes, staffed a Forest Pest Outreach table at an Emerald Ash Borer Management Workshop of the Connecticut Tree Wardens Association in Rocky Hill (163 attendees) *December 12*
- Participated in the statewide CAPS committee meeting at the USDA offices in Wallingford (16 attendees) *December 13*
- Gave the talk “Emerald Ash Borer and Friends: Beetles to Watch Out For In 2014” at the annual meeting of the Connecticut Nursery and Landscape Association in Manchester (40 attendees) *January 14, 2014*
- Staffed a table on Emerald ash borer and Asian longhorned beetle at the Annual Meeting of the Connecticut Tree Protective Association in Plantsville *January 16*
- Gave the talk “Biosurveillance: Using a Native Wasp to Find an Invasive Beetle” at the Yale School of Forestry lunchtime seminar series in New Haven (30 attendees) *January 23*
- Taught the class “Insects that Attack Trees” at the Bartlett Arboretum in Stamford (10 attendees) *February 11*
- Taught the class “Insects that Attack Trees” for the Arboriculture 101 course, Wallingford (45 attendees) *February 12*
- Gave the talk “The Death Curve: What Happens After EAB Arrives” at the Forest Health Workshop held at Fort Trumbull State Park in New London (60 attendees) *March 4*
- Staffed the CAES booth at Agriculture Day at the Capitol in Hartford *March 19*
- Presented the talk “Emerald Ash Borer in Connecticut” at the annual meeting of the Experiment Station Associates in Hamden (45 attendees) *March 26*
- Gave the presentation “Biosurveillance: Using a Native Wasp to Catch an Invasive Beetle” and staffed a table at the Windham/Tolland Master Gardener Opportunity Fair in Vernon (35 attendees) *April 11*
- Staffed a table on “Biosurveillance: Using a Native Wasp to Catch an Invasive Beetle” at the New London/Middlesex Master Gardener Opportunity Fair in Norwich (30 attendees) *April 15*
- Presented a lecture titled “Emerald Ash Borer in Connecticut” at the Middlesex Institute for Lifelong Education at Middlesex Community College in Middletown (15 attendees) *April 24*
- With Dr. Charles Vossbrinck, judged the New Haven Public Schools Science Fair in New Haven *May 12-13*
- Gave a town informational session titled “Emerald Ash Borer in Watertown” in Watertown (10 attendees) *June 10*
- Gave the talk “Emerald Ash Borer in Connecticut” at the Goodwin Nature Center in Hampton (11 attendees) *June 20*
- Presented a webinar titled “Biosurveillance: Using a Native Wasp to Find an Invasive Beetle” to the NY Invasive Species speaker series (37 attendees) *June 25*

SCHULTES, NEIL P.

- Served on a Master Thesis Defense Committee for Janet Minton at the Department of Biology, Indiana-Perdue University, FT. Wayne, IN *July 15, 2013*
- Represented the Experiment Station and Executive Committee at a New Members meeting for the Quinnipiac Chapter of Sigma Xi at Quinnipiac University *September 18*

- Hosted a hands-on laboratory module for genetic fingerprinting of bee populations in Connecticut in the Yale undergraduate Genetics Course in *November*
- Presented a lecture on Genetic Engineering in Plants to 45 students in the Plant Biology 103 course at Southern CT State University *November 25*
- Taught a three week module on "Genetically Modified Plants in Agriculture" to undergraduates enrolled in the Yale University course Sci031, "Current Topics in Science" *January 20, 30, and February 7, 2014*
- Presented a seminar on "Genetically Modified Plants in Agriculture" at the New England Flower Show Expo in Hartford, CT *February 20*
- Served as a coordinator and judge in the Sigma Xi Quinnipiac Chapter Student Research Conference at Quinnipiac University *April 23*
- Hosted a multi-laboratory tour of the Biochemistry Department for 15 undergraduate students in the course "Plant Physiology 103" from Southern Connecticut State University *April 29*
- Presented the seminar "Genetically Modified Plants in Agriculture: An Interplay of Science and Society" at the Institute for Learning in Retirement at Albertus Magnus College *May 28*
- Spoke to High School students from the Sound School who are studying Biotechnology about current experiments in the C4 Rice Project *June 4*

SHEPARD, JOHN J.

- With Michael Thomas, conducted a hands-on workshop on mosquito biology and spoke about the Mosquito Trapping and Testing Program to a group of 14 students and 2 teachers from Co-op Arts and Humanities High School in New Haven as part of the Yale Peabody Fellows SEPA NIH Program on mosquito biology *November 13, 2013*
- Spoke to four 7th grade science classes (via Skype) about mosquito collection techniques and answered questions about mosquito biology from students at the STEM Academy at Rogers Park Middle School in Danbury as part of the Yale-Peabody Fellows SEPA NIH program on mosquito biology (102 students, 2 teachers) *November 19-20*
- Gave a talk on arbovirus activity in Connecticut, 2013 at the 59th Annual Meeting of the Northeastern Mosquito Control Association in Hull, MA (170 attendees) *December 9-11*
- Conducted a hands-on workshop on mosquito biology at the Co-op Arts and Humanities High School in New Haven as part of the Yale-Peabody Fellows SEPA NIH Program on Mosquito Biology (15 students, 1 teacher) *January 28, 2014*
- Participated in a Board of Directors meeting of the Northeastern Mosquito Control Association in Northboro, MA (11 attendees) *January 31*
- Spoke about and presented hands-on activities about the mosquito life cycle to seven pre-kindergarten classes as part of the STEM Program at the Academy of Aerospace and Engineering Elementary School in Rocky Hill (155 participants) *February 26*
- Presented a display on the Mosquito Trapping and Testing Program, West Nile Virus, Eastern Equine Encephalitis, and Mosquito Biology at "Bitten! Bloodsuckers & Climate" at the Yale Peabody Museum of Natural History (2,077 visitors) *April 17*
- With Michael Misencik and Tanya Petruff, met with Dr. Alicia Bray of Central Connecticut State University to discuss potential research opportunities and sampling of mosquitoes in state forests *May 14*

SHORT, MICHAEL R.

- Presented a poster entitled "Evaluation of Eight Repellents in Deterring Eastern Cottontail Herbivory in Connecticut" at The Connecticut Urban Forest Conference & The Connecticut Forest Forum in Southington (200 attendees) *October 20*

- Participated in and successfully completed requirements for Adult First aid/CPR/AED training conducted by the American Red Cross in New Haven
- Participated in and presented the poster "Evaluation of Eight Repellents in Deterring Eastern Cottontail Herbivory in Connecticut" at the 70th Annual Northeast Fish & Wildlife Conference in Portland, ME *April 13-15*

SMITH, VICTORIA L.

- Participated in the Connecticut Nursery and Landscape Association's Summer Meeting held at Summer Hill Nursery in Madison (200 participants) *July 17, 2013*
- Participated in a meeting of the Connecticut Chapter of the American Society of Landscape Architects held at Planters Choice Nursery in Newtown (50 participants) *July 23*
- Participated in the 87th Annual Meeting of the National Plant Board, as outgoing Eastern Plant Board President, and in discussions on quarantine-significant pests and diseases, held at the Galt House in Louisville, KY (150 participants) *August 4-8*
- Was interviewed about recent detections of Emerald ash borer by Mark Sims, CT Radio Network *August 12*
- Was interviewed about recent detections of Emerald ash borer by the Meriden Record Journal *August 12*
- Was interviewed about recent detections of Emerald ash borer by Bill Leukhardt of the Hartford Courant *August 12*
- Was interviewed about the upcoming hearing on expansion of the Emerald ash borer quarantine boundaries by Quannah Leonard of the Waterbury Republican American *August 27*
- Participated in a public forum at the Town Hall in Prospect on expansion of the existing quarantine boundaries for Emerald ash borer infestation (15 participants) *August28*
- Participated in the Nursery and Landscape Research Tour, held at the Valley Laboratory in Windsor, with a presentation titled "Regulatory Status of Boxwood Blight" (60 participants) *September 10*
- Participated in a meeting of the Yale Biosafety and Recombinant DNA Committee in New Haven (20 participants) *September 19*
- Gave the talk "Two years Later – the CT Boxwood Blight Experience" at the workshop "Disease and Pest Management in the Landscape" sponsored by UConn-Extension and the Northeastern Division of the American Phytopathological Society held in Southbury (100 participants) *October 25*
- Participated in the annual Forest Health Cooperators Meeting, sponsored by the US Forest Service, held at Southern Maine University in Gorham, Maine, and reported on aerial surveys, forest health surveys, and forest conditions (20 participants) *November 20-21*
- Participated in a National Plant Board Working Group on *Phytophthora ramorum*, to refine details of the upcoming new Federal Order concerning regulation of *P. ramorum* held at USDA-Federal Grain Inspection Services Offices in Aurora, CO (25 participants) *December 4-6*
- Participated in the Fall meeting of the CT Cooperative Agricultural Pest Survey held at USDA Offices in Wallingford (15 participants) *December 13*
- Participated in a webinar outlining survey plans for 2014 held in the Analytical Chemistry Conference Room (over 100 participants nationwide) *December 18*
- Participated in a meeting of the Yale Biosafety Committee in New Haven (20 participants) *December 19*
- Participated in a meeting of the National Plant Board Systems Approach to Nursery Certification Agricultural Regulations working group, held at the Holiday Inn, Orlando Airport, located in Orlando, FL (650 attendees) *January 13-17, 2014*
- Organized and participated in the annual Forest Health Workshop held at Fort Trumbull State Park Conference Center, New London. There were 12 presentations by scientists from CAES and University of Connecticut on topics of interest to foresters and arborists (60 attendees) *March 4*

- Participated in a workshop on the new Federal Order concerning *Phytophthora ramorum*, held at the USDA-APHIS-Plant Protection and Quarantine Office in Wallingford *March 26*
- Participated in a meeting of the Yale Biosafety Committee in New Haven (15 participants) *May 15*
- Participated in a meeting of the National Plant Board's Board of Directors as a representative of the Eastern Plant Board, held at the USDA-APHIS Plant Inspection Station in Los Angeles, CA (15 participants) *May 19-22*
- Participated in the spring Cooperative Agricultural Pest Survey Committee Meeting held at USDA-APHIS-PPQ offices in Wallingford (10 participants) *May 30*
- With Tia Blevins and Peter Trenchard, participated in an Aerial Survey Aviation Safety Workshop sponsored by the US Forest Service at Granite Air in West Lebanon, New Hampshire (20 participants) *June 2*
- Participated in an evening meeting of the CT Pomological Society, held at Belltown Hill Orchards in South Glastonbury and gave a brief presentation on ALB and EAB (65 participants) *June 10*
- Participated in a meeting of the Yale Biosafety Committee in New Haven (15 participants) *June 19*

STAFFORD, KIRBY C., III

- Was interviewed about the passing of the cicadas by Steve Kalb of Connecticut Radio Network *July 2, 2013*
- Was interviewed about the increased number of mosquitoes with all the rain by David Groman of the Waterbury Republican American *July 5*
- Was interviewed about the increased number of mosquitoes with all the rain by Karena Garrity of the Shoreline Times *July 5*
- Participated in the joint meeting of the Northeastern Regional Association of Experiment Station Directors (NERA) and Extension Directors (NEED) *July 7-9*
- Was interviewed about the insecticide permethrin by Paul Greenberg of the Discovery Channel *July 15*
- Was interviewed about Dr. Louis Magnarelli by Ed Stannard of the New Haven Register *July 16*
- Interacted with growers at the Summer Meeting of the Connecticut Nursery and Landscape Association held at Summer Hill Nursery in Madison *July 17*
- Was interviewed about ticks and tick control by Robert Tedeschi of the New York Times *July 17*
- Interacted with arborists at the Connecticut Tree Protective Association Summer Meeting held at the Farmington Club *July 18*
- Was interviewed about Dr. Louis Magnarelli by Bob Miller of the Danbury News Times *July 19*
- Was interviewed about the Emerald ash borer detection in Sherman, CT by Bob Miller of the Danbury News Times *July 26*
- Was interviewed about Plant Science Day and research at the Station by Ray Andrewsen, WQUN-1220 AM Radio *August 1*
- Was interviewed about the Emerald ash borer by Kate Mattiace, Citizen News, Fairfield *August 2*
- Was interviewed about the Emerald ash borer by Bob Miller, Danbury News Times *August 19*
- Was interviewed about ticks and Lyme disease by Pat Grandjean, Connecticut Magazine *August 21*
- Was interviewed about the Giant Swallowtail by Mike Patrick, Republican American *August 29*
- Was interviewed about West Nile virus and the potential for Eastern Equine Encephalitis in Wallingford by Eric Vo, Record-Journal *August 30*
- Met with Susan Hom, Commission on Human Rights and Opportunities, in Hartford *September 12*
- Was visited by Patti Miller, DVM, PhD., a veterinary medical officer from Georgia, to discuss research *September 16*
- Chaired a conference call of the Multi-state Activities Committee for the northeast region *September 17*

- Spoke on the state perspective on the Emerald ash borer quarantine and state permit requirements at an EAB forum for the CT Tree Protective Association (52 attendees) *September 18*
- Was interviewed about ticks and Station activities by Jennifer Dursten of the Yale Daily Magazine *September 20*
- Participated in a national meeting of the Experiment Station section and Experiment Station Directors and chaired a meeting of the northeast Multi-state Activities Committee in Columbus, OH *September 24-26*
- Was interviewed about activities around the Station by Jan Spiegel of The Connecticut Mirror *September 30*
- Participated in a Board Meeting of the Connecticut Coalition Against Bed Bugs (5 attendees) *October 3*
- Spoke on tick-borne diseases and tick management at a Department of Entomology, Penn State University seminar series in State College, PA (50 attendees) *October 25*
- Spoke on the Emerald ash borer quarantine and then on the firewood regulations at an informational forum for the CT Professional Timber Products Association held at Sessions Woods in Burlington (84 attendees) *November 5*
- Presented the talk "Expansion of Zoonotic Babesiosis and Lyme disease and Comparison with Human Cases in Connecticut, 2001-2010" at the annual meeting of the Entomological Society of America in Austin, TX *November 10*
- With Dr. Goudarz Molaei, Dr. Scott Williams and Dr. Laura Hayes, spoke with representatives of U.S. Biologics, Inc., about research opportunities *November 21*
- With Dr. Laura E. Hayes, participated in a tick IPM working group conference call *December 11*
- Introduced the Experiment Station and tick research to visiting students and a teacher from the Norwich Free Academy, and led a tour of the tick and mosquito laboratories. Dr. Gale Ridge, Elizabeth Alves, Dr. Philip Armstrong, Michael Thomas, and Angela Bransfield participated in the program (14 attendees) *December 11*
- With Dr. Laura E. Hayes, Dr. Scott C. Williams and Dr. Goudarz C. Molaei, participated in a conference call with U. S. Biologic to discuss new technologies for control of tick-associated disease *December 17*
- With Dr. Scott C. Williams and Dr. Laura E. Hayes, participated in a meeting on the CDC Tick IPM Project in Redding, CT *December 17*
- With Dr. Scott C. Williams and Dr. Laura E. Hayes, participated in a meeting of the wildlife officials from the CT Department of Energy and Environmental Protection, Redding town officials, State Representative John Shaban, and town hunters on the tick IPM project *January 9, 2014*
- Was interviewed about the tick IPM program by Sara Hagan, Connecticut News 12 *January 9*
- Was interviewed about winter temperatures and survival of the Emerald ash borer by Ruth Epstein, Republican-American *January 10*
- Participated in the Annual Meeting of the Connecticut Tree Protective Association at the Aqua Turf in Plantsville, CT *January 16*
- Participated in a conference call of the Tick IPM working Group *January 17*
- Presented two talks on ticks, Lyme disease, and tick control at the Winter Lawn Care Conference of the Massachusetts Association of Lawn Care Professionals in Sturbridge, MA – one for their Technical Seminar (150 attendees) and one for their Business Owner/Manager Seminar Workshop (22 attendees) *January 23*
- With Dr. Theodore G. Andreadis, met with the State Forester, DEEP, to discuss cooperative forestry items *January 24*
- With Dr. Scott C. Williams met with officials of DEEP to discuss Tick Integrated Management Project in Redding *January 31*

- Spoke to visiting staff from the Stamford Health Department attending a tick identification session with Elizabeth Alves (5 attendees) *February 6*
- Spoke on tick integrated pest management at the NOFA Organic Land Care Course held at Three Rivers Community College in Norwich (60 attendees) *February 11*
- Participated in a webinar trial run for a March national tick IPM webinar *February 21*
- With Dr. Laura E. Hayes and Dr. Scott C. Williams, participated in a meeting with Maria Diuk-Wasser and her staff from Yale University to discuss possible collaborative research projects (6 attendees) *February 26*
- Spoke on the Emerald ash borer and firewood regulations at the Forest Health Workshop in New London (60 attendees) *March 4*
- Spoke on landscape management for tick control for the National NPMA Pestworld webinar "Principals of Tick Management and Tick-Borne Disease" (430 participants) *March 5*
- Was interviewed about cold temperatures and its impact on invasive insects by Patrick Skahill, WNPR Radio *March 6*
- Spoke on tick bite prevention and insect repellents at the Southbury Garden Club (27 attendees) *March 7*
- With Dr. Laura E. Hayes, met with the First Selectman and Health Officer in Redding, CT to discuss a new tick management study (5 attendees) *March 12*
- Was interviewed about the tick study in Redding CT by Greg Hladky of the Hartford Courant *March 24*
- Was interviewed about ticks and Lyme disease by Kathy Connolly for the Day, and Lawn & Garden Magazine *March 31*
- Was interviewed about the reservoir targeted Lyme disease bait study that will be carried out in Redding, CT by Bob Miller of the Danbury News Times *March 31*
- Was interviewed about the reservoir targeted Lyme disease bait study that will be carried out in Redding, CT by Judy Benson of The Day *March 31*
- Participated in a meeting organized by Dr. Gale Ridge of the Connecticut Coalition against Bed Bugs at the Station (6 attendees) *April 4*
- Gave three talks on ticks and tick-borne diseases at Boehringer Ingelheim in Ridgebury, which was also simultaneously provided to employees online (22 attendees) *April 8*
- Spoke on ticks and Lyme disease for Science Day at the Housatonic Valley Regional High School in Falls Village (80 student attendees) *April 11*
- Was interviewed about ticks and tick-borne diseases by Liese Klein of New Haven Magazine *April 11*
- Was interviewed about ticks and tick-borne diseases by Mike Patrick of the Republican-American *April 16*
- Was interviewed about ticks by Rachel Doming-Rooney of Channel 3 Eyewitness News *April 17*
- With Dr. Scott C. Williams, met with Dr. Trevor N. Petney of the Karlsruhe Institute of Technology, Zoological Institute, Germany, and author and director Berndt Welz of Germany, to discuss some filming for a Lyme disease documentary *May 6*
- With Dr. Scott Williams, met with Dr. Trevor N. Petney and Berndt Welz for the film interview in Lyme *May 7*
- With Dr. Laura E. Hayes, held a conference call with Steve Zatechka of U.S. Biologic to discuss the rodent Lyme disease vaccine study *May 8*
- Was interviewed about ticks and the upcoming tick season by John Charlton *May 13*
- Spoke about the relationship between deer and ticks at a meeting of the Shelton Deer Committee in Shelton (9 attendees) *May 13*
- Was interviewed about ticks by Sam Gingerella of WTIC-AM Radio in Farmington *May 14*
- Was interviewed about tick activity and Lyme disease prevention by Judy Benson of the New London Day *May 28*

- Participated in a Cooperative Agricultural Pest Survey meeting in Wallingford (10 attendees) *May 30*
- Participated in the annual meeting of the Connecticut Academy of Science and Engineering in Cromwell *June 5*

STONER, KIMBERLY A.

- With Mark Creighton and Robert Durgy, was interviewed at Griswold Research Center about pumpkin pollination, pesticides in pollen and nectar, and the role of honeybees in pollination by Judy Benson of the New London Day *July 5, 2013*
- Was interviewed about pumpkin pollination and wild bees by Sandy Csizmar of the Hartford Courant *July 10*
- Was photographed doing research on pumpkin pollination, collection of trapped pollen from honeybee hives, bumble bees, and honeybees at the Griswold Research Center by Rich Messina of the Hartford Courant *July 11*
- Presented a Mobile Garden Clinic on pest management at the Little Red Hen Community Garden at 32 Mead Street in New Haven (17 adult and 3 youth attendees) *July 27*
- Was interviewed for an article on pollinators by Myrna Watanabe for BioScience Magazine, and provided photographs by Michael Thomas and Jess Gambel for the article *September 18*
- Participated in a meeting of the Urban Agriculture Working Group held at City Hall in New Haven *October 10*
- Participated in a panel on Pest Management Policy, focusing on policies for pest management on municipal and school outdoor properties, sponsored by the North Haven Conservation Commission at the North Haven Public Library (40 attendees) *October 23*
- Organized and led a meeting on lead and arsenic in soils in New Haven, working on best practices to mitigate or avoid these contaminants in urban agriculture with Thomas Rathier of the Valley Laboratory and Dawn Pettinelli of the Soil Testing Laboratory at the University of Connecticut and representatives of New Haven agricultural and environmental groups (7 attendees and several e-mail participants) *October 24*
- Spoke on "Conserving Pollinators in our Horticultural Businesses" at a conference for nursery and greenhouse growers on biological control held in Sturbridge, MA (105 attendees) *November 6*
- Led a meeting of the Subcommittee on Lead and Arsenic in Soil of the Urban Agriculture Working Group for the City of New Haven, which is working on a publication of Best Management Practices for Gardening in Soils with Lead (7 attendees) *November 12*
- Participated in a meeting of the Urban Agriculture Working Group for the City of New Haven, held at City Hall (10 attendees) *November 14*
- Presented a draft document on "Gardening in City Soils with Lead" to the Working Group on Urban Agriculture of New Haven at City Hall in New Haven (12 attendees) *January 9, 2014*
- Distributed a survey on pollination of pumpkin and winter squash at the CT Vegetable and Small Fruit Conference in South Windsor *January 16*
- Participated in developing a proposal for an Urban Agriculture Resource Center in New Haven as part of the Working Group on Urban Agriculture at City Hall in New Haven (16 attendees) *January 29*
- Participated in the town hall meeting of the Governor's Council on Agricultural Development in Hartford *January 29*
- With Dr. Brian D. Eitzer and Tracy Zarrillo, participated in a meeting of the project "Pollination Security for Northeastern Fruit and Vegetable Crops at the University of Massachusetts-Amherst, and reported on research relating bee counts to pollen deposition on pumpkin and winter squash farms in Connecticut *February 10*
- Presented two workshops: "The Future of Honey Bees, Wild Bees, and Pollination, and What You Can Do" (55 attendees) and "Lead and Arsenic in Soil: Where Is It and What Can you Do About It? (35 attendees), CT NOFA Winter Conference, Western Connecticut State Univ., Danbury *March1*

- Spoke on “The Future of Honey Bees, Wild Bees, and Pollination, and What You Can Do” at a meeting of the Land Heritage Association of Glastonbury held at the South Glastonbury Public Library (65 attendees) *March 4*
- Participated in a meeting of the Urban Agriculture Working Group held at New Haven City Hall (12 attendees) *March 12*
- Spoke on “The Future of Honey Bees, Wild Bees, and Pollination, and What You Can Do” to the Branford Land Trust at the Branford Public Library (52 attendees) *March 26*
- Presented the talk “Evaluating Pesticides Found in Trapped Honey Bee Pollen in Connecticut” at the Northeast Natural History Conference in Springfield, MA (55 attendees) *April 9*
- Presented the talk “The Future of Honey Bees and Wild Bees, and What You Can Do” at the New Milford Rotary Club in New Milford (65 attendees) *April 29*
- Gave the presentations “Common Bees on Alternative Flowering Plants on Vegetable Farms” and “How Bees are Exposed to Pesticides” at a Pollinator Conservation Course, run by the Natural Resources Conservation Service and the Xerces Society held at the Cornell Cooperative Extension Agroforestry Center in Acra, NY (65 attendees) *May 22*
- Co-led a New Haven Land Trust workshop on bees with beekeeper Ben Gardner at the Liberty Springside Community Garden in New Haven (15 attendees) *May 25*
- Spoke to the Orchard Valley Garden Club on “Saving our Bees, One Garden at a Time” at the Southington Public Library (45 attendees) *May 28*
- Participated in an intensive Pollen Analysis Short Course taught at the University of Main in Orono, ME *June 1-7*
- Taught a session titled “Pest Management on Organic Farms” as part of the Institute for learning in Retirement held at Massaro Farm in Woodbridge (6 attendees) *June 11*

STUBER, HEIDI
- Presented a tick display and answered questions at the Yale Peabody Museum Biodiversity Day: Bitten! Bloodsuckers and Climate (2,077 visitors) *April 17*

THOMAS, MICHAEL C.
- Participated in the Dragonfly Society of the Americas annual meeting in Prince Albert, Saskatchewan, Canada *July 11-13, 2013*
- Co-led the Farmington Valley Butterfly Count sponsored by the North American Butterfly Association (12 attendees) *July 20*
- Participated in a board meeting of the Connecticut Entomological Society at the Yale Peabody Museum of Natural History in New Haven *September 5*
- Demonstrated insect collecting and preservation techniques to the Yale University EEB Terrestrial Arthropods Class at the Yale Forestry Camp in Norfolk, CT (12 students) *September 6-7*
- Co-instructed a lab field trip to Archbold Biological Research Station, Lake Placid, Florida, for the Yale University EEB Terrestrial Arthropods (8 student attendees) *October 23-27*
- Presented recommended changes to the State’s Endangered Species List to the Taxonomic Advisory Committee on Rare and Endangered Insects at the DEEP Eastern District Headquarters in Marlborough *October 29*
- With John Shepard, conducted a hands-on workshop on mosquito biology and collection techniques to a group of 14 students and 2 teachers from the Co-op Arts and Humanities High School in New Haven participating in the Yale-Peabody Fellows Program *November 13*
- Hosted Postdoctoral Research Associate Roberta Engel of the Department of Biological Sciences and the Eck Institute for Global Health at the University of Notre Dame, for a tour of the mosquito rearing facilities *January 6, 2014*

- With John Shepard, conducted a hands-on workshop on mosquito biology to a group of 23 students and 1 teacher from Park City Prep Charter School in Bridgeport as part of the Yale-Peabody Fellows SEPA NIH program on mosquito biology *March 12*
- Assisted DEEP Wildlife Division staff in managing critical habitat for the state endangered Ghost Tiger Beetle, *Ellipsoptera lepida*, in Enfield, CT *June 1*
- Participated in the Dragonfly Society of the Americas annual meeting in Ladysmith, Wisconsin *June 11-14*

VOSSBRINCK, CHARLES R.
- Judged exhibits at the Connecticut State FFA Agri-science Fair held at Southington Agriculture Center *May 8, 2014*
- Was a judge for the CAES Special Awards at the New Haven Science Fair *May 12-13*
- Participated in the Eukaryotic Pathology Database Workshop in Athens, Georgia *June 15-18*

WARD, JEFFREY S.
- Hosted a Research Working Group for the Governor's Council for Agricultural Development in New Haven *July 2, 2013*
- Gave a talk on native woody shrubs for the Federated Garden Club on the Connecticut Environmental Council at Lockwood Farm (11 attendees) *July 8*
- Was interviewed about running bamboo at the Griswold Research Center by Judy Benson of the New London Day July 10
- Participated in the CNLA Summer Field Day in Madison *July 17*
- Participated in the CTPA Summer Meeting in Farmington *July 18*
- Discussed white pine ecology with members of the Cornwall Conservation Trust (3 attendees) *July 23*
- Participated in the CT Forest Stewardship Committee in Middlefield *July 25*
- Participated in a conference planning meeting of the Connecticut Urban Forest Council in Southbury *July 26*
- Was an invited guest on WTIC AM 1080 talk show "Garden talk" to offer advice on plant care *July 27*
- Advised Wallingford Center, Inc. on urban tree selection and planting (20 attendees) *August 6*
- Participated in a Research Working Group for the Governor's Council for Agricultural Development in Hartford *August 9*
- Was interviewed about Japanese barberry by Quannah Leonard of the Waterbury Republican *August 16*
- Participated in the CT DEEP Endangered Species Taxonomic Advisory Committee for Plants meeting in Marlborough *August 20*
- Was interviewed about running bamboo by Phyllis Swebilius of the New Haven Register *August 21*
- Was interviewed about early fall colors and forest health by Steve Grant for the Hartford Courant *August 28*
- Spoke on "Spread and containment of running bamboo" at the Valley Laboratory Nursery and Landscape Research Tour (20 attendees) *September 10*
- Administered practical and oral examinations to arborist candidates for the Connecticut Tree Protective Examining Board *September 11*
- Spoke on running bamboo characteristics and control on "Town Matters" in Montville *September 12*
- Was interviewed about forest health by Steve Grant for the Hartford Courant *September 12*
- Participated in a Connecticut Invasive Plant Council Meeting in Hartford *September 17*
- Spoke on "Outdoor identification of woody plants" at the Federated Garden Club Study School in Derby (42 attendees) September 25

- Spoke on “Running bamboo (Phyllostachys spp.) in Connecticut” at the CT Real Estate Instructors Seminar in New Haven (65 attendees) *September 27*
- Was interviewed about fall colors by Mary Ellen Godin of the Meriden Record Journal *October 7*
- Spoke on invasive species control to a combined meeting of the Litchfield, Goshen, Morris, and Cornwall Land Trusts in Litchfield (65 attendees) *October 10*
- Spoke on “A short history of the Connecticut forest” to the Bethany Garden Club (27 attendees) *October 15*
- Spoke on “Impacts of invasive control and herbivory reduction on plant communities” at the Society of American Foresters National Convention in Charleston, SC (15 attendees) *October 24*
- Gave the invited talk “Precommercial crop tree release at canopy closure benefits oak saplings” at the SAF Oak Silviculture: Noteworthy Advances, Looming Challenges special session in Charleston, SC (50 attendees) *October 26*
- Participated in a Connecticut Invasive Plant Council meeting in Hartford *October 29*
- Moderated a session on wind and roadside forests at the Connecticut Urban Forest Conference in Southington (100 attendees) *October 30*
- Spoke on “Crop tree management – managing a forest one tree at a time” at the Yale Forestry Forum (23 attendees) *October 31*
- With Joseph P. Barsky, met with staff from White Memorial Foundation to discuss roadside forest management *November 13*
- Spoke on tree identification, forest measurements, and ecology to students from Coop High School, New Haven (9 students, 2 Teachers) *November 6*
- With Joseph P. Barsky, met with officials from Manchester Water Company to discuss roadside forest management *November 13*
- Spoke on woodlot management to the Oxford Land Trust (27 attendees) *November 18*
- Was interviewed about beech bark disease and the importance of beech in Connecticut’s forests by Bob Miller of the Danbury News-Times *November 22*
- Met with the Executive Committee of the Connecticut Tree Wardens Association in Glastonbury to discuss past and future CAES research (12 attendees) *December 3*
- Administered practical and oral examinations to arborist candidates for the Connecticut Tree Protection Examining Board *December 11*
- Participated in the CT Statewide Vegetation Management Task Force in Middlefield *December 12*
- Gave the invited lecture “Influence of disturbance on stand development during deciduous forest succession” at Harvard Forest, Petersham, MA (14 attendees) *December 13*
- Met with the Wilton tree warden to discuss roadside forest management *December 20*
- Met with the Westport tree warden to discuss roadside forest management *December 20*
- Participated in a Connecticut Invasive Plant Council meeting in Hartford *January 7, 2014*
- With Joseph P. Barsky, participated in an interagency meeting for “Foresters for the Birds” at the Audubon Connecticut Center in Southbury *January 15*
- Spoke on “Identification de Arboles y Arbustos” at the Seminarios en Espanol of the CNLA Annual Meeting in Manchester (27 attendees) *January 15*
- Spoke on “Practical Tree ID” at the CNLA Annual Meeting in Manchester (70 attendees) *January 15*
- Attended the Connecticut Tree Protective Association annual meeting in Plainville *January 16*
- Participated in a meeting of the Audubon Connecticut Science Committee in Middlefield to discuss forest management and birds *January 23*
- Participated in an executive committee meeting of the Connecticut Urban Forest Council in Middlefield *January 31*
- Was interviewed about roadside forest management by Patrick Skahill of WNPR *February 10*

- With J. P. Barsky, hosted an interagency meeting for “Foresters for the Birds” at the Station *February 18*
- Presented the paper “Improving the competitive status of oak regeneration using stand management and prescribed fires” at the Tall Timbers Fire Ecology Conference at Yale University (50 attendees) *February 21*
- Participated in the Tall Timbers Fire Ecology Conference at Yale University *February 20-22*
- Spoke on “Stormwise” roadside forest management and rehabilitating high-graded stands research at the annual meeting of the Connecticut Chapter, Society of American Foresters in Middlefield (40 attendees) *February 25*
- Spoke on “Stormwise” roadside forest management at the Forest Health Monitoring Workshop in New London (60 attendees) *March 4*
- Spoke on “Trophic level interactions: deer, invasives, and native plants” for the Forest Ecosystems Health Class at Yale University (12 attendees) *March 6*
- Administered practical and oral examinations to arborist candidates for the Connecticut Tree Protection Examining Board *March 12*
- Was interviewed about signs of spring in the forest by Judy Benson of the New London Day *March 16*
- Spoke on “Right tree – Right Place” for the public works directors, Naugatuck Valley Council of Governments (11 attendees) *March 19*
- Spoke on oak regenerated and black birch management of NESAF field trip in Hudson, NH (42 attendees) *March 27*
- Was interviewed about invasive plants and tick-borne disease by LuAnn Brandsen of Midwest Living Magazine *April 1*
- Was interviewed about timing of trees flowering and producing pollen by Judy Benson of the New London Day *April 8*
- Served as a judge for the Columbus Family Academy Science Fair in New Haven *April 11*
- Was interviewed about timing of trees flowering and producing pollen by Jeff Cohen of WNPR *April 8*
- Spoke on biology and control of running bamboo to the Greater New Haven Association of Realtors (32 attendees) *April 17*
- With Dr. Brian Eitzer, Dr. Richard Cowles, Dr. Todd Mervosh, and Joseph P. Barsky, hosted an exhibit on innovative research by the Station in the Capitol Corridor in Hartford for Ag Day at the Capitol *April 22*
- Gave the workshop “The history of Connecticut’s Forest” to UConn Master Gardeners Continuing Education Class in Hamden (28 attendees) *April 23*
- Spoke on “Forest Management” for the forestry class at Wamago High School in Litchfield (16 attendees) *April 24*
- Was interviewed about the effect of winter on trees and shrubs by Bob Miller of the Danbury News-Times *April 25*
- With Joseph P. Barsky, hosted a visit by USDA Forest Service scientists to discuss forest management *April 30*
- Hosted a visit by USDA Forest Service scientists Gary Miller and Patrick Brose to discuss forest management *May 1*
- Spoke on forest management at a “Forests are for the Birds” field workshop in Salisbury (12 attendees) *May 3*
- Discussed roadside forest management with Bruce Lindsay, Westport Tree Warden, and Tony McDowell of Earthplace *May 7*
- Participated in an executive committee meeting of the Connecticut Urban Forest Council in Middlefield *May 10*

- Spoke on “Barberry, deer, and ticks” to the West Haven Land Trust (17 attendees) *May 14*
- Spoke on “Barberry, deer, and ticks” to the Southbury Land Trust (37 attendees) *May 27*
- Discussed tree maintenance with students at Common Ground High School and TNC staff members (3 student and 4 adult attendees) *May 28*
- Visited with USDA Forest Service managers, scientist, and others to provide advice on oak management on the Green Mountain National Forest in Pownal, VT (18 attendees) *June 3*
- Administered practical and oral examinations to arborist candidates for the Connecticut Tree Protection Examining Board *June 11*
- Was interviewed about controlling running bamboo by Jason Frazer of WFSB, Channel 3 *June 12*
- Spoke on “Dating vegetation at crime scenes” at the Clandestine Grave Workshop at the University of New Haven in West Haven (14 attendees) *June 17*
- Participated in Connecticut Chapter – Society of American Foresters summer meeting in Burlington *June 24*

WHITE, JASON C.

- Participated in an Association of Public Health Laboratories quarterly Agriculture/Chemistry conference call *July 9, 2013*
- Participated in an Organizational Committee conference call for the upcoming 10th International Phytotechnologies Conference in Syracuse, NY *July 11*
- Participated with Dr. Brian Eitzer, Kitty Prapayotin-Riveros, Terri Arsenault, Craig Musante, Michael Cavadini, and Dr. Walter Krol in the monthly FDA FERN Chemistry Cooperative Agreement Program conference call *July 11*
- Hosted Judith Singer of the CT DEEP Water Quality Program, as well as two student interns from a local high school, and gave them a tour of Department laboratories *July 11*
- Served as a Dissertation Committee member and participated by Skype in the Oral Proposal Defense of Arnab Mukherjee, Ph.D. candidate at the University of Texas, El Paso *July 18*
- Served as a Dissertation Committee member and participated by Skype in the B-exam of Sanghamitra Majumdar, Ph.D. candidate at the University of Texas, El Paso *July 18*
- Participated in the Northeast Environmental and Public Health Laboratory Directors Quarterly Meeting at the CT Department of Public Health Laboratory in Rocky Hill, CT *July 24*
- Participated with Joseph Hawthorne, Kittipath Prapayotin-Riveros, and Dr. Walter Krol in an FDA ISO mentoring conference call with Ohio Department of Agriculture *July 25*
- Attended a USDA AFRI Program Review and gave a presentation entitled “Nanomaterial Contamination of Agricultural Crops” in Charlotte, NC (25 attendees) *July 26-27*
- Participated in an Association of Public Health (APHL) organized conference call with Consumer Reports on a potential project to evaluate imported seafood for chemical contamination *August 6*
- Hosted Captain Michael McLaughlin of the United States Public Health Service and the Food and Drug Administration for his 3-day visit *August 6-8*
- Gave a presentation at the 103rd Annual Plant Science Day entitled “Food safety research in the Department of Analytical Chemistry: Surveillance of fresh and manufactured foods for chemical contamination (100 attendees) *August 7*
- Participated in a conference call with Professor Lee Newman of the State University of New York College of Environmental Science and Forestry regarding the promotion of Ms. Wenjun Cai from a master’s degree program to a Ph.D. research program. He agreed to serve on the Ph.D. Committee of Ms. Wenjun *August 9*
- With Joseph Hawthorne, met with Mr. Mark Struss of Millipore regarding installation of a new water purity system in the laboratory *August 15*
- Served as a thesis committee member at the Master’s Thesis defense of Ms. Rinda Soumya Mangu of the University of New Haven *August 14*

- Participated in an Organization Committee conference call for the upcoming 10th International Phytotechnologies Conference in Syracuse NY *August 15 and 29*
- With Dr. Brian Eitzer, Kitty Prapayotin-Riveros, Terri Arsenault, Craig Musante, Michael Cavadini, Dr. Christina Robb, Joseph Hawthorne, and Dr. Walter Krol, participated in the monthly FDA FERN Chemistry Cooperative Agreement Program conference call and the monthly FDA ISO Accreditation conference call *August 15*
- With Dr. Brian Eitzer, Kitty Prapayotin-Riveros, Terri Arsenault, Craig Musante, Michael Cavadini, Dr. Christina Robb, Joseph Hawthorne and Dr. Walter Krol, participated in the Year 2 "Kick Off Call" for the FDA ISO Accreditation Program *August 25*
- Participated in a National Science Foundation webinar highlighting recently funded nanotechnology research *August 30*
- Participated in a webinar hosted by Chemical and Engineering News entitled "The Analysis of Nanoparticles by Liquid Chromatography Mass Spectrometry" *September 3*
- Viewed an NIEHS informational webinar on an upcoming Request for Proposals focused on how contaminant availability limits remediation success *September 5*
- Participated in an FDA FERN cCAP Technical Meeting conference call regarding the organization and structure of the upcoming annual meeting *September 5*
- Participated in an Organizational Committee Conference Call for the upcoming 10th International Phytotechnologies Conference in Syracuse, NY *September 5 and 12*
- Participated in the monthly Laboratory Preparedness meeting held at the CT Department of Public Health Laboratory in Rocky Hill *September 9*
- Participated in the on-site assessment and gap analysis by the FDA/ORA for our ISO Accreditation 17025 funding *September 10*
- Was interviewed for a feature article on nanotechnology by Nancy Maddox of the APHL publication Lab Matters *September 11*
- With Joseph Hawthorne and Dr. Roberto de la Torre Roche, met with Jack Bennett and Sue Isch at the Dr. Katherine A. Kelley State Public Health Laboratory to begin collaborative experiments on the use of Scanning/Transmission Electron Microscopy with Energy Dispersive X-Ray Spectroscopy *September 12*
- Participated in the annual FDA FERN cCAP Technical Meeting in St. Paul, MN and gave the PowerPoint Presentation "CAES 2013 Laboratory Update" (50 attendees) *September 17-19*
- With Dr. Brian Eitzer, Kitty Prapayotin-Riveros, Terri Arsenault, Craig Musante, Michael Cavadini, Dr. Christina Robb, Joseph Hawthorne, Dr. Roberto de la Torre Roche, John Ranciato, and Dr. Walter Krol, hosted Mr. Frank Greene of the CT Department of Consumer Protection Food Division and his staff to discuss cooperation in FDA funded sample collection and analysis *September 23*
- Hosted a teleconference call for all investigators on our USD AFRI-funded grant on nanomaterial contamination of agricultural crops *September 24*
- With Terri Arsenault and Joseph Hawthorne, hosted Dermot Jones of CT DPH for an onsite audit of State Certified programs *September 25*
- With Kitty Prapayotin-Riveros, Terri Arsenault, and Michael Cavadini participated in a bi-monthly mentor/mentee call with the Ohio Department of Agriculture as part of our FDA ISO Accreditation Grant *September 26*
- Gave the plenary session presentation "Plant-Nanoparticle Interactions" at the 10th International Phytotechnologies Conference in Syracuse, NY (220 attendees) *October 1-4*
- Gave the poster presentation "Nanoparticle Co-exposure Alters the Toxicity and Accumulation of Persistent Pesticides in Agricultural Crops" at the 10th International Phytotechnologies Conference in Syracuse, NY *October 1-4*
- Hosted the annual Editorial Board meeting of the International Journal of Phytoremediation in Syracuse, NY *October 3*

- As President of the International Phytotechnology Society, hosted the annual Officer's Meeting *October 3*
- Gave a lecture entitled "Nanotechnology Use in Agriculture: Benefits and Potential Risks" at the monthly Laboratory Preparedness Advisory Group Meeting at the CT Department of Public Health Laboratory in Rocky Hill (25 attendees) *October 7*
- Along with Dr. Brian D. Eitzer, Ms. Kitty Prapayotin-Riveros, Terri Arsenault, Craig Musante, Michael Cavadini, Dr. Christina Robb, Joseph Hawthorne, Dr. Roberto de la Torre Roche, John Ranciato, and Dr. Walter Krol, participated in a 2.5 day in house accreditation training session entitled "ISO/IEC 17025:2005, Internal auditing and Root Cause Analysis" given by A2LA and focused on overall FDA-sponsored accreditation activities *October 15-17*
- Participated in a conference call hosted by Professor Jason Unrine of the University of Kentucky on a upcoming session at the sustainable Nanotechnology Conference where we will be giving a co-presentation on nanoparticle cerium interactions with plants and preparing a review manuscript for submission to a new journal called *Environmental Science: Nano October 25*
- Along with Kitty Prapayotin-Riveros, Terri Arsenault, and Michael Cavadini, participated in a conference call entitled "Sampling Agreement: ISO and MFRPS Grantees" by FDA ORA *October 29*
- Gave a lecture entitled "Engineered Nanomaterials and Agricultural Crops: Co-contaminant Interactions and Trophic Transfer" at the second annual meeting of the Sustainable Nanotechnology Society in Santa Barbara, (35 attendees) *November 3-5*
- Along with Dr. Brian Eitzer, Kitty Prapayotin-Riveros, Terri Arsenault, Craig Musante, Michael Cavadini, Christina Robb, Joseph Hawthorne, and Dr. Walter Krol, participated in the monthly FDA FERN Chemistry Cooperative Agreement Program teleconference call *November 14*
- Participated in the FDA FERN Data Entry Training Webinar *November 18*
- Along with Dr. Brian Eitzer, Kitty Prapayotin-Riveros, Terri Arsenault, Craig Musante, Michael Cavadini, Christina Robb, Joseph Hawthorne, and Dr. Walter Krol, participated in an FDA and APHL webinar on "Control charts and trend analysis for ISO/IEC17025:2005" *November 18*
- Along with Dr. Brian Eitzer, Kitty Prapayotin-Riveros, Terri Arsenault, Craig Musante, Michael Cavadini, Christina Robb, Joseph Hawthorne, and Dr. Walter Krol, participated in the bimonthly ISO 17025 Accreditation mentor/mentee conference call with the Ohio Department of Agriculture *November 19*
- Along with Dr. Brian Eitzer, Kitty Prapayotin-Riveros, Terri Arsenault, Craig Musante, Michael Cavadini, Christina Robb, Joseph Hawthorne, and Dr. Walter Krol, participated in an FDA FERN-wide teleconference call on the 10th year of FERN and on APHL ISO Accreditation support programs *November 21*
- Along with Dr. Walter Krol, attended a meeting at CT DEEP Marine Fisheries in Old Lyme to discuss collaborative work with the University of Connecticut Center for Environmental Science and Engineering and CT DEEP on the analysis of synthetic pyrethroids and methoprene in Long Island lobster tissues *November 22*
- Along with Michael Cavadini, Terri Arsenault, and Joseph Hawthorne, hosted the quarterly meeting of the CAES Safety Committee *November 25*
- Described the work and programs in the Analytical Chemistry Department to visitors Dr. Sarah Hale and Dr. Gerard Cornelissen of the Norwegian Geotechnical Institute *November 26*
- Presented a poster entitled "Nanomaterial contamination of agricultural crops" and co-presented a poster with Dr. Joseph Pignatello entitled "Nanoscale interactions between engineered nanomaterials and black carbon (biochar) in soil" at the annual NSF Nanoscale Science and Engineering Conference in Arlington, VA *December 4-6*
- Participated in a USDA REEport informational webinar *December 12*
- With Kitty Prapayotin-Riveros, Terri Arsenault, Michael Cavadini, and Dr. Walter Krol participated in an FDA webinar focused on MFRPS-ISO accreditation sampling agreements *December 18*

- Was interviewed by the New Haven Register about a recent article on the use of tire crumb rubber in athletic fields *December 27*
- Participated in the monthly Laboratory Preparedness Advisory Group Meeting at the CT Department of Public Health Laboratory in Rocky Hill, CT *January 6, 2014*
- With Kitty Prapayotin-Riveros, Terri Arsenault, Dr. Brian Eitzer, Craig Musante, Michael Cavadini, Dr. Christina Robb, Joseph Hawthorne, and Dr. Walter Krol, participated in the monthly FDA FERN Chemistry Cooperative Agreement Program teleconference call *January 9*
- With Dr. Theodore G. Andreadis, attended the Commission on Human Rights and Opportunities Meeting of the CAES 2013/14 Affirmative Action Plan in Hartford *January 14*
- With Kitty Prapayotin-Riveros, Terri Arsenault and Dr. Walter Krol, participated in an ISO 17025 Mentor/Mentee conference call with Ohio Department of Agriculture *January 22*
- With Dr. Theodore G. Andreadis, attended a meeting at the University of Connecticut to discuss unified reporting and collaborative projects with Dr. Gregory Weidemann, Dean and Director of the College of Agriculture and Natural Resources at the University of Connecticut, and his staff *January 23*
- With Joseph Hawthorne, Dr. Roberto de la Torre-Roche, Dr. Alia Servin and Dr. Jose Angel Hernandez-Viezcas attended the Toxi-Rounds seminar at the Public Health Laboratory in Rocky Hill, CT *January 30*
- With Kitty Prapayotin-Riveros, participated in the webinar on eLEXNET goal for 2014 *February 10*
- Participated in a USDA NIFA webinar on the use of the new NIFA Portal for required reporting *February 13*
- With Dr. Theodore G. Andreadis, met with Commissioner of the Department of Agriculture Steven Reviczky and CAES Board of Control Vice President Terry Jones and discussed research and programs within the Department of Analytical Chemistry *February 20*
- With Kitty Prapayotin-Riveros, Terri Arsenault, Dr. Brian D. Eitzer, Craig Musante, John Ranciato, Michael Cavadini, Joseph Hawthorne, Dr. Walter Krol, Dr. Roberto de la Torre-Roche, Dr. Alia Servin, and Dr. Jose Angel Hernandez-Viezcas, participated in the Association of Public Health Laboratories webinar training on “Ethics and Data Integrity for Technical Staff” *February 21*
- With Dr. Theodore G. Andreadis, met with Professors David Hill and Thomas Murray, as well as medical student William Berger of the Quinnipiac University Frank Netter School of Medicine to discuss potential collaborative internships at CAES for medical students *February 24*
- Was interviewed about the risks of nanotechnology by freelance science reporter Virginia Gewin *February 25*
- Participated in the McIntire-Stennis Administrative-Technical Representatives annual meeting in Washington, DC *March 4-5*
- With Kitty Prapayotin-Riveros, Terri Arsenault, Dr. Brian Eitzer, Craig Musante, John Ranciato, Michael Cavadini, Joseph Hawthorne, Dr. Walter Krol, and Dr. Christina Robb, participated in the FDA ISO Accreditation Year 2 Quarter 2 teleconference call with Dr. Ruiqing Pamboukian and Dr. Anthony Adeuya of the US FDA *March 6*
- Participated in the APHL Agricultural/Chemist Laboratories quarterly teleconference call *March 6*
- Participated in an FDA MFRPS webinar *March 10*
- Testified in front of the Finance, Revenue and Bonding Subcommittee at the Legislative Office Building in Hartford regarding the Valley Laboratory construction/renovation project (10 attendees) *March 11*
- Chaired a quarterly meeting of the CAES Safety Committee *March 12*
- With Kitty Prapayotin-Riveros, Terri Arsenault, Dr. Brian Eitzer, Craig Musante, Michael Cavadini, Dr. Christina Robb, Joseph Hawthorne, and Dr. Walter Krol, participated in the monthly FDA FERN chemistry cooperative agreement program teleconference call *March 13*

- Presented a seminar entitled “Environmental Implications of Nanotechnology” at the New Haven Chapter of the American Chemical Society monthly meeting (15 attendees) *March 13*
- With Kitty Prapayotin-Riveros, Terri Arsenault, Dr. Brian Eitzer, Craig Musante, Michael Cavadini, Dr. Christina Robb, Joseph Hawthorne, Dr. Walter Krol, Dr. Roberto de la Torre-Roche, Dr. Alia Servin, and Dr. Jose Angel Hernandez-Viezcas met with Intelligence Analyst Kate Bunting of the US Drug Enforcement Agency *March 14*
- Met with a Legislative Aid from Senator Richard Blumenthal’s Office *March 18*
- Participated in the Editorial Advisory Board meetings of Environmental Science & Technology and Environmental Science & Technology Letters in Dallas, TX *March 19-20*
- With Kitty Prapayotin-Riveros, Terry Arsenault, and Dr. Walter Krol, participated in an ISO 17025 Mentor/Mentee Conference Call with Ohio Department of Agriculture *March 27*
- With Kitty Prapayotin-Riveros, Terri Arsenault, Michael Cavadini, and Dr. Walter Krol, participated in an FDA ISO teleconference planning call with Dr. Ruiqing Pamboukian for the upcoming Face-to-Face grantees meeting *April 4*
- Participated in a Society of Wetland Scientists conference call to discuss various issues associated with scientific publication *April 4*
- Hosted and gave a laboratory tour to Terry Jones of the CAES Board of Control and other members of the Food Corps *April 9*
- With Kitty Prapayotin-Riveros, Terri Arsenault, Dr. Brian Eitzer, Craig Musante, Michael Cavadini, Dr. Christina Robb, Joseph Hawthorne, and Dr. Walter Krol, participated in the monthly FDA FERN chemistry cooperative agreement program teleconference call *April 10*
- Participated in the USDA NIFA Reporting Web Conference *April 10*
- With Joseph Hawthorne, Dr. Roberto de la Torre-Roche, and Dr. Alia Servin, participated in a teleconference call with University of Texas El Paso graduate student Arnab Mukherjee to discuss collaborative experiments *April 11*
- Gave a tour of Department of Analytical Chemistry laboratories and programs to Dr. Quan Zeng of Michigan State University *April 16*
- Gave a tour of Department of Analytical Chemistry laboratories and programs to Dr. Lindsay Triplett of Colorado State University *April 22*
- Co-presented with Dr. Charles Mackay of Hartford Hospital a lecture entitled “Pyrethroids, Lobsters and Long Island Sound” at the CT Public Health Laboratory for the monthly Toxicology Rounds Seminar Series (20 attendees) *April 24*
- Presented a webinar entitled “Environmental Implications of Nanotechnology” for a Phytotechnology Class at the Missouri University of Science and Technology (20 attendees) *April 25*
- Participated in an Association of Public Health Laboratories Data Acceptance Workgroup teleconference call *April 30*
- With Joseph Hawthorne, hosted undergraduate student Nicole Cammisa from Muhlenberg College and assisted with the chemical analysis of samples from jointly executed experiments May 2
- Participated in the monthly Laboratory Preparedness Advisory Group Meeting at the CT Department of Public Health Laboratory in Rocky Hill May 5
- With Kittypath Prapayotin-Riveros, Terri Arsenault, Dr. Brian Eitzer, Craig Musante, Michael Cavadini, Dr. Christina Robb, Joseph Hawthorne, John Ranciato, and Dr. Walter Krol, participated in the monthly FDA FERN Chemistry Cooperative Agreement program teleconference call May 8
- Participated in the FDA FERN Northeastern region bi-monthly teleconference call May13
- Participated in the Association of Public Health Laboratories Data Acceptance Workgroup teleconference call May 16
- Participated in a teleconference call with Professor Elizaeth Nichols from North Carolina State University and Dr. Clayton Rugh from Xero Flor America on their possible hosting of the 12th Annual International Phytotechnologies conference May 16

- With Kitty Prapayotin-Riveros, Michael Cavadini, and Dr. Brian Eitzer, attended the FDA ISO/IEC 17025:2005 Accreditation for State food Testing Laboratories Cooperative Agreement 2014 Face-to-Face Meeting in Irvine, CA and gave the platform presentation "A completely Paperless/Electronic Laboratory Management System" (70 attendees) May 20-22
- Participated in the monthly Laboratory Preparedness Advisory Group Meeting at the CT Department of Public Health Laboratory in Rocky Hill, CT *June 2*
- With Drs. Christina Robb, Brian Eitzer and Walter Krol, met with representatives of Waters Corporation to discuss MALDI as a new analytical platform for the Department *June 9*
- Participated in an FDA webinar on using the updated FERN website *June 10*
- With Kitty Prapayotin-Riveros, Terri Arsenault, Dr. Brian Eitzer, Craig Musante, Michael Cavadini, Dr. Christina Robb, Joseph Hawthorne, John Ranciato, and Dr. Walter Krol, participated in the monthly FDA FERN chemistry cooperative agreement program teleconference call *June 12*
- With Dr. Christina Robb, Terri Arsenault, and Kitty Prapayotin-Riveros, attended an APHL webinar entitled "Creating an ISO17025 Quality Manual" *June 12*
- With Kitty Prapayotin-Riveros, Terri Arsenault, Dr. Brian Eitzer, Craig Musante, Michael Cavadini, Dr. Christina Robb, Joseph Hawthorne, John Ranciato, and Dr. Walter Krol, participated in a teleconference call with FDA assessors to discuss our year 2 third quarter ISO Accreditation Plan *June 13*
- Gave a lecture entitled "Environmental Implications of Nanotechnology" to a University of New Haven graduate student class (60 attendees) *June 19*
- Gave a tour of Department facilities and discussed programs with students and faculty from SCSU and CCSU (25 attendees) *June 25*
- With Craig Musante, Dr. Alia Servin, and Dr. Roberto de la Torre-Roche, viewed a Spectroscopy webinar entitled "Characterizing and Monitoring Nanoparticles" *June 25*

WILLIAMS, SCOTT C.

- Participated in a conference planning meeting of the Connecticut Urban Forest Council in Southbury *July 26, 2013*
- Met with officials from The Nature Conservancy in New York, a wildlife biologist from New York DEC, and White Buffalo, Inc. about a collaborative research project regarding the training of recreational hunters to better manage white-tailed deer herds to ecologically acceptable levels *July 29*
- Was interviewed about the scientific principles of animal repellents by John Camp of the Wall Street Journal *July 31*
- With Joseph P. Barsky and Michael Short, was featured on a YouTube informational video arranged by the East Haddam Land Trust *July 31*
- Met with researchers at the University of Connecticut to discuss collaborative research and small mammal capture techniques demonstration *August 23*
- With Michael Short and Megan Floyd, conducted a small mammal trapping demonstration and deer exclosure explanation to students in the Wildlife Techniques class in the Department of Natural Resources and the Environment at the University of Connecticut Storrs (25 student attendees) *September 16*
- Organized and attended the 25th Annual Conference on Urban and Community Forestry and the 9th annual Forest Forum. and moderated the session "Wildlife Habitat Enhancement Using Forest Management Tools" in Plantsville, CT (80 attendees) *October 30*
- Participated in a meeting of The Connecticut Agricultural Experiment Station's Institutional Animal Care and Use Committee *October 31*
- With Joseph P. Barsky, Michael R. Short, and Megan Floyd, hosted the Connecticut FFA Forestry Career Development Event at Lockwood Farm *November 6*

- Gave an invited lecture titled “Ecological interconnectedness between a native ectoparasite, an alien invasive shrub, a native rodent, and a native invasive mammal and potential health impacts to humans” to the Potapaug Chapter of the National Audubon Society Lecture Series, Old Lyme (29 attendees) *November 7*
- Gave a talk on symbiotic relationships including blacklegged tick parasitism and disease transfer to the 6th grade science class at St. Thomas’s Day School, New Haven (23 students, 3 teachers) *November 19*
- With Michael R. Short and Megan Floyd hosted the 6th grade science class from St. Thomas’s Day School and demonstrated invasive species removal techniques and toured the Station grounds and explained other ongoing research at the Connecticut Agricultural Experiment Station, New Haven (23 students, 3 teachers) *November 25*
- Participated in an Executive Council conference call for the Northeast Section of he Wildlife Society December 2
- Lectured by Skype on various research projects in the Forestry and Horticulture Department to a new York University Scientific Journalism class (15 student attendees) *December 5*
- Hosted a conference call with members of the Northeast Section of the Wildlife Society on strategies to establish a position statement about management of overabundant suburban white-tailed deer *January 16, 2014*
- With Dr. Kirby C. Stafford, III, met with Commissioner Susan Whalen, Natural Resources Bureau chief William Hyatt, and Wildlife Division Director Rick Jacobson of the DEEP, regarding the deer portion of the ongoing Centers for Disease Control Integrated Tick Management Grant in Redding *January 21*
- With Michael Short, participated in a collaborative aerial deer survey with Department of Energy and Environmental Protection Wildlife Division Director Rick Jacobson and Deer Program Biologist Dr. Howard Kilpatrick *February 11*
- Was interviewed about ticks and tick-borne disease along the Connecticut Shoreline by local outdoor writer Edward Ricciuti *March 5*
- Was interviewed about white-tailed deer abundance and trends in Connecticut by Greg Hladky, a Hartford Courant blogger *March 18*
- Spoke on “Reducing Tick Abundance by Recreational Deer Hunting – Is It Possible?” at the Annual Meeting of the Connecticut Agricultural Experiment Station Associates in Hamden (40 attendees) *March 26*
- Gave the invited talk “Ticked Off!: Invasive Plants and Lyme Disease – A Surprising Connection” at the headquarters of the Steward B. McKinney National Wildlife Refuge in Westbrook (15 attendees) *March 27*
- Participated in an Executive Committee Meeting of the Connecticut Urban Forest Council in New Haven *March 28*
- Presented an invited lecture “Reducing Tick Abundance by Recreational Deer Hunting – Is It Possible?” at the Annual Meeting of the New York Chapter of The Wildlife Society in Oxford, NY (985 attendees) *April 3-4*
- With Michael Short, hosted a field visit discussing collaborative small mammal monitoring research with officials from the Yale School of Public Health in North Branford and Lyme *April 9*
- Was interviewed about tick and Lyme disease ecology by New York University student Katie Free *April 9*
- Gave an invited talk updating members of the Town of Redding Gentlemen’s Club on the status of the Centers for Disease Control Integrated Tick Management Study underway in their town of Redding (15 attendees) *April 10*
- Hosted the annual Meeting of the Executive Board of the Northeast Section of the Wildlife Society in Portland, ME *April 13*

- Moderated the "Mammals and Parasites" concurrent technical session at the 70th Annual Northeast Fish and Wildlife Conference in Portland, ME *April 15*
- Presented the lecture "Can Coordinated Recreational Hunting Reduce Tick Abundances? Exploring the Deer Density Divide Between a Municipality and its Hunters" at the 70th Annual Northeast Fish and Wildlife Conference in Portland, ME (120 attendees) *April 15*
- Participated in a Conference Planning Subcommittee meeting of the Connecticut Urban Forest Council in Middlefield *May 8*
- With Michael R. Short, met with staff from Bobbex, Inc. to discuss a rabbit repellent trial *May 16*
- Gave an invited lecture about blacklegged ticks, Lyme disease, and small mammal trapping to the Department of Ecology and Evolutionary Biology's Wildlife Techniques class at the University of Connecticut, Storrs (8 student and 1 professor attendees) *May 27*
- With Michael R. Short, demonstrated small mammal trapping, handling, and bloodletting to the Department of Ecology and Evolutionary Biology's Wildlife Techniques class at the University of Connecticut, Storrs (8 student and 1 professor attendees) *May 28*
- Hosted a conference planning committee of the Connecticut Urban Forest Council at Lockwood Cottage *June 27*

YI, PENG
- Presented the poster "Interactions Between Cerium Oxide Nanoparticles and Biochar Nanoparticles" at the Gordon Research Conference on Environmental Sciences: Water in Holderness, New Hampshire *June 22-27, 2014*

ZARRILLO, TRACY
- Gave a talk and workshop on "Bumble Bees of Connecticut" at a meeting of the Connecticut Entomological Society held at UConn in Storrs (30 attendees) *March 21, 2014*

ADVANCES IN KNOWLEDGE

DEPARTMENT OF ANALYTICAL CHEMISTRY

Service, research, and outreach activities in the Department are conducted within the focus areas of **Food Safety** and **Environmental Monitoring/Remediation**. Service and research activities in each focus area are often mutually complimentary. A rough breakdown of sample numbers expressed as a function of source is shown below.

Source of Sample	Numbers of samples analyzed
Department of Agriculture	125
Department of Consumer Protection	225
Department of Energy and Environmental Protection	241
FDA, Health Depts., Cities/Towns, Misc. Foundations	111
Proficiency Test Samples	18
University Research Collaborators	1,698
CAES Departments	567
Grand Total	2,985

I. SERVICE ACTIVITIES

Analyses are conducted across a wide range of sample matrices submitted to the Department of Analytical Chemistry by other state and federal agencies, municipalities, police departments, non-profit groups, businesses, and other departments at the Connecticut Agricultural Experiment Station (CAES). This list is not intended to be all-inclusive.

1. ANALYSES ON BEHALF OF CONNECTICUT DEPARTMENT OF AGRICULTURE

Analytical Chemistry has two long-standing programs with the CT Department of Agriculture (DoAg) involving the analysis of feed and fertilizer products.

a. Animal Feeds:

- Analysts: Craig Musante, John Ranciato
- Goal: To assure products are in compliance with stated label guarantees.
- Summary: This was one of the primary analyses of the Station in 1875. Products for household pets and commercial agricultural operations are included. Samples are collected by inspectors from the DoAg. Analytical results are reported to DoAg, who in turn report findings to the product dealer and/or manufacturer.
- Results: From July 1, 2013 to June 30, 2014 we received and have completed analysis of 20 feed samples. These samples are analyzed for parameters such as protein, fat, moisture, fiber, and select micronutrients. Samples deficient in one or more analytes (determined according to the investigational allowances outlined in the Official Publication of the Association of American Plant Food Control Officials) numbered 10 (50%). Analytical findings are turned over to the CT Department of Agriculture for regulatory response.

b. Fertilizers:

- Analysts: Craig Musante, John Ranciato
- Goal: To assure products are in compliance with stated label guarantees.
- Summary: This was one of the primary analyses of the Station in 1875. Products from residential and commercial agricultural operations are included. Samples are collected by inspectors from DoAg. Analytical results are reported to DoAg, who in turn reports findings to the product dealer and product manufacturer.
- Results: From July 1, 2013 to June 30, 2014, we received and initiated analysis of 93 samples for macronutrients, such as nitrogen, available phosphoric acid, and potash, and for micronutrients, including but not limited to boron, sulfur, cobalt, magnesium, and iron. Of the 93 submitted samples, analysis has been completed on 22 samples. To date, samples deficient in one or more analytes (determined according to the investigational allowances outlined in the Official Publication of the Association of American Plant Food Control Officials) numbered 8 (36.3%). Analytical findings are turned over to the CT Department of Agriculture for regulatory response.

c. Analysis of seaweed samples

A collaborative project with the DoAg Bureau of Aquaculture has continued into a second year and involves the chemical and microbial analysis of seaweed being grown commercially in CT for sale to restaurants. Chemical analysis happens in the CAES Department of Analytical Chemistry; the microbial pathogen analysis happens on split samples at the Department of Public Health (DPH) Laboratory Environmental Microbiology Section. During the current reporting period, 9 samples have been screened for pesticides by both liquid and gas chromatography with mass spectrometry (LC-MS; GC-MS), as well as polychlorinated biphenyls (PCBs), and select heavy metals. Results are then reported to DoAg Aquaculture staff for a decision on regulatory action. All samples analyzed to date were judged to be suitable for sale on the basis of chemical analysis results.

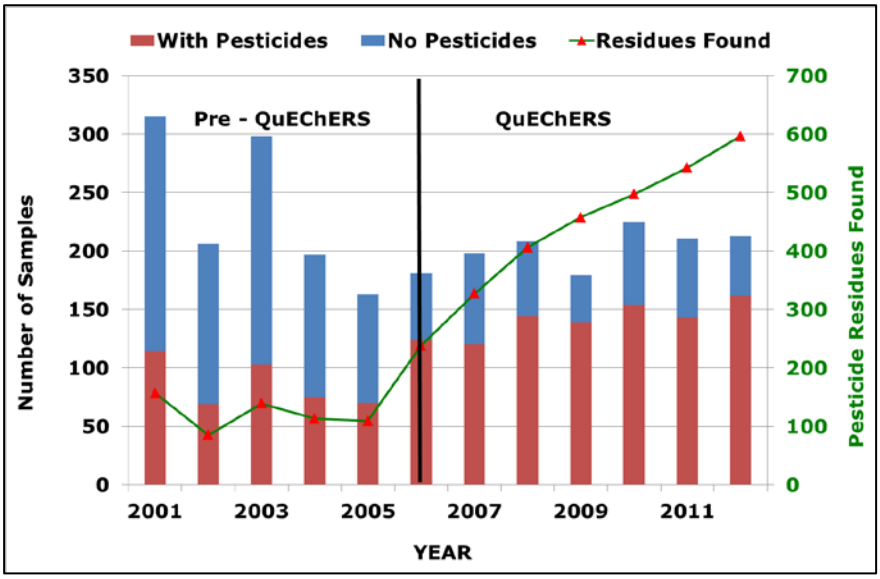
2. Analyses on behalf of Connecticut Department of Consumer Protection, Food and Standards Division

Analyses conducted for the CT Department of Consumer Protection (DCP) are important to public safety. The results of these analyses are reported in a timely fashion and can lead to the recall of products that have levels of chemical residues deemed unacceptable by regulatory agencies.

a. Pesticide residues in food:

- Analysts: Walter Krol, Brian Eitzer, Kittipath Prapayotin-Riveros, Michael Cavadini
- Summary: As part of a Market basket program, we determine concentrations of agrochemicals in fresh and processed foods from local, domestic, and imported sources offered for sale in CT and assure compliance with established tolerances. Market basket survey samples are collected by DCP Inspectors and results are published in an annual Station bulletin available by mail and at www.ct.gov/caes.
- Results: From July 1, 2013 through June 30, 2014 a total of 8 samples of fresh (6; 75%) and processed (2; 25%) food were analyzed for pesticide residues. An additional 16 samples of tea were analyzed as part of a targeted study. Beginning January 1, 2006, all market basket samples were analyzed using the QuEChERS method, providing lower limits of detection and increased number of detectable agrochemicals (see figure). Please see past Records of the Year and Station bulletins for details.

Of the 8 samples analyzed, 7 (87.5%) contained a total of 23 residues. There were 16 different pesticide active ingredients found at an average concentration of 0.074 ppm, and the average number of pesticide residues per sample was 3.29. The impact on our program of fully implementing QuEChERS is shown graphically to the right. Owing to the statistical variability associated with such a small sample size the 2013 data was not included in the graph. Note that the number of residues observed and the proportion of samples with residues have dramatically increased. At the same time the average residue concentration has decreased by a factor of 10. This is because the new technique allows for the detection of many more residues at much lower concentrations.



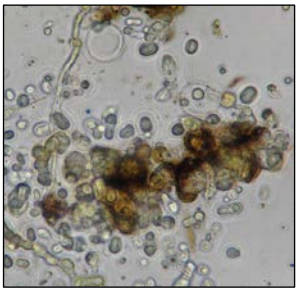
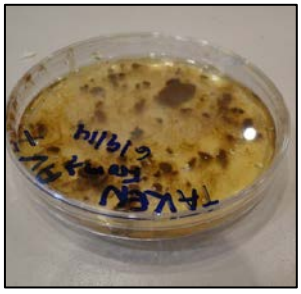
In a targeted study focusing on teas, 16 samples of tea bags were collected by DCP Inspectors, including green and black teas, oolong tea, and 5 organic products. Of the 11 non-organic teas, all contained pesticide residues, with an average of 8 residues per sample. In addition, all also contained violative residues with an average of 5 violations per samples; two tea samples contained 10 violative pesticide residues. Two of the organic teas contained no pesticide residues but the remaining three have 6 violative residues each. In nearly all cases, these were "zero tolerance" violations and residues (violative or otherwise) were present at part per billion levels. The data was reported to FDA and a regulatory response is anticipated shortly.

- With US FDA funding and support, the Department has received new equipment and begun a major 5-year effort to bring the Market basket program under the scope of ISO 17025 Accreditation.

Impact: The Department of Analytical Chemistry's Market basket program serves as the sole surveillance and monitoring effort in the state, assuring that the food supply within CT is safe and free from adulteration.

b. Miscellaneous samples

- Analyst: John Ranciato
- Summary: From July 1, 2012 to June 30, 2013, 104 consumer complaint samples were submitted for analytical requests such as foreign material identification, possible product adulteration or tampering. For some samples, we rely on the expertise in other departments, including Plant Pathology & Ecology, Entomology, and Forestry & Horticulture.

3. ANALYSES ON BEHALF OF DEPARTMENT OF CONSUMER PROTECTION, LIQUOR CONTROL DIVISION

a. Beverages/products for ethanol content

- Analyst: Terri Arsenault
- Goal: To provide % ethanol content for label registration and taxation purposes.
- Summary: We analyzed 21 products such as beers, wines, and liquors for ethanol content. Results were submitted to DCP in support of label registration.

b. Beverage authenticity

- Analyst: Terri Arsenault
- Goal: To determine if products offered to customers at CT establishments are authentic as to brand.
- Summary: 59 alcoholic products were examined for authenticity; 15 samples were found to not match the chromatographic profile of comparison authentic samples. These

results are returned to the DCP Division of Liquor Control, who determine appropriate regulatory action. A conductivity meter was shown to identify some types of brand adulteration in vodka and was deployed in the field by DCP Inspectors. Research is now progressing on using heavy metal profiles to further identify brand adulteration with some success for certain brands of vodka.

c. Miscellaneous Samples for Alcohol

- Analyst: Terri Arsenault
- Goal: To determine if various products contain ethanol.
- Summary: Sometimes products are suspected of containing alcohol, but are labeled insufficiently, or are sold in unlicensed establishments. Three beverage samples were shown to contain about 10% ethanol, but were incompletely labeled and sold in a local grocery store that lacked a liquor permit. In another case, three samples were sold as astringents, two of which contained ethanol while the other contained isopropyl alcohol. Lastly, one sample was received from a hospital following a suspected poisoning from methanol. While the sample was shown to contain some methanol, the amount was similar to that in the authentic sealed sample.

4. Analyses on behalf of Department of Energy and Environmental Protection (DEEP), Waste Management Bureau

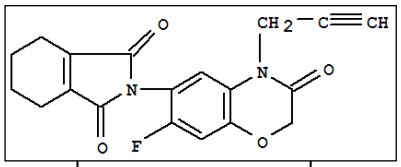
a. Analysis of PCBs (polychlorinated biphenyls)

- Analysts: Joseph Hawthorne, Brian Eitzer
- Goals: To ascertain the extent of polychlorinated biphenyl (PCB) contamination. Common matrices include soils, water, oil, sediments, and surface wipes. Additional matrices this year included paint chips, cardboard, and Speedy-Dry.
- Summary: From July 1, 2013 to June 30, 2014, 35 samples were analyzed from pre-existing sites and/or spill locations in CT. Sample collection is performed by DEEP PCB Enforcement Unit Inspectors as part of mandatory long-term monitoring of these areas. As such, the findings are reported to DEEP for assessment of continued regulatory compliance.

b. Analysis of pesticides

- Analysts: Brian Eitzer, Terri Arsenault, Michael Cavadini
- Goals: To ascertain pesticide concentrations associated with misapplication or drift in support of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Additional samples are analyzed in support DEEP surface and groundwater monitoring programs. Matrices include soils, waters, oils, sediments, and surface wipes. Water, vegetation and soil samples can now be analyzed for glyphosate using liquid chromatography-mass spectrometry (LC/MS).
- Summary: From July 1, 2013 to June 30, 2014, 206 samples were analyzed under this program.

Connecticut Department of ENERGY & ENVIRONMENTAL PROTECTION



Flumioxazin

Impact: Forty nine sediment samples from numerous waterways were collected throughout the state in response to concerns over synthetic pyrethroids applied for insect control. The new screening method did not detect pyrethroids above 10 parts per billion (ppb) in any of the samples.

c. Analysis of lobster tissue for synthetic pyrethroids

• Analysts: Walter Krol, Jason C. White

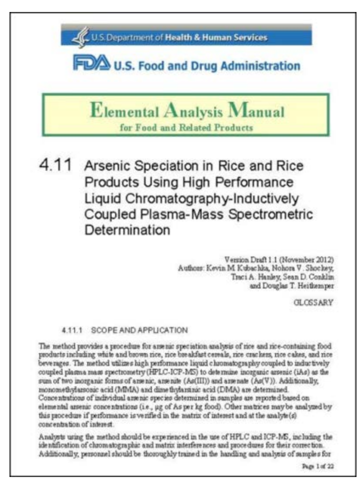
• Goals: To determine the presence and quantity of synthetic pyrethroids in lobsters from Long Island Sound

• Summary: We were contacted by officials of the CT DEEP in October of 2013 regarding a funded study at the University of Connecticut Center for Environmental Science and Engineering (CESE) evaluating the presence of synthetic pyrethroids in 90 lobsters collected from Long Island Sound. Several of the samples had significantly higher levels of the pesticides than anticipated by DEEP officials and we were asked to provide rapid analysis to confirm the findings. After a brief method development period, we validated an in-house method of pyrethroid analysis in lobster muscle and hepatopancreas. UConn and DEEP staff then coordinated shipment to our laboratory of archived lobster tissue from the initial CESE study. Although these were samples that CESE had tentatively identified as having significant pyrethroid content, we did not confirm these findings. Some deterioration had occurred in some of the samples during storage at CESE. In addition, different extraction and analysis methods were used by the two laboratories. As such, a larger steering committee has been formed by DEEP and a joint investigation, including members of CAES, CESE, several divisions of DEEP, EPA, the Pyrethroid Working Group, and a representative from Earthplace, has been initiated. The goal is for CAES and CESE to jointly validate an extraction and analysis protocol and then to simultaneously analyze fresh lobster samples from Long Island Sound.

5. ANALYSES ON BEHALF OF MUNICIPAL AND FEDERAL AGENCIES

a. Analysis of samples for FDA Food Emergency Response Network (FERN)

• Analysts: Craig Musante, Terri Arsenault, Brian Eitzer, Christina Robb, Walter Krol, Kitty P.-Riveros, Joseph Hawthorne, Michael Cavadini



U.S. Department of Health & Human Services

U.S. Food and Drug Administration

Elemental Analysis Manual
for Food and Related Products

4.11 Arsenic Speciation in Rice and Rice Products Using High Performance Liquid Chromatography-Inductively Coupled Plasma-Mass Spectrometric Determination

Version Draft 1.1 (November 2012)
Authors: Kevin M. Kubachka, Nohora V. Shockey, Traci A. Hanley, Sean D. Conklin and Douglas T. Heitkemper

GLOSSARY

4.11.1 SCOPE AND APPLICATION

The method provides a procedure for arsenic speciation analysis of rice and rice-containing food products including white and brown rice, rice breakfast cereals, rice crackers, rice cakes, and rice beverages. The method utilizes high performance liquid chromatography coupled to inductively coupled plasma mass spectrometry (HPLC-ICP-MS) to determine inorganic arsenic (iAs) as the sum of two inorganic forms of arsenic, arsenite (As(III)) and arsenate (As(V)). Additionally, monomethylarsonic acid (MMA) and dimethylarsinic acid (DMA) are determined. Concentrations of individual arsenic species determined in samples are reported based on elemental arsenic concentrations (i.e., µg of As per kg food). Other matrices may be analyzed by this procedure if performance is verified in the matrix of interest and at the analyte(s) concentration of interest.

Analysts using the method should be experienced in the use of HPLC and ICP-MS, including the identification of chromatographic and matrix interferences and procedures for their correction. Additionally, personnel should be thoroughly trained in the handling and analysis of samples for

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• Summary: The Analytical Chemistry department has a Cooperative Agreement with the US FDA to conduct research and analyses related to chemical contaminants, including poisons and toxins, in food. The Department has successfully participated in proficiency tests and surveillance assignments for pesticides, toxins, heavy metals and other contaminants on several different analytical instruments. Dr. Brian Eitzer was asked by FDA to lead several research projects investigating or validating new analytical platforms. In addition, Ms. Terri Arsenault was asked by FDA to serve as one of two instructors for a nation-wide GC-MS Training Course. Dr. Christina Robb is currently conducting experiments on the detection of two toxic plant proteins, ricin and abrin. Last, the Department participated in a FDA-run validation exercise focused on speciating arsenic in rice.

Impact: Now that the Department has successfully

passed the FDA validation exercise for arsenic speciation, federal surveillance samples (rice, juice, and other commodities) can be sent to our laboratory for a determination of organic and inorganic forms of arsenic.

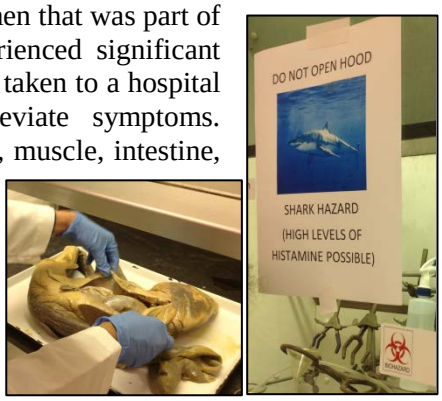
b. Analysis of samples for municipalities and other groups

- Analysts: Terri Arsenault, Brian Eitzer, Walter Krol, Craig Musante, John Ranciato
- Summary: From July 1, 2013 through June 30, 2014, Department staff analyzed 62 samples for municipalities or other groups. As in previous years, the Connecticut Agricultural Education Foundation submitted soil samples from the grounds of elementary schools interested in establishing student run gardens to provide food for school lunches. Additional soil samples were submitted from the Foote School in New Haven, from FoodCorps CT on behalf of Putnam Public Schools in Putman, and from the grounds of a correctional facility. Separately, one set of samples was submitted through the Yalesville Veterinary Hospital involving the death of two dogs due to liver and kidney failure. At the request of the veterinarian, samples of water and plant-like material were analyzed for blue green algae content and potential presence of toxic Amanita mushrooms. Nothing toxic or suspicious was found. A set of liquor samples was submitted from Waterbury Hospital where a patient was experiencing symptoms consistent with methanol exposure. Although traces of methanol were found in the alcohol, the levels were consistent with store-bought comparison samples. Last, Yale University Detectives, in conjunction with the Quinnipiac Valley Health District, requested foreign material analysis of several food trays served on campus at a medical school luncheon attended by approximate 40 local doctors. Attendees had complained that the food had an odd and unpleasant texture. No evidence of adulteration was found.

Impact: The negative findings of adulteration alleviate law enforcement and citizen concerns over foul play and allow valuable local resources to be appropriately focused. In addition, analysis of soil samples on elementary school grounds allows staff to make appropriate decisions about the location of student vegetable gardens.

c. Analysis of histamine in a shark specimen

- Analysts: Terri Arsenault, Joseph Hawthorne
- Summary: The Farmington Valley Health District, in conjunction with the CT Department of Public Health, requested histamine analysis on an intact shark specimen that was part of a dissection in a high school biology class. Two students experienced significant anaphylactic reactions while initiating specimen dissection and were taken to a hospital emergency room where epinephrine was administered to alleviate symptoms. Department staff removed and homogenized select organs (stomach, muscle, intestine, liver) and coordinated histamine analysis with the New Hampshire Department of Public Health (a partner FDA FERN laboratory). Although histamine was detected in some samples, the concentrations were deemed to be too low to be of concern.



Impact: In response to our findings, the local health district and school administrators were able to eliminate several potential widespread exposure routes of concern and were able to confidently continue specimen dissections in the school.

6. ANALYSES ON BEHALF OF OTHER STATION DEPARTMENTS

a. Analyses related to pollinator decline- Department of Entomology

- Analyst: Brian Eitzer
- Summary: Upon request from Dr. Kim Stoner in the Entomology Department, as well as State Bee Inspector, Mr. Mark Creighton, we determine concentrations of agrichemicals in pollen, bees and wax to ascertain possible relationship to bee health. LC-MS/MS methods have been developed for low level detection of specific pesticides of concern; 53 samples were analyzed during the current period. See Research section below.

b. Analysis of pesticides in tobacco leaves- Valley Laboratory

- Analysts: Brian Eitzer
- Summary: A cooperative project with Dr. James Lamondia at the Valley Laboratory has continued into a second year; the focus is on assessing application strategies that will reduce pesticide residues on tobacco leaves while providing protection from pathogens of concern.

c. Nutrient Analysis in Vegetation- Valley Laboratory

- Analyst: John Ranciato, Craig Musante
- Summary: Upon request from Dr. Richard Cowles at the Valley Laboratory, we are conducting nitrogen analysis on 40 needle samples from Christmas trees.

d. Elemental Analysis- Department of Plant Pathology

- Analyst: Craig Musante
- Summary: In conjunction with Dr. Wade Elmer of the Department of Plant Pathology, elemental analysis of 459 samples of various crops grown in the presence or absence of nanoscale micronutrient amendments was conducted.

7. ANALYSIS OF CHECK SAMPLES

- Analysts: Walter Krol, Terri Arsenault, Joseph Hawthorne, Christina Robb, Brian Eitzer, Craig Musante, Michael Cavadini
- Summary: Annual performance evaluation samples required for our polychlorinated biphenyl (PCB) regulatory program, as well as annual proficiency testing samples related to our FDA FERN work, FDA ISO Accreditation program and the AAPCO Check Sample program (pesticide formulations), were completed during the reporting period. Our reported results met required criteria in all instances.

II. RESEARCH ACTIVITIES

Research projects in the Department of Analytical Chemistry include applied and fundamental studies. Research is often stimulated by our service work and in turn, research results often impact service activities.

1. FOOD SAFETY

- *Improvement of analytical methods for determination of pesticide residues in food*
- Investigators: Brian Eitzer
- Summary: In a series of FDA coordinated research projects, we have been asked to evaluate and validate new and more sensitive analytical equipment for the improved detection of pesticide residues, toxins and poisons in food. One project involving a new High Resolution LC-MS platform for a broad pesticide screen (up to 500 analytes) has been completed with partner FERN laboratories in California and Florida and a peer review manuscript has been published. A second project involves implementation of a new triple quadrapole GC-MS (GC-MS/MS) for the detection of pesticide residues in state food samples (the Market basket program). A third project involves validation of the FDA Toxin/Poison method on a new LC-MS/MS platform supplied by FDA. Last, we are involved in a project being led by the FDA Center For Food Safety and Applied Nutrition (CFSAN) that is evaluating the rapid LC-MS/MS analysis of mycotoxins at part per trillion (ppt) levels in milk.

Impact: The implementation and development of new, more sensitive equipment and analytical techniques will enhance pesticide surveillance activities in the state and serve to better protect the food supply against incidental or intentional adulteration.

2. ENVIRONMENTAL MONITORING/REMEDIATION

Project 1: *Nanoparticle fate in agricultural systems*

- Investigators: Craig Musante, Roberto De La Torre-Roche, Joseph Hawthorne, Alia Servin, Jason C. White
- Summary: Nanomaterials (NM) are substances with at least one dimension less than 100 nm (one billionth of a meter), and this small size results in unique physical and chemical properties not observed at the bulk scale. Nanotechnology is the field of research that takes advantage of these unique and useful nanoscale properties. Current nanomaterial use is ubiquito
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• us; over 1600 NM-containing products are commercially available in areas such as electronics, health-care, cosmetics, agriculture, pharmaceuticals, and food processing. Of special concern to our laboratory is the use of nanomaterials in agriculture, including pesticide and fertilizer formulations. Also of concern is the presence of nanomaterials in biosolids, which are often applied to agricultural fields to aid plant growth. From a regulatory perspective, nanomaterials are considered to have equivalent risk to that of corresponding bulk materials. However, recent data out of our laboratory and others has suggested that this assumption may not be true. A lack of understanding regarding the fate and effects of nanomaterials in agricultural systems is troublesome given that food crop contamination could be a significant uncharacterized pathway of human exposure. Two USDA AFRI competitive grants are funding research to define the impact (physiological and molecular toxicity, accumulation) of NMs on food crops, with a focus on the risk posed to humans from exposure to these contaminated plants. Another concern being investigated in this research is the impact of nanomaterials on the fate and effects of other chemicals (pesticides, co-contaminants) present in agricultural systems. A final part of the study is investigating potential nanoparticle trophic transfer and food chain contamination. In fact, a recently completed study has shown the nanoparticle cerium oxide is accumulated from soil at significantly higher levels than is the bulk material and that this greater particle-size-specific accumulation transfers through to crickets that consume the plant leaves and even to spiders that consumer the crickets. Co-investigators on this work include colleagues at the University of Massachusetts, State University of New York College of Environmental Science and Forestry (SUNY ESF), Southern Illinois University-Carbondale, University of Texas El Paso, the US National Institute of Standards and Technology (NIST), The Institute of Experimental Botany in the Czech Republic, Hasselt University in Belgium, University of Parma in Italy, and the University of Carthage in Tunisia.

Impact: Our research demonstrates that the toxicity of nanomaterials to crop species can be significantly greater than that observed for the corresponding bulk material, and that these materials have the potential for trophic transfer and food chain contamination. The results also suggest that nanomaterials may alter the fate and effects of other agricultural chemicals. These findings have implications for the widespread use of nanomaterials in commercially available products.

Project 2: *Phytoremediation of soils contaminated with weathered persistent organic pollutants (POPs)*

- Investigators: Jason C. White, Joseph Hawthorne, Wesleyan University students
- Summary: A field trial of phytoremediation has been initiated at Wesleyan University's Long Lane Farm. In conjunction with CT DEEP, a previous remedial action plan had shown levels of dieldrin in the farm soil that are above residential criteria set by DEEP. Removal of the very large amounts of soil was deemed too costly and impractical. With the assistance of a Wesleyan University student group, a mesocosm-based phytoremediation trial has been established at the University to determine if *Cucurbita pepo* (zucchini) can remove dieldrin from the site and result in acceptable concentrations in the soil based on state residential criteria. In separate laboratory and greenhouse trials, *C. pepo* has previously been shown to accumulate large amounts of other persistent organic pollutants (POPs) such as DDE and chlordane.

Impact: The accumulation and translocation weathered POPs is a unique ability seemingly restricted to *C. pepo* (zucchini/pumpkin). The current investigation may represent the first field trial where a plant-based system is used to successfully remediate a soil contaminated with persistent organic pollutants.

Project 3: *Hydraulic Fracturing: Analysis of residential and surface water*

- Investigators: Jason C. White, Terri Arsenault, Craig Musante, Michael Cavadini, Yale Occupational and Environmental Medicine (OEMP) staff
- Summary: A large multi-institution study headed by the Yale OEMP has continued into a second year. Residential and surface waters are being collected from areas Pennsylvania and West Virginia that are varying distances away from hydraulic fracturing operations. Our laboratory is providing analysis for pesticides and related organic chemicals, as well as for 26 different elements. Results are submitted to Yale OEMP, who are compiling and analyzing the results of this multi-year study.

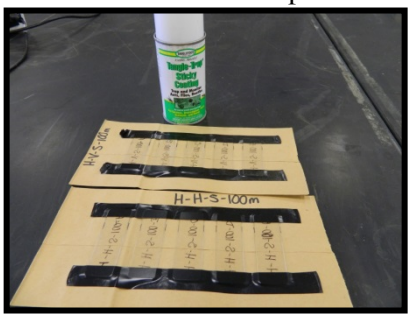
Project 4: *Analysis of pesticides in Connecticut pollen - Baseline survey*

- Investigators: Brian Eitzer, Kim Stoner (Department of Entomology)
- Summary: We are conducting research into how honey bees get exposed to pesticides during foraging. A honey bee can travel up to two miles from its hive as it collects pollen for use as food. During this time, the honey bee can be exposed to pesticides used in the residential or agricultural fields from which it collects. We have been collecting pollen from honey bee hives that represent urban, suburban and rural locations. Pollen is collected by the use of traps located on the hive so that the pollen balls fall from the bees as they return to the hive. This pollen can be very diverse as bees will visit many different plants; the photo on the right (below) shows different colors of pollen collected from a single sampling. As might be expected, different pesticide mixtures are applied to different crops creating a very variable database of pesticide exposure. The pollen is being collected from the same locations for a period of several years so as to allow us to look for temporal trends within this highly diverse data set. During the past year we have continued to incorporate the use of high resolution mass spectrometry into our pesticide screening techniques; this permits detection of a larger number of pesticides and pesticide metabolites.

Impact: Honey bees are being exposed to pesticides. Long-term monitoring from the same hives and locations provides baseline data that can be used to assess temporal trends and changes in pesticide exposure.

Project 5: *Quantifying routes of exposure of honey bees to neonicotinoid seed treatments of corn*

- Investigators: Brian Eitzer, Greg Hunt, Christian Krupke (Dr. Hunt and Dr. Krupke are at Purdue University)
- Summary: Corn production for food and feed (and recently fuel) represents the largest single use of arable land in North America. Pest management in corn (which includes scouting/monitoring and applying pesticides as needed) has been replaced by a form of risk management, where each seed is treated for management of a broad suite of pests (primarily insects and nematodes). Neonicotinoid insecticides thoroughly dominate this market. Virtually every corn kernel planted in North America (the lone exception being organic production = 0.2% of total acreage) is coated with neonicotinoid insecticides at approximately 0.5 mg/kernal. The nature of these molecules ensures that insecticide activity extends not only to the roots, but to the above-ground plant parts as well. The major compounds used are highly toxic to bees, with LD50 values in the range of 0.02-0.03 ng/bee. Given that corn is typically planted at 31,000 kernels/acre, it is essential that any potential routes for pollinator exposure to these insecticides be evaluated. In previous years we examined fields where talc or graphite was added to the planters to insure good seed flow during large scale automated planting. During the past year we also analyzed dosimeters placed around fields where an alternative waxy material was used. Our results show that elevated concentration of these pesticides can be found at all distances tested, but the waxy material appeared to reduce the amount of pesticides found.



Impact: Knowledge of exposure routes of honey bees to pesticides is important so as to minimize the impact of pesticide use on pollinators of our food crops. In response to reports of high pesticide concentration in the talc dust, seed companies are developing an alternative waxy material to be used as a substitute. This material appears to reduce transport of these compounds and could therefore reduce exposure of bees to these pesticides.

Project 6: Pollination security for fruit and vegetable crops in the northeast

- Investigators: Brian Eitzer, Kim Stoner (Department of Entomology); Anne Averill (University of Massachusetts); Frank Drummond (University of Maine), Bryan Danforth (Cornell University)
- Summary: We are participating in a multi-year grant to examine pollination security in specialty crops. Four crops are being studied; apples in New York, cranberries in Massachusetts, blueberries in Maine, and cucurbits in Connecticut. We are trying to determine the role of pollinators in the production of these crops. Among the factors being considered are pollinator diversity, pathogens, parasites and the use of pesticides. Our role within this project is to quantify the presence of pesticides both in the plants and the pollinators. These include samples of several different bee species, including squash bees, mason bees, bumblebees, and honey bees that are pollinating these crops. This data will then be correlated against pollination efficacy.

Impact: Knowledge of pesticide exposure to pollinator communities and the resulting ability of those communities to pollinate crops can be used to guide farmers in the proper usage of the pesticides to insure not only crop pollination but also protection from pests and pathogens.

PUBLIC OUTREACH

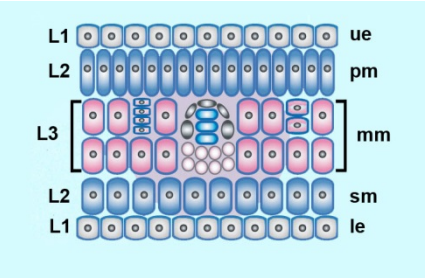
Telephone/internet inquiries: We receive 400-500 calls from the public each year requesting information on issues such as pesticides in food and the environment, heavy metals in food, soils, and consumer products. In some instances, we refer the caller to a more appropriate CAES Department or State agency.

Station Bulletins and Fact Sheets: Station Bulletins are typically published annually by our Department. These bulletins are available in printed form and on the CAES web site (www.ct.gov/CAES). They are also available at libraries throughout Connecticut. Fact sheets are articles written for the general public regarding topics of timely and widespread interest. These are also available on our website and in printed form.

DEPARTMENT OF BIOCHEMISTRY AND GENETICS

Genetic Regulation of Leaf Development

Dr. Neil McHale assisted by Regan Huntley continued work on the molecular mechanisms controlling formation of the leaf blade in Nicotiana. Plant photosynthesis is carried out in the leaf blade, a highly specialized structure with distinct cell layers performing different functions. The upper (ue) and lower (le) epidermis prevent desiccation but allow free gas exchange with the atmosphere through small stomatal openings. Light interception and photosynthesis occur primarily in the palisade mesophyll (pm), just below the upper epidermis. The inner layers of middle mesophyll (mm) house the vascular system that transports sugars (phloem) and water (xylem). Identification of key genes governing blade growth would provide valuable tools for eventual engineering of crop plants with higher primary productivity.



By introducing random mutations into the genome of Nicotiana sylvestris, we isolated several genes with critical roles in the initiation and subsequent expansion of the leaf blade. Our primary concentration was on a gene named LAM1. Sequence analysis of LAM1 revealed that it was a member of the WOX super family of homeodomain transcription factors, which have been shown to control developmental events throughout the plant. To determine the pattern of this gene's expression in leaf primordia, we fused its promoter region to a GUS reporter gene and introduced this transgene into wild type plants. The pattern of GUS staining indicated that LAM1 is expressed primarily (though not exclusively) in vascular tissue of leaves. To examine the functional consequence of vascular expression by itself, we fused the coding region of LAM1 to a vascular specific promoter from the SUC2 gene in Arabidopsis. This AtSUC2::LAM1 transgene restored blade formation and mesophyll differentiation in mutant lam1 plants, showing that veins perform a critical role in formation of leaf blades. But these transgenic leaf blades displayed a number of anatomical abnormalities, indicating that vascular expression alone was insufficient for full delivery of LAM1 function. Two other candidate mechanisms for LAM1 regulation emerged from analysis of the genomic structure of the gene. One was a set of four auxin response elements in the LAM1 promoter, and the other was a highly conserved pair of binding domains for MADS proteins in the 3' untranslated region following the LAM1 reading frame. Transgenic plants designed to test the importance of these regulatory features are under construction. Early results indicate that binding domains for MADS proteins are critically important to LAM1 function during blade expansion.

Impact

Genes controlling patterns of plant development have been used extensively to make agriculturally important alterations in growth habit and time to flowering in a variety of crop plants. Genes like LAM1 can be used to tailor the development of leaf blades, the living solar panels that convert sunlight into energy required for photosynthesis. Our initial publications on the LAM1 gene were a critical cornerstone in the eventual isolation of this gene in the laboratory of Kiran Mysore (Noble Foundation, Ardmore, OK) by Dr. Million Tadege who made this the focus of his postdoctoral work in that lab. Research on LAM1 in alfalfa leaves continues to be the centerpiece of his program at Oklahoma State University where he is an assistant professor. Cloned genes and mutant strains from our program have likewise influenced the direction of investigations in many other research laboratories.

Mechanisms Governing C4 Photosynthesis

Dr. Richard Peterson, assisted by Carol Clark continued investigations into metabolism of glycolic acid in *Zea mays*. Glycolate is an early product of photosynthesis and considered to arise predominantly from phosphoglycolate produced, in turn, by oxygenation of ribulose bisphosphate (RuBP) as catalysed by RuBP carboxylase/oxygenase (Rubisco). Metabolism of glycolate begins with its oxidation to glyoxylate and ends with recovery of up to 75% of the fixed carbon in 3-phosphoglyceric acid. The remaining carbon is released as CO_2 constituting an internal flux that opposes fixation of atmospheric CO_2 when O_2 is present. This respiration in the light is referred to as "photorespiration". Rates of photorespiration are comparatively high in plants utilizing only the Calvin cycle to fix CO_2 such as tobacco (C_3). Although glycolate synthesis is slow in C_4 plants such as maize, it is not absent [Zelitch et al. (2009) *Plant Physiology* 149: 195-204]. Reliable assessments of tissue steady state glycolate levels in the literature are comparatively rare. A major goal of this research is to compare tobacco and maize with respect to the partitioning of RuBP consumption between carboxylation and oxygenation. We employ a sensitive assay based on the phenylhydrazone derivative of glyoxylate formed from partially pre-purified glycolate extracted from leaf tissue and treated *in vitro* with glycolate oxidase. Steady state glycolate levels are remarkably stable to a light-dark transition and to shifts in gas phase O_2 and CO_2 levels in both species. Patterns of glycolate accumulation and integrated CO_2 fixation were compared at various gas phase O_2/CO_2 ratios when the glycolate oxidase inhibitor α-hydroxy-2-pyridinemethanesulfonic acid (HPMS) was supplied exogenously to leaf tissue. In both species to date, glycolate tends to accumulate linearly with the integral of CO_2 fixation. Furthermore, the slope of this relationship increases in proportion to the increase in the external O_2/CO_2. Overall, the results that at a fixed temperature glycolate arises in both species by a similar mechanism but partitioning of carbon to glycolate is much reduced in maize.

Impact

The impact of this work will be development of crop plants with higher photosynthetic capacity and the ability to withstand environmental stress. When water supply is limiting, the photosynthetic apparatus can be damaged irreparably by continuous exposure to sunlight. Genes under investigation are critical to protection of the light harvesting complex from this photo-oxidative damage. Our work has had a direct influence on the course of related ongoing work in the labs of Dr. Agu Laisk, Department of Cell and Molecular Biology, University of Tartu, Estonia; Dr. Thomas Brutnell, University of Missouri; and Dr. Tim Nelson (Yale University).

Protecting Honeybee hives from American Foulbrood Disease

Dr. Douglas W. Dingman, assisted part-time by Regan Huntley, continued investigations on the bacterium *Paenibacillus larvae*, causative agent of the disease American foulbrood (AFB) in larvae of honeybees (*Apis mellifera*), and the microsporidial pathogens *Nosema apis* and *Nosema ceranae*. He has also continued to examine the genetic diversity (i.e., maternal lineage) of honey bees within Connecticut through the use of mitochondrial DNA sequence analysis.

- Long-term examination of AFB and nosemosis infection profiles at two apiaries in CT have been continued. Mitotype monitoring for maternal lineage at these two apiaries has now been included in this investigation. These profiles continue the time-line comparative analysis of infections within two separate apiaries and are showing a persistent presence of these diseases.
- Research examining the correlation of hemolytic activity to genotype of the various *P. larvae* isolates has been started. The Connecticut isolates are being compared to isolates collected outside of the United States for placement of this phenotype to genotype.
- PCR amplification of six virulence-associated genes in *P. larvae* to compare DNA sequences and amino acid sequences across different genotype groupings of the bacterium is continuing. Differences in sequence has been detected for several genes.

- A sequence difference has been detected for a fragment of the *plx*2B toxin gene (i.e., part of the VIP2 gene set). DNA sequencing is continuing for completion of the gene and has been expanded to include the *plx*2A toxin gene. Sequence comparisons between the different strains tested will then be performed for the complete gene set.
- *P. larvae* enolase genes of two different genotypes, following PCR amplification, have been cloned into expression vectors for large scale production of purified enzyme. Enzyme kinetic studies will follow purification to investigate the role of the enzyme in virulence differences between the various genotypes.
- Honey bees collected in Connecticut are being examined for presence of the microsporidia *Nosema apis* and *Nosema ceranae* via PCR and microscopic diagnostic tests. For two Connecticut apiaries under long-term investigation, *N. ceranae* has been determined to be a persistant presence in the hives.
- Workshops to train Connecticut beekeepers on microscopic analysis of honey bees for nosema presence, and for estimation of the infection rate within a bee hive, are continuing.
- An investigation to monitor genetic diversity of honey bees in a Connecticut hive is being investigated through mitochondrial DNA sequence analysis. Many apiaries within Connecticut are supplying bees for analysis. At present, results have identified five mitochondrial profiles; Type C1, C11, C12, M4, and O2.
- Database entry of registered beekeepers in Connecticut for the years 2007-2012 has been completed. Apiary registrations for 2013 are currently being added to the database.

Impact

Diseases of honey bees, caused by bacterial and fungal infections (i.e., American foulbrood (AFB) and nosemosis, respectively) cause significant economic losses to beekeepers and agriculture. This investigation continues to show a presence of AFB and nosemosis within Connecticut beehives. Beekeepers, by being aware of the prevalence of these two diseases, can make informed decisions on control and treatment procedures of the diseased hives. Advancing molecular knowledge pertaining to *P. larvae*, through investigation of virulence associated genes and through geo-distribution characterizations of genotypes, will provide information to aid development of new approaches to lower the impact of this disease. By receiving training on how to monitor hives for nosemosis, beekeepers are receiving the tools needed to help them better control this disease. Connecticut beekeepers are organizing for the production of locally reared honey bee queens. By understanding the maternal lineage of bees, attachment of phenotypic trait to genotype will make tracking, selecting, and propagating the genetics of healthy bees easier.

Plant Nucleobase Transporters

Dr. Neil Schultes assisted by Regan Huntley investigates the movement of plant nucleobases (purines and pyrimidines) across biological membranes. Nucleobases are important for plants in that they are precursors to the nucleotides that make up DNA and RNA, are involved in ATP synthesis, carbohydrate, glycoprotein and phospholipid metabolism, and central to the biosynthesis of many secondary compounds including cytokinins and caffeine. Plants have a robust biochemistry for nucleobases including *de novo* synthesis, salvage and catabolism pathways. The complex biochemistries involve specific parts of the different cells and a number of subcellular locals, necessitating the transport of intermediates across many different biological membranes. Membrane bound transporters act as metabolite-specific gatekeepers that regulate traffic of metabolites between cellular compartments (chloroplasts, nuclei, vacuoles, mitochondria, peroxisomes and endoplasmic reticulum) and between cells. As such transporters are often key control points in plant biochemistry.

In plants there are six different families of transporters just for moving nucleobases. Our research on determining the function of transporters from three of the six nucleobase transporter families: the nucleobase-ascorbate transporter (NAT), and nucleobase-cation symporter1 (NCS1) and Azaguanie-like transporters. The function of the plant transporters is determined through heterologous complementation studies. In this procedure the plant gene encoding the transporters are cloned into DNA vectors (plasmids) that are engineered to express in brewer's yeast (*Saccharomyces cerevisiae*). Once expressed in yeast a series of experiments testing the ability of the engineered yeast to take up or transport radio-labeled nucleobases are performed. In this manner the metabolite-specific transport profile and associated kinetic parameters for each nucleobase transporter is determined.

We are performing and evolutionary-function analysis thereby leveraging the diversity and power of evolution to determine the function of NCS1 from species across the plant kingdom. The rational is that particular amino acids sequences important for NCS1 function are conserved in all plant species, while "filler" amino acids vary. The metabolite transport profile has been determined for NCS1 transporter genes from algae (*Chlamydomonas reinhardtii*); moss (*Physcomitrella patens*); gymnosperm (*Picea glauca*); monocots (*Zea mays* and *Setaria viridis*) and dicots (*Nicotiana sylvestris*). Our data complements the ongoing research in structure-function and three dimentional structural studies of NCS1 transporters actively pursued in fungal and bacterial systems.

We are investigating the function of eight of the Arabidopsis NAT transporters using similar techniques. Our results show that NAT transporters move xanthine and recognize various other nucleobase compounds. Xanthine transport is intimately associated with the synthesis of allantoin in soybeans – the major nitrogen transport molecule throughout the plant. In addition we are characterizing two Azaguaine-like transporters from *Arabidopsis thaliana* and three from *Zea mays*.

In addition we collaborate with Drs. Richard Peterson and Israel Zelitch in research on photosynthesis. We are assisting Dr. Peterson in genotyping nine maize lines that carry a transposon-insertion/disruption mutations in one of the following genes that encode for proteins of the chloroplast enzyme NAD(P)H dehydrogenase complex.

Impact

The movement of nitrogen and carbon-based compounds within plants is highly regulated by transporter proteins in the cell membrane. Understanding nitrogen and carbon use patterns by plants will have important implications for both basic plant biology as well as applied science. Developing plants that use fertilizer more efficiently is just one example of how results from this research may be applied. Our investigations on nucleobase-ascorbate transporter genes in plants has an impact on a number of other research laboratories investigating similar research interests. One example is our collaboration with Dr. Mourad from the Department of Biology Indiana-Purdue University on uracil transporter-encoding genes in *Arabidopsis thaliana*.

DEPARTMENT OF ENTOMOLOGY

The Department of Entomology is involved in a variety of service, research, pest surveillance, and plant regulatory activities. The primary service activities are provided through the Kenneth A. Welch Insect Information Office. Staff in this office answer insect related questions and identify insects and related arthropods for the public, government agencies, growers, and business organizations. All scientists provide information to citizens of Connecticut by answering telephone inquiries, making farm visits, participating in meetings of growers and other groups, and speaking on their research. Most of the research in the Department has a major applied aspect, addressing the integrated management of ticks, pests of field crops, nurseries, and orchards, wood-boring insects, invasive insects, and honey bees and other bee pollinators.

The Office of the State Entomologist at the Connecticut Agricultural Experiment Station, created by the Connecticut General Assembly in 1901, is part of the Department of Entomology with responsibility, in part, to ensure our nursery industry is free of plant pests and certify their products for shipment to other states and outside the United States. The Connecticut Green Industry (i.e., nursery, greenhouse, floriculture, sod, Christmas trees) is the largest agricultural business in Connecticut. The industry estimates that environmental horticulture generates $1.022 billion gross income supporting 48,000 full and part-time jobs in Connecticut. In conjunction with regulatory activities, Department staff conducts a surveillance program in Connecticut for a variety of established pests and for exotic plant pests, some of regulatory concern, that represent a threat to our green industry, forests, and urban ornamental trees and shrubs. Surveillance for plant pests is performed in partnership with the United States Department of Agriculture (USDA) through the Cooperative Agricultural Pest Survey (CAPS) program and the U.S. Forest Service. In addition, we participate in a Forest Pest Survey and Outreach Program supported by the USDA. For plant diseases of regulatory concern, we work closely with the Plant Disease Diagnostic Laboratory in the Department of Plant Pathology and Ecology. We also conduct forest health surveys and a statewide aerial survey for gypsy moth defoliation (and any defoliation by other insects) and a gypsy moth egg mass survey. The results of our plant and forest surveys for 2013 may be found later in the Department's research activities along with summaries of our regulatory activities. The Office of the State Entomologist and the Apiary Inspector also oversee registration of beekeepers and inspection of honey bee colonies for pests and disease.

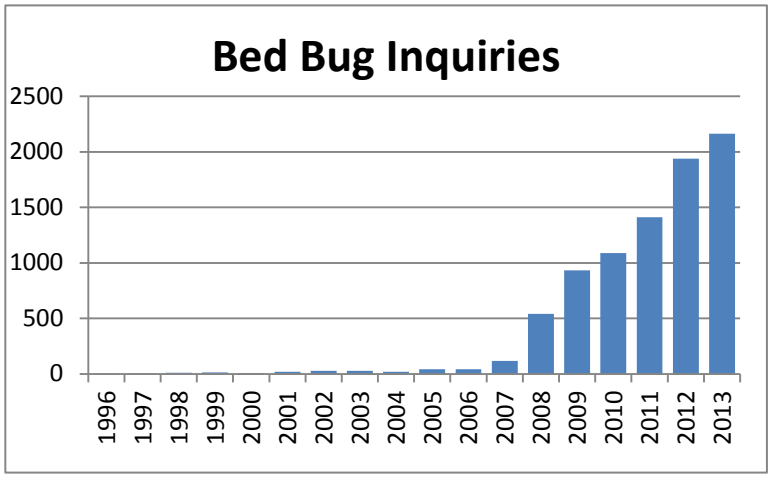
The staff of the Department of Entomology also take a lead in providing extensive outreach activities for the Experiment Station by providing information to both children and adults about the Experiment Station's research at public events and at health and agricultural fairs, such as the Eastern States Exposition (Big E) in Springfield, MA, Celebrating Agriculture in Woodstock, CT, the Garden Expo in Fairfield, CT, the Yale Peabody Museum's Biodiversity Day, Norwalk-Wilton Tree Festival, and the Connecticut Flower and Garden Show. Honey bees, butterflies, wood-boring beetles and/or ticks continue to be popular exhibits at these events. Pictured are Peter Trenchard, Stephen Sandrey, and Katherine Dugas at the CAES display at the Connecticut Flower and Garden Show in Hartford.

Service Activities

Insect Inquiry Office: Dr. Gale Ridge oversees the New Haven insect information office. Ms. Rose Hiskes serves citizen insect inquiries in the Station's Windsor laboratory. Insect identification services date back to the nearly the inception of the institution starting with the first Annual

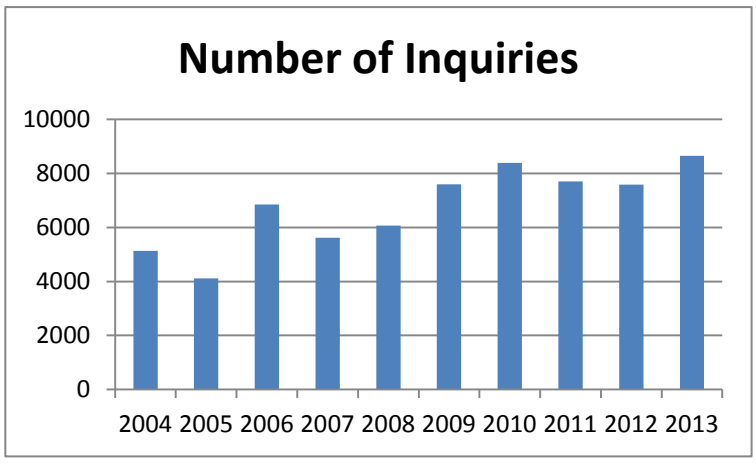
Report of the Connecticut Agricultural Experiment Station published in 1877. The station announced that it was offering to "identify useful or injurious insects…..and to give useful information on the various subjects of Agricultural Science for the use and advantage of the citizens of Connecticut".

Since 2000, there has been a trend from traditional communication such as mail and visitors to phone/cell phone calls and the internet. Phone calls remain the primary citizen contact. The office serves private citizens, pest management professionals, the real estate industry, nurseries, land care businesses, arborists, health departments, other medical professionals, charities, manufacturing, the hospitality industry, housing authorities, museums, municipalities, libraries, state government, and the media. Between July 1, 2013 and June 30, 2014 the insect inquiry office handled at least 8,652 recorded inquiries. There were 940 categories of inquiries including insects, arachnids, animals, use of pesticides, insect damage, general entomology, and horticultural issues. Of these, 2364 (27.5%) were related to man and medical issues, 144 (2%), undetermined/general inquiries 5825 (67.5%) natural resources, and 319 (3%) food related. Bed/bat/bird bug inquiries remain the leading inquiry for the office with 2,164 (25%) of the identifications performed by the office. The bed bug webpage additionally had the highest level of activity. In order of numbers, the second highest query were beetles which include inquiries about the emerald ash borer and Asian longhorn beetle, followed by delusory parasitosis of which there were over 200 cases, then bees and wasps, white grubs, brown marmorated stink bug, carpet beetles, ticks, and cicada killers.



Number of bed bug inquiries from 1996 – 2014.

The office continued to lead in public outreach, introducing a new Spanish interpretation service. There were numerous State and New England wide presentations and training programs for bed bugs, the emerald ash borer, and the Asian longhorn beetle. The Connecticut Coalition Against Bed Bugs (CCABB), chaired by Dr. Ridge continued to publish public education outreach material including a bill board in Hartford and 550 state wide public transportation bus posters. The office continues to build collaborative relationships and led projects with local, state, and federal agencies, to better serve the needs of the citizens of Connecticut.



Number of inquiries from FY 2004/2005 to FY2013/2014 (i.e., July 1st - June 30th).

Left: Bed bug billboard; I91 Hartford CT. Right: Statewide bed bug, public transportation bus poster. Designed by Katherine Dugas.

CAPS and Forest Pest Programs: The Cooperative Agricultural Pest Survey and Forest Pest Survey and Outreach Project (FPSOP), supported by the USDA-APHIS-PPQ and overseen by State Survey Coordinator Katherine Dugas, are two programs that provide for pest survey and educational outreach on the identification and risks posed by a number of potential invasive insects and plant diseases. With worldwide trade and travel increasing, we are at an increased risk of foreign plant species, plant diseases, and insect pests being introduced in the U.S. In Connecticut, the CAPS program has conducted surveys in nurseries, Christmas tree farms, state parks, and conservation and public lands. This includes the biosurveillance program for the emerald ash borer. In addition, in May 2014, Katherine Dugas at CAES with the assistance of Dr. Joseph Elkinton at the University of Massachusetts in Amherst, released 2,000 parasitoid Tachinid flies, *Cyzenis albicans* in Groton, Connecticut for the control of the winter moth, *Operophtera brumata*, that has recently been causing tree defoliation in the southeastern part of the state (see picture of larva on red maple bud, photo by K. Dugas). This parasitic fly feeds only on the winter moth. This fly has helped control the winter moth in Nova Scotia. Releases of the fly in Massachusetts began in 2005 and have been conducted for the past three years in Rhode Island. This is the first release in Connecticut and multiple releases over several years will be required to establish the beneficial fly and provide for any control of the moth. The FPSOP program main objective is outreach and education about forest pests and also works with the national Don't Move Firewood Campaign and Connecticut Master Gardeners. The program reached over 9,000 people through 32 events including agricultural fairs, garden shows, schools, and events or festivals tied to special occasions like Earth Day.

Bird and Butterfly Garden: The Bird and Butterfly Garden is a partnership of the Federated Garden Club of Connecticut, the Spring Glen Garden Club of Hamden, and The Connecticut Agricultural Experiment Station. Most maintenance and improvements to the garden are done by farm manager Richard Cecarelli and his staff. The garden is open to the public Monday-Friday 8:30 a.m.-4:00 p.m., it is closed on the weekends and state holidays. The garden creates several favorable habitats for our native birds, butterflies, and pollinating insects and helps us determine which plants may work best in Southern Connecticut gardens. Plants are labeled for easy identification. The Bird & Butterfly Garden at Lockwood Farm is listed in the 'Nature Conservancy Open Days Directory for New England'.

Jeffrey Fengler and Jane Canepa-Morrison observed 15 different butterfly species, 1 species of moth, 19 species of birds, and 13 other species around the garden on Plant Science Day August 7, 2013.

Butterflies & Moths	*Birds*	*Other*
Spicebush Swallowtail	American Crow	European Honeybee
Cabbage White	Mourning Dove	Green Frog
Pipevine Swallowtail	Northern Mockingbird	Bumblebee spp.
Pearl Crescent	Barn Swallow	Large Milkweed Bug
Tawny-edged Skipper	Bluejay	Cicada Killer Wasp
Peck's Skipper	American Robin	Carpenter Bee
Silver-spotted Skipper	Song Sparrow	Japanese Beetle
Eastern Tiger Swallowtail	Northern Flicker	Carolina Locust
Orange Sulphur	Common Grackle	Black-mantled Gilder (dragonfly)
American Copper	American Goldfinch	Carpenter Ant
Summer Azure	Gray Catbird	12-spot Skimmer (dragonfly)
Question Mark	Ruby-throated Hummingbird	European Paper Wasp
Common Sootywing	European Starling	Leaf-footed Bug
Fiery Skipper	Red-tailed Hawk	
Zabulon Skipper	Turkey Vulture	
Hummingbird Clearwing	Eastern Kingbird	
	Cedar Waxwing	
	Red-winged Blackbird	
	Northern Oriole	

Sponsored Meetings and Conferences: A Forest Health Workshop, organized annually by Dr. Victoria Smith, was held March 4, 2014 at Fort Trumbull State Park, New London, CT. It consisted of a variety of presentations by Station Staff and the University of Connecticut Cooperators on various aspects of research and findings of concern to foresters in the Department of Energy and Environmental Protection, USDA-APHIS-PPQ, and the forest health community.

Tick Testing: Ticks, primarily the blacklegged tick *Ixodes scapularis*, had the highest number of specimens submitted for identification. Ticks are processed in the Tick Testing Laboratory at the Experiment Station by Elizabeth Alves and Bonnie Hamid. A total of 2,940 ticks feeding on humans were submitted for identification in 2013, of which 2,594 were the blacklegged tick or "deer" tick, *Ixodes scapularis*. Beginning in 2006, the policy was changed to only test engorged ticks. Therefore, of the ticks received in 2013, 1,628 (62.8%) were tested for the presence of *Borrelia burgdorferi*, the causal organism for Lyme disease, and 514 (31.6%) were found to carry this organism. Other tick species received included 257 *Dermacentor variabilis*, 76 *Amblyomma americanum*, 3 *Ixodes dentatus*, 2 *Ixodes cookei*, and 1 *Rhipicephalus sanguineus*.

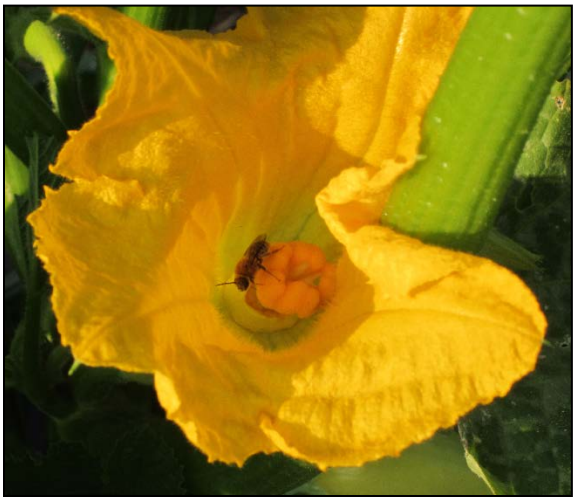
Research Activities

Integrated Tick Management: Dr. Scott C. Williams, Dr. Goudarz Molaei, Dr. Kirby C. Stafford, and postdoctoral scientist Dr. Laura E. Hayes conducted the second year of a field experiment in Redding, CT, aimed at estimating the effectiveness of integrated and individual management strategies in reducing tick populations and human exposures to tick-borne diseases in residential areas. Treatments in the experiment are 1) natural product application (rodent bait box distribution and the spray applications of the entomopathogenic fungus Metarhizium anisopliae), 2) management of white-tailed deer (*Odocoileus virginianus*) populations and 3) a combined treatment with both natural product application on individual properties and deer population management. David Whiteman (Connecticut Tick Control, LLC) and Dr. Anthony J. DeNicola (White Buffalo, Inc.) undertook natural product application and deer population management, respectively, within assigned residential areas. Heidi Stuber and Michael Short assisted with sampling of black-legged tick (*Ixodes scapularis*) and white-footed mouse (*Peromyscus leucopus*) populations in the four residential areas where the field experiment is being conducted. Heidi Stuber, Elizabeth Alves, and Tia Blevins are assisting with the laboratory testing of field-collected samples of ticks and white-footed mouse serum for evidence of pathogen exposure. Results from the first year of the study showed that natural product application reduced nymphal blacklegged tick populations on residential properties by an average of 75%. Estimates of the baseline rates of blacklegged tick infection prevalence with the Lyme bacterium (*Borrelia burgdorferi*) in study areas averaged 46%. Dr. Williams, with the assistance of Michael Short and Megan Floyd, captured and released a total of 234 white-footed mice in 2013 and the prevalence of mice positive for infection with the Lyme disease spirochete ranged from 52.5 to 73.1%. Aerial deer surveys were also conducted in 2013 and 2014 by Dr. Williams, which found that the average deer density in Redding was ca. 30 deer per square mile. The deer densities post-harvest in 2013 were < 10 deer per square mile in both study neighborhoods and < 10 per square mile in one of two neighborhoods in 2014. Deer populations decreased by 28% in areas between 2013 and 2014 where population management was done. Deer populations increased over that same time period by 21% in areas where no population management occurred. Effectiveness of deer population management and natural product application treatments, both alone and in combination on tick populations and disease parameters will be estimated in the final project year. This project is funded by a cooperative agreement (i.e., grant) from the Centers for Disease Control and Prevention for the period from 2012 through 2015.

Dr. Laura E. Hayes in the field.

Impact:
Lyme disease continues to be a major public health concern with around 300,000 cases in the United States each year. Integration of several tick reduction strategies should help provide homeowners and small communities with information on ways to reduce tick numbers sufficiently to reduce the risk of disease.

Pollination of Pumpkins and Winter Squash: Pumpkins and winter squash (*Cucurbita* spp.) require insect pollination in order to set fruit, and fruit size is also closely related to the amount of pollen deposited on the female flowers. As part of a regional study of pollination of specialty crops, Dr. Kimberly Stoner and her team (Tracy Zarrillo, Morgan Lowry, Benjamin Gluck, Amelia Tatarian, Alana Russell) are measuring pollen deposition on the stigmas of female flowers, relating average pollen deposition over the field to bee counts and bee species present. They are also doing detailed study of bee visits to individual female flowers, recording bee behavior with video, and relating bee activity to pollen deposition on that flower. On most of the 20 farmers' fields studied, pollen deposition has been adequate for maximum fruit set and fruit size.



Left: Alana Russell and Benjamin Gluck at the squash plot at Lockwood Farm. Right: male *Peopnapis* squash bee on female squash flower.

Emerald Ash Borer Wasp Watcher Program: The wasp watcher program was begun in the spring of 2010. *Cerceris fumipennis* (Hymenoptera: Crabronidae) is a native, solitary hunting wasp that uses adult buprestid beetles to provision her nest for her larvae. The wasps nest in colonies of 1 – 500 holes and prefer hard-packed sandy soil. When colonies are located it is easy to monitor the wasps returning to their holes and identify the beetles that they are carrying. In areas that are infested by emerald ash borer (EAB), the wasps will bring EAB adults to the nests. Thus the wasp provides a highly efficient, and effective, 'biosurveillance' system. With funding from USDA APHIS/ PPQ CAPS program and the US Forest Service, we have surveyed colonies throughout CT since 2009. The program is run by Dr. Claire Rutledge assisted by Mioara Scott. The program had several goals. The first is to increase our ability to monitor colonies of *Cerceris fumipennis* for invasive buprestid beetles, in particular EAB. Secondly, we hoped to educate and involve citizens on the issues and science surrounding invasive species in general and wood boring insects in particular. We continue to be joined by volunteers at the White Memorial Conservation Center and by Master Gardeners at the University of Connecticut Extension Master Gardeners Program as well as arborists, families and foresters. In 2013, we had 46 volunteers, 25 of whom were returning watchers. We monitored colonies were distributed throughout Connecticut in all 8 counties, a total of 89

colonies were monitored. Emerald ash borer was detected in 5 new towns, including 2 in additional counties. In total we collected 3,629 buprestid beetles. In 2014, we had 42 watchers return and an additional 29 volunteer. Before the end of June 2014, we had detected EAB in 5 new towns in New Haven County, with 4 of those detections being made by wasp watchers.

Research on *Cerceris fumipennis:* Several lines of inquiry on the biology and ecology of *Cerceris fumipennis* beyond biosurveillance are being conducted by Dr. Claire Rutledge. The first project is in collaboration with Philip Careless, Dr. Melissa Fierke SUNY and Colleen Teerling, Maine Forest Service. With funding from the US Forest Service, we are collecting data to determine the degree-day requirements of *C. fumipennis*. This knowledge should help us to better use and manipulate *C. fumipennis* as a bio-surveillance tool. In 2014, the project was joined by Monika Chandler of the Minnesota Department of Natural Resources who will provide data for validation of the models already created with data from the New England collaborators. The second regards the cues used by *C. fumipennis* to recognize their prey. This project is in collaboration with Dr. Peter Silk of the Canadian Forest Service. A paper on the hydrocarbons used in the recognition of prey by the wasp has been accepted by *Entomologia Experimentalis et Applicata.* A third line of inquiry is examining the distance travelled by *C. fumipennis* when she hunts. This is an important question because it tells us how much area is surveyed by a wasp colony. To address it, we are mapping host trees of host-specific buprestid beetles in the vicinity of *C. fumipennis* colonies. Knowing how far from the trees are from the colonies gives us a minimal distances the wasps forage, and thus an estimate of the area surveyed.



Left: Wasp Watchers at a training in North Haven in June 2014. George and his children (on left) detected EAB in Orange, CT 4 days later. Middle: *Cerceris fumipennis* female emerging from her burrow. Right: Nailing a bolt containing *T. planipennisi* to an infested ash tree. The tiny wasps will emerge in several days, and seek out emerald ash borer larvae to parasitize.

Classical Biological Control of Emerald Ash Borer: Following the detection of EAB in Connecticut, the determination was made to join the USDA APHIS/ PPQ biological control program for EAB. In May 2013, Dr. Claire Rutledge began releases of the gregarious endoparasitoid, *Tetrastichus planipennisi* and the egg parasitoid *Oobius agrili* in Middlebury and Prospect, CT. The parasitoids are shipped from the USDA APHIS emerald ash borer mass-rearing facility in Brighton Michigan. Six releases were conducted between May and August with a total of 10,245 *T. planipennisi* and 2,878 *O. agrili* being released. During the summer of 2013, EAB were detected in 9 more towns, so release sites were secured in 2 more towns that were at the then known-edge of the infestation, Sherman and Sleeping Giant. In 2014 releases were begun on May 30 at all four sites and are planned to continue through the summer. Recovery efforts to determine if the parasitoids have established will begin in 2015.
Surveys for Invasive Insects: The brown marmorated stink bug (*Halyomorpha halys*) is an invasive stink

bug from Asia. The nymphs and adults feed on many vegetable, fruit, and legume crops. So far, severe damage from the stink bug has been restricted mostly to states in the mid-Atlantic region and the Pacific Northwest. Dr. Maier, with assistance from Morgan Lowry, Tracy Zarrillo, Katherine Dugas, Gale Ridge, and Rose Hiskes, has investigated the distribution of this invasive stink bug. Based on specimens brought or mailed to the Station, they have determined that the stink bug has spread across Connecticut. Currently, this non-native stink bug is recorded from 89 towns. Thus far, crop injury has not appeared in the state. The Eurasian spruce needleminer (*Batrachedra pinicolella*) is an invasive pest that can cause cosmetic injury to spruces, particularly Norway spruce (*Picea abies*). Dr. Maier, assisted by Morgan Lowry and Tracy Zarrillo, is determining the distribution and adult flight period of this moth. In 2013 and 2014, they captured adult males in traps baited with two components of the sex pheromone—*Z*-5-decen-1-ol and *Z*-5-decen-1-yl acetate. In North Branford, the males flew during 4 weeks in June in 2013 and from mid-June to mid-July in 2014. During 6 years of trapping, the onset of the male flight has varied by nearly one month. Based on pheromone traps deployed in most states in the northeastern United States, the alien moth occurs in all New England states, New Jersey, New York, and Pennsylvania. Highly local populations infest spruces as far west as Michigan.

Impact of the Lily Leaf Beetle: The lily leaf beetle (*Lilioceris lilii*) injures and sometimes kills Asiatic and Oriental lilies that are grown in flower gardens in Connecticut. Both the larvae and the bright red adults of this European beetle feed upon the foliage and flowers of lilies. Although this invasive beetle prefers Asiatic true lilies, it has spread from gardens into the wild where it now threatens the health of native lilies, such as the Canada lily (*Lilium canadense*) and the Turk's-cap lily (*L. superbum*). Based upon an examination of wild Canada lilies in July of 2013, this alien beetle occurs in at least 80% of the wild stands. In 2013, Dr. Maier and his assistants conducted an experiment to evaluate the impact of the lily leaf beetle on wild Canada lilies in Canaan, Connecticut. They infested individual caged plants with 10, 5, or 0 (control) eggs in May and then recorded plant weight in early August to reveal difference among experimental groups. Based upon the 2013 data, as few as five larvae can completely defoliate individual plants of this wild lily. The final dry weight of plants was significantly higher in uninfested plants than in those provided with 10 or 5 eggs. In fact, lilies initially given 10 eggs had a dry weight of only 16.1% of the controls. Beetle larvae completely devoured the foliage of 47% of the total plants in the 10-egg experimental group, and plants in this group failed to develop flowers. Therefore, feeding by the lily leaf beetle has a severe impact upon wild Canada lilies, particularly those with higher larval density.

Above left: Mating adults of the lily leaf beetle, *Lilioceris lilii*. Above right: An adult of the elderberry beetle, *Desmocerus palliates* (see next page).

Seventeen-year Periodical Cicadas: Periodical cicadas emerged in the spring of 2013, providing a wonderful opportunity for state citizens to observe one of the most remarkable phenomena in all of nature. In the northern United States, nymphs of periodical cicadas live underground for nearly 17 years before they emerge from the soil and transform to adults. Dr. Maier, assisted by Morgan Lowry, Tracy Zarrillo, and DEEP volunteers, surveyed the state to determine precisely where cicada populations occurred. In 2013, they recorded cicadas in 20 towns, which is a decrease from 1996 when 22 towns had cicadas. Until 2013, only one species (*Magicicada septendecim*) of the three northern 17-year species had been found in the state. In June, Dr. Maier discovered small populations of a second species (*M. septendecula*) on Totoket Mountain in North Branford. This is the northeasternmost record of this relatively rare species. This species differs from the widespread *M. septendecim* in both its song and its appearance. Populations of this second species were concentrated in two nearby forested areas that were dominated by hickories (*Carya* species). One of the forested areas also had butternut (*Juglans cinerea*), a suspected host, in the recent past. The second area had a large component of white ash (*Fraxinus americana*), a known host. *Magicicada septendecula* may be threatened in the state by the decline of butternut from diseases and by that of ash from infestations of the emerald ash borer (*Agrilus planipennis*). Dr. Maier estimated the density of nymphs of the two species in one of the forested plots by counting the emergence holes of nymphs in quadrats that were selected randomly. He estimated that 1,487 nymphs of *M. septendecula* and 17,313 of *M. septendecim* emerged in one 0.25-hectare plot.

Longhorned Beetles of Connecticut: Dr. Maier and his assistants have studied the distribution and hosts of longhorned beetles (Cerambycidae) for over 15 years. They have gathered biological data on both native and non-native wood-borers by capturing adults in baited traps, rearing adults from larvae in wood, collecting adults on flowers, and examining adult specimens in museums. During the past 2 years, they have captured over 60 species in panel traps baited with various sex pheromones and host volatiles. The catch of 24 species was sufficiently large to allow the seasonal flight pattern to be discerned for the first time. To date, they have reared 88 species from dead wood. The biological data are entered into a database, which now has 11,485 entries. Information in this database will assist in modifying existing management plans or developing new ones for pestiferous longhorned beetles in northeastern North America.

NURSERY AND PLANT INSPECTION ACTIVITIES

Plant inspection and regulatory services are coordinated and conducted through the office of the state entomologist, whose members are State Entomologist Dr. Kirby Stafford, Deputy State Entomologist Dr. Victoria Smith, Plant Inspectors Peter Trenchard, Stephen Sandrey, Jeffrey Fengler, and Tia Blevins, and Apiary Inspector Mark Creighton.

NURSERY INSPECTION AND CERTIFICATION

Three-hundred five nurseries were certified to conduct intra- and interstate business. There were 671 nursery inspections during the growing season.

NURSERY INSECTS AND DISEASES

the most important diseases and pests found in nurseries (in order of prevalence) were boxwood blight, aphids on various trees and shrubs, boxwood leaf miner, imported willow leaf beetle, and lily leaf beetle.

JAPANESE BEETLE CERTIFICATION TO CANADA

Eight Connecticut nurseries, which met the inspection requirements of the US/Canada Japanese Beetle Harmonization Plan, shipped 24,401 plants to Canada in 2013.

NURSERY DEALER PERMITS

Nursery Dealer Permits were issued to 157 firms. One-hundred twenty three of these companies operate individual outlets, the remaining businesses have more than one outlet each. In total, there were 568 outlets.

PHYTOSANITARY CERTIFICATES

Three-hundred and thirty three phytosanitary inspection certificates were issued covering the shipment of the following plant materials to destinations outside the United States:

PRODUCT	QUANTITY
APPLES (CARTONS)	1000
BULBS & TUBERS (DAHLIA & GLADIOLAS)(# BAGS)	678
CHINESE TREE PEONY (PLANTS)	13
GREENHOUSE PLANTS	
RHIZOMES	311
CUTTINGS	18
NURSERY STOCK	
UNROOTED CUTTINGS	234
PLANTS (B AND B)	19,440
BARE ROOT PLANTS	34
ORCHIDS (PLANTS)	2,716
PERENNIALS	
BARE ROOT PLANTS	4,161
POTTED PLANTS	12
SEEDS (BAGS)	533
TOBACCO	
BALES	56,024
BUNDLES	32,703
CARTONS	24,500
PALLETS	431
WALNUT SHELLS (BAGS)	101

SPECIAL INSPECTIONS

Eleven inspections were made for 96 individual plants to assist homeowners moving out of state.

Seventy eight inspections were made to assist nurseries moving the following plants interstate:

Product	Quantity
Nursery stock (containers)	121
(bare root plants)	1,500
Greenhouse plants	963
Logs	50
Seed (# Bags)	64

Biotechnology Regulatory Services Inspection Activity

In cooperation with officers from the Wallingford USDA-APHIS-PPQ office, eight inspections were conducted in 2013 at facilities or laboratories working with recombinant or regulated organisms.

Permits to Move Live Plant Pests, Noxious Weeds, and Soil

In 2013, there were forty-four PPQ 526 Permits (Permit to move live plant pests, noxious weeds, and soil) approved in CT. There were three PPQ 525 Permits (Permit to move soil) approved in CT.

Boxwood Blight

First discovered in Middlesex County, CT in November 2011, boxwood blight, caused by the fungus *Cylindrocladium pseudonaviculatum (Calonectria pseudonaviculata),* continues to be an issue for both nurseries and landscapes. This disease was new to CT and to the US. In 2013, action concerning boxwood blight was taken eleven times at nurseries, garden centers, and private residences; fifty-three samples were collected from nurseries (six positives) and forty-two samples from private residences (12 positives). Efforts continue to educate landscapers about boxwood blight and its consequences.

Chrysanthemum White Rust:

In 2013 we inspected 72,257 plants for cwr, caused by *puccinia horiana*. Five hundred forty seven plants were found to be positive, and were destroyed.

Emerald Ash Borer:

With the detection of the emerald ash borer in three additional counties; Hartford, Fairfield, and Litchfield, in 2013, the state internal quarantine for this beetle was expanded August 29, 2013 from New Haven County to include all four of these counties in Connecticut.

Gypsy Moth

There was no observable defoliation due to gypsy moth recorded in CT in 2013. During egg mass surveys in winter 2013-2014, however, there are locations where sufficient numbers of egg masses are present to cause damage in summer of 2014. These locations are being closely monitored.

Asian Longhorned Beetle

We conducted sixty five inspections of 6,196 trees in all counties of CT for presence or signs of ALB infestation.

Hemlock Woolly Adelgid

During 2013, we required all hemlock nursery stock that was being shipped out of Connecticut to be treated for hemlock woolly adelgid. Two nurseries shipped hemlock trees out of state. Our inspectors observed treatments and issued shipping certificates for the plants.

Ramorum Leaf Blight (*phytophthora ramorum*

There were three trace-forward actions involving *p. ramorum* in CT in 2013. Potentially infested host material was shipped to one nursery and many private home owners. A total of 18 samples were collected, and determined to be negative for presence of *p. ramorum*. No further action was taken.

One nursery was involved in trace-back actions. Two samples were collected and determined to be negative for presence of *p. ramorum*. No further action was taken.

Daylily Rust:

During 2013, we surveyed daylilies in nurseries and garden centers for signs of daylily rust, caused by *puccinia hemerocallidis*. Eighty nine inspections (43,576) were conducted.

Apiary Inspection:

There are currently seven hundred thirty seven registered beekeepers maintaining 5,343 hives. In 2013, nine hundred three hives in five hundred ninety beeyards in CT were inspected. American foulbrood was detected in five hives; these were destroyed by burning. The most common problems were high levels of Varroa mites and a high level of queen failure. CT beekeepers continue to lose colonies overwinter in higher numbers than experienced in the past years. These losses are consistent with regional and nationwide trends. Inspections have discovered the small hive beetle on a regular basis in most areas of the state with a stronger presence in the sandy regions along Long Island Sound. Winter hive inspections have detected the adult beetle coexisting within the winter cluster. Despite these challenges, beekeeping interest is still strong with over 465 new beekeepers being trained this winter. Due to high winter losses in 2012-2013, local beekeepers were not able to provide sufficient numbers of honey bees for pollination of our apple orchards and pumpkin fields. For the first time, honey bees were brought in from out of state to meet pollination demands.

Forest Health Survey:

During the summer and autumn of 2013, we examined 51 permanent, one-acre forest plots that were established to monitor forest health in Connecticut. These plots are located on state, nature conservancy, and municipal water company properties. We considered 25 pathogens for monitoring and determined which trees served as host plants. Within each plot, 20 to 30 trees were tagged for long-term studies. We evaluated signs of defoliation and disease, such as dead tree branches, limbs and crowns. Descriptions and determinations are designed to reflect increasing damage or tree decline. We measure the trees at diameter at breast height (dbh) as an additional way to monitor their health. We will continue to use these plots to monitor the forests over several years to assess whether our state forests remain healthy or are declining. Many stands of conifer forest were severely damaged during superstorm Sandy.

Hemlock Woolly Adelgid:

This pest has been present in CT for many years, and continues to cause patchy damage and decline among the remaining population of hemlocks. Statewide in 2013, 7,657 acres were affected by HWA. Scale insects, such as elongate hemlock scale and circular scale, are increasing in some areas.

Asian Longhorned Beetle.

Asian longhorned beetle was a target in the wood boring/bark beetle survey, through the caps program in 2013. Visual surveys for signs of ALB were conducted at numerous locations statewide. We examined many thousands of trees in CT for signs of infestation. In addition, insects submitted by arborists and homeowners as possible ALB have been examined. All surveys and identifications, thus far, have been negative. White spotted sawyer and western conifer seed bug are most frequently accused of being ALB.

Hardwood Anthracnose:

Anthracnose diseases of hardwood trees may be caused by several different genera of fungi; for purposes of mapping, any severe discoloration and defoliation of hardwoods is considered to be anthracnose. These diseases are favored by cool wet conditions. Damage to trees from anthracnose diseases was sporadic across the state; 3,244 acres were affected by anthracnose.

Orange-striped Oakworm:

The orange-striped oakworm, *anisota senatoria*, is a native moth that ranges from eastern canada southward to georgia. It is a common pest of oak species in Connecticut. However, in 2013, no damage due to orange-striped oakworm was recorded.

Red Pine Scale:

Red pine scale, *Matsucoccus gallicolus*, was described in CT in the 1940's, and causes sporadic damage. A total of 29 acres statewide were affected by red pine scale.

Locust Leaf Miner:

The locust leafminer (Odontota dorsalis) is primarily a pest of black locust. Adults skeletonize and eat holes in the leaves; whereas, larvae mine the tissue between the upper and lower-leaf surface (mining damage is the most destructive). Under outbreak conditions, whole hillsides turn gray or brown, often suggesting fall color change. Outbreaks of the locust leafminer are generally more spectacular than destructive. In 2013, 1,057 acres were affected by locust leafminer.

Ash Rust:

Near coastal areas, *Puccinia sparganioides* infects several ash (*Fraxinus*) species including: white, green, and occasionally, black ash. The alternate hosts are several species of cordgrass (*Spartina* species) and a marsh grass (*Distichlis spicata*). Generally, ash rust disfigures and defoliates trees but it does not seriously threaten their health. Nevertheless, near wetlands where cordgrass and marsh grass grow, repeated ash rust infections may weaken ash trees, making them more susceptible to winter damage and branch dieback due to opportunistic diseases. In New Haven County, about 90 acres were affected by ash rust.

Snow/Ice and Fire Damage:

During Hurricane Irene and the severe winter of 2010-2011, many trees were damaged by wind, snow, and ice. These trees are still showing the effects of branch breakage, loss of crowns, and general wind damage. Many trees were damaged or destroyed during SuperStorm Sandy, which struck the state in October 2012. Conifers were especially impacted by wind damage during Sandy. There were almost 1,000 acres with detectable wind damage, 10,500 acres damaged by hail, and about 15 acres damaged by wildfires statewide.

Thousand Cankers Disease:

Due to limited numbers of walnut in CT, there is no monitoring program for Thousand Cankers Disease, even though this disease is the subject of a number of newly-enacted quarantine regulations for many states.

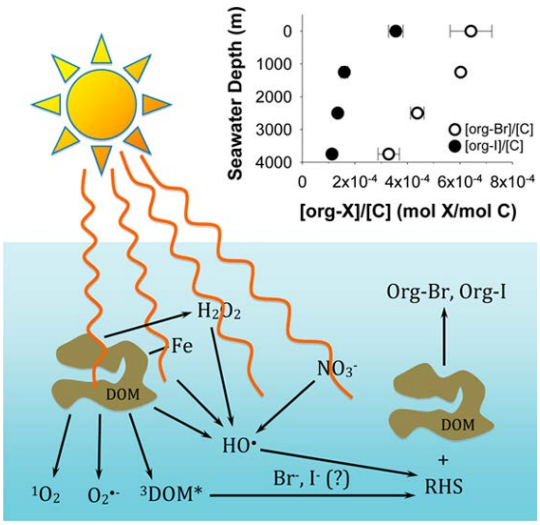
DEPARTMENT OF ENVIRONMENTAL SCIENCES

A. Photochemical Processes in the Environment.

1. Sunlight-Driven Photochemical Bromination and Iodination of Dissolved Organic Matter in Seawater: A Natural Abiotic Source of Organobromine and Organoiodine, (Méndez-Díaz, et al., *Environmental Science and Technology*, 2014, *48* (13), 7418–7427).

More than 3,600 natural organohalogen compounds have been identified, most of which are produced in marine environments. The vast majority of these are thought to originate from biological processes. Abiotic processes are presently reported to account for only a small number of volatile organoiodine and organochlorine compounds, including the important atmospheric ozone-depleting gases CH_3I, CH_2I_2, CH_2ICl, and CH_3Cl. However, a much wider variety of organohalogens may arise from the non-specific halogenation of dissolved organic matter (DOM) by photochemically generated reactive halogen species (RHS) at the ocean surface. Radical and non-radical RHS (e.g., $X^{\bullet}$, $X_2^{\bullet-}$, $XY^{\bullet-}$, X_2, XY, and HOX; where X = Br or I, and Y = Cl) can be produced in sunlit surface water from the oxidation of halides by hydroxyl radical, and potentially also by photoexcited DOM or chlorophyll. Radical RHS may react with organic compounds by one-electron oxidation, H-abstraction, and addition to unsaturated C-C bonds and certain types of aromatic rings, while non-radical RHS (e.g., X_2, HOX) are widely known to halogenate a variety of organic functional groups. While photo-initiated halogenation of specific organic probe compounds during sunlight illumination of natural and simulated seawater has been reported, non-specific halogenation of DOM has not been reported, due in part to difficulties in quantifying the bulk organohalogen (org-X) content of DOM in seawater against the interference posed by a high background of inorganic halide. A method capable of quantifying total org-X levels in seawater would enable confirmation of a role for RHS in DOM processing, and would be useful for evaluating the relative importance of biological and abiotic production of natural organohalogens.

In this work, sequential solid phase extraction (SPE) and silver-form cation exchange filtration were used to desalt and pre-concentrate seawater DOM prior to non-specific organohalogen analysis by ICP-MS. Using this approach, native organobromine and organoiodine contents were found to range from 3.2-6.4 $\times$ 10^{-4} mol Br/mol C and 1.1-3.8 $\times$ 10^{-4} mol I/mol C (or 19-160 nmol Br L^{-1} and 6-36 nmol I L^{-1}) within a wide variety of natural seawater samples, compared with 0.5-1.2 $\times$ 10^{-4} mol Br/mol C and 0.6-1.1 $\times$ 10^{-4} mol I/mol C in terrestrial natural organic matter (NOM) isolates. Together with a chemical probe method specific for RHS, the SPE/ICP-MS approach was also employed to demonstrate formation of nanomolar levels of organobromine and organoiodine during simulated and natural solar irradiation of DOM in artificial and natural seawaters. In a typical experiment, the organobromine content of 2.5 mg C L^{-1} of Suwannee River NOM in artificial seawater increased by 69% (from 5.9 $\times$ 10^{-5} to 1.0 $\times$ 10^{-4} mol Br/mol C) during exposure to 24 h of simulated sunlight. Increasing I^- concentrations (up to 2.0 $\times$ 10^{-7} mol L^{-1}) promoted increases of up to 460% in organoiodine content (from 8.5 $\times$ 10^{-6} to 4.8 $\times$ 10^{-5} mol I/mol C) at the expense of organobromine formation under the same conditions. The results suggest that sunlight-driven reactions of RHS with DOM may play a significant role in marine bromine and iodine cycling.



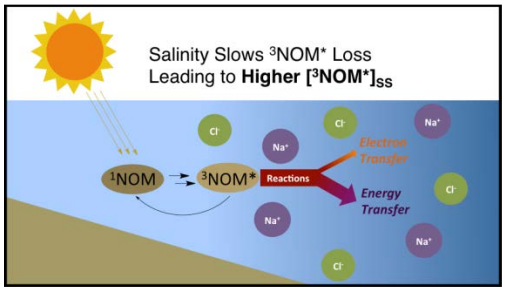
Depiction of sunlight photochemical reactions leading to halogenation of dissolved natural organic matter. Graph shows organo-Br and organo-I content (normalized to organic carbon content) of seawater with depth at Ocean Station Papa (located on the southeast edge of the Alaska Gyre in the northeastern Pacific Ocean) collected in October, 2012.

2. Influence of salinity on triplet-state natural organic matter loss by energy transfer and electron transfer pathways (Parker, et al., *Environ. Sci. Technol*. 2013, 47: 10987−10994).

Estuaries receive contaminant inputs from aquaculture operations and streams entering these estuaries. The fate of contaminants in estuarine environments is important because these environments serve as nurseries for marine life. Natural organic matter (NOM) is an important photosensitizer in the indirect photo-degradation of dissolved organic pollutants. When exposed to sunlight, a ground state NOM chromophore (^{1}NOM) can be promoted to a singlet excited state (^{1}NOM*), which can return to the ground state or transition to a triplet state (^{3}NOM*) by a spin-forbidden, relatively slow intersystem crossing. The much long lifetime of ^{3}NOM* compared to ^{1}NOM* enables it to play an important role in photochemical reactions. Target contaminants may be degraded either by direct interaction with ^{3}NOM* or through interactions with other reactive oxygen species resulting from photosensitization by NOM, such as hydroxyl radicals and singlet oxygen. NOM-photosensitized reactions leading to the degradation of organic contaminants have been well-characterized in freshwater environments, but are poorly characterized in marine and estuarine environments. While some studies have identified differences in photochemical reactions in estuarine and marine waters compared to freshwaters, the factors responsible for these differences could not be isolated because these studies used natural water samples.

The purpose of this study is to isolate the effects of seawater levels of IS and specific anions on the formation, loss and steady-state concentrations of ^{3}NOM* using a newly developed sorbate probe method. The formation rates, pseudo-first order loss rate constants and steady-state concentration of ^{3}NOM* were monitored using the sorbate probe method in synthetic matrices with increasing ionic strength (IS) to seawater values using seawater halides or other salts. The steady-state concentration of ^{3}NOM* approximately doubled at seawater IS, regardless of the salt used, due to a decrease in the ^{3}NOM* decay rate constant. The electron transfer-mediated degradation of 2,4,6-trimethylphenol (TMP) by ^{3}NOM* was significantly slowed at higher IS. A model is proposed wherein high IS slows intra-organic matter electron transfer pathways, an important ^{3}NOM* loss pathway, leading to longer ^{3}NOM* lifetimes. Although IS did not appear to impact energy transfer pathways directly, the higher ^{3}NOM*

steady-state concentrations promotes energy transfer interactions. The observed decrease in decay rate constant and increase in steady-state concentration of ^{3}NOM* at high IS, as well as the inhibition of electron transfer pathways, should be considered when determining the fate of organic pollutants in estuarine and marine environments.



Salinity slows the decomposition of triplet excited-state natural organic matter, increasing its steady-state concentration.

B. Sorption of Contaminants to Natural Particles

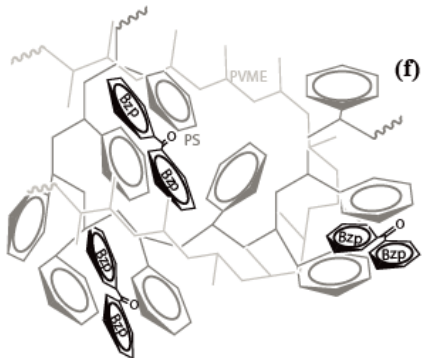
1. Sorption Selectivity in Natural Organic Matter Probed with Carbonyl-^{13}C-Labeled Benzophenone and ^{1}H-^{13}C NMR Spectroscopy, (Cao, et al., *Environmental Science and Technology*, ASAP, DOI: 10.1021/es501129f).

The exact manner in which nonionic organic compounds sorb to natural organic matter (NOM) remains elusive. A robust model for sorption has to account for the high variability in the organic carbon (OC)-normalized partition coefficient (K_{OC}) among whole soils and NOM isolates, and the selectivity and nonideality frequently encountered in sorption such as nonlinearity, competition, and hysteresis. Three major hypotheses have been proposed to explain sorption selectivity: (1) preference for particular microdomains that may be formed within NOM based on their functional group character—for example, "aromatic/charcoal," "paraffinic," or "carbohydrate" domains; (2) preference based on strong functional group interactions, such as hydrogen bonding (H-bonding) or π–π electron donor–acceptor (π–π EDA) interactions; or (3) preference based on the nature of the thermodynamic physical state of NOM, i.e., the configurations and conformations of the molecules and strands that define pore structure and the flexibility of the matrix.

The present study was initiated to investigate specific domain or functional group interactions of deuterium-exchanged, carbonyl-^{13}C-labeled benzophenone (benzophenone-(^{13}C=O)-d_{10}) and different types of NOM including Beulah-Zap lignite, a type II kerogen (IL-6), Pahokee peat, and Amherst soil humic acid. The use of isotopically enriched contaminants in NMR-based investigations of contaminant-NOM interactions enables studies at relatively low sorbate concentrations. Full deuteration of benzophenone eliminates intramolecular ^{1}H-^{13}C correlation and permits correlation of the benzophenone carbonyl ^{13}C exclusively with nearby protons in NOM, which can potentially reveal specific interactions. The molecular environment of the sorbate molecule therefore can be detected, directly and unequivocally, through ^{1}H-^{13}C two-dimensional heteronuclear correlation (2D HETCOR) NMR experiments.

The sorbents included the ones mentioned above plus a polystyrene-poly(vinylmethyl ether) (PS-PVME) blend. PS-PVME consists of PS and PVME chains that are mixed at the 5-nm scale or less. The NOM sorbents all consist predominantly of a mixed aromatic–alkyl or aromatic–O-alkyl matrix that is homogeneous on the 3-nm scale, as evidenced by fast equilibration of aromatic and alkyl ^{1}H magnetization. In addition, Beulah lignite and IL-6 kerogen exhibit small fractions of distinct

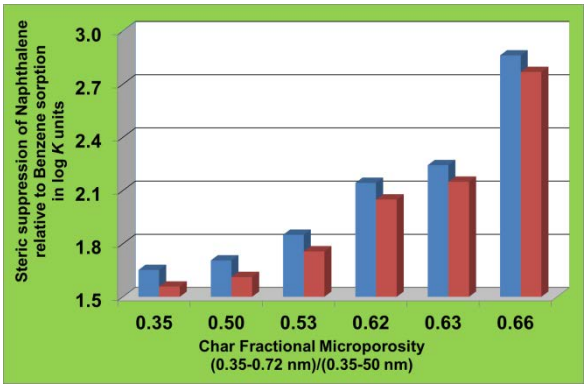
polymethylene $(CH_2)_n$ domains, and Pahokee peat contains significant fractions of polar and nonpolar alkyl domains. Benzophenone-(^{13}C=O)d_{10} shows proximity to both aromatic rings and alkyl segments in all samples, but preferentially interacts with aromatic rings in PS-PVME and Beulah lignite, possibly due to π-π electron donor–acceptor interactions. The data for IL-6 kerogen are also compatible with preferential location of benzophenone near the alkyl-substituted edges of aromatic rings, while in Pahokee peat, clear signatures of benzophenone affinity to both aromatic-rich and nonpolar alkyl domains have been detected. Amherst humic acid shows evidence of some affinity to polar alkyl segments, but which is weaker than that to aromatic rings. Our results indicate that specific interactions of the sorbate and the presence of domains in the sorbent influence the magnitude and selectivity of sorption.



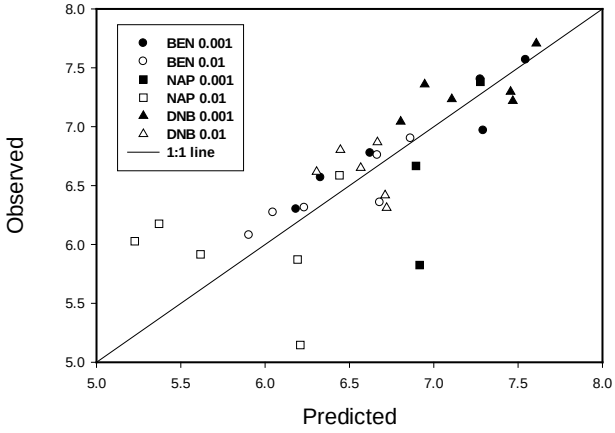
Depiction of the arrangement of benzophenone molecules "stacking" with benzene rings of the polystyrene-polyvinyl methyl ether blend, possibly by forming a π-π electron donor–acceptor interaction.

2. Influence of Molecular Structure and Adsorbent Properties on Sorption of Organic Compounds to a Temperature Series of Wood Chars, (Lattao, et al., *Environ. Sci. Technol.,* 2014, 48(9): 4790-4798).

Chars from wildfires and soil amendments (biochars) are strong adsorbents that can impact the fate of organic compounds in soil, yet the effects of both organic compound structure and adsorbent properties on sorption are poorly understood. We studied the sorption of benzene, naphthalene, and 1,4-dinitrobenzene from water to a series of wood chars made anaerobically at different heat treatment temperatures (HTT) from 300 ^oC to 700 ^oC, and to graphite used here as a nonporous, unfunctionalized reference adsorbent. Peak suppression in the NMR spectrum by sorption of the paramagnetic relaxation probe TEMPO indicated that only a small fraction of char C atoms lie near sorption sites. Sorption intensity for all solutes maximized with the 500 ^oC char, but failed to trend regularly with N_2 or CO_2 surface area, micropore volume, mesopore volume, H/C ratio, O/C ratio, aromatic fused ring size, or HTT. A model relating sorption intensity to a weighted sum of microporosity and mesoporosity was more successful. Sorption isotherm linearity declined progressively with carbonization of the char. Application of a thermodynamic model incorporating solvent-water and char-graphite partition coefficients permitted for the first time quantification of steric (size exclusion in pores) and π-π electron donor-acceptor (EDA) free energy contributions, relative to benzene. Steric hindrance for naphthalene increases exponentially from 9 to 16 kJ/mole (~1.6 - 2.9 log units of sorption coefficient) with the fraction of porosity in small micropores. π-π EDA interactions of dinitrobenzene contributes –17 to –19 kJ/mole (3 – 3.4 log units of sorption coefficient) to sorption on graphite, but less on chars. π-π EDA interaction of naphthalene on graphite is small (–2 to 2 kJ/mole). The results show that sorption is a complex function of char properties and solute molecular structure, and not very predictable on the basis of readily-determined char properties.



Steric hindrance effect of naphthalene sorption relative to benzene sorption as a function of the fraction of porosity in micropores relative to total porosity in micropores plus mesopores of the char.



Predictive ability of a model that assumes a weighted distribution of sorption coefficients (carbon-normalized) between micropores and mesopores of chars: $K_{\text{ch-C,r}} = a \cdot \text{microporosity} + b \cdot \text{mesoporosity}$. Scales are in log units. BEN, benzene; NAP, naphthalene; and DNB, 1,4-dinitrobenzene. Two concentrations: 0.01 and 0.001 times water solubility.

3. Effect of Adsorption Nonlinearity on the pH−Adsorption Profile of Ionizable Organic Compounds, Feng Xiao and Joseph J. Pignatello,* *Langmuir* 30: 1994−2001 (2014).

Ionizable organic compounds (IOCs)—compounds whose charge depends on pH—are used in many industrial, commercial and agricultural products and processes. Adsorption to mineral and carbonaceous surfaces plays a central role in their environmental fate and hazardous effects; in technologies involved in their removal from contaminated water, soil and sediment; and in technological applications such as chromatography, catalysis, and materials science. Adsorption of IOCs is controlled in part by the solution pH, which governs the charge and charge density on the adsorbent surface and the speciation of the IOC in solution. Adsorbed ions and neutral molecules interact with surfaces by different forces and may alter the surface or bulk properties of the solid phase in fundamentally different ways. The mobility and hazardous effects of IOCs depend strongly on their species distribution in solution and extent of adsorption. For these reasons, a comprehensive understanding of the effects of solution pH on the adsorption behavior of IOCs is essential.

A linear speciation model (LSM) that assumes concentration-independent adsorption of charged and neutral species is often employed to model the pH–adsorption profile ("adsorption edge"). Deviations from that model—including shift of the adsorption edge from its expected inflection point at pH = pK_a and the appearance of an adsorption maximum ("hump") near the pK_a—are sometimes used to infer mechanism. We investigated adsorption of six organic acids and bases on the non-functionalized, extremely low variable-charge surface of graphite. Isotherms at constant pH of both charged and neutral species were usually highly nonlinear, and the adsorption edges typically showed a shift, hump or both. We postulate that this behavior is due to the gradual extinction of the dissolved neutral or charged species as the pH approaches and then crosses the pK_a. This leads to an increase in the affinity of that species for the solid due to the inherent nonlinearity of its isotherm. Extinction of the more strongly-adsorbing species mainly causes the shift, while extinction of the less strongly-adsorbing species gives rise to the hump. A nonlinear speciation model (NSM) based on Freundlich or Langmuir equations was employed to fit the adsorption edge. The NSM captured both the shift and the hump and was superior to the LSM. Increasing adsorption nonlinearity of the neutral species shifts the adsorption edge in the acidic direction (organic bases) or alkaline direction (organic acids); whereas increasing nonlinearity of the charged species increases the hump size. Both shift and hump size increase with the difference in adsorption affinity between neutral and charged species. The results show that concentration-dependence alone can strongly affect the shape of pH–adsorption curve, and should be taken into account in future modeling.

The NLM for observed adsorption distribution coefficient (K_d) is given by,

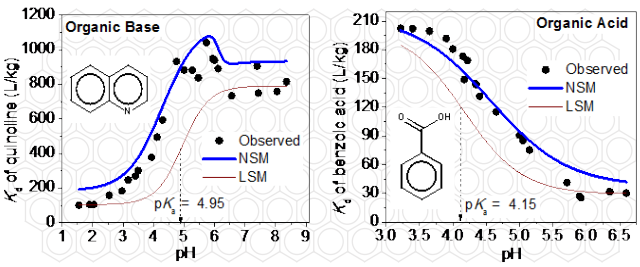
$$K_d = K_F^{ion} \cdot \left(C_w\right)^{n^{ion}-1} \cdot \left(f^{ion}\right)^{n^{ion}} + K_F^{neut} \cdot \left(C_w\right)^{n^{neut}-1} \cdot \left(f^{neut}\right)^{n^{neut}}$$

where K_F^{ion} and K_F^{neut} are adsorption coefficients of the charged (+ or –) or neutral form; n^{ion} and n^{neut} and are exponential parameters between 0 and 1 for the charged and neutral species; and f^{ion} and f^{neut} are the fractions of the charged or neutral form in solution given by,

$$f^{ion} = \begin{cases} \dfrac{1}{1+10^{(pH-pK_a)}} & \text{(cation)} \\ \dfrac{1}{1+10^{-(pH-pK_a)}} & \text{(anion)} \end{cases}$$

$$f^{neut} = 1 - f^{ion}$$

where pK_a is the negative log of the acidity constant. The equation becomes LSM when both n^{ion} and n^{neut} are equal to 1.



Comparison of linear and nonlinear speciation models (LSM and NSM, respectively) for fitting adsorption data as a function of pH.

C. Contaminant Degradation

1. Comparison of Halide Impacts on the Efficiency of Contaminant Degradation by Sulfate and Hydroxyl Radical-Based Advanced Oxidation Processes (AOPs), Yi Yang, Joseph J. Pignatello, Jun Ma,* William A. Mitch,* *Environ. Sci. Technol.*, 48(4), 2344–2351 (2014).

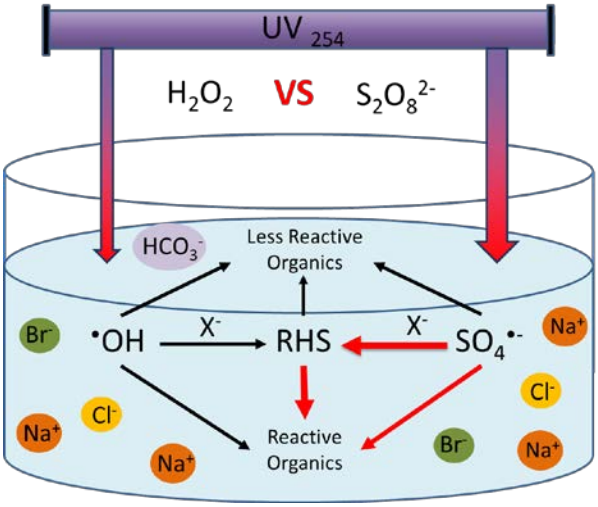
There is an increasing need for techniques to remove organic contaminants from brackish industrial and municipal wastewaters. The US Bureau of Reclamation's *Desalination and Water Purification Technology Roadmap* identified several non-potable beneficial reuse options for brackish wastewaters (e.g., brackish water aquaculture), but indicated that the development of technologies for organic contaminant destruction in these waters is needed to meet future water demands.

Hydroxyl radical-based Advanced Oxidation Processes (AOPs), for example, the ultraviolet photolysis of hydrogen peroxide (UV/H_2O_2), have been widely used for broad-spectrum removal of organic contaminants from freshwaters, because hydroxyl radicals ($^{\bullet}OH$) react with many organic chemicals at near diffusion-controlled rates. Sulfate radical-based AOPs, for example, the ultraviolet photolysis of peroxodisulfate ($UV/S_2O_8^{2-}$), have recently received attention for freshwaters, because the sulfate radical ($SO_4^{\bullet-}$) also reacts with a wide range of organic contaminants with near diffusion-limited rate constants. Sulfate radical-based AOPs have been shown to effectively remove aromatic components in produced waters. In general, $SO_4^{\bullet-}$ is more prone to one-electron oxidation reactions than $^{\bullet}OH$, expanding the range of contaminant transformation pathways; for example, $SO_4^{\bullet-}$ promotes the decarboxylation of carboxylic acids.

However, little research has addressed the application of these AOPs to brackish waters. Although both the UV/H_2O_2 and $UV/S_2O_8^{2-}$ AOPs have been applied to produced waters from oil sands petroleum extraction operations, the impacts of salts have not been systematically evaluated. Halide ions, especially Br^-, are known to be the most important $^{\bullet}OH$ scavengers in seawater. Although one might anticipate that significant scavenging of $^{\bullet}OH$ by Br^- would render AOP treatment inefficient, this scavenging forms radical (especially $Br^{\bullet}$, $Br_2^{\bullet-}$, $ClBr^{\bullet-}$) and non-radical (HOX, X_2, and X_3^-) Reactive Halogen Species (RHS) that are also capable of oxidizing organics.

The effect of halides on organic contaminant destruction efficiency was compared for UV/H_2O_2 and $UV/S_2O_8^{2-}$ AOP treatments of saline waters; benzoic acid, 3-cyclohexene-1-carboxylic acid, and cyclohexanecarboxylic acid were used as models for aromatic, alkene, and alkane constituents of naphthenic acids in oil-field waters. In model freshwater, contaminant degradation was higher by $UV/S_2O_8^{2-}$ because of the higher quantum efficiency for $S_2O_8^{2-}$ than H_2O_2 photolysis. The conversion of $^{\bullet}OH$ and $SO_4^{\bullet-}$ radicals to less reactive halogen radicals in the presence of seawater halides reduced the degradation efficiency of benzoic acid and cyclohexanecarboxylic acid. The $UV/S_2O_8^{2-}$ AOP was more affected by Cl^- than the UV/H_2O_2 AOP because oxidation of Cl^- is more favorable by $SO_4^{\bullet-}$ than $^{\bullet}OH$ at pH 7. Degradation of 3-cyclohexene-1-carboxylic acid, was not affected by halides, likely because of the high reactivity of halogen radicals with alkenes. Despite its relatively low concentration in saline waters compared to Cl^-, Br^- was particularly important. Br^- promoted halogen radical formation for both AOPs resulting in $ClBr^{\bullet-}$, $Br_2^{\bullet-}$, and $CO_3^{\bullet-}$ concentrations orders of magnitude higher than $^{\bullet}OH$ and $SO_4^{\bullet-}$ concentrations and reducing differences in halide impacts between the two AOPs. Kinetic modeling of the UV/H_2O_2 AOP indicated a synergism between Br^- and Cl^-, with Br^- scavenging of $^{\bullet}OH$ leading to $BrOH^{\bullet-}$, and further reactions of Cl^- with this and other brominated radicals promoting halogen radical concentrations. In contaminant mixtures, the conversion of $^{\bullet}OH$ and $SO_4^{\bullet-}$ radicals to more selective $CO_3^{\bullet-}$ and halogen radicals favored attack on highly reactive reaction centers represented by the alkene

group of 3-cyclohexene-1-carboxylic acid and the aromatic group of the model compound, 2,4-dihydroxybenzoic acid, at the expense of less reactive reaction centers such as aromatic rings and alkane groups represented in benzoic acid and cyclohexanecarboxylic acid. This effect was more pronounced for the UV/$S_2O_8^{2-}$ AOP.



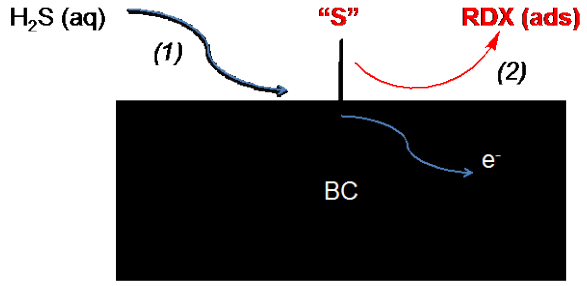
Schematic showing how reactive halogen species can form during UV photolysis of contaminated waters in the presence of hydrogen peroxide or peroxydisulfate bulk oxidants.

2. The role of black carbon conductivity in mediating hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) degradation on carbon surfaces by nucleophilic substitution in the presence of sulfides, W. Xu, J. J. Pignatello, and W.A. Mitch,* *Environ. Sci. Technol.*, *47* (13), 7129–7136 (2013).

As most rivers eventually discharge to estuaries, estuaries receive the cumulative loadings of a wide range of contaminants emitted to freshwaters. Hydrophobic contaminants tend to sorb strongly to marine sediments, where black carbon (i.e., soots and charcoals) and hydrogen sulfides coexist. Research over the past two decades has highlighted the important role of black carbons as inert geosorbents in sequestering organic contaminants. In fact, activated carbon, an produced form of black carbon, has been applied to marine sediments to reduce the bioavailability of organic contaminants to benthic organisms. There has been increasing interest in the reactivity of black carbon in mediating the transformation of certain sorbed contaminants in the presence of hydrogen sulfides (i.e., H_2S, HS^-, S^{2-}). Sulfides naturally occur at millimolar concentrations in estuarine pore waters due to biological sulfate reduction. They can act as both nucleophiles and reductants.

Recent research has demonstrated that black carbons catalyze the transformation of nitrated explosive compounds sorbed to the carbon surfaces in the presence of H_2S and HS^-. Although surface oxygenated functional groups, particularly quinones, and electrical conductivity have both been hypothesized as promoting these reactions, the importance of these properties has not been tested. In this work, the importance of electrical conductivity was addressed by producing chars of increasing electrical conductivity via pyrolysis of wood shavings at increasing temperature. The reactivity of chars with respect to transformation of the explosive hexahydro-1,3,5-trinitro-1,3,5-triazine ("RDX") in the presence of sulfides correlated with electrical conductivity. Oxygenated functional groups were apparently not involved, as demonstrated by the elimination of reactivity of an activated carbon after ozone treatment or sorption of model quinones to the activated carbon surface. Although RDX transformation correlated with char electrical conductivity, no RDX transformation was observed when RDX was physically separated

from sulfides but electrically connected through an electrochemical cell. RDX transformation occurred in the presence of a surface-associated sulfur species. The correlation with char electrical conductivity suggests that sulfides are oxidized on carbon surfaces to products that serve as potent nucleophiles promoting RDX transformation.



(1) Formation of surface sulfur species.
(2) Nucleophilic attack on RDX.

II. *Mosquito Trapping and Testing Program* (*Phillip Armstrong, Theodore G. Andreadis, Goudarz Molaei, Michael Thomas, John Shepard)*

Mosquito surveillance for West Nile (WN) virus and Eastern Equine Encephalitis (EEE) is integral to the public health response to these mosquito-transmitted viruses in Connecticut. The objectives of the surveillance program are to provide: 1) early evidence of local virus activity; 2) information on the abundance, distribution, identity and infection rates of potential mosquito vectors and; 3) information that is used to assess the threat of WN virus and EEE to the public and guide the implementation of mosquito control measures. The CAES is responsible for conducting all mosquito trapping and testing activities. The program is conducted by Dr. Theodore Andreadis, Dr. Philip Armstrong, John Shepard, Michael Thomas, Angela Bransfield and Michael Misencik. Mosquito trapping is conducted at 91 permanent trapping stations that are located in 72 municipalities throughout the state.

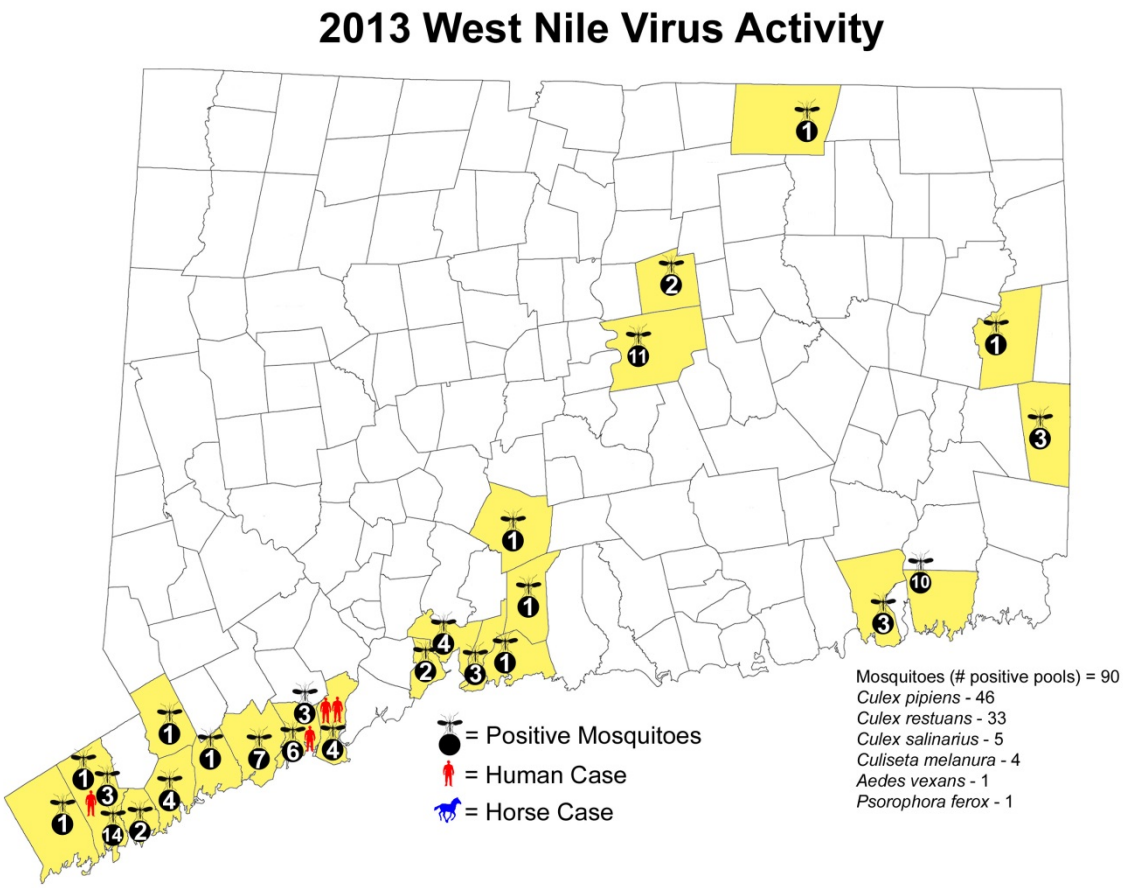
In 2013, statewide mosquito trapping was conducted from June 3 through October 30. Approximately one-third of the sites were located in densely populated residential locales along an urban/suburban corridor in the coastal southwestern corner of the state extending up through the Connecticut River Valley. Trap sites typically included parks, greenways, golf courses, undeveloped wood lots, sewage treatment plants, dumping stations, and temporary wetlands associated with waterways. Trapping locations in the other regions of the state were established in more sparsely populated rural settings that included permanent fresh-water swamps (red maple/white cedar) and bogs, coastal salt marshes, horse stables, and swamp-forest border environs.

Mosquito trapping was conducted with CO_2 (dry ice)-baited CDC miniature light traps equipped with aluminum domes, and gravid mosquito traps baited with a lactalbumin-yeast-hay infusion. Traps were placed in the field in the afternoon, operated overnight, and retrieved the following morning. Trapping frequency was minimally made once every ten days at each trap site over the course of the entire season. Adult mosquitoes were transported alive to the laboratory each morning in an ice chest lined with cool packs. Mosquitoes were immobilized with dry ice and transferred to chill tables where they were identified to species with the aid of a stereo microscope (90X) based on morphological characters.

Female mosquitoes were pooled in groups of 50 or fewer by species, collection date, trap type, and collection site and stored at -80^{o}C until processed for virus.

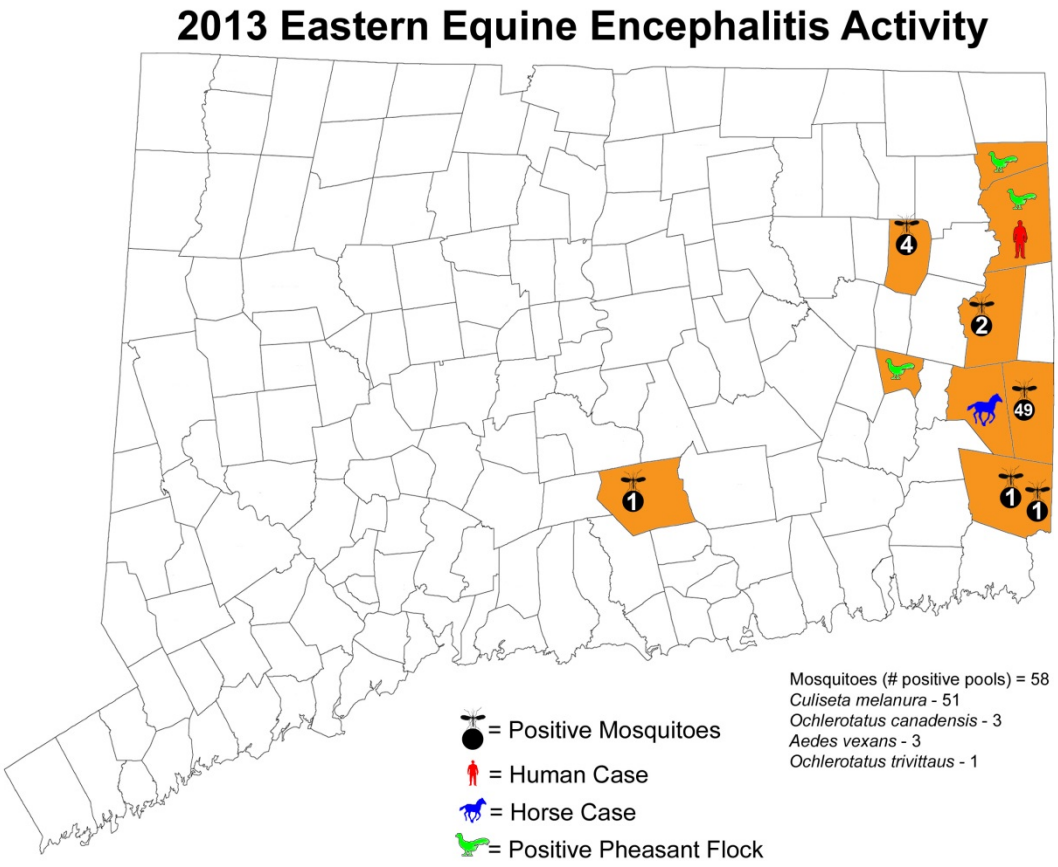
Aliquots of each mosquito pool were inoculated into Vero cell cultures for detection of West Nile virus (WN), eastern equine encephalitis (EEE), and other mosquito-borne arboviruses of public health importance. Virus isolates from mosquito pools were tested for WN, EEE, Flanders (FL), Jamestown Canyon (JC), Cache Valley (CV), Trivittatus (TVT), Highlands J (HJ), LaCrosse (LAC), St. Louis Encephalitis (SLE), and Potosi (POTV) viruses. Isolated viruses were identified by Real Time (TaqMan) reverse transcriptase polymerase chain reaction (RT-PCR) or standard RT-PCR using virus-specific primers. All of the virus isolation work was conducted in a certified Bio-Safety Level 3 laboratory at the CAES.

In 2013, a total of 192,172 mosquitoes (13,601 pools) representing 41 species were trapped and tested. A total of 90 isolations of WN virus were made from 6 mosquito species: *Culex pipiens* = 46, *Cx. restuans* = 33, *Cx. salinarius* = 5, *Culiseta melanura* = 4, *Aedes vexans* = 1, *Psorophora ferox* = 1, collected at 25 sites in 22 towns in 6 counties (Fairfield, Hartford, New Haven, New London, Tolland, and Windham). The first positive mosquitoes were collected on July 2, and the last on October 8. The majority of WN virus activity was detected in densely populated urban and suburban regions in southern Fairfield and New Haven counties. Four cases of WN were locally acquired (1 = encephalitis/meningitis, 3 = fever) with no fatalities. The age range was 39 to 86 years, and the median age was 57 years. Date of onset ranged from July 29 to September 28. Human cases were temporally and spatially consistent with WN virus isolations from mosquito pools. No horse cases of WN were reported.



A total of 58 isolations of EEE were made from 4 mosquito species: *Culiseta melanura* = 51, *Aedes vexans* = 3, *Ochlerotatus canadensis* = 3, *Oc. trivittatus* = 1, collected at 6 sites in 5 towns in 3 counties (Middlesex, New London, Windham). The first positive mosquitoes were collected on July 10, the earliest date EEE virus has been isolated from mosquitoes CT. The last positive mosquitoes were collected on October 22. There was one horse case of EEE reported in the town of Griswold (New London County) with date of onset on September 8. Additionally there were 3 EEE outbreaks in pheasant flocks located in the towns of Sprague (New London County) and Killingly and Putnam (Windham County).

In the fall of 2013, an adult resident of eastern Connecticut died of EEE virus associated illness. While EEE virus has been previously identified in animals and mosquitoes, this is the first confirmed human case in the state. The patient was hospitalized with encephalitis and tested for WNV infection but the results were negative. The patient died 5 days after admission to the hospital. Postmortem examination of brain tissue revealed extensive necrosis and was sent to the Centers for Disease Control for arbovirus testing. Brain tissue tested positive for EEE virus by immunohistochemical and PCR testing.



Other mosquito-borne viruses isolated included: Highlands J (HJ) = 9 isolates from 1 species (August 27 - October 17); Jamestown Canyon (JC) = 15 isolates from 9 species (June 4 - August 26); Potosi Virus (PTV) = 3 isolates from 2 species (September 12 - October 10); Trivittatus Virus (TVT) = 19 isolates from 2 species (July 9 – September 12)

Mosquito species trapped and tested for arboviruses in Connecticut, 2013

Species	Number Mosquitoes	Number Pools	Virus					
			EEE	HJ	JC	PTV	TVT	WNV
Aedes albopictus	547	137						
Ae. cinereus	9,558	805						
Ae. vexans	27,182	1,342	3			2		1
Anopheles crucians	127	76						
An. punctipennis	2,889	609			2			
An. quadrimaculatus	916	282			1			
An. walkeri	3,585	256						
Coquillettidia perturbans	25,045	1,109			1			

Culex erraticus	43	12						
Cx. pipiens	9,643	1,002						46
Cx. restuans	9,283	1,098						33
Cx. salinarius	12,630	793						5
Cx. territans	148	112						
Culiseta melanura	12,124	865	51	9				4
Cs. minnesotae	5	5						
Cs. morsitans	23	16						
Ochlerotatus abserratus	1,094	87			2			
Oc. atropalpus	1	1						
Oc. aurifer	1,438	116						
Oc. canadensis	22,343	987	3		3			
Oc. cantator	2,032	198			3			
Oc. communis	3	1						
Oc. excrucians	100	39			1			
Oc. grossbecki	5	3						
Oc. hendersoni	1	1						
Oc. japonicus	1,192	456						
Oc. provocans	76	7			1			
Oc. sollicitans	255	60						
Oc. sticticus	5,314	273			1		1	
Oc. stimulans	164	34						
Oc. taeniorhynchus	4,329	199						
Oc. thibaulti	4,995	217						
Oc. triseriatus	1,529	430						
Oc. trivittatus	15,460	770	1			1	9	
Orthopodomyia signifera	8	8						
Psorophora ciliata	15	7						
Ps. columbiae	26	12						
Ps. ferox	15,488	733						1
Ps .howardii	2	2						
Tx. r. septentrionalis	1	1						
Uranotaenia sapphirina	2,553	440						
TOTAL	**192,172**	**13,601**	**58**	**9**	**15**	**3**	**10**	**90**

EEE = Eastern Equine Encephalitis, **HJ** = Highlands J, **JC** = Jamestown Canyon, **PTV** = Potosi Virus, **TVT** = Trivittaus Virus, **WNV** = West Nile

Impact. Participation in the statewide surveillance program provides timely information about levels of virus activity in the mosquito population which is used to monitor virus amplification within enzootic transmission cycles, and assess risk of human infection. This information is used inform the public and health care providers of these risks, guide vector control efforts, and prevent disease outbreaks. In

addition, this large-scale sampling effort also informs out understanding of the ecology of mosquitoes and mosquito-borne viruses. Additional studies on the role of different mosquito species to serve as vectors of viral pathogens may be used to target anti-vector interventions more effectively.

III. *Epidemiology and Population Genetics of Mosquitoes* (*Goudarz Molaei, Theodore G. Andreadis, Phillip Armstrong, Michael Thomas, John Shepard)*

A New Insect-Specific Flavivirus Infecting *Culiseta melanura* Mosquitoes

The genus *Flavivirius* includes a number of newly-recognized viruses that infect and replicate only within mosquitoes. To determine whether insect-specific flaviviruses may infect *Culiseta melanura* mosquitoes, Dr. Philip Armstrong and Michael Misencik screened pools of field-collected mosquitoes for *Flavivirus* infection by RT-PCR targeting conserved regions the nonstructural 5 gene. Nucleotide sequences amplified from *Cs. melanura* pools were genetically similar to other ISF's and most closely matched Calbertado virus from *Culex tarsalis*, sharing 68.7% nucleotide and 76.1% amino acid sequence identity. The virus was detected solely in *Cs. melanura* pools, occurred in sampled populations from Connecticut, New York, New Hampshire, and Maine, and infected both adult and larval stages of the mosquito. Estimated infection rates were relatively stable in overwintering *Cs. melanura* larvae collected monthly from November 2012-May 2013 (MLE=0.7-2.1/100 mosquitoes) and in host-seeking females collected weekly from June-October 2013 (MLE=3.8-11.5/100 mosquitoes). Phylogenetic analysis of viral sequences revealed limited genetic variation that lacked obvious geographic structure among strains in the northeastern U.S. This new virus was successfully isolated in mosquito cell culture and is provisionally named Culiseta virus based on its host association with *Cs. melanura*.

Impact. The *Flavivirus* genus represents a diverse group of viruses that include a number of medically-important human pathogens such as dengue virus, West Nile virus, and yellow fever virus. These viruses may be maintained in transmission cycles between arthropod vectors and vertebrate hosts whereas other flaviviruses appear to be limited to insects, termed insect-specific flaviviruses (ISFs). In this study, we describe a new ISF infecting *Culiseta melanura*, estimated its infection prevalence within field-collected mosquitoes, and described basic components of the transmission cycle. This discovery could have implications for the transmission of related flaviruses such as West Nile virus that share the same mosquito vector. ISFs have been shown to inhibit medically-important flaviviruses from establishing secondary infection in the host cell through “superinfection exclusion”. Future studies will assess the impact of this new virus on suppressing or enhancing infection with West Nile virus in the mosquito vector.

Population Genetics of *Culiseta melanura,* the Main Vector of Eastern Equine Encephalitis Virus in Eastern USA and Canada (*Goudarz Molaei, Theodore G. Andreadis, Michael Thomas, John Shepard)*

Eastern equine encephalitis virus (EEEV) is a highly pathogenic mosquito-borne zoonosis that is lethal in about 40% of human cases and results in neurological impairment in most survivors. In the northeastern U.S., EEEV is maintained in an enzootic cycle involving the ornithophilic mosquito, *Culiseta melanura,* and wild passerine birds in freshwater swamp habitats. In the past, human disease outbreaks occurred intermittently with no apparent pattern. However, since 2003, we have witnessed annual reoccurrence of virus activity with increased human involvement and expansion into new regions. The underlying conditions responsible for this sustained resurgence are unknown. *Although Cs. melanura is considered the principal enzootic vector, the role this species plays in epidemic/epizootic transmission to humans and* equines *is not well defined.* Despite the extraordinary importance of *Cs. melanura* in the EEEV

transmission cycle, little is understood about the population genetic structure of this species across northeastern U.S. and southeastern Canada. Due to potentially low gene flow and local adaptation, populations of *Cs. melanura* may differ in vector-host interactions and vectorial capacity with profound impacts on public health and vector control. We hypothesize that *Cs. melanura* populations involved in transmission of EEEV throughout the range of distribution have substantial, yet undocumented, geographic population structure that may impact vector-host interactions, vectorial capacity, and dynamics of pathogen transmission leading to differing levels of human and equine involvements. We have recently initiated a research project to investigate population genetics of *Cs. melanura*, and our specific scientific and technological objectives are: 1) To examine spatial and temporal variations in population genetic structure of *Cs. melanura*, 2) To evaluate the potential impact of variations in population genetic structure of *Cs. melanura* on the risk of human and equine infection in EEEV foci, and 3) To investigate the occurrence of population structuring and gene flow patterns. This research project will elucidate previously uncharacterized yet fundamental features of the population genetic structure of *Cs. melanura*, and reveal how it might impact vector-host interactions and vectorial capacity of this species. This project will provide a basis to understand the involvement of *Cs. melanura* in epidemic/epizootic transmission of EEEV to humans and equines. A key innovation to this project involves implementing a cutting-edge next generation genotyping method, to examine the origin and structuring of *Cs. melanura* in EEEV foci, and identify the proximal risk factors for human and equine infections. Examination of the population genetics of *Cs. melanura* from various foci will prove helpful in better understanding of the ecology of EEEV transmission, enable mosquito control agencies to more precisely target interventions at the most epidemiologically important populations, and serve as a valuable reference for other similar vector-borne zoonoses.

Epidemiology of Eastern Equine Encephalitis Virus in Virginia (*Goudarz Molaei, Theodore G. Andreadis, Philip Armstrong,* Charles Abadam, Jay Kiser, Karen I. Akaratovic)

During the last decade, episodes of EEEV have reemerged in the eastern U.S. with increased virus activity and human and equine cases. The first documented major outbreak of EEEV in Virginia and neighboring states dates back to 1933. Additional outbreaks occurred in 1934, and since then disease outbreaks have occurred intermittently in VA. Understanding of the vector-host interactions of various mosquito species is critical for determining their respective roles in enzootic and epidemic/epizootic transmission of EEEV in this state and throughout the range of distribution. To gain insights into the epizootiology of EEEV in Virginia, a collaborative research project was initiated with The Division of Mosquito Control, City of Suffolk's Department of public works, VA with the following objectives: 1) Estimate frequency of vector contact with candidate reservoir hosts in virus foci. Blood-fed *Culiseta* mosquitoes have been sampled from EEEV foci in Virginia, and the source of blood meal have been identified using molecular technique, 2) Estimate frequency of vector contact with incidental hosts. Similarly here, candidate epidemic/epizootic vectors, including mosquitoes of genera *Aedes*, *Anopheles*, and *Coquillettidia* have been examined for the source of vertebrate blood meals.

A New Microsporidian Parasite of Mosquitoes

Ochlerotatus japonicus is an invasive rock hole and container-breeding mosquito native to East Asia that was first detected in the northeastern United States in 1998. It has rapidly spread throughout much of eastern

North America where it is now firmly established and is of considerable public health significance. It is an aggressive human biter, is a competent vector of several important arboviruses including eastern equine encephalitis and has been incriminated in transmission of West Nile virus. Dr. Theodore Andreadis, Dr. Charles Vossbrinck and colleagues from Japan described a new genus and species of parasitic Microsporidia, *Takaokaspora nipponicus* based on light microscope and ultrastructural morphology, developmental features, transmission cycles and comparative sequence analyses of the small subunit ribosomal DNA (SSU rDNA). The microsporidium is both vertically and horizontally transmitted, exhibits dimorphic development alternating between diplokaryotic and monokaryotic stages and produces two morphologically distinct spores, one in larvae and another in adult females. Horizontal transmission of infection to larval mosquitoes occurs via direct oral ingestion of uninucleate spores that are produced in vertically-infected larval hosts. Development in horizontally-infected hosts is diplokaryotic following karyokinesis of uninucleate schizonts and binary fission to produce small membrane free, ovoid, binucleate spores that are confined to adult female reproductive tissues (ovariole sheath and oviducts). Vertical transmission of the microsporidium from adult females to larval progeny takes place via surface contamination of the egg (transovum). Microsporidian development in vertically-infected larvae is haplophasic with unpaired nuclei throughout, producing rosette-shaped sporogonial plasmodia contained within a thin non-persistent sporophorous vesicle and culminating in the formation of membrane free, uninucleate, conical spores. Development is confined to host fat body tissue which appears as swollen white masses in the thorax and selected segments of the abdomen causing larvae to appear abnormally distorted, and results in death during the third and fourth instar stages. The SSU rDNA sequences obtained from *Oc. japonicus* were unique when compared with GenBank entries of all other mosquito-parasitic species. Phylogenetic trees constructed by Maximum Parsimony, Maximum Likelihood and bootstrap analyses using the Neighbor Joining search parameter yielded similar typologies. In each case, the novel microsporidium was the sister group to the clade containing *Parathelohania* species from *Anopheles* mosquitoes and the monotypic *Novothelohania ovalae* from *Ochlerotatus caspius* showing approximately 10% to 13% sequence divergence to those two genera providing strong support for establishment as a separate genus.

IV. *Invasive Aquatic Plant Program (Gregory Bugbee)*

We are quantifying the locations of invasive aquatic plants in Connecticut's lakes and ponds, determining their effects on native plant communities, establishing baseline data to track their spread and providing information that is critical for management strategies.

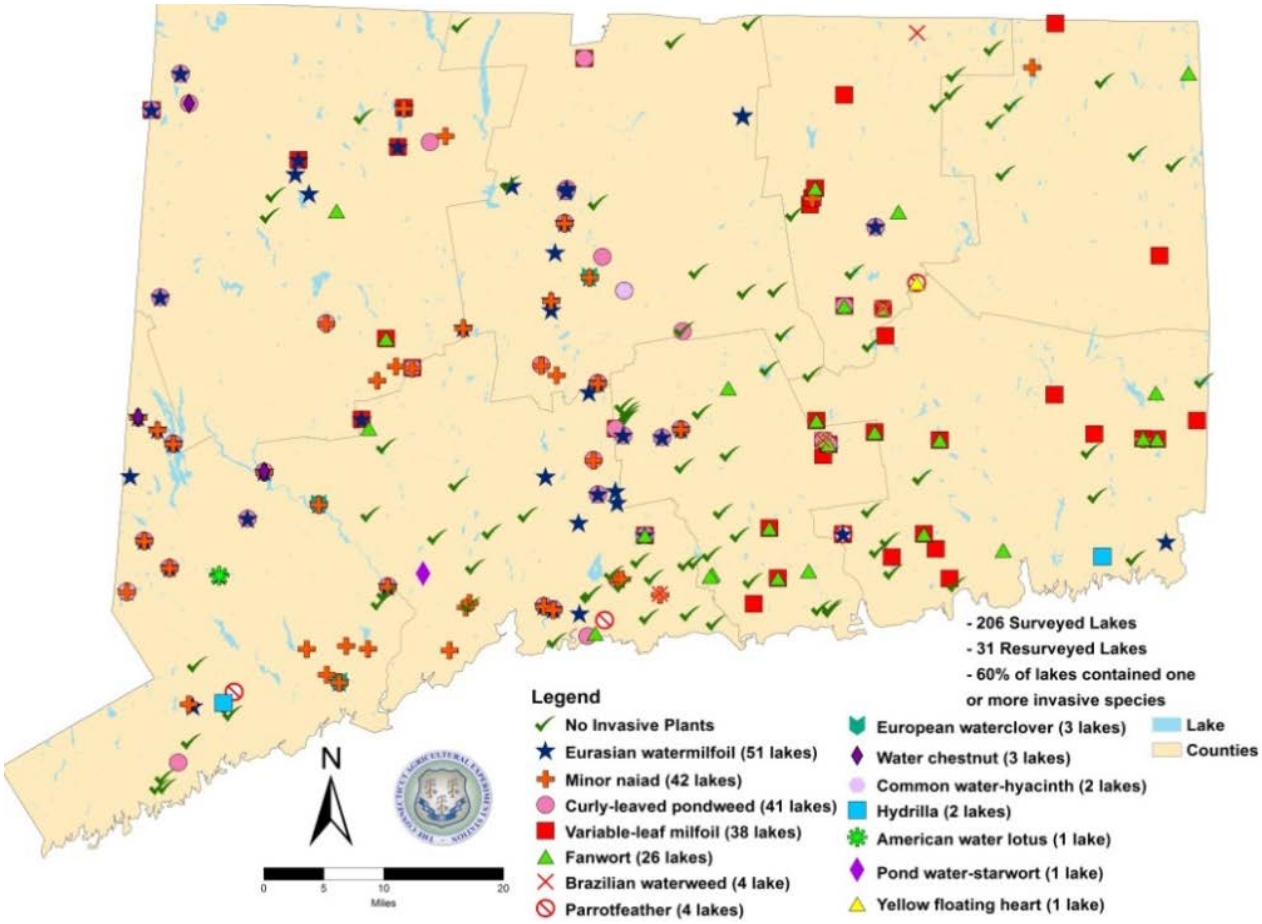


Figure 1. Locations of invasive plants in Connecticut's lakes and ponds as found in CAES IAPP surveys from 2004 - 2013.

Surveillance and Monitoring: Since 2004 the Connecticut Agricultural Experiment Station Invasive Aquatic Plant Program (CAES IAPP) has completed aquatic vegetation surveys of 206 Connecticut lakes and ponds (Figure 1). A total of 33 water bodies have been resurveyed at least five years later to determine how invasive plants are changing the quality of lakes overtime. In 2013, Greg Bugbee and Jordan Gibbons mapped native and invasive aquatic vegetation in five new and 18 previously surveyed water bodies (Figure 1). In addition, Lake Candlewood, Connecticut's largest lake, was surveyed for the sixth consecutive year to determine the effects of alternate year deep and shallow winter drawdown on Eurasian watermilfoil (*Myriophyllum spicatum*), minor naiad (*Najas minor*) and curly leaf pondweed (*Potamogeton crispus*). Lake Lillinonah, Connecticut's third largest lake was surveyed for the third time to track changes in the population of invasive species. We established transects in each water body, using global positioning systems to quantify changes in native and invasive aquatic species abundance and distribution. We collected water samples and analyzed them for pH, temperature, dissolved oxygen, clarity, alkalinity, conductivity and phosphorus. This data, along with watershed information, is being

used to investigate the factors that influence the susceptibility of water bodies to certain invasive species. We archive dry specimens of all plant species in the CAES herbarium for future reference. We designed our Invasive Aquatic Plant Program to utilize the latest digital technology to rapidly and comprehensively report our findings to the public. Lake survey maps and other data are published online within days of their completion (http://www.ct.gov/caes/IAPP).

More than 60 percent of the water bodies contain one or more invasive plant species and some lakes contained as many as four invasive species (Figure 1). The most common invasive plants are Eurasian watermilfoil, variable watermilfoil (*Myriophyllum heterophyllum)*, minor naiad, curly leaf pondweed and fanwort *(Cabomba caroliniana*). Less common invasive plants are water hyacinth (*Eichhornia crassipes*), water shamrock (*Marsilea quadrifolia*), hydrilla (*Hydrilla verticillata*) and water chestnut (*Trapa natans*). Our 2009 survey of Fence Rock Lake, in Guilford, discovered Connecticut's first infestation of Brazilian waterweed (*Egeria densa*) and our resurveys in 2010, 2011, 2012 and 2013 found the population expanding (Figure 3). We have since found Brazilian waterweed in Lower Moodus Reservoir (East Haddam), Staffordville Reservoir (Stafford Springs) and Mono Pond (Coventry). We are working with the local lake associations and the CTDEEP to develop and test novel control strategies.

Table 1. Lakes and ponds surveyed by CAES IAPP in 2013.

Lake Name (*resurvey)	Town	Acres
Amos Lake*	Preston	112
Ashford Lake*	Ashford	52
Beaver Pond	Meriden	31.9
Billings Lake*	North Stonington	100
Candlewood Lake*	Sherman	5400
Crystal Lake*	Ellington	187
Dog Pond*	Goshen	65.8
Fence Rock Lake*	Guilford	17
Grannis Lake*	East Haven	20
Hart Pond	Litchfield	20
Horseshoe Pond	Wilton	6
Lake Hayward*	East Haddam	172
Laurel Lake*	New Hartford	16
Lake Lillinonah*	Newtown	1547
Muddy Pond	Woodstock	38.3
Pattagansett Lake*	East Lyme	128
Private Pond	Clinton	1.25
Private Pond	Guilford	0.5
Route 7 Pond	Wilton	8
Timber Lake*	Torrington	16
Twin Lake North*	Simsbury	120
Tyler Lake*	Goshen	187
Lake Zoar*	Newton	920

Figure 2. Jordan Gibbons (with rake) assessing rapid expansion of Eurasian watermilfoil in Coventry Lake with concerned town official.

Impact. Our surveys provide one of the most complete aquatic plant and water chemistry databases available. This has allowed us to model the risk of invasion for water bodies that currently do not contain specific invasive species. This model can be used by resource managers and policy makers to improve monitoring protocol and early detection and rapid response efforts. When we group lakes by the presence on invasive aquatic plants we found they occurred in two distinct groups: 1) fanwort and variable watermilfoil and 2) curly leaf pondweed, minor naiad, and Eurasian watermilfoil. When we compared the occurrence of each group with water chemistry we detected highly significant differences. The fanwort and variable watermilfoil group preferred lakes with

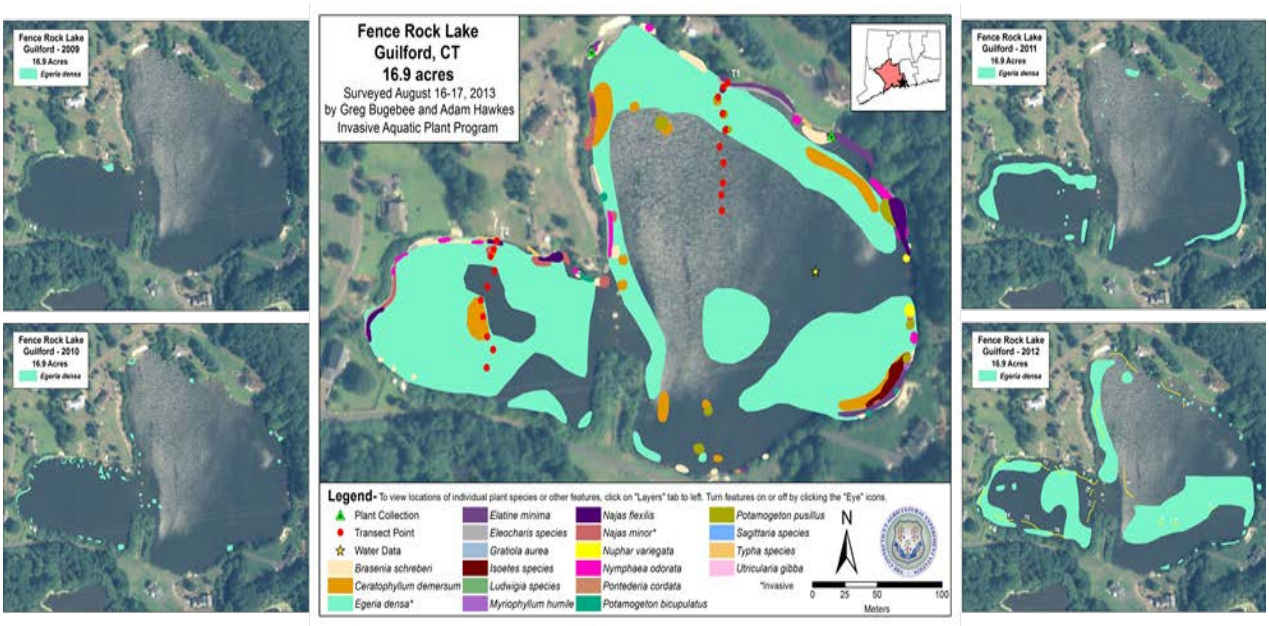


Figure 3. Spread of Brazilian waterweed in Fence Rock Lake: 2009 (top left), 2010 (bottom left), 2011(top right), 2012 (bottom right), 2013 (center). Center map show typical complete survey with

lower conductivity, alkalinity, and pH than the curly leaf pondweed, minor naiad, and Eurasian watermilfoil group. Finally, we developed a mathematical model based on lake water chemistry that could predict which lakes contained the invasive species with nearly 80 percent accuracy. This model was further refined with addition of hydrosoil characteristics such as organic matter content, pH and conductivity to suggest the first filter to invasion is water chemistry followed by the make-up of the hydrosoil.

Control Technology: The goal of this objective is 1) to research novel means of control that minimize herbicide usage and protects native vegetation and 2) investigate non-chemical management options such as winter water level drawdown.

Herbicides: Novel methods of chemical control with herbicides can rapidly remove invasive plants and begin to restore native plant communities to aquatic ecosystems.

Bashan Lake – East Haddam, CT - We are in the 13th year of research involving the use of spot applications of the herbicide 2, 4-D to control variable milfoil in Bashan Lake. We have largely restored the lake to preinfestation conditions; however, regrowth requires yearly surveys and modest retreatments. We have shown the effectiveness of late summer herbicide applications thus limiting the exposure of those who use the lake to the herbicide. We have integrated underwater video equipment with GPS and geographic information system (GIS) technology to precisely locate and treat the patches of variable watermilfoil.

Fence Rock Lake- Guilford, CT - CAES IAPP discovered Brazilian waterweed in Fence Rock Lake in 2009 and has since documented its yearly expansion (Figure 3). Because this plant is the first documented case of large scale invasion of this plant in CT and no information is available on its control,

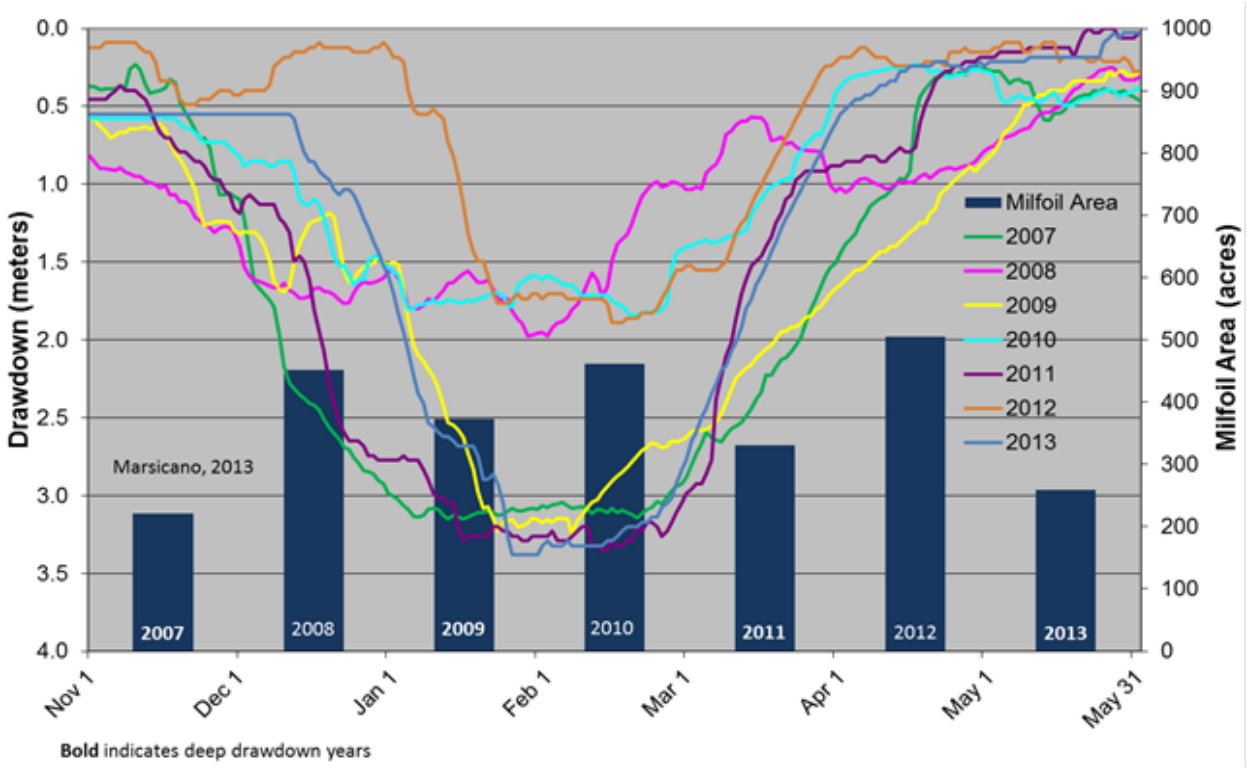


Figure 4. Effects of duration and depth of winter drawdown on coverage of Eurasian watermilfoil in Candlewood Lake 2007 - 2013.

we arranged for testing the herbicide diquat (6,7-dihydrodipyrido (1,2-a:2',1'-c) pyrazinediium dibromide) in the summer of 2014. Our discussions with local residents and government officials yielded necessary permits. The herbicide is scheduled to be applied to the shoreline areas of the lake in July using deep water injection. Pre and post treatment vegetation will be monitored on over 100 georeferenced points to determine efficacy on both the Brazilian waterweed and nontarget desirable native plants.

Winter water level drawdown: *Candlewood Lake - Brookfield, New Fairfield, New Milford, Sherman, CT.* Lake Candlewood's aquatic plant community is dominated by Eurasian watermilfoil. Winter water level drawdown is used to manage the watermilfoil. Using state-of-the-art global positioning systems, we have documented the success of the drawdowns each year since 2007. The winter drawdown protocol consists of alternate year shallow (1m) and deep (3m) water level reductions. Drawdown timing and duration varies depending on the hydrogenerating needs of FirstLight Power Resources. These variables and inconsistencies in winter weather result in differences in milfoil control. The coverage of milfoil shows a negative relationship to drawdown depth and duration (Figure 4). Our yearly report to The Federal Energy Regulatory Commission, FirstLight Power Resources, CT DEEP, Candlewood Lake Authority and other stakeholders provide data that is crucial for making decisions on future drawdown practices for Connecticut's largest lake.

Figure 5. Jordan Gibbons lecturing at CAES IAPP aquatic plant workshop.

Outreach: We strive to disseminate all information from our program to the public in a timely fashion and educate stakeholders

in the identification, prevention and management of invasive aquatic species. We make every effort to engage citizens, lake associations, and other stakeholders. CAES scientists have organized several workshops (Figure 5) on the identification of invasive aquatic plants. We also gave presentations to professional organizations such as the Northeast Aquatic Plant Management Society and the Connecticut Invasive Plant Working Group, numerous lake associations, town meetings and student groups such as the Connecticut Envirothon. We have made all our information freely and readily available via our website (Figure 6). Included are all our digitized interactive lake maps, our complete herbarium and publications (http://www.ct.gov/caes/IAPP). *Impact:* Our invasive aquatic plant control and outreach efforts have resulted in the protection of lakes and provided scientifically proven methods for use by others. Our workshops have trained hundreds of citizens to recognize and report new infestations in order to prevent future problems and the associated control expenditures.

Figure 6. CAES IAPP main web page provides access to survey maps, digitized herbarium, journal articles and reports.

V. *Soil Testing (Gregory Bugbee)*

Testing soil samples for fertility and suggesting methods for growing better plants are a continuing service for citizens of Connecticut. At the laboratory in New Haven, Gregory Bugbee tested 5112 samples and answered approximately 1,600 related inquiries

Impact. The soil testing services and recommendations made by The Connecticut Agricultural Experiment Station reduce unnecessary fertilizer treatments to lawns and nursery stock throughout the state. This provides direct economic and environmental benefit to the suburban community by reducing nitrogen runoff into soil and water.

VI. *Research on Spiders, Viral Diseases of Insects, and Evolutionary Biology (Charles Vossbrinck)*

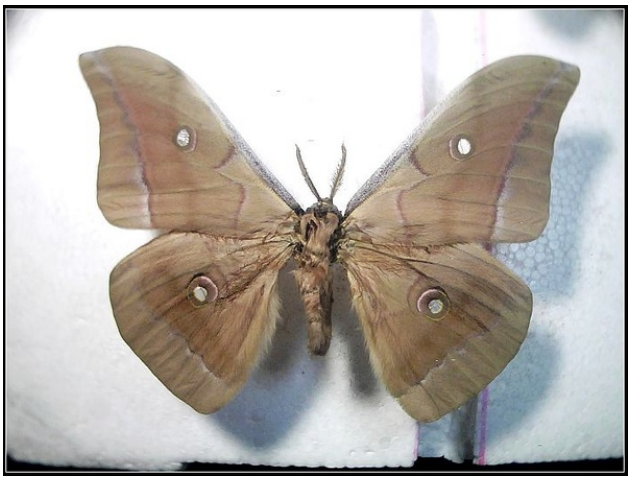
A documented spider bite in Connecticut

Reports of confirmed spider bites are infrequent. Documentation of a spider bite by observation of a

spider biting, collection of the spider and reliable identification of the spider is rare. Most medical training in North America provides little information about the kinds of spiders that may bite or the means of identifying them. Consequently, misidentification of spiders by medical personnel is very common (Vetter, 2009).

In order for a spider to bite a human, the spider must have chelicerae (fangs) strong enough to pierce human skin. For a reaction to occur, the person has to be susceptible to the venom released by the spider. Almost all species of spiders are venomous (secrete a toxin through their chelicerae), but are only defined as poisonous if humans have a reaction to their venom. We reported a case of envenomation in Connecticut, USA, by the broad-faced sac spider *Trachelas tranquillus* in September 2013. The bitten subject, a 50 year old female Caucasian, reported a painful wasp-like sting and brushed the spider from her leg. An erythematous macule formed at the site of the bite. The macule was gone by the next day and there was no associated necrosis. The spider was collected and brought to our laboratory for identification. This is the first reported case of a *T. tranquillus* bite in Connecticut.

Viral genome sequenced to study disease in the Chinese Oak Silkmoth



Along with colleagues in Chongqing, China we have begun a project to understand the co-evolutionary battle that occurs between insects and their attacking viruses. We are using genomic analysis to study how insects fight against infecting viruses and how the viruses change to counter the insect's defense. Baculoviruses are a group of rod-shaped, double-strand DNA viruses that infect a taxonomic range of insects. A particular nucleopolyhedroviruses (AnpeNPVs) causes epizootic outbreaks in populations of the oak silkworm *Antheraea pernyi*.

The Chinese oak silkworm, *Antheraea pernyi*, has long been considered an important economic insect in China. This "free-range" silkworm is a member of the giant silk moths and displays a great diversity of colors in the wild. Since the silk produced by *Antheraea pernyi* is thicker and stronger than conventional silk, it is used for suits, jackets, draperies and other applications. The pupae of *Antheraea pernyi* are also used as an alternate host to breed *Chouioia cunea* (Yang), a parasitoid of the fall webworm, *Hyphantria cunea* (Drury) for biological control purposes (Wang *et al*., 1999; Sun *et al*., 2012). Epizootics caused by the nucleopolyhedrosis virus (AnpeNPV) are the primary threats to the cultivation of the oak silk moth. Using comparative biochemical analysis, we have uncovered a number of biochemical/molecular strategies that the oak silkworm is using to fight infections and disease caused by this virus.

Convergent Evolution in Proteins

There are numerous examples of convergent evolution in nature. Major ecological adaptations such as flight, loss of limbs in vertebrates, pesticide resistance, adaptation to a parasitic way of life etc., have all evolved more than once as seen by their analogous functions in separate taxa. But what about protein evolution? Does the environment have a strong enough influence on intracellular processes that enzymes and other functional proteins play to evolve similar functional roles separately in different organisms. Manganese Superoxide Dismutase (MnSOD) is a manganese-dependent metallo-enzyme, which plays a crucial role in protecting cells from anti-oxidative stress by eliminating reactive (superoxide) oxygen species. It is a ubiquitous housekeeping enzyme found in nearly all organisms. In this study we compare phylogenies based on MnSOD protein sequences to those based on scores from Hydrophobic Cluster Analysis. We calculated HCA similarity values for each pair of taxa to obtain a pair-wise distance matrix. A UPGMA tree based on the HCA distance matrix and a common tree based on the primary protein sequence for MnSOD were constructed. Differences between these two trees within the animals, enterobacteriaceae, planctomycetes and cyanobacteria are presented and as possible examples of convergence. We note that several residue changes resulting in changes in hydrophobicity at positions which are under the effect of positive selection.

DEPARTMENT OF FORESTRY AND HORTICULTURE

Connecticut's landscape is a quilt of forests, farms, towns, and cities. Scientists in the Department of Forestry and Horticulture are studying the factors that influence both forest and farm productivity, including novel specialty crops, the effect of the growing deer population on natural and managed landscapes, and innovative forest management practices.

New Crops Program

Investigation of new crops is essential to provide fresh opportunities for farmers during a time of changing agriculture in Connecticut. Today, about 11,000 acres on 733 farms in Connecticut are devoted to vegetable production with an annual cash value of 30.2 million dollars. This compares to 19.1 million dollars from 582 farms in 2002. Seventy-nine percent of these farms are less than 100 acres in size; sixty-three percent are less than 50 acres in size. With numerous small farms, there is a need for growers to find a diversity of high-value niche crops. In addition, small farm sizes in Connecticut have resulted in marketing shifts from wholesale contracts with local supermarkets to direct retail sales. Approximately 313 farms offer direct sales through roadside stands and sales rooms, where a variety of fruits, vegetables, nursery stock, and Christmas trees are offered. About 36 of these are open all year. Nearly 20% of these farms offer pick-your-own fruit and vegetables to reduce the cost of harvest labor. These savings are passed on to the consumer.

The development of a network of farmers' markets in Connecticut's major urban centers and densely populated suburbs is an important segment of direct sales of vegetables to consumers. All produce sold at farmers' markets must be "Connecticut Grown". Farm fresh produce is offered at reasonable prices to urbanites who cannot travel to the farms. Niche crops valued by diverse ethnic groups are also sold at these markets. According to the Connecticut Department of Agriculture, there were 143 farmers' markets in 2013, attended by over 400 farmers compared to 87 markets in 2007, a 64% increase.

As the popularity of farmers' markets in Connecticut have surged, so too has the need for growers to find a diversity of high value niche crops. Consumers used to a wide variety of fruits and vegetables in large supermarkets are seeking a greater diversity of ethnic and specialty crops at farmers' markets and roadside stands. A recent survey of vegetable growers by The Connecticut Agricultural Experiment Station showed that over 70 vegetable crops are currently being grown in Connecticut. Since 1982, The Connecticut Agricultural Experiment Station has been investigating specialty crops to provide new opportunities for Connecticut's farmers. Over 40 fruits and vegetables have been studied resulting in over 50 publications. Results are also communicated to growers at meetings and farm visits. Some of the crops studied in the New Crops Program include globe artichoke, Belgian endive, radicchio, heirloom tomatoes, sweet potatoes, specialty melons, okra, and tomatillos. Research included cultivar trials and experiments to determine the best cultural methods for growing each specific crop in Connecticut. Crops that were chosen have a high market value and an existing or expanding market that would readily accommodate these commodities.

Specialty Pepper Trials

Specialty peppers include both hot and sweet varieties of unusual shape, size, or color. Colored peppers command a higher market price because they have extra flavor, nutrition, and aesthetic appeal. Most colored peppers are obtained by leaving the fruits on the bush until they reach mature color (e.g., red, yellow, orange). Others, such as banana pepper, are pale yellow even when immature. Green bell peppers are high in vitamin C (one medium green bell pepper contains 177 percent of the RDA for vitamin C). As they mature and sweeten (turn color), the vitamin A content rises 9-fold while the vitamin C content doubles. In 2013, Dr. Maynard evaluated 10 varieties of specialty peppers on yield and quality at Windsor and Lockwood Farm.

Impact: Baron (red) (7.7 lbs/plant) had the greatest yields followed by Early Sunsation (yellow) (7.6 lbs/plant), Lilac (red) (6.4 lbs/plant), and Chocolate Beauty (brown) (6.2 lbs/plant). At a retail price of $2.49/lb, there is a potential crop value of $139,196/acre. The long-term benefits of growing specialty peppers include an additional product and revenue for growers who attend farmers markets or have their own roadside stands. In addition, there may be health benefits for those who consume colored bell peppers. Fifty-three percent of Connecticut vegetable farmers responding to our survey are now growing specialty peppers.

Broccoli Trials

Broccoli is one of the most popular vegetables around the world and has long been regarded as a super food packed with tremendous health benefits. Cultivar trials of broccoli were first conducted at the Experiment Station in 1986-1988 with additional trials in 1993-1995 and 2000-2002. In these trials, over 100 cultivars were evaluated. Most of the cultivars tested are no longer available from seed companies. To evaluate yield and quality of broccoli cultivars released since 2002, Dr. Maynard evaluated the yield and quality of ten cultivars for spring harvest at Windsor and Mt. Carmel.

Impact: Avenger (0.8 lbs/head), Imperial (0.7 lbs/head), Bay Meadows (0.6 lbs/head), and Diplomat (0.6 lbs/head) had the greatest yields. At a retail price of $1.99/lb, there is a potential crop value of $15,697/acre. Cultivar selection can dramatically increase yields and profits for the grower. By growing Avenger instead of Blue Wind, the grower can produce over 4,450 more pounds per acre or gross about $9,000 more per acre. The long-term benefits include additional revenue for farmers in the spring, especially those who attend farmers markets in urban areas. Over half of all vegetable growers in Connecticut grow broccoli.

Sweet Corn Trials

Among all vegetables grown in Connecticut, sweet corn ranks first in acres grown and cash value with over half of all vegetable farms including sweet corn as a crop. Supersweet corn trials were conducted from 1995-1998 by CAES. Of the 22 cultivars evaluated, only 5 remain for sale. Trials including new varieties developed in the last 15 years would provide important information to the over 300 Connecticut farms who grow sweet corn. . In 2013, Dr. Maynard evaluated the yield and quality of 5 varieties of sweet corn planted May 1 and June 1 at Windsor and Lockwood Farm. In addition, cool soil percent germination will be determined from the early (May 1) planting.

Impact: Espresso had the greatest germination (96%) at both sites for the May 1 planting. Espresso (116 ears/20 ft) also had the greatest yields when averaging both plantings at both sites followed by Quickie (106 ears/20 ft) and Cuppa Joe (104 ears/20 ft). At a retail price of $0.60/ear, there is a potential crop value of $60,636/acre. Cultivar selection can dramatically increase yields and profits for the grower. By growing Espresso instead of Temptation, the grower can produce over 18,000 more ears per acre or almost $11,000 more per acre. The long-term benefits include additional revenue for farmers in the spring and early summer, especially those who attend farmers markets in urban areas.

Specialty Melons Trials
Specialty melons command a high price in the marketplace and are defined as members of the curcurbit family whose fruit may be large and have unique flavors. In commercial trade, specialty melons are often referred to as "mixed melons" and include canary, Crenshaw, casaba, Christmas, and Persian melons. In 2013, Dr. Maynard evaluated the yield and quality of eleven cultivars of specialty melons at Windsor and Lockwood Farm. Included in the trials were three galia cultivars, two canary cultivars, two Crenshaw cultivars, and one charentais cultivar. Three honeydew cultivars were also included because they also demand higher prices in the marketplace relative to cantaloupe.

Impact: Early Dew (honeydew) (6.3 lbs/plant), Arava (galia) (10.2 lbs/plant), Tweety (canary) (4.8 lbs/plant), Early Hybrid (Crenshaw) (10.7 lbs/plant), and Savor (charentais) (3.6 lbs/plant) had the greatest yields. Cultivar selection can dramatically increase yields and profits for the grower. For honeydew melons, by growing the cultivar Early Dew instead of Honey Brew, the grower can produce 19,054 more pounds per acre or 7,841 more melons per acre. At a retail price of $2.50/melon, the grower could potentially gross almost $20,000 more per acre by growing Early Dew instead of Honey Brew. The long-term benefits of growing specialty melons include an additional product and revenue for growers who attend farmers markets or have their own roadside stands. Almost half of all vegetable growers in Connecticut grow melons.

Hop Trials
There is a potential new market for local hop production in Connecticut to support the rapidly expanding local craft brewing industry. Hops are successfully grown in some Northeast states, but no data currently exists for Connecticut. Normally, hops are grown utilizing a high (20 ft) trellis system but that is a determent for many growers because it requires specialized equipment. In 2013, Dr. Maynard established a trial evaluating five disease-resistant hops cultivars when grown with the traditional high trellis system versus a low trellis system (10 ft). Dr. James LaMondia is repeating this trial at Windsor where the low trellis system utilizes existing tobacco shade tent structures. Plant vigor, cone yields, and disease and insect pest problems of the different cultivars grown utilizing the two trellis systems will be evaluated over the 3 years of this project.

Impact: The long term benefits include the addition of a specialty crop in Connecticut which would increase the revenues of vegetable growers and support the craft brewing industry in the state.

Sheet Composting of Oak and Maple Leaves
Many municipalities in Connecticut with leaf collection programs in the fall are turning to farmers to dispose of their leaves. However, not all farmers have extra land to set aside for a standard composting operation. Instead, they layer undecomposed leaves on their fields and simply plow them under. This is called sheet composting. Nitrogen deficiency can be a problem in these soils because microorganisms involved in leaf decomposition use nitrogen more efficiently than plants. There is some question whether the differences in the rates of decomposition between oak and maple leaves would lead to differences in plant response when these leaves are used in a sheet composting operation. This is also a situation that confronts many home gardeners who have a predominance of oaks in their backyards.

To help answer this question, Dr. Maynard has been conducting a long-term sheet composting experiment

in which plots were amended with either all oak or all maple leaves. Undecomposed leaves were layered about 6 inches thick in the falls of 1994-2013 and incorporated into the soil by rototilling. In 2013, eggplant was grown with all plots receiving the same amount (1300 lbs/A) of 10-10-10 fertilizer. Yields from plots amended with oak leaves were compared to plots amended with maple leaves and the unamended controls. The greatest eggplant yields were from plots amended with maple leaves (10.3 lbs/plant) followed by plots amended with oak leaves (8.6 lbs/plant) and the unamended control plots (7.5 lbs/plant). Lettuce yields from the plots amended with oak leaves were slightly greater (0.7 lbs/head) than yields from plots amended with maple leaves and the unamended control (0.6 lbs/head).

Impact: Many Connecticut homeowners are now disposing of their oak and maple leaves in their gardens without worrying about any deleterious effects on yields in their vegetable gardens. Incorporating tree leaves into gardens improves the environment by storing carbon in the soil and reducing the volume of material in the solid waste collection and disposal system.

Reducing Animal Damage

Rabbit Repellent Trial:
Herbivory by eastern cottontail rabbits (*Sylvilagus floridanus*) can be the source of significant agricultural, nursery, and managed landscape damage. Where cottontails cannot be managed by lethal means, or where trap and release is infeasible, repellents may be a reasonable alternative. Dr. Scott Williams is testing 6 different repellent formulations (Bobbex Deer Repellent® Canadian formulation concentrate, Bobbex Deer Repellent® Canadian ready-to-use (RTU), Bobbex-R Animal Repellent® concentrate, Bobbex-R Animal Repellent® RTU, Plantskydd® RTU Liquid Spray, and Scoot® Deer and Rabbit Repellent RTU Liquid Spray) on pansies, petunias, and Portulaca. Five wild eastern cottontails were trapped and relocated to a 24' x 48' enclosure, resulting in a density of 189 cottontails per acre. We are conducting three one-week trials on each plant genera using all six repellents in each trial. There are eight raised beds (six treated, two controls) with two flats of plant material within each inside the enclosure and one fenced raised bed outside the enclosure. An equal amount of plant material was transplanted to flats that were watered equally and randomly assigned treatments. After one-week exposure to cottontails, remaining plant material is removed, dried, and weighed. Difference between dried plant mass of treated and untreated vegetation will be determined. Daily caloric demand for cottontails will be calculated and summed for each trial. Repellent effectiveness will be defined as the sum of the product of caloric demand rank and rank of dry mass difference for each repellent.

Impact: Browse damage from overabundant herds of white-tailed deer cause the Connecticut nursery and landscape industry $1.5-$2 million in direct damages to plants prior to sale at nurseries and garden centers as well as $1 million in lost sales to homeowners discouraged by repeated deer damage annually. However, rabbit damage to the growing industry has yet to be quantified, but is likely significant as well as a costly frustration for the gardening public. Formulations to limit rabbit damage are often marketed as limiting deer damage as well and their usage could help reduce Connecticut nursery loses by $1.1-$1.5 million and could improve sales by $750,000 annually.

Deer Herbivory Exclosure Study

Drs. Scott Williams and Jeffrey Ward are studying the impact of deer on natural ecosystems by comparing growth rates and species diversity of vegetation protected from white-tailed deer (*Odocoileus virginianus*) herbivory within exclosures to adjacent unprotected control plots. Deer exclosures prevent deer from browsing vegetation. The project is a collaborative effort with The Nature Conservancy to maintain and sample twelve deer exclosures (and adjacent control plots), at Burnham Brook Preserve in East Haddam, the Bingham Easement in Salem, and Devil's Den Preserve in Weston. We are also including four of our own exclosures on South Central Connecticut Regional Water Authority property in North Branford. Plots have been sampled for herbaceous species cover in spring of 2006-2014. Late summer sampling has been conducted from 2005-2013 and included all woody and herbaceous plants. Preliminary data analyses indicate that herbaceous cover within exclosures is greater than control plots. Density of tree seedlings at least two feet tall is twice as high within exclosures compared to control plots. All locations will be resampled for both woody and herbaceous vegetation in late summer 2014. Results from this study will reveal plant species composition and growth rates in the absence of browsing deer.

Impact: Overabundant herds of white-tailed deer negatively affect forest regeneration by repeated herbivory. This in turn will negatively affect the future of the timber industry and other wildlife populations in Connecticut. The Nature Conservancy in Connecticut uses these data to scientifically justify and document the results of their deer management program by educating their constituency on the negative impacts of overabundant white-tailed deer on the very forest flora and fauna they are charged with protecting. The Nature Conservancy also uses these data as a benchmark with which to monitor and compare noticeable browse damage on other properties which may require deer reduction.

Reducing deer damage to oak stump sprouts

When cut down, many tree species put root energy reserves into forming new sprouts from the stump. These stump sprouts are in integral part of a regenerating forest. However, in Connecticut, it is not known how many of these new sprouts successfully reach the upper canopy largely due to browse damage by white-tailed deer. Therefore, Drs. Scott Williams and Jeffrey Ward, in collaboration with the Wildlife Division of the Connecticut Department of Energy and Environmental Protection and the South Central Connecticut Regional Water Authority, have selected five sites throughout the state (Bozrah, Burlington, Guilford, Litchfield, and Madison) where timber management has recently occurred. Three of the five sites were recently managed for New England cottontail (*Sylvilagus transitionalis*) habitat, a fourth was part of a timber sale, and the fifth is part of a forest stand rehabilitation project. A total of 187 oak stumps were identified, measured, and numbered. We used 6' fence to individually enclose half of the stumps, effectively isolating them from browsing deer. Additionally, half of those stumps fenced from deer have three 8" x 12" holes cut into the fence at ground level to permit cottontail rabbit access to resprouts. In spring 2014, an additional 10 resprouting stumps were fenced at all locations except for Guilford to improve sample size as only about half of monitored stumps actually produced sprouts. After several growing seasons, we will be able to determine the impact browsing deer and rabbits have on limiting regeneration of oak stump sprouts.

Impact: Oak is a valuable commodity for both the timber

industry as well as a source of hard mast for native wildlife species. Protecting new oak stump sprouts with portable cages could be a viable alternative to area-wide fencing for maintaining oak as a significant component of forests in areas with high deer abundance. The Metropolitan District Commission is utilizing similar cages after seeing our preliminary results.

Invasive Plant Control

Two factors that can degrade native plant community composition and structure, and hinder restoration efforts, are invasive species and chronic over-browsing by ungulates such as white-tailed deer. In response, scientists in the Department of Forestry and Horticulture are examining the separate and combined effects of these two threats, and possible strategies to minimize their impacts and thereby enhance forest productivity and ecosystem services.

Interaction of Deer Browse and Invasive Plants

Several studies have examined the separate effects of invasive species and herbivory on tree seedlings and herbaceous plants. However, few studies have examined whether the effects of invasive species and herbivory are synergistic, additive, or antagonistic. This study examined potential causal links between invasive species, primarily Japanese barberry (*Berberis thunbergii*); herbivory, primarily by white-tailed deer (*Odocoileus virginianus*); and a dearth of native regeneration in the ground and shrub layers. At three locations throughout Connecticut in 2007, invasive shrubs were treated twice (I2, initial mechanical cutting in March followed by directed heating of survivors with propane torches in July), once (I1, single mechanical cutting in March), or were not treated (I0). After the initial mechanical cutting, half of each treatment area was protected from browsing deer with a 2.3 m polyethylene fence (IF-fenced, IU-unprotected). Thus, there were six treatment combinations I2F, I2U, I1F, I1U, I0F, and I0U. Within each of the six treatment combinations, percent coverage estimates for all herbaceous species and stem counts for woody species were made at ten 4-m^2 sample points in early summer from 2007-2010.

The I2 treatments resulted in a decrease in Japanese barberry cover, but not other invasives through 2013. The IF treatments had no effect on Japanese barberry cover for the six years of the study. Somewhat surprisingly, cover of invasive species other than Japanese barberry increased dramatically when protected from herbivory, regardless of the number of treatments. The number and quality (size) of tree seedlings > 15 cm tall increased with both herbivory protection and the number of invasive treatments. For example, I2F treatment subplots averaged 44,000 stems ha-1 that were at least 30 cm tall, compared to only 7,000 stems ha-1 on I0U subplots. All IF subplots had over 1,300 stems ha-1 that were at least 180 cm tall (above the browse line), while the I2U and I1U subplots had no stems taller than 60 cm.

Similar to the response of tree seedlings, annual and biennial forb cover increased with both herbivory protection and the number of invasive treatments. Annual cover in 2010 averaged 4.1% on I2F subplots compared with only 0.2% on I0U subplots. Herbivory protection had no effect on cover of perennial species, but either I1 or I2 treatments increased perennial cover to 25% compared with 10% on I0 subplots. However, as the number of tall saplings continues to increase on IF subplots, it is likely that trees will eventually create enough shade to initiate a decline in perennial cover. In contrast, grass cover was higher on IU subplots than on the IF subplots, 13% and 7% respectively. Grass cover was also

increased by at least one invasive treatment (15%) than on I0 subplots (2%). Protection from herbivory had no effect on fern cover, while controlling invasives decreased fern cover by 66%.

Impact: Both the invasive shrub Japanese barberry and native white-tailed deer are can have detrimental impacts on Connecticut's native forested ecosystems. Information on invasive control and growth characteristics was provided to 4 media outlets (Landscape Architecture magazine, CT Post, The Daily Voice, Brainerd Communications), 17 associations (CT, NY, VT, MA), 10 government agencies (CT, VT, WI, NC), 8 towns, 9 private companies/utilities, and 25 individuals. A better understanding of the interaction between the two species can be used to promote improved forest health throughout the State, which will help to sustain the timber products industry.

Japanese Barberry Infestations Serve as a Refuge for Blacklegged Ticks
In many Connecticut forests with an overabundance of white-tailed deer (*Odocoileus virginianus*), Japanese barberry (*Berberis thunbergii*) has become the dominant understory shrub. This exotic invasive provides habitat favorable to blacklegged tick (*Ixodes scapularis*) and white-footed mouse (*Peromyscus leucopus*) survival. To determine mouse and larval tick abundances at six replicate sites, Dr. Scott Williams has been trapping mice since 2007 in unmanipulated dense barberry infestations, areas where barberry was controlled, and areas where barberry was minimal or absent. The number of feeding larval ticks/mouse was recorded. Adult and nymphal ticks were sampled along permanent draglines within each treatment area, retained, and were tested for the presence of *Borrelia burgdorferi*, the causal agent of Lyme disease in humans and pets.

To date, there have been 2,002 white-footed mice captures. The number of captured mice did not differ between treatments. However, the average number of feeding larval ticks per mouse was highest on mice captured in dense barberry (5.9 larvae per mouse). Adult tick densities in dense barberry (234 per acre) were higher than in both controlled barberry (120 peracre) and no barberry (69 per acre) areas. Ticks sampled from full barberry infestations and controlled barberry areas had similar infection prevalence with *B. burgdorferi*, 53 and 48% respectively. Adult tick infection prevalence with *B. burgdorferi* varied widely between treatments and study areas, but was lowest in areas where barberry was absent and generally lower where barberry was controlled. This in concert with the overall reduction in the adult tick cohort in areas where barberry was controlled resulted in 140 *B. burgdorferi*-infected ticks per acre in dense barberry, 73 per acre where barberry was controlled, and 38 per acre where barberry was absent.

Results indicate that managing Japanese barberry will have a positive effect on public health by reducing the number of *B. burgdorferi* infected blacklegged ticks that can develop into motile life stages that commonly feed on humans. Mouse trapping and tick sampling efforts will continue for several more years to monitor long terms effects of controlling Japanese barberry.

Impact: This research scientifically documented the potential negative impacts an invasive plant can have on human health and forest managers have used it to strengthen their argument for the increased need to control invasive plants. Invasive plant control will also reduce the number of ticks capable of causing Lyme disease in humans and domesticated animals. Various entities within the towns of Coventry, Easton, East Haddam, Greenwich, Guilford, Hampton, Lyme, Mansfield, Newtown, Redding, and Weston and in the states of

Massachusetts, Michigan, New York, Pennsylvania, Rhode Island, and Vermont have used these results to educate and in part to justify equipment purchase and initiate or reinvigorate invasive plant control programs. Additionally, numerous towns in Connecticut as well as the states of Delaware and Maryland and the Province of British Columbia have used our research linking deer and invasive plants to justify their respective deer management programs.

Running bamboo (*Phyllostachys*) control

There are some plants that are either loved or hated – including running bamboos that can have rhizomes extending well away from the original planting. At the request of the Connecticut Invasive Plant Council, Dr. Jeffrey Ward has been investigating treatment options for controlling running bamboo. Controlling running bamboo can be problematic, especially where it has grown into areas with desirable vegetation. It must be noted that treating culms at a distance from an established clump is only a short-term solution unless that rhizomes of the established clump are fully contained by an effective root barrier.

Because much of the information on the rate of spread and control of *Phyllostachys* is anecdotal, Dr. Jeffrey Ward began a series of experiments at our experiment farms and at several field sites. At our Lockwood (Hamden), Valley Lab (Windsor), and Griswold farms we planted *Phyllostachys aurea* (golden fishpole bamboo), *P. aureosulcata* (yellow groove bamboo), and *P. aureosulcata* spectabilis (spectacular bamboo) in the spring of 2012. We are comparing the growth (height and number of culms or canes) and rate of spread (distance from original planting) of each species/cultivar when not controlled with the options of (1) periodic mowing around plantings and (2) containing the rhizomes with heavy plastic liners. In the first two years, new culms were observed growing 2-10 feet from the original plantings. We will continue to monitor these plantings in the coming years.

In 2012, Dr. Ward began an experiment at three locations to examine whether cutting followed by herbicide sprays would control dense, established bamboo stands. All clones were cut to near ground-level to reduce height of culms, reduce leaf density, and weaken starch reserves in roots. The much shorter (1-6 ft tall) new culms that grew after cutting were treated with 2% glyphosate foliar spray (5oz/gallon of a 41% concentrate, 2.0% solution) in late August or early September and again two weeks later. The foliage was sprayed until wet using glyphosate. Sites were visited on June 6, 2014 to locate surviving and/or new culms.

At the MRT and OFR study sites, all old culms were dead and a single new culm had emerged. At Merritt where a quarter-acre stand was treated, several culms remained green on the lower stem and there was a single new stunted culm cluster. The Merritt plot suggests that running bamboo can effectively treated by cutting and applying herbicide in a single growing season. While control was nearly 100%, treated areas should be checked after herbaceous plants have died in late October to spot any small Phyllostachys that may have emerged. These can then be easily killed with a spot treatment of glyphosate.

Impact: We have demonstrated that running bamboo can be controlling with two foliar applications of glyphosate. In addition to media inquirers and stories (New London Day, New Haven Register, Connecticut Post), requests for information on controlling running bamboo have been provided to state (DEEP, DOT, legislators) and local officials (East Lyme, Milford, Montville, Prospect, Wallingford, Woodbury), universities (UConn, Univ. Georgia), real estate agents, landscapers, and numerous homeowners.

Forest Management

The value of the forest to Connecticut is much more than the timber and other forest products. First and foremost, forests protect watersheds, aquifers and groundwater supplies that provide the bulk of our clean

drinking water. Trees also provide air pollution control, acting as giant filters to remove dust, particulates, and some airborne chemicals. In addition, trees cool our environment in the summer by recycling water and reflecting sunlight. Forests contribute to the character of Connecticut and add to our enjoyment during throughout the year.

Precommercial crop tree release

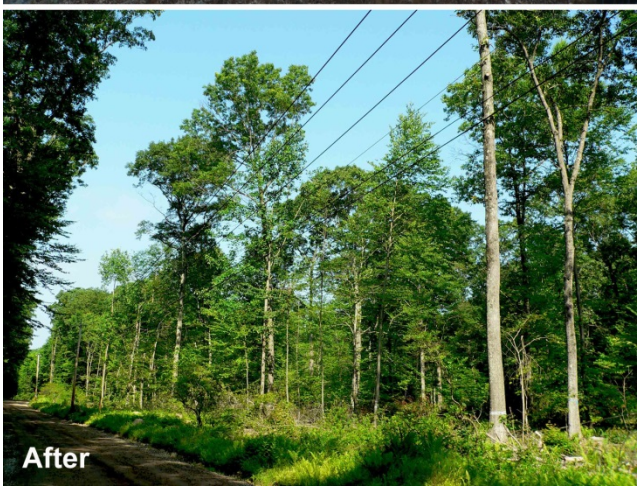
The effects of precommercial crop tree release (CTR) on growth and stem quality of red oaks (7- to 22-yr-old) were examined by Dr. Jeffrey Ward on seven study areas established in Connecticut in 1988. The three treatments were uncut control, trees given one crown-touching release, and trees released a second time five years after the initial release. Diameters and crown classes were measured annually. Heights were measured in 1988-1994, 2001, and 2012. Bole quality measurements were completed in 1989 and 2011. CTR of oak saplings increased upper canopy persistence (remaining in dominant or codominant crown class) and diameter growth with no loss of height growth or increased number of branches on the lower bole. Upper canopy persistence of released codominant oaks was 80% compared with 50% for untreated stems. Trees released twice had diameters 1.5 inches greater than unreleased trees with no increased taper. Heights 24-years after release did not differ among treatments. The presence and number of branches on the lower bole did not differ among treatments in 2011. Precommercial crop tree release provides a management tool to (1) increase the number of oaks that will form part of the mature forest in sapling stands that have few oaks or (2) focus growth on oaks with quality stems in sapling stands with abundant oak.

Impact: The increased diameter growth provided by precommercial crop tree release should optimize potential stand value and result in at least a 4% real rate of return by decreasing the time needed to reach minimal diameter of grade or veneer sawtimber.

Storm Resistant Roadside Forests

Tree-lined streets provide not only the aesthetic ‘sense of place’ that is Connecticut, but provide many benefits along roadways including reduced traffic speeds, prolonged pavement life, and improved stream quality by reducing storm water runoff. However, these benefits are not without the potential cost of losing power and communication along with road obstruction during severe weather. In the past several years, three major storms (Irene-Aug 2011, Halloween snowstorm-Oct 2011, Sandy-Oct 2012) disrupted the lives of Connecticut’s residents by causing trees to fail and destroy utility lines. Part of the solution for reducing damage caused by trees during severe weather events is to favor trees with short mature heights adjacent to roads and overhead utilities.

Approximately 36% of Connecticut’s roads, 7,600 of 21,000 miles, cross landscapes that would be considered forested landscapes in the traditional, rural sense. Although the expanse of roads and utility corridors in such forested areas is enormous; proactive management has been minimal. Historically,



maintenance of roadside trees in these forested areas has been limited to pruning by utilities to specified distances from lines, and occasional hazard tree removal. Few, if any, resources have been invested on management of the surrounding forest.

The ultimate challenge is to maintain the aesthetic appeal of our forested byways while reducing the potential of tree caused damage to infrastructure during severe storms. Because most Connecticut's forests do not have a diverse age structure (e.g., most large oaks originated in the early 1900's), creating a storm resistant roadside forest could provide an opportunity to increase biodiversity by increasing the diversity of age classes, species, and stand structures.

In 2013, Dr. Jeffrey Ward working with colleagues at Audubon Connecticut and the University of University with assistance from Connecticut Light and Power, began a research program to implement and evaluate proactive management protocols developed by Dr. Ward and Thomas Degnan (Burns & McDonnell) for converting rural roadside forests that are currently highly susceptible to storm damage during severe weather to forests with trees that are more both resistant to high loading (wind, snow, ice) and are comprised of shorter trees that are less likely to fall on wires and roads then they do fail. During 2013-2014, CAES established demonstration areas in three counties (Hartford, Litchfield, Middlesex) and UConn established demonstration areas in two counties (Tolland, Windham). In 2014, CAES will establish demonstration areas in the remaining three counties.

These areas will demonstrate how combined arboriculture (individual tree care) and silviculture (forest management) practices are an effective way to manage roadside trees in forested areas. Though arboricultural pruning practices should immediately decrease the probability of utility interruption due to branch failure, their effectiveness is limited to several years and will have minimal effect during severe tropical storms. Complementary silvicultural work (forestry) in the adjacent forest will be a longer-term process that will require several years to fully implement, but will have benefits that last for decades. It should be noted the protocols are designed to be cost-neutral or create a positive cash flow for the forest landowner.

The silvicultural protocols are designed promote open-grown trees, such as those in fields, with crowns that are wide rather than tall, have stouter stems and branches, and develop well-anchored, widespread root systems. All of the characteristics of open-grown trees make them more resistant to wind damage, especially to becoming wind thrown.

Impact: The storms in 2011 were estimated to have caused Connecticut more than $3 billion in economic

losses. CGS Sec 16-234a(4) recognized our work by designating the Right Tree-Right Place lists as the state standard of trees and shrubs compatible with utility infrastructure. Replacing urban/suburban roadside trees as they die with shorter Right Tree – Right Place species will impose not additional costs to property owners and towns.

Recognizing the importance of our work for their forest management programs, Connecticut Water Company, the Town of Manchester, White Memorial Foundation, and CT DEEP have provided land and personnel assistance to establish the demonstration areas. In addition, our roadside forest management research has been presented to Public Works Directors, Naugatuck Valley Council of Governments, representatives of four municipalities (Bethel, Manchester, Westport, Wilton) and three non-electric utilities (South Central Connecticut Regional Water Authority, Metropolitan District Commission, Aquarion Water Company,), Connecticut Department of Transportation, Connecticut Tree Protective Association, Plant Science Day, CT Chapter Society of American Foresters, New England Society of American Foresters, the CT Forest Health Workshop, WNPR (CT) radio, Wallingford Center, Inc., and students at Wamago High School.

DEPARTMENT OF PLANT PATHOLOGY AND ECOLOGY

The mission of the Department of Plant Pathology and Ecology is to manage plant health problems using innovative methods to protect the environment, ensure a safe food supply, and maintain a healthy landscape for Connecticut. Our diverse basic and applied research programs seek a better understanding of the biology and ecology of plant pathogens and interactions between plants, pathogens, and the environment. Our services focus on the diagnosis of plant health problems for all Connecticut residents, including homeowners, plant care professionals, and commercial growers. The Department also has an active outreach program, which offers numerous fact sheets, disease management guides, web-based information, workshops, and presentations for grower groups, garden and horticultural clubs, special interest groups, and students.

RESEARCH ACTIVITIES

Winegrape Research

Dr. Frank Ferrandino is continuing the project, "Coordinated winegrape variety evaluations in the eastern USA," which was initiated by Dr. Nail in 2008. Thirty-two different winegrape varieties are planted at Lockwood Farm (Hamden, CT) and the Valley Laboratory (Windsor, CT). These plantings are evaluated for plant vigor, fruit yield and chemistry, and relative susceptibility to disease. The intent of this project is to provide a coordinated approach to the evaluation and dissemination of knowledge gained by cooperator evaluation of existing and newly released winegrape varieties in the eastern USA. The coordination is fostered by cooperator involvement in the USDA/CSREES project, "NE-1020, Multi-state evaluation of winegrape varieties and clones." The NE-1020 is a national project for grape variety and clone evaluation, the goals of which are recognized as a high priority with the National Grape and Wine Initiative (http://www.ngwi.org/). The historical justification, goals, and membership of the NE-1020 are provided at the NE-1020 website. Over the past 3 years, winegrapes from 10 or more cultivars from CAES plots have been sent to Cornell and made into wine. This procedure is followed for winegrapes grown in 12 Eastern states. The ultimate goal is to assess the suitability of winegrape cultivars for each location.

Dr. Ferrandino scouting for disease at Lockwood Farm (6/18/2014).

Impact: Growers are informed as to the relative merits of winegrape cultivars before planting. The planting of a vineyard requires a large investment ($3,000/acre) with no expected return for at least 3 years. Thus the choice of a suitable cultivar is critical to the eventual success of such an enterprise.

Epidemiological Research

Dr. Ferrandino is continuing his work on 3D Lagrangian Stochastic Simulation for turbulent flows in hedgerow canopies in collaboration with Dr. D. E. Aylor. The goal is to develop models to predict disease. These simulations are programmed in Microsoft Visual Studio. Direct measurement of turbulent wind statistics in the field are needed to verify these models and these will be performed over the next few growing seasons.

Impact: Improved models of spore dispersal enable better predictions of the spread of disease.

Weather Stations and Weather Data

Dr. Ferrandino has maintained three remote sensing weather stations located on the CAES research farms (Hamden, CT; Windsor, CT; Griswold, CT). In April 2014, an additional weather station was added at Gouveia Vineyards (Wallingford, CT). Data loggers at each weather station were linked via WIFI to the existing Internet connections maintained at each farm. Weather data from the three CAES experimental farms and Gouveia Vineyards is available at: https://www.hobolink.com/s/d0696313715dd96f86b25f3552cc1f47. This link is available on the CAES website.

Weather station at Newport, RI.

Each weather station measures temperature, relative humidity, sunlight, wind speed and direction, rainfall, leaf wetness, and soil temperature every 15 minutes. These data are sent back to a central location once per hour where it is accessible via the Internet, and used to calculate disease risk assessment reports. These reports are made available to growers via Internet postings and direct email alerts. Disease risk assessments are also delivered to the winegrape growers on a weekly basis. Early in the season, disease risk assessments are also used in conjunction with scouting of each vineyard to assess inoculum levels that are critical for primary infections.

Impact: Growers are alerted when disease risk is high. Early fungicide sprays are more efficacious and may reduce the need for later applications, thereby reducing overall use of chemicals.

Boxwood Blight

Boxwood blight, first reported in Connecticut in October 2011, continues to be a problem throughout the U.S. and in CT. This new disease to North America, caused by the fungus *Calonectria pseudonaviculata* [(*C.ps.*), syns. *Cylindrocladium pseudonaviculatum, C. buxicola*], continues to threaten boxwood, whose current wholesale market value for nursery production is estimated to be $103 million annually (United States Department of Agriculture, 2010). It has already resulted in significant financial losses in the state, which to date have exceeded $5.5 million. As founding members of the multi-institutional Boxwood Blight Working Group, Drs. Sharon M. Douglas and Robert E. Marra have been conducting investigations to improve understanding, detection, and management of this disease.

Detection

Dr. Marra has been instrumental in the development and optimization of real-time PCR and other nucleic acid-based assays for early and accurate detection of the boxwood blight pathogen, *Calonectria pseudonaviculata* (*C.ps.*). Through these efforts, Dr. Marra has achieved high specificity of a real-time PCR assay for *C.ps.* based on the Histone H3 gene; closely related sister species show no specificity. With the additional goal of being able to detect *C.ps.* in infected but asymptomatic plant tissue, Dr. Marra has demonstrated that the *C.ps.* real-time assay works well in conjunction with a real-time assay that targets the plant-specific cytochrome oxidase gene (COX), introducing an important and powerful internal control on DNA extractions. Sensitivity of the assay was down to as little as 5 picograms of *C.ps.* Recent work in Dr. Marra's lab has used this assay in greenhouse experiments to show that *C.ps.* can be reliably and repeatedly detected from asymptomatic foliage as early as 24 hrs after infection (see Figure 1).

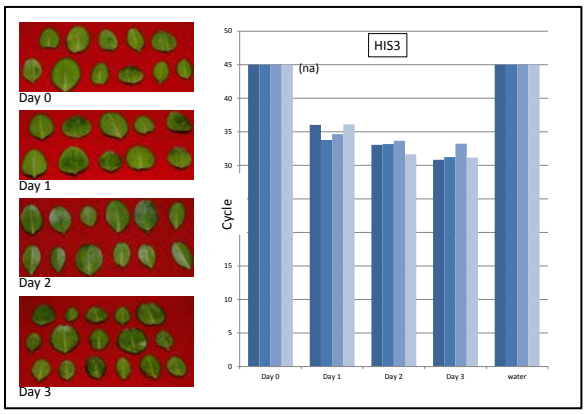


Figure 1. Boxwood plants were inoculated with viable conidia (1000/ml), rinsed, then sampled every 24 hrs for four days. DNA extractions from leaves were followed by the Histone H3 real-time PCR assay. Four replications of the experiment are shown here, represented by four shades of blue. As shown in the figure, symptoms do not begin to appear until Day 3, whereas results from real-time PCR show that the fungus is detectable beginning with Day 1. Decreasing cycle numbers (y-axis) indicate higher concentration of the fungus; "na" at Cycle #45 indicates "no amplification."

Dr. Marra's lab has also been investigating the potential for this assay in detecting low levels of the fungus in water, an issue relevant to the nursery industry. Results from these experiments show that large volumes of water can be filtered onto nitrocellulose filters, and the filters then tested for presence of the fungus. Using this method, as few as ten conidia per liter of water have been detected.

Similarly, Dr. Marra has been interested in determining the ability to use this real-time PCR assay to detect the presence of the fungus in soil and potting media. Working with three different formulations of potting media obtained from three Connecticut growers, Dr. Marra's lab has shown that, despite the inherent challenges and difficulties with extracting DNA from soils and potting media, as few as 50 conidia in 100 mg potting media can be detected.

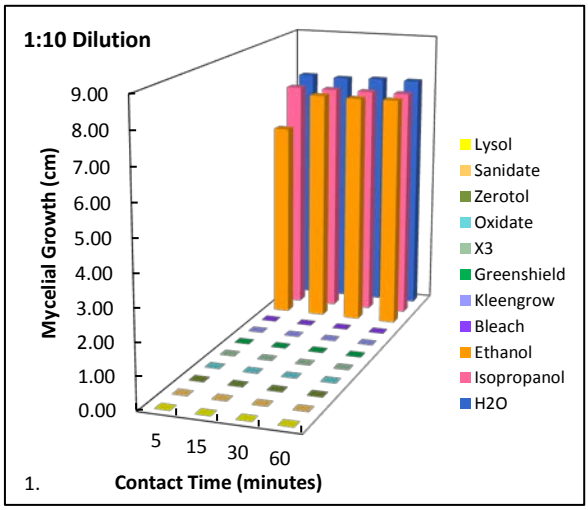
Lastly, Dr. Marra has completed development and testing of three real-time PCR assays that rapidly distinguish the predominant G1 genotype from the fungicide-resistant G2 genotype, which is not yet found in North America. Although these two genotypes are currently under consideration for designation as different species, the Histone H3 diagnostic assay described above does not distinguish between them. Distinguishing the G1 and G2 genotypes requires utilization of a special kind of real-time probe that targets single-nucleotide polymorphisms (SNPs) at three genes, Histone H3, beta-tubulin, and calmodulin. The three assays have been tested against a large collection of isolates, including European G2 strains, demonstrating their efficacy.

Disinfectant Mitigation Strategies

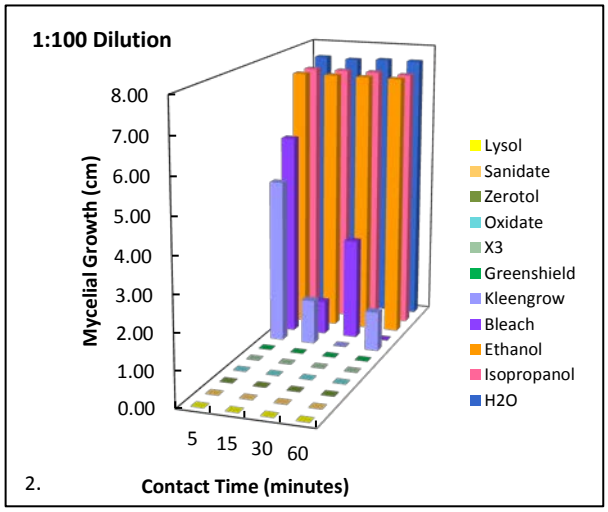
Dr. Douglas has been conducting studies aimed at providing science-based information on the efficacy of sanitizing agents for *C.ps.* using two isolates obtained from infected plants in Connecticut, Cps-ct1s (a single-spored isolate from boxwood) and Cps-ct21s (a single-spored isolate from pachysandra). These studies assessed mycelial growth and conidial germination for the two isolates challenged with log concentrations of sanitizers (hydrogen dioxide, Oxidate and ZeroTol; hydrogen peroxide and peroxyacetic acid, Sanidate; hydrogen peroxide, peroxyacetic acid, and octanic acid, Xeroton-3 (X3); alcohol, isopropanol and ethanol; quarternary ammonium compounds, Greenshield and KleenGrow; a phenol-based compound, Lysol; and sodium hypochlorite, with and without detergent or surfactant). Mycelial growth was assessed using two methods to evaluate efficacy of sanitizers, including exposing mycelia for 5, 15, 30, and 60 min contact periods. Conidial germination was assessed by exposing conidia to log concentrations of sanitizers for 5, 15, 30, and 60 min contact periods. Differences were observed between the methods and among sanitizers and concentrations, and ranged from complete inactivation to slowed growth (Figures 1, 2, 3).

Our results demonstrated that several commercial sanitizers effectively inhibited mycelial growth and conidial germination of *C.ps.* at label rates. These included household bleach, ZeroTol, Oxidate, Xeroton-3, and Lysol Brand Concentrate. Differences observed between the two methods for evaluating efficacy on mycelial growth also suggest that the way mycelia are exposed to sanitizers is an important consideration when evaluating products for nursery use. Additionally, we found that conidial suspensions used in these studies might not reflect what happens in the nursery—*C.ps*. conidia are formed in a slimy, sticky matrix, which could impact the efficacy of the sanitizer. Our goal, from a landscaper/grower viewpoint, was to identify inexpensive sanitizers that completely inhibited growth or germination in the shortest contact time—products that slowed growth or reduced germination were not acceptable, since they reduced but did not eliminate any risk for contamination. These results helped refine BMPs for boxwood blight, but illustrate the need for further research on the efficacy of disinfectants used in nursery production systems. Also pertinent for consideration are the pros and cons of each sanitizer for landscape vs. nursery use, safety (i.e., label requirement for personal protective equipment during application), corrosion, and cost.

Figures 1, 2, & 3. Mean mycelial growth (cm) for Cps-ct1s using flooded plates for all contact times with sanitizers.



1.



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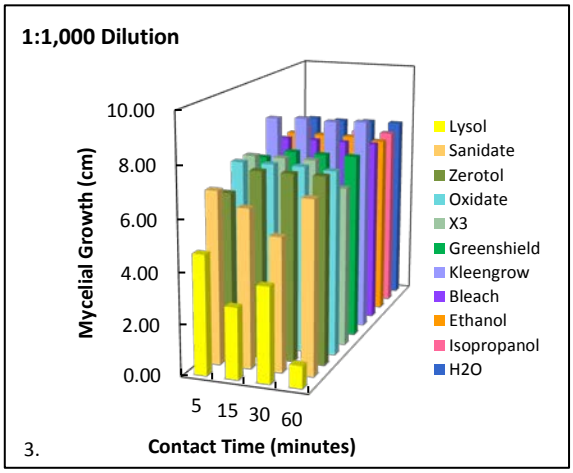


3.

Refining Best Management Practices (BMPs)

The Experiment Station, led by Dr. Douglas, continued its leading role in refining BMPs to provide guidance for nurseries, garden centers, landscapers, and property owners for dealing with this disease and offered suggestions to minimize the spread of the disease through commerce and planting of infected material. Information from studies on sanitizing agents required modification of guidelines for property owners and landscape professionals for managing this disease (*Guidelines for Reporting and Managing Boxwood Blight in Connecticut Landscapes Version 3.0* by S. M. Douglas, http://www.ct.gov/caes/lib/caes/documents/special_features/boxwood_blight/guidelines_for_reporting_and_managing_boxwood_blight_in_connecticut_landscapes_version_3_01-27-14.pdf. All boxwood blight BMPs were updated to incorporate this new information, and the updated BMPs can be found on the Boxwood Blight page of the CAES website (www.ct.gov/caes). Management guidelines are based on the host plant affected—properties with boxwood, pachysandra, or both boxwood and pachysandra. These management practices are based on what is known about the biology, dispersal, and survival characteristics of this plant pathogen and are subject to modification on the availability of new information.

Impact: Boxwood is not only an important landscape plant in Connecticut and the U.S., it is also a significant part of the wholesale and retail nursery industry in the state. Identification of effective methods for detection and remediation help refine current BMPs and reduce economic losses. Although previous significant losses were reported, CAES actions helped to maintain boxwood as a viable and important component of the Connecticut landscape and nursery industry.

Neonectria Canker Caused by *Neonectria ditissima*

Dr. Marra continues his research on Perennial Target Canker (also known as Neonectria canker), focusing on the ecology and genetics of the causal agent, the fungal pathogen, *Neonectria ditissima*. The goal of this research is to gain a fuller understanding of the life history, evolution, population dynamics, and host-interactions of *N. ditissima*, particularly with respect to its principal hosts, black and yellow birch (*Betula lenta* and *B. alleghaniensis*). Fundamental knowledge of the natural history of *N. ditissima* is lacking, yet is an essential component to effective management strategies. Dr. Marra has developed the field techniques and laboratory tools necessary to the study of this fungus and the disease it causes, and has used these tools and methods to examine the relationship between mating system and genetic structure.

Previously, Dr. Marra developed and used a set of 13 polymorphic microsatellite markers to study mating and genetic differentiation in *N. ditissima* from two nearly adjacent sites at West Rock Ridge State Park in New Haven, CT. This study revealed a paradoxical juxtaposition of high levels of genetic diversity alongside high levels of selfing and biparental inbreeding. The results confirm an earlier hypothesis that *N. ditissima* has a "mixed mating system" (selfing and outcrossing occurring in the same population). In order to test the hypothesis that these observations of selfing are possibly the result of high levels of biparental inbreeding, we are evaluating putatively self-fertilized sets of progeny using AFLPs.

Impact: Due to its increasing abundance in Connecticut, black birch is a tree of growing importance and concern. Although trees infected with Perennial Canker can persist for decades, the extensive scarring caused by the cankers renders them of little value for lumber or veneer. Our efforts to more fully understand the biology and natural history of *N. ditissima* is an important contribution in the fields of mycology and evolutionary biology, and will contribute to the identification and utilization of control strategies. An important result of this research is that they are the first to demonstrate, in a fungus, empirical support for theoretical models that posit the importance of biparental inbreeding to the evolutionary stability of mixed mating.

Sonic and Electrical Resistance Tomography (SoT, ERT, respectively) in the Assessment of Internal Decay in Living Northern Hardwoods

Dr. Marra was the recipient of a National Science Foundation grant, funded through the EaGER (Early Grants for Exploratory Research) program, to evaluate the use of sonic and electrical resistance tomography (SoT and ERT, respectively) to assess the extent and magnitude of internal decay in living trees. SoT measures differences in the velocity of sound, which is directly correlated to the extent of decay. ERT, which measures differences in the conductivity of electricity based on the amount of water present, can identify incipient stages of decay. After traveling to Germany in April for training on the use of the equipment from the engineer who designed it, Dr. Marra and co-PI Dr. Nicholas Brazee (University of Massachusetts, Amherst), conducted the field phase of this project at Great Mountain Forest (GMF) in Norfolk, CT, from early June through early July of 2014. Approximately 15-20 trees of each of the three principal northern hardwood species – American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), and yellow birch (*Betula alleghaniensis*) – were measured using the tomographic equipment at three cross-sectional levels, 50, 100, and 150 cm above ground (Figures 1 & 3). Following tomography, the GMF forestry manager, with the assistance of forestry staff, felled the trees, and then

assisted Dr. Marra in cutting cross-sections ("cookies") from the felled trees (Figure 2). The cross-sections, once air-dried, will be planed, sanded, and photographed, for direct comparison to tomographic images. Wood samples representing different levels of decay as indicated by tomography will also be assayed for the concentration of carbon.

Figure 1. Drs. Marra (left) and Brazee taking sonic tomographic measurements on a yellow birch at Great Mountain Forest, June 2014.

Figure 2: Dr. Marra (standing) with GMF crew at landing where cross-sections ("cookies") were cut from the felled trees.

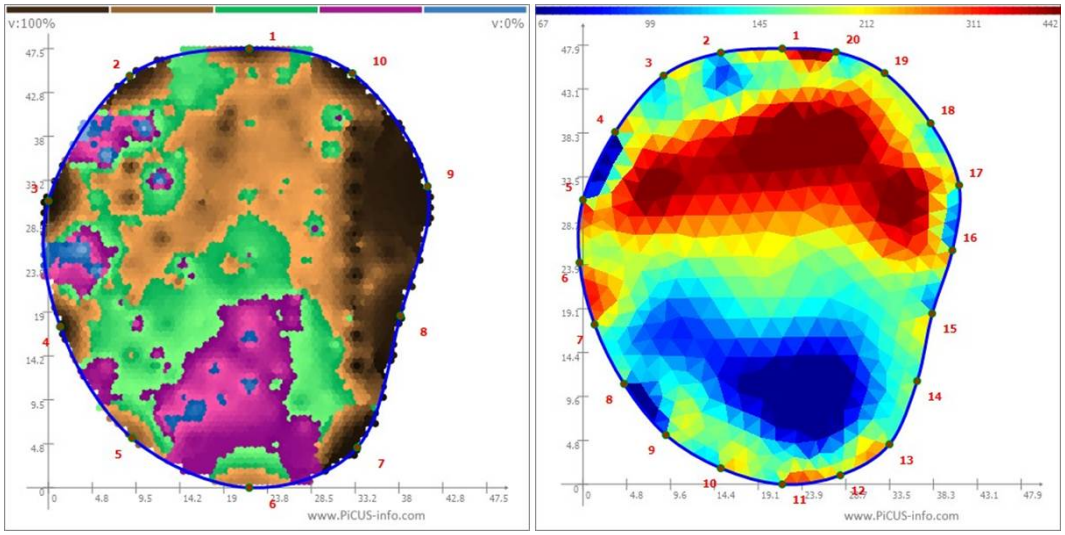


Figure 3: SoT (left) and ERT (right) images from the 100cm level of a yellow birch sampled at the Great Mountain Forest research site. Colors in the SoT image progress from dark brown, which indicates high sonic velocities typical of dense, nondecayed wood, through decreasing velocities represented respectively by light brown, green, magenta, and blue. Colors in the ERT image progress from red, which indicates no electrical conductivity, to dark blue, which indicates high levels of conductivity and the presence of water.

Impact: As forests are increasingly looked upon to sequester and store atmospheric carbon, it is essential that all components of carbon cycling be considered in the carbon balance models that are used to assess and quantify the role of forests in carbon sequestration. The results of this project will constitute an important first step in Dr. Marra's long-term goals of addressing these critical missing components, and contributing data that will be relevant to other ecologists and carbon balance modelers.

Bacterial Spot of Stone Fruits

The SARE project on bacterial leaf spot (BLS) of stone fruits, for which Dr. Marra assumed responsibility, focused on developing and testing of biological controls against the causal bacterium, *Xanthomonas arboricola* pv. *pruni* (Xap). Having demonstrated that the use of bacteriophage was not likely to succeed, Dr. Marra's goal for the 2013 growing season was to evaluate two potential biological control strategies–Serenade (*Bacillus subtilus*) and Blight Ban (*Pseudomonas fluorescens*)–alongside the currently recommended combination of copper and Mycoshield (oxytetracycline). This was done in three orchards, one at each of the three CAES research farms. Results from this single-season experiment were mixed and inconclusive, likely due to the fact that disease pressure was relatively low for the 2013 season.

Impact: BLS caused by Xap is a major problem for peach growers in Connecticut. Control options are limited, and expensive. An effective biocontrol strategy would qualify as organic disease control, making it a very desirable option for orchardists. However, this research confirms that none of the three methods tested here – phage, Serenade, and Blight Ban – are effective at controlling BLS.

Butternut Research

Butternut populations have been fragmented by *Melanconis* dieback disease, butternut canker disease (*Ophiognomonia clavigignenti-juglandacearum* = *O.c.j.*), and loss of riparian habitat. Since 2005, Dr. Sandra L. Anagnostakis has examined 103 species and hybrid trees throughout CT. She found *Melanconis* cankers to be widespread on many of the trees she examined. Although this pathogen is known as a "slow killer," it appears to have a key role in killing trees in the state. In contrast, *O.c.j.*, the pathogen long considered as a more serious threat to butternut, was found only twice. *Melanconis* and *O.c.j.* were also found on the same trees, suggesting the possibility that one may have predisposed the trees to the other.

One strategy for managing these diseases is to identify sources of genetic resistance. However, screening widely dispersed trees presents many obstacles including tree size, access, and limited resources for travel. To date, no reliable seedling inoculation method has been developed for butternut for either of these diseases. In searching for other methods to screen for potential sources of resistance, Dr. Anagnostakis found that smooth-barked, blemish-free branches of mature trees can be inoculated in the laboratory, and the size of the cankers that develop from the inoculations can be used as a way to assess relative resistance. This method can be used for initial screening of mature trees.

Impact: Butternut trees are rapidly disappearing from CT forests and orchards, and more studies on the pathogens responsible, and possible cures, are needed.

Butternut stems inoculated with *O.c.j.* with bark peeled to reveal cankers: canker size was a measure of relative resistance or susceptibility. Stems in photo on left were from a tree with some resistance; stems in photo on right were from a more susceptible tree (note larger cankers and discoloration).

Chestnut Breeding for Orchard Trees

Asian chestnut gall wasp (*Dryocosmus kuriphilus*) was found at Lockwood Farm for the first time in 2011, although it has been present in the U.S. for a number of years. Several heavily galled chestnut trees have since died from the combined stress of the infestation, chestnut blight, and winter damage. In search of possible sources of resistance to this important pest, Dr. Anagnostakis has crossed the commercially important cultivars 'Colossal' and 'Eaton' with Chinese chinquapin (*Castanea henryi*) as the male (pollen) parent. The seedlings were planted around a tree of 'Sleeping Giant' at Lockwood Farm in Hamden that was heavily infested. After two years, many galls developed on the 'Colossal' x *C. henryi* seedlings, but fewer galls developed on the 'Eaton' x *C. henryi* seedlings. In 2014, crosses of 'Colossal' and CAES cultivar 'Lockwood' were made with pollen from Ozark chinquapins (*C. ozarkensis*), which appear to have better resistance to gall wasp. Seed from these crosses will be planted in 2015 at Lockwood to see whether they have inherited resistance to infestation.

Impact: Gall wasp is a serious pest in commercial orchards and we are working to produce resistant trees for the growers.

Two-year-old 'Colossal' x *C. henryi* seedling with many galls (arrows).

Two-year-old 'Eaton' x *C. henryi* seedling with fewer galls (arrows).

Dr. Anagnostakis is making crosses of 'Colossal' (a commercial cultivar) and 'Lockwood' (a CAES cultivar) because they have very large nuts, and Ozark chinquapins (*C. ozarkensis*), because their nuts have exceptionally good flavor. Crosses of 'Colossal' (female) with 'Lockwood' (male) and both with Ozark chinquapins as males will be made ('Colossal' is male sterile). Ozark chinquapins from Arkansas and Oklahoma are also being crossed with each other as controls. Some of the nuts resulting from the crosses will be planted and some tested by a commercial CT laboratory for analysis. Nut quality, particularly the fatty acids palmitic, steric, oleic, linoleic, and linolenic, is considered to be extremely

important for human nutrition. In addition, fatty acids have been reported to influence perceived flavor. In 2013, open pollinated nuts from these trees were tested and the table below shows the results of the analyses (gm/kgm dry weight). Note that Ozark nuts (reported to have exceptional flavor) had higher levels of fatty acids than 'Colossal' or 'Lockwood'.

Trees	Protein	Total Lipids	Palmitic	Steric	Oleic	Linoleic	Linolenic
'Colossal'	54.4	35.4	4.7	0.4	24.2	5.4	0.8
'Lockwood'	82.0	6.4	1.5	0.2	1.5	2.6	0.7
Ozark AR	98.9	110.0	20.6	1.7	56.7	28.7	2.4
Ozark OK	88.0	123.0	20.7	2.0	66.3	29.4	3.1

Biochar and Earthworms

Biochar is a fine-grained, charcoal-like product, which has soil-enhancing properties. It also suppresses Fusarium crown and root rot of asparagus. Biochar may suppress disease by 1) absorbing toxins in the soil, 2) increasing mycorrhizal colonization in the roots, and 3) allowing the densities of fluorescent pseudomonads to proliferate in the rhizosphere.

In 2014, Dr. Wade H. Elmer's asparagus plots in Griswold and Windsor were harvested for the third year. We observed that mulching had the greatest effect on yield. Augmenting soil with adult earthworms did not improve yield above mulching alone. This may be due to mulching favoring and increasing the natural population of earthworms so that additional augmentation was unnecessary. This hypothesis still needs to be validated. Adding biochar did not differ from controls and may be due to the ability of biochar to bind up nutrients along with the toxins, which led to smaller plants and less yield. However, biochar plots at Lockwood Farm did much better than Windsor or Griswold and this may be a result of them being planted in old asparagus soils that likely contained toxic residues.

Two new pilot studies with biochar were established this year. In the first pilot study, Dr. Elmer and Dr. James LaMondia, Valley Laboratory, exposed biochar-treated peppers to *Verticillium dahliae* and *Pratylenchus penetrans* in microplots in Windsor. We will compare whether biochar can suppress disease. The second study was on *Spartina alterniflora* exposed to *Fusarium palustre* to determine if biochar could suppress disease and improve growth. Both studies are being monitored during the summer of 2014.

The role that earthworms play in the cycling of biochar in the soil column is poorly understood. A study conducted in collaboration with Dr. Elmer and Drs. Charisma Lattao and Joseph Pignatello in the Department of Environmental Sciences was done to examine the behavior of earthworm feeding on biochar. Feeding courts were established with eight biochars from different feedstocks with varying physicochemical properties. Consumption preference was estimated by digitally photographing the biochar samples and visually estimating disappearance over time (Figure 1). The most preferred biochar was an aged biochar (>70 yrs), whereas the least preferred was a fast-pyrolysis biochar made from hardwood sawdust. Consumption of biochar by earthworms was inversely proportional to the total C and proportional to ash, Ca, Mn, and Si levels. Tailoring specific biochars for consumption by earthworms by supplementing them with Ca, Mn, and Si may lead to a non-disruptive system for delivering biochar into the lower soil horizons of perennial crops.

Impact: These studies may provide evidence that mulching new asparagus fields may increase earthworm activity which, in turn, increases soil health and results in increased yields. In fields where

toxic residues persist, biochar has more benefit and may absorb toxins and allow old abandoned asparagus fields to be replanted.

Figure 1. Earthworm feeding courts: (Left) day one showing the ringed containers used to apply the different biochars; (Right) seven days later showing the preferential consumption of the different biochars.

Sudden Vegetation Dieback

Sudden Vegetation Dieback and Salt Tolerance of *Fusarium palustre* and *Meloidogyne spartinae*

The loss of vegetation along intertidal creeks has been extreme (Figure 2). The condition is known as Sudden Vegetation Dieback (SVD) and *Spartina alterniflora* (SA) is the dominant plant species affected by SVD. *Fusarium palustre* is a recently described fungal species that is pathogenic on SA, but is not responsible for SVD. Plant pathogens co-evolve with their hosts and adapt to the environmental constraints placed on host plants. Drs. Elmer and LaMondia compared the salt tolerance of two salt marsh pathogens, *Fusarium palustre* and *Meloidogyne spartinae*, to genetically related terrestrial species, *F. sporotrichioides* and *M. hapla*, respectively, to assess whether the salt marsh species had acquired selective traits for persisting in saline environments or if salt tolerance was comparable among *Fusarium* and *Meloidogyne* species. We observed that *F. palustre* was significantly more tolerant to NaCl than *F. sporotrichioides* and that *M. spartinae* survived at all NaCl concentrations tested, including 1.0 M for at least 12 days. No juveniles of *M. hapla* survived exposure to 0.3 M NaCl. These findings are consistent with the hypothesis that marine organisms in the upper tidal zone must have the ability to osmoregulate to withstand a wide range of salinity, and provide evidence that these pathogens evolved in saline conditions and are not recent introductions from terrestrial niches.

Figure 2. Sudden Vegetation Dieback: (Left) shows an intertidal creek tributary of Toms Creek River at Hammonasset Beach State Park in 2007 compared to 2014 (Right) where dieback in 2014 is severe.

Sudden Vegetation Dieback, Nutrition, and Herbivory

In 2014, we observed that recovery from SVD in certain marshes is exacerbated by grazing pressure by the purple marsh crab *Sesarma reticulatum*. We previously showed that disease and/or drought increased herbivory of SA. We now are examining the role of silicon in salt marsh health. High nitrogen levels may have prevented SA from absorbing sufficient silicon for sustainable growth. Studies done in mecocosms with adult *S. reticulatum* in the greenhouse found that plants nourished with silicon were less consumed than untreated plants. Field plots along crab-infested creek banks have been established to see if silicon-nourished plants are more or less susceptible to herbivory by the crab.

Genetic Variation and Dispersal Dynamics in *Fusarium palustre*, Associated with Sudden Vegetation Dieback in Salt Marshes of Eastern United States

Dr. Marra's research continues on *Fusarium palustre*, the fungal pathogen of *Spartina alterniflora* that was recently described by Drs. Marra and Elmer. A key component of wetland dieback syndrome, *F. palustre* has been shown by Dr. Marra to have a surprisingly high degree of genetic diversity both within and among populations sampled from various marshes ranging from Louisiana to Maine. In addition to constructing molecular phylogenies using DNA sequences from three genes, Dr. Marra has been using Amplified Fragment Length Polymorphisms (AFLP) to test hypotheses about the introduction and spread of the pathogen, and relatedness among populations. Most recently, Dr. Marra has been using these AFLP markers to analyze a group of approximately 100 additional *F. palustre* isolates from China and the Gulf of Mexico, to test hypotheses of genetic relatedness to North American strains. Dr. Marra is also analyzing other *Fusarium* isolates obtained by Dr. Elmer from salt marshes in South America, which according to preliminary sequencing results represent new, undescribed species.
Impact: Serious destruction has and will continue to occur in multiple marshes along Connecticut's Long Island Sound, making SVD of considerable ecological and societal importance. Our findings have demonstrated that stress and disease are important factors in herbivory and have also demonstrated a putative role for silicon nutrition. These findings may decipher a critical factor associated with marsh grass recovery in SVD sites and lay an understanding for how physiological and nutritional changes in *S. alterniflora* may affect its susceptibility to drought, disease, and herbivory.

Nanoparticles Studies for Root Disease Management

Materials at the nanoscale, or nanoparticles (NP), possess unique chemical and physical properties not observed in equivalent bulk materials. Although the effect and fate of NP in plants has only begun to receive attention, the literature clearly demonstrates enhanced availability and transport as a function of nanometer particle size. NP of these metal oxides applied foliarly may allow a slow release of ions that may be loaded into the phloem for transport to susceptible root tissues. Dr. Elmer, in collaboration with Dr. Jason White, Department of Analytical Chemistry, examined NP of metal oxides of Al, Cu, Fe, Mn, Ni, and Zn on tomatoes for effect on growth and soilborne disease. Greenhouse trials showed that NP of Cu, Mn, and Zn were associated with plants exhibiting reduced disease symptoms of the tomato wilt pathogen *Fusarium oxysporum* f. sp. *lycopersici* when compared to controls. A field study with eggplant transplants compared NP of Cu, Mn, and Zn to the bulked equivalent for their effect on eggplant growth, yield, and disease suppression. NP of Cu increased plant size and yield, but increased symptoms of Verticillium wilt caused by *Verticillium dahliae*.

Impact: To date, there is no information on how NP micronutrients might uniquely affect root pathogens. The role and function as fertilizer has not been sufficiently explored. These findings show positive and negative benefits of the use of NP. NP absorption of certain elements in plant leaves and roots could significantly impact plant disease management and may be a promising alternative to conventional pesticides.

Disease Survey

Drs. Yonghao Li and Sharon Douglas, assisted by Mary Inman, diagnosed a wide range of plant diseases on trees, shrubs, flowers, lawn grasses, fruits, and vegetables during the past year. The drought conditions in the fall of 2013 and extreme and unusually cold temperatures associated with the "Polar Vortex" in the winter of 2013-2014 caused severe stress and physical damage to trees and shrubs in forests, farms, and landscapes. The rainy, cool weather conditions in the spring of 2014 provided favorable conditions for outbreaks of infectious diseases caused by fungi, bacteria, and oomycetes.

<u>Herbaceous and Woody Ornamentals:</u>

In the early spring of 2014, tobacco mosaic virus (TMV) was detected in many shipments of petunia cuttings that were produced at a commercial production facility in El Salvador. TMV is a highly contagious virus that can be transmitted easily through handling and by direct contact of healthy plants with infected plants. It can spread to other host plants, including many popular bedding and vegetable plants. Numerous plant samples were brought to the PDIO for TMV testing, since greenhouse growers were advised to destroy all petunias from that facility. Impatiens necrotic spot virus (INSV) continued to be a major virus disease problem in greenhouse bedding plants. Root rot diseases caused by *Thielaviopsis* sp. and *Pythium* sp. not only caused significant losses for greenhouse flower production, but also destroyed some annual flowers and contaminated soil in landscapes. The two major diseases on Rudbeckia were fungal leaf spot caused by *Septoria* sp. and downy mildew caused by *Plasmopara* sp.

Stressed by foliar diseases and drought conditions during the growing season of 2013, and damaged by extreme and unusually cold temperatures in the winter of 2013-2014, many species of trees, including hickory, oak, arborvitae and white pine, expressed symptoms of early defoliation and dieback in the spring of 2014. Since increased numbers of Leyland cypress are being planted in Connecticut for its fast-growing habit, more cases of Seiridium canker were detected in nurseries and landscapes. Severe outbreaks of Alternaria leaf spot of privet caused early defoliation in the summer of 2014. Boxwood

blight caused by *Calonectria pseudonaviculata* and Volutella canker caused by *Volutella buxi* remained two major diseases causing severe damage to boxwood plantings in landscapes. *Gymnosporangium* rusts were found on different hosts, including apple, pear, quince, serviceberry, and cedar. A severe outbreak of ash rust caused by *Puccinia sparganioides* was observed in the early summer of 2014. Canker diseases made major contributions to dieback of many woody ornamentals, such as Botryosphaeria cankers of ash, crabapple, and rhododendron; Phomopsis cankers of juniper, maple, black pine, and rhododendron.

Tobacco mosaic virus on petunia

Downy mildew of rudbeckia

Seiridium canker of Leyland cypress

Ash rust

Rhizosphaera needlecast continued to be diagnosed on spruce trees in landscapes and Christmas tree plantations. Swiss needlecast, along with Rhabdocline needlecast, were major disease problems of Douglas-fir. Phytophthora root rot caused transplant failure and decline of Christmas trees, especially Fraser firs that were planted in clay soils with poor drainage.

Vegetables:

Septoria leaf spot remained as the most common disease in tomatoes, which caused severe early defoliation of tomato plants. In the early summer of 2014, bacterial leaf spot caused by *Xanthomonas*

campestris pv. *vesicatoria* was found on tomato plants grown in vegetable gardens. INSV was detected in tomato, pepper, and eggplant seedlings that were grown in a greenhouse. Powdery mildew remained as a common problem of cucurbits in both commercial farms and vegetable gardens. But an early outbreak of bacterial leaf spot was observed on summer squash plants in the early spring of 2014. Xanthomonas bacterial leaf spot was commonly observed in pepper fields.

Impatiens necrotic spot virus on tomato

Bacterial leaf spot of tomato

Leaf curl of peach

Powdery mildew of strawberry

Tree and Small Fruit:

Powdery mildew along with black rot and downy mildew remained as a major disease problem of grape. Leaf curl and brown rot were two major disease problems of peach. An epidemic of powdery mildew of strawberry was observed in a small farm in the late summer of 2013.

Turf:

Brown patch and summer patch were two major disease problems on residential lawns, although some minor diseases were found, such as red thread, powdery mildew, slime mold, anthracnose, rust, and Pythium root rot. Since extended cold temperatures resulted in a longer period of snow cover, severe snow mold damage was found in some lawns in the early spring of 2014.

Weeds:

Predominant weeds in turf and gardens were crabgrass, annual blue grass, ground ivy, wild violets, wild garlic, bentgrass, bittercress, chickweed, clover, foxtail, garlic mustard, mugwort, nightshade, nutsedge, oriental bittersweet, phragmites, pigweed, purslane, spurge, red sorrel, and speedwell. Spreading of running bamboos remained an increasing public concern. Identification and control of Japanese knotweed and poison ivy continued to be significant problems.
Impact: Information on the diseases that occur on plants in Connecticut landscapes, natural woodlots, and forests each year helps to monitor and assess the impact of these problems on the overall health of plants in the state. This information also assists in detecting new diseases or in identifying potentially important emerging diseases on specific plants, which can then be monitored in the years that follow.

SERVICE ACTIVITIES

Members of the Department of Plant Pathology and Ecology are involved in a wide range of service and public outreach activities. Some of these services involve presentations, publications, displays at meetings and other outreach events, tours of facilities, and interviews, in addition to being conducted in cooperation with other state agencies.

Seed Testing: In Cooperation with the Connecticut Department of Agriculture, Bureau of Regulation and Inspection

Every year, inspectors from the Bureau of Regulation and Inspection of the Connecticut Department of Agriculture collect official samples of vegetable, crop, and lawn seeds for analysis. Samples are submitted to The Connecticut Agricultural Experiment Station since it is the official seed testing laboratory for Connecticut. The Department of Plant Pathology and Ecology performs the germination and purity analyses that are required for compliance with the Connecticut Seed Law Regulations and the Federal Seed Act. In 2014, 315 vegetable, 7 lawn, and 7 crop seed samples were submitted to Dr. Douglas for testing. Mary Inman and Pamela Sletten test all seeds following strict protocols designated by the Association of Official Seed Analysts (AOSA). Seedlings are carefully examined, since they must appear “normal” (i.e., free from decay, have well-developed primary root systems, have well-developed and intact hypocotyls and/or epicotyls, and have healthy cotyledons). Vegetable seeds are tested for germination, and of the 315 vegetable seed samples tested, 38 did not meet their label claims for germination. They were not retested because of insufficient numbers of seeds. Seed samples were examined for prohibited noxious weed seeds and no vegetable samples contained weed contaminants. Lawn seeds are tested for both germination and purity. Five of the seven lawn seed samples tested met label claims for both purity and germination. One sample failed purity claims, but passed germination claims and one sample failed germination claims, but passed purity claims. None of the 2014 lawn samples contained seeds of noxious weeds. Crop seeds are also tested for both germination and purity. Six of the 7 crop seed samples tested passed label claims for purity and germination. One sample failed claims for germination, but passed label claims for purity. No noxious weeds were identified in the samples. A *Station Technical Bulletin* (TB11) “Seed Germination and Purity Analysis 2014,” was written to report the findings of this year’s results.

Impact: Results of seed tests conducted by Station staff are reported to the Seed Control Official of the CT Department of Agriculture who has the authority to stop the sale of products that do not meet label claims or contain noxious weeds. In the short term, this program protects state residents from purchasing inferior seed and ensures that seeds comply with the Connecticut Seed Law Regulations and the Federal Seed Act. The long-term benefit of the seed testing program is to minimize the unintentional introduction of noxious weed seeds that could potentially impact crops of economic importance and the state's ecosystem.

Samples for Analytical Chemistry and the Connecticut Department of Consumer Protection

During the year, Dr. Li and Ms. Inman examined 23 samples from the Connecticut Department of Consumer Protection at the request of the Department of Analytical Chemistry of the Experiment Station.

Ramorum Blight/*Phytophthora ramorum*: Samples for 2013-2014 Trace-Forward and Trace-Back Surveys

As a result of the renovation of Jenkins Laboratory, Drs. Marra and Douglas and The Molecular Plant Disease Diagnostic Laboratory of the Experiment Station are not participating as an approved laboratory in the **National Plant Pathogen Laboratory Accreditation Program (NPPLAP)** for testing *Phytophthora ramorum* for the near future. Participation in this program will be reconsidered once we move back into the renovated building.
Although the yearly national survey for *P. ramorum* is not being conducted this year, the Station continued to comply with trace-forward and trace-back surveys at the request of USDA-APHIS-PPQ in 2013-2014. Drs. Douglas and Marra supervise assays for testing samples in conjunction with Dr. Victoria Smith (Deputy State Entomologist), who supervises the collection of samples by CAES nursery inspectors. One trace-forward survey was authorized, which resulted in four samples. Samples were pre-screened for all *Phytophthora* species using immunostrips. All samples tested negative for *Phytophthora* species. One trace-back survey was authorized, and resulted in two samples, both of which tested positive for *Phytophthora* species using ELISA. DNA was extracted from these samples and sent to an authorized NPPLAP laboratory—they were negative for *P. ramorum*.

Citizen Inquiries
Plant Disease Information Office

Drs. Li and Douglas, assisted by Ms. Inman, answered 4,467 inquiries about plant health from Connecticut citizens. Although the majority of inquiries were on ornamentals, trees, and shrubs (67%), other categories, such as food crops (16%) and turf grasses (4%), were also well represented. A moderate percentage of inquiries fell into the miscellaneous category (13%), which included identification of plants and poison ivy control and identification. Although the majority of inquiries were from Connecticut homeowners (59%), there were many inquiries from commercial growers and plant care professionals (36%). Inquiries from cooperative extension, health, news, and agricultural personnel (5%) remained consistent with previous years. A further breakdown of inquiries showed that 40% of the questions came in by phone, 17% came in by mail, 9% came as email, and 34% were brought in person. The number of physical samples handled by the PDIO (51%) continued to exceed the number of phone calls (49%)—this is a trend that has been observed for the past 5 years. Over 1,160 letters and email messages with attached files of fact sheets were sent from the PDIO. Many citizens opted to download fact sheets posted on the CAES website in lieu of letters, since this gave them instant access to the information of concern. Most of the miscellaneous questions were concerned with identification, human toxicity, and control of poison ivy and other poisonous plants, identification of various plants and weeds, mushroom

identification for health officials, and information about pesticides and their relationships to health and environmental concerns.

Additional Inquiries from Stakeholders

Dr. Anagnostakis answered 256 questions and made 14 site visits. Dr. Elmer made 5 site visits to growers and answered 12 phone calls and 5 emails. Dr. Ferrandino answered 26 questions, tested 7 samples, and made 11 site visits. Dr. Li made 13 site visits.

Impact: During the period covered by this Report, over 5,170 Connecticut residents had plant disease problems accurately diagnosed by members of the Department of Plant Pathology and Ecology. In many cases, the plant health problems diagnosed did not require fungicides for control, contrary to the initial perception that fungicides would be required. Staff worked closely to educate professionals and homeowners to develop disease management programs that were compatible with the environment that incorporated cultural practices, sanitation, and genetic resistance prior to pesticide use. Accurate diagnosis of plant health problems, educated citizenry, and implementation of integrated disease management strategies reduce pesticides introduced into the environment and water of Connecticut.

MEETINGS ORGANIZED BY THE DEPARTMENT OF PLANT PATHOLOGY AND ECOLOGY

Meetings and Workshops

Dr. Sharon M. Douglas served on the organizing committee, moderated, and led a discussion session on "Boxwood Blight Biology & Epidemiology" for the *2nd International Boxwood Summit* held 13 May 2014 at the National Agricultural Library on the USDA-ARS campus in Beltsville MD. Dr. Robert E. Marra also participated as an invited speaker on "Boxwood Blight: Detection, Biology & Genetics." Dr. Douglas and Dr. James LaMondia presented a poster titled "*Calonectria pseudonaviculata* can cause leaf spot and stem blight of *Pachysandra terminalis* and *P. procumbens*."

Dr. Wade H. Elmer co-sponsored two Bedding Plant Meetings with Ms. Leanne Pundt (UConn Cooperative Extension) and Dr. Yonghao Li. Topics covered included: "Root Rot Diseases," "Foliar Diseases of Spring Crops and their Management," "Slow Release Fertilizers," and "Tales from Grower Greenhouses: What Bugged You in 2013?" On February 25, the meeting was held at the Tolland Cooperative Extension Center in Vernon, CT (approx. 38 attendees) and on February 27, the meeting was held at the University of Connecticut, Torrington campus, in Torrington, CT (approx. 42 attendees). Out of the 58 evaluations returned, 57 (98%) cited Dr. Elmer's talk on Root Rot Diseases as useful or very useful.

VALLEY LABORATORY

Scientists at the Valley Laboratory conduct multidisciplinary research on insects, diseases, soil nutrition, mycology, integrated pest management and weeds of concern to commercial agriculture and homeowners in Connecticut. The Valley Laboratory, located in Windsor, was originally established by the Board of Control in 1921 to conduct tobacco research. While research on shade and broadleaf tobacco continues today, the research mission has greatly expanded to reflect the diverse agriculture present in the State. In addition to research, scientists and staff diagnose insect and plant health problems, test soils for fertility, conduct outreach to growers and homeowners by speaking to professional and community groups, host informational meetings, and assist students.

Activities on the farm

There were a total of 41 experimental plots at the Windsor research farm during the past year. Three Windsor-based scientists had 22 of these plots; six New Haven-based scientists and a University of Connecticut graduate student were using 19 plots. The remaining plots were maintained by the Farm Manager as rotation crops or for seed collection. Valley Laboratory scientists also conducted experiments in many plots off site, such as in growers' fields, the Lockwood and Griswold farms and State forests. Valley Lab Farm Manager James Preste kept the farm and equipment ready and in excellent shape. He expertly maintained the many field plots and addressed the specific needs of each scientist. He and his summer research assistants did an outstanding job maintaining the extensive ornamental garden in cooperation with the Connecticut Nursery and Landscape Association. Mr. Preste and Dr. LaMondia coordinated the Valley Laboratory effort to comply with EPA Worker Protection Standards for Agricultural Pesticides and organized and conducted training sessions for the staff.

RESEARCH ACTIVITIES

Hemlock Woolly Adelgid Research

Biological control using imported predators of the adelgid is a major long-term national strategy for reducing the impact and spread of invasive hemlock woolly adelgid (HWA) threatening eastern hemlocks. *Sasajiscymnus tsugae* (Coleoptera:Coccinellidae), originating from Honshu, Japan, and discovered by a CAES scientist, is one of the primary biological control agents released for HWA management.

Evaluation of Volatiles as Possible Attractants for *Sasajiscymnus tsugae*, Introduced Predator of the Hemlock Woolly Adelgid

Dr. Carole Cheah, in collaboration with Dr. Allen Cohen of North Carolina State University, Insect Rearing Program, conducted olfactometer testing of *S. tsugae* responses to foliage of other Japanese tree species. Adult males and females showed no preference to foliage of *Picea polita*, the tiger tail spruce (synonymous with *P. torano*). *P. polita* is the alternate host for hemlock woolly adelgid in Japan. Mature adult female and male *S. tsugae* also did not show preference for an uninfested southern Japanese hemlock seedling of *Tsuga sieboldii*, which is the natural tree host for HWA in its native southern Japan.

HWA status in Connecticut 2014

Dr. Carole Cheah's field surveys of state lands where hemlocks occurred in 2013 had previously shown that HWA has dramatically increased and spread after 2 consecutive warmer winters following a long period of patchy low populations. However, the winter of 2014 was severe and the polar vortex event in

early January resulted in widespread winter mortality of HWA throughout Connecticut. Minimum daily temperatures of -7 to -9°F occurred in the three climatic regions (National Oceanic and Atmospheric Administration) of Connecticut. Mean HWA mortality was 84% for the whole of Connecticut while regionally, survival of HWA was higher in the colder north-west (division 1), where winter mortality averaged 78.5%. Higher survival in the coldest region of Connecticut may indicate that the adelgid is developing more cold-hardiness. Adelgid winter mortality in the central and northeast regions (division 2) averaged 83.5% while southern, coastal HWA (division 3) averaged 84% mortality. Spring populations of HWA were depressed overall and the second summer progrediens generation of HWA is locally heavy but patchy in distribution, occurring only where there was better survival in urban areas.

In June 2014, a larva of *S. tsugae* was recovered at the Valley Laboratory farm in Windsor, indicating the HWA predator survived the unusually cold winter of 2013-2014.

Implementation of Biological Control of Mile-a-Minute Weed in Connecticut

Mile-a-minute weed, *Persicaria perfoliata*, (MAM) originates from Asia, was first discovered in the eastern U.S. in the 1930s and is classified as an invasive weed in Connecticut. Infestations are found in 9 eastern states and the first record of MAM in Connecticut was from Greenwich in 1997, confirmed in 2000. In Connecticut, 41 towns have confirmed reports of MAM, though some have only limited reports of a few plants. This rapidly growing prickly and prolific vine is annual in its northern range but quickly forms dense thickets which overwhelm and displace native vegetation and reduces plant diversity. An introduced weevil, *Rhinoncomimus latipes* (Coleoptera: Curculionidae), imported from central China, has been successfully reared and released for biological control of this invasive species in the Mid-Atlantic and southern New England states. This project is a collaboration between the CAES and the University of Connecticut and is funded by USDA APHIS PPQ, in cooperation with the New Jersey Department of Agriculture Phillip Alampi Beneficial Insect Laboratory, the University of Rhode Island and the University of Delaware. In collaboration with Donna Ellis from the University of Connecticut, nearly 36,000 weevils have been released to date in 17 towns from 2009-2014. The weevils have been released to control MAM in North Haven, Greenwich, Newtown, New Milford and Bridgewater (2009), Stamford, Westport and Fairfield (2010) and Sprague and Norwalk (2011), Wilton, Middlefield (2012) and Roxbury, Stonington, Stratford, Ridgefield, Woodbury (2013). Further releases are being implemented in additional towns in 2014. Dr. Cheah has participated in the releases and monitoring of all the release sites since 2009. Weevils have been established at all previous release sites, survived five diverse Connecticut winters, severe spring and summer flooding, and reproduced with multiple generations. High feeding impact has been recorded in the late summer at several sites. Dispersal has also been recorded at least 14 miles from the nearest release site.

Impacts:

- Weevils released to control mile-a-minute weed in the western and eastern portions of the state are starting to impact and reduce local populations of MAM at several release sites.
- Establishment of *R. latipes* for mile-a-minute weed would provide a natural control to limit spread and range expansion of a prolific invasive weed, and reduce the need for chemical control, especially in watershed areas, in utility right-of ways, agricultural lands, bird refuges etc.


Releases of weevils in Middlefield and Greenwich June 2014

Elongate Hemlock Scale Research
Augmentative Biological Control of Elongate Hemlock Scale

Elongate hemlock scale, *Fiorinia externa* (EHS), an exotic scale present in Connecticut since the 1960s, has recently rapidly expanded its range and population densities to seriously damaging levels on forest and landscape hemlocks over much of Connecticut in the past 5 years. Forest stands in Connecticut with heavy elongate hemlock scale infestations have shown thinning crowns and declining health, leading to pre-emptive hemlock salvage in forest management. Preliminary sampling in EHS-dominated Connecticut stands in 2010 by Dr. Cheah has indicated increased numbers of the twice-stabbed lady beetle, *Chilocorus stigma,* which is a native and widespread omnivorous scale predator, but *C. stigma* has not been mass-reared and is not available commercially. This project, funded by USDA APHIS PPQ, seeks to develop optimal laboratory methods to mass rear suitable scale cultures and *C. stigma* for potential augmentative and safe biological control releases in EHS-affected stands. In 2013-2014, Dr. Cheah continued to survey for EHS in Connecticut and collected *C. stigma* in the fall for laboratory experiments. Cultures of Florida red scale, *Chrysomphalus aonidum*, originally obtained from the University of Florida/IFAS at the Southwest Florida Research and Education Center in Immokalee, FL, were maintained on butternut squash through the summer. In 2013, adult *C. stigma* survived for a month on the squash infestation of *C. aonidum* and appeared to be adapting to a new host/prey system but no oviposition was observed. However, surviving adults readily returned to feeding on elongate hemlock scale on hemlock after their exposure to *C. aonidium*, demonstrating the oligophagous habit of this species. All previous scale species cultures on butternut squash have not been successful. Mealybug cultures were readily established on squash, but *C. stigma* adults appeared to have no sustained interest in feeding on the adults and eggs. However, *C. stigma* fed and developed successfully to adult on circular scale, *Nuculaspis tsugae*, another exotic scale species on hemlocks and in 2014, *N. tsugae* inoculations onto butternut squash are in progress.

Surveys in 2013 -2014 showed that eastern hemlocks continued to decline in certain regions, especially in the northwest corner, due to heavy EHS infestations, in either single or joint infestations with HWA. Thinning crowns and increased incidences of hemlock borer, a native secondary pest that attacks stressed trees, was observed in marginal sites. At risk from the combined threats of the scale and the return of HWA are 171,000 acres of eastern hemlock throughout Connecticut forests. Large areas of hemlock are being salvaged on watershed lands due to rapid decline in hemlock health and value. The map below show the status of EHS in Connecticut following new forest surveys from 2011 – 2013 (Fig. 1).

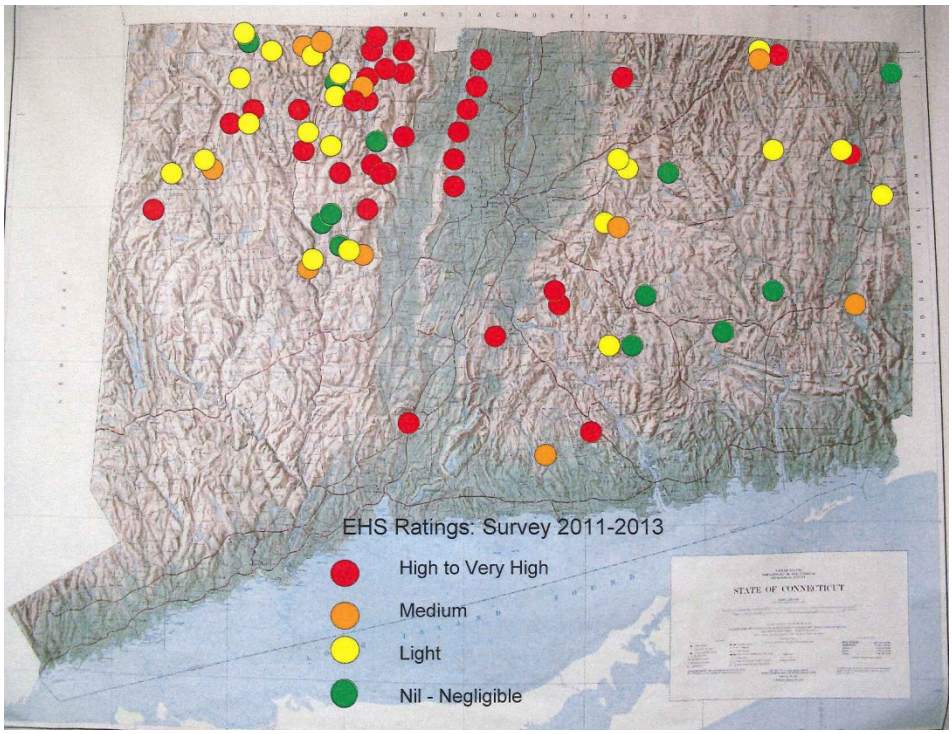


Figure 1: Connecticut EHS Survey 2011-2013

In 2014, elongate hemlock scale winter survival was much higher than for hemlock woolly adelgid. Assessments were made of field mortality after the polar vortex event in early January 2014. Mean winter mortality of EHS was 54.8 % in northern sites (n=6) and 34% in southern sites (n=2) but with high variability.

Impacts: Currently there is no effective non-chemical control of elongate hemlock scale and the range is expanding northwards into Maine. Development of novel mass rearing procedures for *C. stigma*, a safe, omnivorous, climatically-adapted native predator of EHS, would allow implementation into new areas, augment local forest populations and also provide a method of biological control for many scale pests in plantations and orchards, reducing pesticide usage.

Insect Management

Since discovering spotted wing drosophila in Connecticut in 2011, Dr. Cowles has focused on developing low environmental impact and IPM-compatible approaches for managing this pest. Conventional practices require applications of insecticides directly on ripening fruits soon before they are harvested. A successful alternative will need to attract the flies away from the fruit and to a surface where they may then encounter an effective lethal agent. The methods to kill the flies could be as diverse as physically drowning the flies in the attractant bait, exposure to vinegar fly pathogens, or contact with insecticides applied to the outside of a trap. A great advantage of this concept is that very little insecticide may be needed when it is applied in this manner, and so unusual insecticides that would be too expensive or harmful to spray on the fruit or plants may be cost effective and safe when applied to traps.

Dr. Cowles developed improved attractants and traps for monitoring and potentially trapping out populations of the spotted wing drosophila (SWD), in collaboration with research and extension fruit specialists throughout the country. His research has determined that kombucha, an inexpensive fermented bait, was superior to the commercial Suzukii Trap bait when tested in greenhouse choice tests. The first SWD trapped in 2014 in CT (and the entire Northeast) was captured in a trap baited with kombucha, rather than five competing baits. In field tests, dark color and black patterns on traps only slightly improve SWD trap capture. A highly attractive odor seems to be of overriding importance. A test using fast knock-down insecticides on the outside of attractant traps demonstrated that only 10 – 30% of flies visiting attractant traps enter the trap and drown in the bait. Therefore, the best method to reduce fly populations with traps must use a feeding stimulant and insecticide applied to the outside of the trap. Sugar and boric acid are particularly well suited for this approach.

Dr. Cowles also tested insecticides to manage SWD. Three reduced-risk insecticides: spinetoram, cyantraniliprole, and acetamiprid, when combined with sucrose, appear to not only be effective against SWD adults but also have sufficient trans-laminar activity to protect blueberries from larval infestation. These materials may serve as the basis for "Eco-berry" insecticide alternatives when growers choose to avoid using the more environmentally damaging organophosphate and pyrethroid insecticides, and may provide sufficient protection of fruit to reduce the need for frequent sprays to berry crops. Extension specialists are currently encouraging growers to use sucrose with their SWD sprays

Impacts: Dr. Cowles' research has assisted fruit extension specialists through New England. The use of baits and traps designed by Dr. Cowles has provided timely monitoring information to fruit growers, enabling them to protect their fruit from damage.

- Growers in New England had early warning of SWD activity from extension personnel using effective monitoring methods
- Growers have adopted the use of sucrose with their sprays to more effectively manage SWD

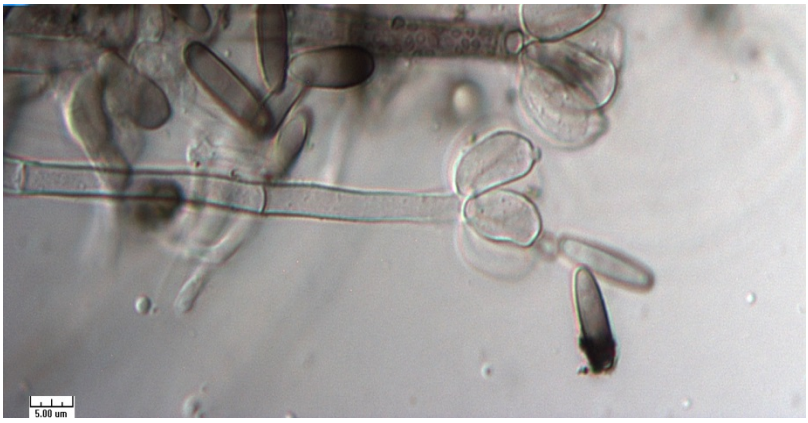
Dr. Cowles, along with Dr. Anthony Lagalante of Villanova University and Kyle Lombard of the NH Department of Natural Resources, applied imidacloprid to mature sugar maples, following the USDA APHIS Asian longhorned beetle quarantine protocol, to determine the degree to which this insecticide would later be detected in harvested sap and syrup. Imidacloprid residues were detected, which would make sap from treated trees unmarketable. These residues are not greatly affected by heat, and so are concentrated when sap is converted to syrup.

Dr. Cowles and many volunteers planted 6,000 fir trees of several species to investigate their genetic adaptability to being grown in wet soils, and their suitability for growing as Christmas trees. In this project, firs from the Mediterranean region (Turkish, Nordmann, and Trojan firs) appear to be highly tolerant of wet sites. However, their early bud break may predispose them to injury from late frosts and they should only be considered for planting in sites other than frost pockets.

Mycology Research

Dr. DeWei Li conducts research on indoor molds of human health concern, fungal succession on water-damaged building materials, and infiltration of mushroom spores from outdoors into residences.

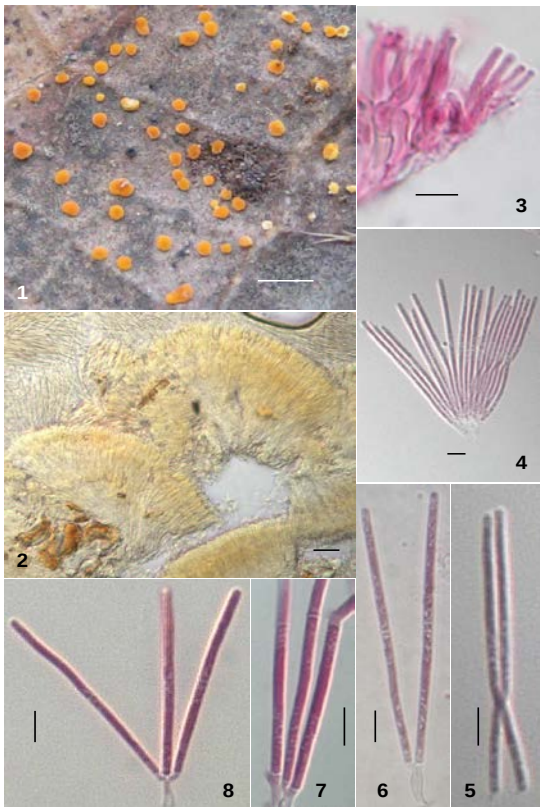
Toxic indoor mold - *Stachybotrys* and *Memnoniella* biosystematics study:



Stachybotrys eucylindrospora was isolated from eye tissues following eye injury and found to cause eye infection. Dr. Li carried out a phylogenetic study to identify *S. eucylindrospora*. This study was conducted in collaboration with mycologists and medical doctors from Medical schools in Texas and Ohio. *Stachybotrys elegans* was reported from indoor environments for the first time.

New human pathogen, *Stachybotrys eucylindrospora.*

Impact: This is the first report of any species of *Stachybotrys* as a human pathogen. The results of this research will assist medical professionals in diagnosis and treatment of infection caused by *Stachybotrys* in the future. In addition to *S. chartarum* and *S. echinata*, *Stachybotrys elegans* joined the fungal diversity list of indoor molds for the first time. These results provide significant information that will influence research and practice by mycologists, medical practitioners, certified industry hygienists, indoor environment professionals, and biologists.



New fungal taxa: specimens were collected through the year indoors and outdoors. One fungal species new to science (*Linodochium sinense*) was reported. More new species are being studied.

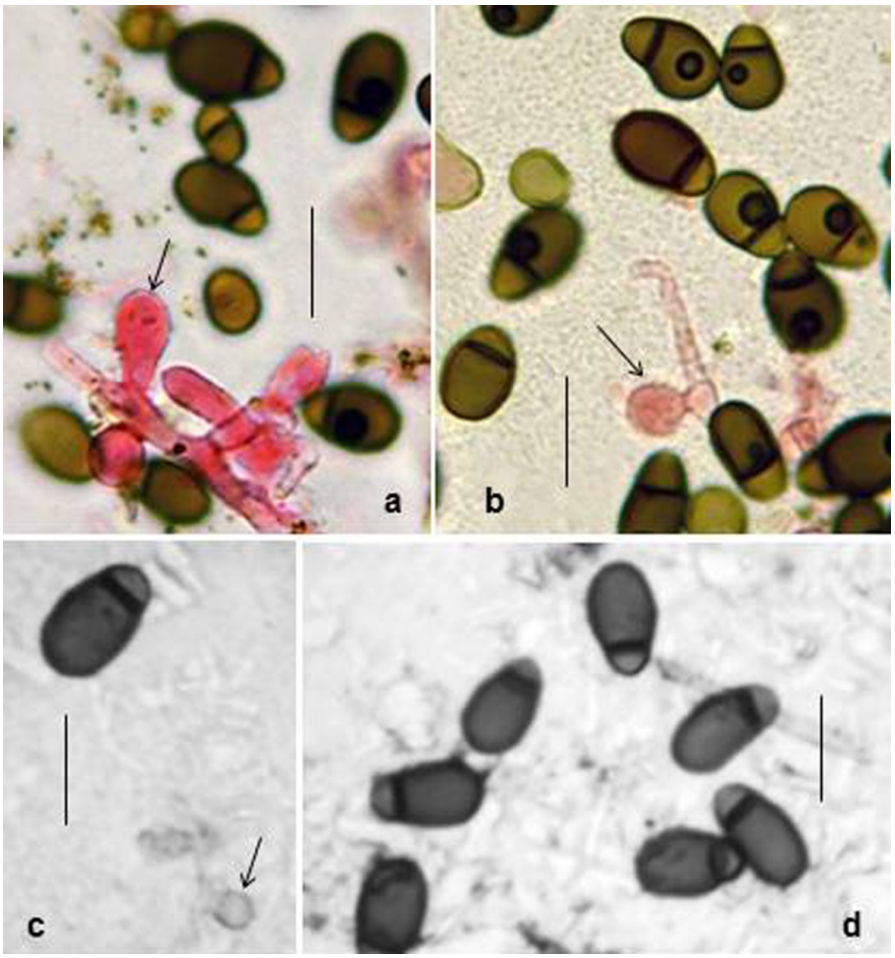
Impact: A vast majority of fungi remain unknown. We are facing a huge task to describe fungi before they disappear. Each and every new fungal species described is significant to science and biodiversity. The effort to discover, describe, and conserve new fungal species has to continue. Identification ofnew species of fungi provides essential information for future studies on ecosystems and biosystematics. The significance of new fungi as bio-resources and to our environments remains unknown. Disappearance of any organism will be a huge and irreversible loss to our human beings. There is no exception for fungi.

A new fungal species *Linodochium sinense.*

Indoor mold study:

Nalanthamala vermoesenii, *Parascedosporium putredinis*, *Stachybotrys elegans*, and *Triadelphia australiensis* were collected from indoor environments. Among these fungi, *Triadelphia australiensis* was a new record for Canada and the USA. *Parascedosporium putredinis* and *Stachybotrys elegans* were reported for the first time from indoor environments.

Impact: Fungal diversity in indoor environments is far from fully studied. The comprehensive list of indoor fungi is still under development. The major obstacle in indoor mycology is to identify indoor fungi to species. Since the health effects of some indoor fungi are species specific, these new records of well characterized fungal species will provide new information to allergic patients, the public, public health professionals, medical practitioners, mycologists, and indoor mold investigators. The new information will also help to characterize potential effects of indoor molds on human health. *Triadelphia australiensis* is a new record for fungal diversity in North America.



Triadelphia australiensis, a new fungal record in the USA and Canada.

Impact: Because the impacts of fungi on health are species specific, the identification of new species and records of indoor molds provides important information to medical practitioners for protecting citizens, particularly children and adults with asthma conditions.

Boxwood blight

Boxwood blight is a new, introduced disease in Connecticut. The impact of the disease has been very high; boxwood plant losses have been estimated at over $3 million in Connecticut since October 2011. In addition, the concern about boxwood has resulted in reduced or lost orders for other plants, resulting in a multiplier effect on economic losses. Dr. James LaMondia has conducted research to determine fungicide efficacy *in vitro* and in plant systems. *Calonectria pseudonaviculata* causes leaf spot and stem lesions resulting in defoliation and dieback of boxwood. *In vitro* assays identified systemic and protectant fungicides with activity against conidial germination and mycelial growth. A number of Connecticut isolates were evaluated against these fungicides to screen for potential fungicide insensitivity; and there was considerable variation in mycelial growth response on media amended with the strobilurin fungicide pyraclostrobin. The EC_{85} for pyraclostrobin against mycelial growth was 5.3 ppm, while conidial germination was much more sensitive, with an EC_{85} of 0.11 ppm. Some isolates did not grow at 5 ppm while others grew at significantly higher concentrations. These fungi were transferred to increasing concentrations of the fungicide and several were identified that could grow at 1000 ppm pyraclostrobin. However, conidial germination of all isolates was completely inhibited when conidia were placed on

media containing 1 ppm pyraclostrobin. Strobilurin fungicides inhibit mitochondrial respiration by binding to the Q_0 site of cytochrome b, blocking electron transfer and disrupting ATP production. A number of fungi have been reported to be more sensitive to strobilurin fungicides *in vivo* than *in vitro* because of an alternative oxidase pathway that functions *in vitro*, but not in strobilurin fungicide–treated plant tissues. Host-plant antioxidants such as flavones may interfere with the induction of the alternative pathway *in vivo*. Salicylhydroxamic acid (SHAM) has been used to inhibit the alternative oxidase pathway. The effects of SHAM incorporated into media on the efficacy of pyraclostrobin were determined for mycelial growth of a number of isolates of *C. pseudonaviculata*. Preliminary results indicate that fungal growth rate did not differ in the presence or absence of SHAM for the pyraclostrobin sensitive isolate. In the absence of SHAM, potential pyraclostrobin-insensitive isolates grew on media amended with 1000 ppm pyraclostrobin. When SHAM was present, these isolates continued to grow, but at slower rates than when SHAM was not present. These data suggest that both the *in vitro* alternative oxidase pathway and pyraclostrobin insensitivity may be contributing to the ability of *C. pseudonaviculata* to grow on pyraclostrobin amended media. Any potential insensitivity to the fungicide is not expressed in conidial germination, which remains more affected by lower rates of pyraclostrobin. This research is continuing.

In planta: A series of container nursery experiments were conducted based on the results of Dr. LaMondia's previous *in vitro* evaluation of fungicide active ingredients against *C. pseudonaviculata* conidial germination and mycelial growth. A number of fungicides including systemic fungicides with activity against mycelial growth and protectant fungicides with activity against conidial germination (thiophanate-methyl, propiconazole, myclobutanil, pyraclostrobin, fludioxonil, kresoxim-methyl, chlorothalonil and mancozeb) all had activity against the pathogen and significantly reduced disease in these experiments. Green Velvet, Green Gem and Tide Hill boxwoods were inoculated with the pathogen 48 hours after the first fungicide application and treatments consisted of protectant fungicides alone or combined applications of systemic plus protectant fungicides at either 14-day or 21-day intervals. Numbers of disease lesions and number of dropped leaves were counted 8 weeks after the first spray. Results indicated that boxwood blight management was most successful using a combination of systemic plus protectant fungicides and that disease control was greater at 14-day than at 21-day intervals. Boxwood blight was more severe on Green Gem than Green Velvet and least on Tide Hill boxwood.

Impact: The identification of fungicide application programs with activity against spore germination and vegetative growth of the boxwood blight pathogen will lead to the development of effective management strategies.

Tobacco Disease Research

The Connecticut Agricultural Experiment Station Valley Laboratory was established in 1921 (as the Tobacco Substation), to combat tobacco problems and diseases such as wildfire. Wildfire was eventually eliminated by the development of plant resistance. Ever since, tobacco breeding to incorporate genetic plant resistance to plant pathogens has been used to successfully manage diseases. Plant resistance to major pathogens is the most economical, environmentally responsible, and often most effective way to control plant diseases. The development of plant resistance to Tobacco Mosaic Virus (TMV) in the 1950's, to ozone damage (weather fleck) in the 1960's, black shank in the 1970's, and Fusarium wilt in the 1980's and early 1990's effectively controlled serious diseases which each threatened to seriously impact cigar wrapper tobacco production in the Connecticut River Valley. There are currently a number of pathogens that threaten the crop. Dr. LaMondia conducts an ongoing breeding program to develop resistance to: *Fusarium oxysporum* (causing Fusarium wilt); *Globodera tabacum* (the tobacco cyst nematode); tobacco mosaic virus, and *Peronospora tabacina* (blue mold) for both shade and broadleaf

types. Recently, a male-sterile F1 hybrid 'B2' highly resistant to Fusarium wilt, TMV and the TCN and with moderate resistance to blue mold was released and licensed. Black shank, caused by *Phytophthora nicotianae*, has recently re-emerged as a serious pathogen in Connecticut and a hybrid broadleaf line with significant resistance to the pathogen was developed. This line, B3, is being evaluated under field conditions in 2014. Black root rot, caused by the fungus *Thielaviopsis basicola* has been damaging and increasing in severity in recent years with cool wet springs. Three sources of dark wrapper tobacco with high levels of black root rot resistance are being used in a back-cross program to transfer resistance to CT broadleaf. Resistant plants are being selected for broadleaf characteristics. Inbreds will be developed for use in hybrid lines with resistance to multiple pathogens. A burley tobacco cultivar (TN-86) with resistance to Potato Virus Y (PVY) has been obtained and is being crossed to CT tobacco types to transfer resistance to that virus.

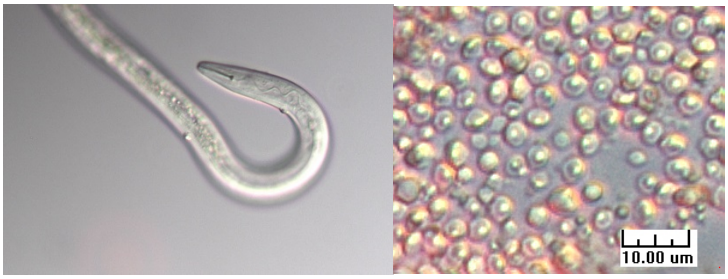
Impacts: The development of a male-sterile hybrid broadleaf cigar wrapper tobacco with resistance to most of the major pathogens, including Fusarium wilt, TMV, the TCN and blue mold, should allow sustainable crop production with reduced losses to disease and much reduced pesticide inputs. B2 has been released as a new cultivar and seed production has been licensed to a local company. Proceeds will support further research on plant resistance. Adding resistance to black root rot and to PVY will further reduce plant losses to disease.

Reduced pesticide residues in tobacco:

Connecticut shade and broadleaf tobacco types are used to produce some of the highest quality cigar wrappers in the world. Blue mold, caused by *Peronospora tabacina*, is a leaf spot disease that can destroy the crop, valued at up to $50,000,000 per year. Fungicides can help protect the leaves, but growers and cigar makers want to keep residues as low as possible. Dr. LaMondia conducted experiments to maximize disease control with reduced levels of fungicide in cured leaves for a second year in 2013. The strategy tested the effects of using dimethomorph or mandipropamid fungicides early in the season and avoiding or minimizing sprays prior to harvest as opposed to the standard application of the same total amount of fungicide spread out more uniformly over the season. Leaves were harvested, cured and fungicide residues determined by Dr. Brian Eitzer of the Department of Analytical Chemistry. Early fungicide application significantly reduced the severity of disease and nearly halved the concentration of fungicide residues in cured broadleaf tobacco.

Impacts: The development of a more effective spray program that results in reduced fungicide residues in broadleaf cigar wrapper tobacco will increase marketability and reduce human exposure to pesticides.

Nematode Management



Northern root-knot nematodes, *Meloidogyne hapla*, are damaging pathogens of many crops, including vegetables and ornamentals. Dr. LaMondia observed a natural decline of populations of these nematodes over time in field microplots infested since 1995 and repeatedly inoculated with the pathogen. *Pasteuria* endospores were observed on the cuticles of 60% of *M. hapla* juveniles exposed to soil from field microplots which appear to have developed suppressive soil characteristics. *Pasteuria* spp. are spore-forming bacterial

obligate parasites of root-knot nematodes. Soil sampled from all microplots was either left as non-treated, microwaved, or autoclaved. Pots containing these soils were inoculated with *M. hapla*; after 5 weeks, autoclaved soil had more galls than either microwaved or untreated soil. Nematodes added to soils were recovered by sugar centrifugation; autoclaved soil had fewer endospore-encumbered nematodes than microwaved soil, which had fewer than non-treated soil. *M. hapla* juveniles exposed to non-treated soil were inoculated to tomato transplants and endospore-filled females were observed.

Impacts: The observation of *Pasteuria* spp. affecting *Meloidogyne hapla* may lead to the development of biological control of these plant pathogenic nematodes and reduce human exposure to pesticides.

Field plots at the CAES Griswold Research Farm naturally infested with *Meloidogyne hapla* were planted to Pacific Gold brassica, rye or tomato in June of 2012. In September, Pacific Gold plots were either tilled in and rolled to seal, or allowed to senesce without tillage. All plots were planted with San Marzano tomato transplants in early June 2013 and plants were destructively sampled through the season to determine numbers of nematode galls on roots. Gall counts from plots planted to tomato or Pacific Gold without tillage were similar, as were those planted to non-host rye or Pacific Gold that had been tilled.

Impacts: Soil incorporation of Pacific Gold brassica appears to be an effective biofumigation method for management of root-knot nematodes.

Hops Research

Hops are a new crop in some Northeast states, but no yield or vigor data currently exists for Connecticut. Hops were grown in the Northeast in the past but production moved west as a result of disease problems such as downy and powdery mildews. New cultivars have been recently developed with resistance to some of these pathogens and hops have become a successful crop in other Northeast states. Representatives of Connecticut breweries and the CT Brewers Guild have encouraged growers to start local hops production, but growers are hesitant to risk financial loss without a demonstration of feasibility. Hop production would add a new specialty crop to Connecticut, increase crop and economic options for local growers and indirectly add value to the brewing industry and other local crops such as malt grains. Drs. James LaMondia and Abigail Maynard, in collaboration with Dr. Victor Triolo of Southern Connecticut State University, received funding from The CT Department of Agriculture to enhance the competitiveness of hops as a new specialty crop in Connecticut by demonstrating the feasibility of hop production in Connecticut. Hop plantings were established in Windsor and Hamden, and data concerning vigor and yield of high value high-alpha acid, disease-resistant hop cultivars are being collected. The 5 cultivars (including a new semi-dwarf cultivar) are being compared in low- versus high-trellis systems for yield, disease and insect pressure.

Impacts: Local hop production would add a new, high value specialty crop to our state and enhance the local craft brewing industry. This is a grower-requested project that is a necessary step prior to the potential development of this new crop.

Forsythia shoot blight was first observed in Connecticut in 2012. Drs. James LaMondia and De-Wei Li, working with colleagues from the University of Massachusetts, isolated and identified the pathogen morphologically and by using BLAST analysis of ITS, Cox II and beta tubulin gene sequences (99% match for the three sequences, E value = 0) as *Phytophthora nicotianae.* The isolated pathogen was demonstrated to be pathogenic to forsythia. Typical symptoms developed within one week of inoculation and the pathogen was re-isolated from diseased tissue. Disease incidence was nearly 100% of inoculated leaves and stems and not observed in control plants without the pathogen. Six-week-old broadleaf tobacco plants were inoculated with tobacco or forsythia isolates of *P. nicotianae* or sterile media alone, by wounding stems and placing colonized 0.25 cm^2 plugs into wounds and covering with Parafilm. After one week, stems were split and the length of internal necrosis in the stem measured. Disease resulted from inoculation with both the tobacco and forsythia isolates. No necrosis was observed in the pathogen-free controls. This was the first report of *P. nicotianae* causing shoot blight on *Forsythia* in the Northeastern United States.

Impacts: *Phytophthora nicotianae* has re-emerged as a significant tobacco pathogen after 40 years of absence and now has been demonstrated to infect ornamentals in Connecticut.

Christmas Trees: Evaluation of Indaziflam, a New Herbicide

Dr. Todd Mervosh has conducted several experiments on weed control in Christmas tree fields over the past 20 years. Emeritus scientist Dr. John Ahrens was his research partner for all of these experiments until Dr. Ahrens passed away in November 2012. The last project the two scientists did together was an experiment in 2012 to evaluate the new herbicide indaziflam (active ingredient of "Alion") in Christmas tree conifers. Alion is registered for use in tree fruits and grapes, but is not yet registered for Christmas trees. Drs. Ahrens and Mervosh were interested in evaluating this herbicide in Christmas tree fields because it controls a broad spectrum of annual broadleaf and grassy weeds, (mostly pre-emergence with some early post-emergent activity), has a mode of action different than any other herbicide used in Christmas trees (inhibits cellulose biosynthesis), is effective at low doses (5 to 10 fluid ounces per acre), and has very low toxicity to mammals and other animals.

The experiment conducted in 2012 at a Christmas tree farm in Enfield showed that eastern white pine, fraser fir and Colorado spruce were all tolerant of Alion when applied before budbreak, but the new growth of all species was injured to some extent when Alion was applied over the top of trees after budbreak. Dr. Mervosh started another experiment in April 2014 to focus on pre-budbreak treatments of Alion in a field of fraser fir planted in 2012. Treatments consisting of Alion at two doses either alone or combined with Roundup Original (glyphosate) and/or Pendulum (pendimethalin) herbicides, were sprayed over the top of the trees. As of June 30, no injury was observed on any of the fraser firs. Early season control of large crabgrass and several annual broadleaf weeds was excellent in all plots to which Alion was applied. The data will be submitted to the herbicide manufacturer and to the federal IR-4 Project, which is instrumental in registering pesticides for specialty crops such as Christmas trees.

Impact: Weed control experiments conducted by Dr. Mervosh have provided Christmas tree growers with more effective and environmentally sound ways to manage weeds in their fields.

SERVICE ACTIVITIES

Requests for information

A total of 5,999 inquiries were answered at the Valley Laboratory during the past year. The majority of these queries were answered by Dr. Mervosh (35%) and Ms. Rose Hiskes (31%) in the inquiry office or by Dr. LaMondia (20% – 89% commercial). About 46% of the information requests to the inquiry office were from the public sector; the remainder was from commercial growers, government, and nonprofit, educational or other (54%). The majority of inquiries concerned, insects, diseases or general horticulture.

Valley Lab scientists made 67 presentations to grower, professional and citizen groups, (over 3,000 people), were interviewed 12 times and made 212 visits to commercial and municipal fields, nurseries, greenhouses, Christmas tree farms, forests and private landscapes to diagnose complex problems or conduct research projects.

Dr. LaMondia initiated and maintained the Connecticut River Valley Blue Mold Web Site to keep tobacco growers current with the progress of this devastating disease in North America, and the potential exposure to the pathogen and management options in the Valley. His laboratory conducted 162 nematode diagnostic samples and conducted testing as an APHIS certified pinewood nematode export testing facility.

Thomas Rathier**,** emeritus soil scientist, continued to visit specific urban sites where community gardens either already existed or were planned by community organizers. At each site, Mr. Rathier made an assessment of the horticultural capabilities of the site as well as the likeliness of heavy metal contamination being found in soils on the site. Samples were taken at each site and analyzed by Mr. Rathier and Mr. Musante (Analytical Chemistry Department). Mr. Rathier subsequently relayed results to appropriate stakeholders along with suggestions for remediation and/or avoidance of soils whose metal concentrations exceed the Connecticut standards.

Soil testing

A total of 6,088 soil tests were expertly performed by Ms. Diane Riddle during the past year. About 74% were performed for commercial growers and 26% for homeowners. Of the commercial samples submitted, 77% were for landscapers; 9% for tobacco growers; 4% for vegetable growers, 4% for municipalities, 3% for nursery growers; 1% for small fruit, 1% for golf course superintendents; and 1% for Christmas tree growers. Diane Riddle also conducted inspections to maintain USDA APHIS Authorized Official Certification.

Valley Lab Information Office Insect, Disease and Plant Health Survey

Dr. Todd Mervosh and Ms. Rose Hiskes diagnosed a wide range of insect, disease and plant health problems on herbaceous and woody ornamentals; lawns, fruits and Christmas trees for homeowners, commercial businesses, other government agencies and nonprofits.

Insects

Insects in structures, such as bed bugs, beetles and ants, were the most frequent problems encountered. This was followed by questions about the pesticides needed to control them. Bed bugs create a lot of anxiety and thus are a public health issue even though they do not transmit disease. Questions about bed

bugs came from health departments, schools, landlords, assisted living facilities, pest control operators, renters and homeowners. If a bedbug infestation is well established, a pest control operator is usually needed for successful treatment. Many homeowners called asking if they can self-treat but the products labelled for bedbugs for home use are for the most part not effective. Other arthropods affecting human health included black-legged (deer) ticks. Also problematic in structures were stored product pests, such as the cigarette, drugstore and sawtoothed grain beetles. Carpet beetles, which can be pests of either plant or animal-based materials were frequently brought in for identification.

Varied carpet beetle larva.

Wood destroying beetles, such as the powder post beetle, were also a problem in homes.

Termites, carpenter ants and carpenter bees were reported destroying wood structures. Some termites are being found in bagged wood mulch but they cannot live in that situation long-term as our termite is subterranean, needing the humid conditions found deeper in the soil, and are also social insects requiring a queen termite to continue reproduction. Carpenter ants were found both foraging for food from nests in the woods as well as nesting in structures. Carpenter bees are an early spring problem with males guarding females while they are making the nest and provisioning cells for the young.

The most common insects from herbaceous and woody ornamentals were beetles, mites, aphids, scales, and bagworms. Asiatic garden beetles are the ghost pest of herbaceous ornamentals, feeding at night and hiding in the duff during the day. Many herbs and perennials in the aster family such as rudbeckia, Echinacea and asters are attacked and defoliated. Last July's heat brought in many plants, such as butterfly bush, with two-spotted spider mite infestations. Elongate hemlock scale is the most prominent scale coming in on hemlock, spruce and firs. Bagworms on evergreen and deciduous plants, such as honey locust, maple and sycamore, are much more numerous than in past years. Small caterpillars balloon on silken threads in the spring and slowly move infestations to new areas. Boxwood psyllid, leafminer and spider mite were common as well.

mph.

Boxwood psyllid nymph.

White grubs and chinch bugs were problems in commercial and home lawns. Cicada killer wasps in lawns and landscape cause much alarm but do not pose a human health risk and the males who guard the nest are incapable of stinging. Cultural management by adding organic matter to the sandy soils liked by this wasp and keeping turf thick and healthy are the best control.

The most prevalent fruit insect pests were the spotted wing drosophila, the eastern tent caterpillar and oriental fruit moth. The brown marmorated stink bug has been reported from home fruit plantings. Also, grape phylloxera is becoming more prevalent with the increased acreage in grapes in the state.

Christmas tree insect pests were mainly scales, white pine weevil, and bagworms. Elongate hemlock scale remains difficult in that it builds up populations on the lower side of the needles until mature males appear as white fluffy material and the tree looks flocked and ready for Christmas.

A possible new pest of Norway spruce and Douglas fir, the spruce shoot gall midge, *Dasyneura abietiperda* was brought in by an arborist in Fairfield County. Growing tips are killed by the larvae boring at the base of the current year's growth. It has been found along the Eastern Seaboard from Connecticut to Maryland according the Lorraine Graney, Head Diagnostician, Bartlett Tree Service.

Pesticides used in landscapes and their possible effects on bees are of concern to many of our callers.

Diseases

A number of Phytophthora diseases were commonly diagnosed on different plants; including vegetables such as pepper, tomato (buckeye fruit rot), cucurbits such as pumpkin and squash, strawberry and also on ornamentals such as rhododendron, Christmas trees and juniper.

Powdery mildew of dogwood

Downy and powdery mildews were common on cucurbits and many ornamentals in the landscape.

Fireblight was a problem on susceptible apple, crabapple, pear and peach trees in spring with temperatures in the 60s during the pink stage of bloom along with rain. Summer pruning was needed to remove inoculum before the fall rainy period arrived.

In landscapes and Christmas trees throughout the state there was a severe outbreak of Rhizosphaera needlecast on white and Colorado spruces.

Most prevalent in turf in the summer were *Pythium*, *Fusarium* and *Rhizoctonia* during periods of conducive weather conditions. Red thread was prevalent in the spring.

In vegetables, anthracnose fruit rot and powdery mildew were problems on tomatoes and pumpkins respectively. Fungal leaf spots were prevalent on susceptible tomatoes during the early summer.

Tobacco diseases in 2013 included target spot, caused by *Thanatephorus cucumeris*, (the sexual state of *Rhizoctonia solani*) and black shank, caused by *Phytophthora nicotianae*. However, the major source of widespread economic losses in wrapper tobacco resulted from storage molds that grew on cured tobacco in sheds due to extended periods of warm and very humid weather late in the curing and stripping process.

Nematode diseases encountered during the past year included foliar nematodes (*Aphelenchoides fragariae*) on strawberry and a number of ornamentals, including Hosta, root-knot nematodes (*Meloidogyne hapla*) infecting and damaging vegetable crops, bloat nematodes (*Ditylenchus dipsaci*) infecting garlic, and pinewood nematodes (*Bursaphelenchus xylophilus*) in samples submitted for export certification.

Plant Health

Winter injury resulting from sudden temperature drops in January and February caused tip and leaf dieback and secondary fungal infections on conifers and broadleaved evergreens.

String trimmer injury was reported from trees and shrubs where a mulch area around the plant base was not maintained.

Fertilizer burn has occurred on landscape conifers as lawn care companies more frequently use motorized rotary spreaders for fertilizer applications.

Broad leaf herbicides applied near susceptible trees, shrubs and vegetables caused damage that needs to be pruned out where possible. Deciduous woody plants may recover over time if the injury is not too severe. Tomatoes in the vegetable garden are usually a total loss and need to be rogued from the garden.

Impacts: Accurate identification of pests of agricultural and human health significance has resulted in economic savings to commercial growers and homeowners, reduced human and environmental exposure to pesticides, and increased human safety.

The Gordon S. Taylor Conference Room

Many agricultural organizations used the conference room at the Valley Laboratory regularly for their meetings. During the past year 13 different groups used the room on 55 occasions. Our most frequent users were the Connecticut Department of Agriculture, Connecticut Rhododendron Society, Connecticut Invasive Plants Working Group, Connecticut Farmland Trust, Connecticut Council for Soil & Water Conservation, Connecticut Christmas Tree Growers Association, Connecticut Green Industries, Forest Pest Program, Connecticut Nursery & Landscape Association, USDA Farm Service Agency, Suffield Land Conservancy, Working Lands Alliance, and the West Hartford Farmers Market. Ms. Jane Canepa-Morrison scheduled the meetings and James Preste arranged the furniture and ensured that the room was available after hours.

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9 Seed Germination and Purity Analysis 2013. 15 pages. Sharon M. Douglas, Ph.D. and Mary K. Inman (2013)

10 Pesticide Residues in Produce Sold in Connecticut in 2011 with Concurrent Surveillance for Microbial Contamination. Walter J. Krol, Ph.D., Brian D. Eitzer, Ph.D., Terri Arsenault, and Jason C. White, Ph.D. (2013)

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