THE CONNECTICUT AGRICULTURAL
EXPERIMENT STATION

Record of the Year

2012 - 2013

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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On July 11, 2013, Dr. Louis A. Magnarelli, 8th Director of the Station (2004-2013) passed away after a long illness. The following article by Terry Jones, Vice President of the Station's Board of Control, is a tribute to Lou and his dedication to his work and the Station.

He is greatly missed.

Remembering Dr. Louis A. Magnarelli:

Scientist, Public Servant, and Friend to Connecticut
by Terry Jones
(Terry Jones is a Shelton farmer and Vice-President of the CAES Board of Control)

"Clearly, the trick in life is to die young as late as possible."

That sentiment, expressed by William Sloan Coffin, former chaplain at Yale University, rings true as we think of Dr. Louis A. Magnarelli. We can only wish that Lou left us much later.

He passed July 11th at age 68 while serving as the 8th director of the Connecticut Agricultural Experiment Station (CAES), founded in 1875, now located at 123 Huntington Street in New Haven.

Lou arrived at the Station in 1975, its centennial year, after receiving his doctorate in medical entomology at Cornell University. He was an excellent scientist, specializing in ticks and their associated diseases. The culture of the Station captured his spirit and energy as he worked tirelessly "putting science to work for society." Lou became Vice-Director in 1992 and was appointed Director in 2004.

Dr. Magnarelli loved the Connecticut Agricultural Experiment Station. It was born a stepchild of Yale and Wesleyan Universities and is the oldest agricultural research station in America. Lou dedicated his professional career to advancing its mission of improving our lives through science.

Yes, right here in Connecticut, hybrid corn was developed and Vitamin A discovered! Work at the Station involves scores of investigations ranging from microscopic nematodes and tiny ticks, mosquitos, and bed bugs to the health of giant sugar maples, nursery and food crops to the well being of our natural environment and the public health of us Nutmeggers.

His love of the institution was also spread amongst his colleagues – a world-class team of scientists and support staff. The Director's office door was always open, and he respected and encouraged the creative ideas that grew amongst his colleagues.

When presented with the concept of growing the annual Plant Science Day to offer greater appeal for children, he sparked plans that encouraged a youthful excitement for science (come see for yourself on Wednesday, August 7th.)

He was humble. At the Capitol, his respectful and soft spoken words – both at hearings and in conversations with government officials – always yielded support and respect for the Station.

He was fair. To curtail the spread of plant diseases, at times, requires the difficult decision to quarantine or even destroy nursery crops. Dr. Magnarelli always listened to grower concerns. Although his decision might result in significant financial sacrifice to individual producers, the long-term success of the industry and the public interest were his yardstick. I never heard a grower speak ill of him!

He was a fighter for his team!

When Gov. Rowland proposed closing the Station in 1996, Lou Magnarelli was serving as Vice-Director under Dr. John Anderson (now Director Emeritus.) The two men rallied the countless citizens including agricultural and environmental groups that recognized the value of the CAES to Connecticut agriculture and public health. They prevailed. Later, the governor remarked to Lou, "I learned not to experiment with the experiment station!"

Lou knew the success of the Station also depended on stewardship of its buildings and infrastructure. He developed a plan to rehabilitate older laboratories, replace inefficient boilers, and repair the Osborne Library – an historic gem and oldest agricultural research library in America. And he launched new visions such as sharing electronic scientific journal resources with Yale University and building a mosquito research laboratory in Griswold to make Connecticut safer from Eastern Equine Encephalitis (aka "Triple E,") which has a 30% mortality rate.

Sadly, Lou will not witness the scheduled 2014 reopening of his biggest infrastructure project – rejuvenation and expansion of the 80-year-old Jenkins/Waggoner Laboratory. He guided the project from its inception over the last eight years of his life.

While hospitalized at Yale-New Haven this spring, Lou continued to guide the Station. His faith in his own recovery was strong. But, from time to time, he'd give me a phone call and like a wise and selfless

coach offered thoughts on “what if.” It was not because he doubted recovery, but more to ensure the smooth forward march of his beloved Connecticut Agricultural Experiment Station.

Truly, the people of Connecticut are blessed to have had Dr. Louis A. Magnarelli among us these past decades. Let us give thanks. Let us also appreciate and support the women and men of our Connecticut Agricultural Experiment Station as they continue to put science to work for our society.

Dr. John F. Ahrens, Emeritus Plant Scientist, passed away a short time after having a stroke on November 10, 2012. John was born in Bellmore, NY and was raised on Long Island. After high school, John attended and graduated from the Long Island Agricultural and Technical Institute (Farmingdale). He enlisted in the US Marine Corps during this time as an inactive reserve. After graduation he worked two years in the Soil Conservation Service in Millbrook, NY and did a one year tour in Korea during the war where he earned the rank of Sergeant, USMC. After marrying in 1952, he moved to Georgia where he received a BSA from the University of Georgia. He then earned both an MS and Ph.D in Plant Physiology from Iowa State University. He began his long career in weed science at the Station at the Valley Laboratory in Windsor in 1957, and continued to conduct research on weeds in nursery production and Christmas trees, and answer grower and other citizen requests for information for twenty years after his official retirement in 1992. He was a member and past president of both the National & Northeastern Weed Science Societies of America. In addition, he owned and operated the Ahrens Tree Farm of Bloomfield, CT & West Woodbury, VT. He was an active member of the National, CT, NH/VT, & NY Christmas Tree Growes Associtions and worked vigorously to assist in the registration of new, effective protocols for weed control in Christmas trees and ornamentals. Dr. Ahrens was a dedicated scientist and was very committed to service to the growers and citizens of the State of Connecticut and beyond. He is greatly missed.

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.

On July 11, 2013, Dr. Louis A. Magnarelli, Director of the Station, passed away. No replacement has been appointed to date. He held the position of Director from November 2004 to July 2013.

Dr. Johan Varekamp, who served on the Board of Control for seven years, retired from the Board on October 16, 2012. Dr. Dana Royer was appointed as his replacement on December 10, 2012.

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

Governor Dannel P. Malloy, President
Terry Jones, Vice President
Paul C. Larson, Secretary
Dr. Louis A. Magnarelli, Director
Commissioner Steven K. Reviczky
Dr. Stephen L. Dellaporta
Ms. Joan Nichols
Dr. Dana Royer

The Board of Control met on August 1, 2012, October 16, 2012, January 16, 2013, and April 10, 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, 2013.

ADMINISTRATION
Dr. Louis A. Magnarelli, Director
Dr. Kirby C. Stafford, III, Vice Director
Michael 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
William A. Berger
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

BIOCHEMISTRY & GENETICS
Dr. Neil A. McHale, Department Head
Carol R. Clark
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
Ron A. LaFrazier
Gloria Mach
Michael A. Scott

ENTOMOLOGY
Dr. Kirby C. Stafford, III, Department Head
Elizabeth E. Alves
Dr. John F. Anderson, Distinguished Scientist
Tia M. Blevins
Mark H. Creighton
Laura Estep Hayes
Rose T. Hiskes
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. Zarillo

ENVIRONMENTAL SCIENCES
Dr. Theodore G. Andreadis, Department Head
Dr. Phillip M. Armstrong
Angela B. Bransfield
Gregory J. Bugbee
Chia-Ying Chen
Jordan Gibbons
Dr. Charisma V. Lattao
Michael J. Misencik
Dr. Goudarz Molaei
Dr. Joseph J. Pignatello
John J. Shepard
Michael C. Thomas
Michael P. Vasil
Dr. Charles R. Vossbrinck
Dr. Feng Xiao

FORESTRY & 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
Dr. Donald E. Aylor, Emeritus
Sandra E. Carney
Dr. Wade H. Elmer
Dr. Francis J. Ferrandino
Mary K. Inman
Dr. Yonghao Li
Dr. Robert E. Marra
Allen P. Michot, III
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
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 2012

Torrential rain and thunder greeted the earliest of the visitors to Plant Science Day, 2012. By mid-morning the skies cleared and a hot, drier day was enjoyed by the 883 visitors to Lockwood Farm.

The following short talks were very well attended.

Short Talks:
Dr. Sharon Douglas greeted the attendees under the Main Tent and introduced the speakers.

Dr. Brian D. Eitzer	Honey Bees and Pesticides: Recent Research on Toxicity and Routes of Exposure
Dr. Sandra L. Anagnostakis	New Disease Threats For Our Trees
Dr. Carole A. Cheah	Biological Control of Mile-A-Minute Weed
Dr. Jeffrey S. Ward	Running Bamboo (*Phyllostachys* spp.) in Connecticut

The Demonstration Tent was full for all demonstrations of the day.

Demonstration Tent:

Mary K. Inman	Pruning Ornamental Shrubs
Richard M. Cecarelli	Mulching Basics

Tours around Lockwood Farm drew many visitors.

Tours:

Pesticide Credit Tour:	Dr. Robert E. Marra, Guide

Stops on Tour:

Dr. Richard Cowles	Spotted Wing Drosophila Management
Dr. Chris Maier	Invasive Insects in Connecticut
Dr. James LaMondia	Management of Boxwood Blight

Lockwood Farm Walking Tour:	Dr. Robert E. Marra, Guide

Stops on Tour:

Dr. Sandra L. Anagnostakis	Chestnut Species and Hybrids
Dr. Abigail A. Maynard	Beach Plum, Paw-Paw, and Japanese Plum Trials
Dr. Sandra L. Anagnostakis	Hybrid Elm Trees
Dr. William R. Nail	Pinot Gris Cultural Trials

Tour of Native Woody Shrubs:	Dr. Jeffrey S. Ward, Guide
Bird and Butterfly Garden Tour:	Jeffrey M. Fengler, Guide

A steady stream of people studied the Barn Exhibits throughout the day.

Barn Exhibits:

Surveillance and Research to Ensure Food and Consumer Product Safety	Dr. Brian D. Eitzer, Dr. Salter J. Krol, Dr. Christina S. Robb, Dr. Roberta De La Torre Roche, and Dr. Jason C. White. Assisted by Terri Arsenault, Craig L. Musante, William A. Berger, John F. Ranciato, Kittipath Prapayotin-Riveros, and Joseph R. Hawthorne
Genes and C4 Photosynthesis	Dr. Richard B. Peterson, Dr. Neil P. Schultes, and Dr. Neil A. McHale. Assisted by Ms. Carol R. Clark and Ms. Regan B. Huntley
Bed Bugs: What We Have Learned And What You Should Know	Dr. Gale E. Ridge
DNA Fingerprinting for Incriminating Mosquitoes in Disease Transmission	Dr. Goudarz Molaei, Dr. Theodore G. Andreadis, Dr. Philip M. Armstrong. Assisted by Michael C. Thomas, and John J. Shepard
Human Health Threats Caused by Exotic Invasive Japanese Barberry	Dr. Scott C. Williams and Dr. Jeffrey S. Ward. Assisted by Michael R. Short And Megan Floyd
Boxwood Blight – A Disease New to Connecticut	Dr. Sharon M. Douglas and Dr. Robert E. Marra. Assisted by Mary K. Inman

Throughout the day, hundreds of questions were answered by the staff under the Question and Answer Tent. The Tent was manned by: Dr. Sharon M. Douglas, Dr. Yonghao Li, Rose T. Hiskes, Mary K. Inman, Dr. Todd L. Mervosh, and Dr. Gale Ridge.

Field Plots:

CHINESE CHESTNUT TREES	Dr. Sandra Anagnostakis. Assisted by Pamela Sletten
EDAMAME TRIALS	Dr. Abigail A. Maynard and Dr. David E. Hill
SHEET COMPOSTING WITH OAK AND MAPLE LEAVES	Dr. Abigail A. Maynard and Dr. David E Hill
SWEET POTATO TRIALS	Dr. Abigail A. Maynard and Dr. David E. Hill
SPECIALTY MELON TRIALS	Dr. Abigail A. Maynard and Dr. David E. Hill
ANNUAL CULTURE OF GLOBE ARTICHOKES	Dr. Abigail A. Maynard and Dr. David E. Hill
BUTTERNUTS AND HEARTNUTS	Dr. Sandra L. Anagnostakis. Assisted by Pamela Sletten
SPECIALTY PEPPER TRIALS	Dr. Abigail A. Maynard and Dr. David E. Hill
SPECIALTY EGGPLANT TRIALS	Dr. Abigail A. Maynard and Dr. David E. Hill
CALABAZA SQUASH SELECTIONS	Dr. Abigail A. Maynard and Dr. David E. Hill

USE OF EARTHWORMS AND BIOCHAR TO SUPPRESS FUSARIUM CROWN ROT OF ASPARAGUS	Dr. Wade H. Elmer. Assisted by Peter Thiel
DATING HERBACEOUS ROOTS	Dr. Jeffrey S. Ward. Assisted by M. Ferreira
COMMERCIAL CHESTNUT CULTIVARS	Dr. Sandra L. Anagnostakis. Assisted by Pamela Sletten
NOAA WEATHER STATION	
REMOTE ACCESS WEATHER STATION	
PHYTOREMEDIATION OF PERSISTENT ORGANIC POLLUTANTS	Dr. Jason C. White. Assisted by William A. Berger, Joseph R. Hawthorne, and Terry Arsenault
TABLE GRAPE DEMONSTRATION PLOT	Dr. William R. Nail. Assisted by N. Petrochko
CONTROL OF BLIGHT ON AMERICAN CHESTNUTS	Dr. Sandra L. Anagnostakis. Assisted by Pamela Sletten
NEW HYBRID CHESTNUT ORCHARD	Dr. Sandra L. Anagnostakis. Assisted by Pamela Sletten
ENVIRONMENTALLY FRIENDLY CONTROL OF POWDERY MILDEW ON LANDSCAPE PLANTS	Dr. Francis J. Ferrandino
TRIAL OF HYBRID WINEGRAPE CULTIVARS	Dr. William R. Nail. Assisted by N. Petrochko
CONTROL OF POWDERY MILDEW ON CHARDONNAY GRAPES	Dr. Francis J. Ferrandino
TECHNICAL DEMONSTRATION TENT	Mary K. Inman and Richard M. Cecarelli
COMPARISON OF GRAFT UNION HEIGHT ON CHARDONNAY GRAPEVINES	Dr. William R. Nail. Assisted by N. Petrochko
SEEDLINGS OF OLD SURVIVING AMERICAN CHESTNUTS	Dr. Sandra L. Anagnostakis. Assisted by Pamela Sletten
WILD CHESTNUTS FROM TURKEY	Dr. Sandra L. Anagnostakis. Assisted by Pamela Sletten
QUESTION AND ANSWER TENT	Dr. Sharon M. Douglas, Dr. Yonghao Li, Rose Hiskes, Mary Inman, Dr. Todd L. Mervosh, and Dr. Gale Ridge
MOSQUITO TRAPPING AND TESTING PROGRAM FOR WEST NILE AND EASTERN EQUINE ENCEPHALITIS VIRUSES	Dr. Theodore G. Andreadis, and Dr. Philip Armstrong. Assisted by John J. Shepard, Michael C. Thomas, S. Finan, E. Calandrella, L. Chong, J. Dickman, S. Fayer,T. Hannon, M. Hiss, M. Olsen, G. Piscitelli, S. Thibodeau, D. Velez, and R. Wright
INVASIVE INSECTS IN CONNECTICUT	Dr. Chris T. Maier. Assisted by Tracy A. Zarrillo and Morgan F. Lowry
SUDDEN VEGETATION DIEBACK OF CONNECTICUT SALT MARSHES	Dr. Wade H. Elmer. Assisted by Peter W. Thiel
GROWTH AND CONTROL OF NON-NATIVE BAMBOOS	Dr. Jeffrey S. Ward. Assisted by A. Simpson and E. Cerne
COMPOSTING LEAVES USING THE STATIC PILE METHOD	Dr. Abigail A. Maynard and Dr. David E. Hill
VERIZON TELEPHONE TRANSMISSION SILO	
THE FARMER'S COW	

KID'S KORNER	Roberta M.-Ottenbreit, Katherine K. Solesky, and Tracy A. Zarrillo
GIRL SCOUTS OF AMERICA	Terri Arsenault
HANDS-ON CHEMISTRY	Dr. Christina S. Robb, Kittipath Prapayotin-Riveros, Dr. Walter J. Krol, Terry Arsenault, Dr. Brian D. Eitzer, and Dr. Jason C. White
INVASIVE AQUATIC PLANT PROGRAM	Gregory J. Bugbee, Mark June-Wells, and Jordan Gibbons. Assisted by Michael Cavadini, M. Fanzutti, and B. Hart
BIOLOGICAL CONTROL OF HEMLOCK WOOLLY ADELGID AND MILE-A-MINUTE WEED IN CONNECTICUT	Dr. Carole A. Cheah
MANAGEMENT OF BOXWOOD BLIGHT, A NEW DISEASE OF THE BUXACEAE IN CONNECTICUT AND THE U.S.	Dr. James A. LaMondia. Assisted by Michele Salvas
USING LEAF COMPOST IN HOME GARDENS	Dr. Abigail A. Maynard and Dr. David E. Hill
ENVIRONMENTALLY-FRIENDLY CONTROL OF POWDERY MILDEW ON VEGETABLE PLANTS	Dr. Francis J. Ferrandino
FIDDLEHEAD TRIALS	Dr. Abigail Maynard and Dr. David E. Hill
NANOPARTICLE TOXICITY TO AGRICULTURAL PLANTS	Dr. Roberto De La Torre Roche, Craig Musante, and Dr. Jason C. White. Assisted by Joseph R. Hawthorne
SPOTTED WING DROSOPHILA MANAGEMENT	Dr. Richard S. Cowles
WASP WATCHERS: CITIZEN SCIENTISTS AT WORK	Dr. Claire E. Rutledge. Assisted by Michael A. Scott
EXPERIMENT STATION ASSOCIATES	
LYME DISEASE IN TICKS FROM CONNECTICUT CITIZENS	Dr. John F. Anderson. Assisted by Bonnie Hamid and Elizabeth E. Alves
CHANGES IN ANTIBODY STATUS IN WHITE-FOOTED MICE	Dr. Louis A. Magnarelli and Dr. Scott Williams. Assisted by Tia Blevins, Michael Short, Joseph P. Barsky, F. Floyd, Geoff Picard, E. Picard, R. Wilcox, M. Chassey, L. Ariori, and E. White
THE "DEER" TICK *IXODES SCAPULARIS*	Dr. Kirby C. Stafford, III. Assisted by Heidi R. Stuber
PROTECT OUR TREES: STOP THE ASIAN LONGHORNED BEETLE AND EMERALD ASH BORER	Rose T. Hiskes. Assisted by Katherine Dugas
NATIVE WOODY SHRUBS	Dr. Jeffrey S. Ward. Assisted by Joseph P. Barsky
BIRD AND BUTTERFLY GARDEN	Jane C.-Morrison and Jeffrey M Fengler
HERBS AND CUT FLOWERS AS POTENTIAL NECTAR AND POLLEN SOURCES FOR BEES	Dr. Kimberly A. Stoner. Assisted by Tracy A. Zarrillo, Morgan F. Lowry, B. Gluck, M. Stuke, C. Bell, K. Madrid, and G. Hafez
CHESTNUT SPECIES AND HYBRIDS	Dr. Sandra L. Anagnostakis. Assisted by Pamela Sletten

BEES, TREES, AND COMMODITIES: THE SURVEY AND INSPECTION TEAM	Dr. Victoria L. Smith, Steven J. Sandrey, Peter W. Trenchard, and Mark H. Creighton
EASTERN BLUEBIRD, SIALIA SIALIS, NEST BOX TRIAL	Lisa L. Kaczenski
HYBRID AND VINIFERA WINEGRAPE CULTIVAR TRIALS	Dr. William R. Nail. Assisted by N. Petrochko
ROCKY HILL AMERICAN CHESTNUT TREES	Dr. Sandra L. Anagnostakis. Assisted by Pamela Sletten
PINOT GRIS CULTURAL TRIALS	Dr. William R. Nail. Assisted by N. Petrochko
BEACH PLUM TRIALS	Dr. Abigail A. Maynard and Dr. David E. Hill
PAWPAW TRIALS	Dr. Abigail A. Maynard and Dr. David E. Hill
JAPANESE PLUM VARIETY TRIALS	Dr. Abigail A. Maynard and Dr. David E. Hill
HYBRID ELM TREES	Dr. Sandra L. Anagnostakis. Assisted by Pamela Sletten
CT NURSERYMEN'S GARDEN	
SOUND SCHOOL AGRICULTURAL SCIENCE PROGRAM	
CT PROFESSIONAL TIMBER PRODUCERS ASSN.	Joan Nichols
CT INVASIVE PLANT WORKING GROUP	Donna Ellis
CT. DEPARTMENT OF LABOR/CONN-OSHA	C. Zinsser
CT HORTICULTURAL SOCIETY	L. Rouleau
CT FARMLAND TRUST	C. Roy
CT FARM BUREAU ASSN.	A. McCullough
CT ENVIRONMENTAL COUNCIL	Erica Fearn
THE CT DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION: FORESTRY DIVISION	Chris Donnelly
CT DEPARTMENT OF AGRICULTURE	R. Olsen
14TH CIVIL SUPPORT TEAM (WMD)	Captain E. Cordon
CT NORTHEAST ORGANIC FARMING ASSN.	D. Legge
USDA, ANIMAL AND PLANT HEALTH INSPECTION SERVICE, PLANT PROTECTION AND QUARANTINE	E. Chamberlain, K. Aitkenhead
BuyCTgrown	D. Rollins
USDA NATURAL RESOURCES CONSERVATION SERVICE	C. Donzella
CT TREE PROTECTIVE ASSN.	Rita Smith
UNITED STATES DEPT. OF LABOR/OSHA	P. Mangiafico
UCONN MASTER GARDENER PROGRAM	J. Hsiang
CT GREEN INDUSTRIES	Robert Heffernan, Executive Director
FRIENDS OF BROOKSVALE PARK, INC.	K. Walker
ELM CITY MARKET	J. Daddio
CT AGRICULTURAL EDUCATION FOUNDATION	E. Provencal

The Farm Staff, Richard M. Cecarelli, Rollin J. Hannan, Jr., and Michael M. McHill, worked on the plots, grass, trimming, and did set up as needed to ready the farm and having it look its best for the day. The barns, buildings, and grounds were cleaned by the Maintenance crew –

Bancroft C. Nicholson, Supervisor, Ronald A. LaFrazier and Michael A. Scott. They also made sure all items needed for the day were delivered to the farm. Tent set ups 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 11:15am Director Louis A. Magnarelli welcomed all to Plant Science Day 2012. He then introduced the Futtner Family, owners of Futtner's Family Farm, LLC, of East Hartford, CT, the 2012 recipients of the 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.

Futtner's Family Farm, located in East Hartford, CT, began operation in 1890. It is now in its fourth generation, and is currently managed by James and Honora Futtner. Jim's great-grandparents came to the United States from Italy in 1880 on their honeymoon. Ten years later, they purchased their first parcel of land (13.88 acres). There were numerous land transactions thereafter, including property that is now part of I-84. Crops are currently grown on about 25 acres, including land in South Windsor, CT. A variety of crops, including sweet corn, melons, squash, lettuce, cabbage, potatoes, and carrots have been sold in retail and wholesale markets. Today the farm includes a popular Pick-Your-Own operation for tomatoes, peppers, and eggplant. A roadside stand is operated 7 months of the year. High quality annuals, perennials, herbs, hanging baskets, rosebushes, and patio pots are also sold. The Futtner family is dedicated to its customers, agricultural industry, and community interests. Jim serves on the South Windsor Agricultural Land Preservation Advisory Commission. Honora was a director for the first 3 years of the Connecticut Farmland Trust. A community supported agricultural program is active, and any extra produce from the farm is donated to Foodshare in Hartford.

After the Century Farm Award was presented, Dr. Magnarelli introduced Ms. Joan Nichols, Connecticut Certified Forester and President of the Connecticut Professional Timber Producers Association, Inc. She gave the Samuel W. Johnson Memorial Lecture entitled "The Connecticut Forest Products Industry: Reflections on the Past, Outlook for the Future". After her talk she was presented with a certificate folder naming her the Samuel W. Johnson Memorial Lecturer for 2012. The certificate was signed by the President of the Board of Control, Governor Dannel P. Malloy, Vice-President of the Board of Control Terry Jones, and Director of the Experiment Station Dr. Louis A. Magnarelli.

Plant Science Day 2012 was a success due to the hard work of the entire staff.

ACTIVITIES AT THE STATION

VISIT BY SCIENTISTS FROM KAZAKHSTAN

On February 7, 2013, Dr. Robert E. Marra hosted a day-long visit by four agricultural biotechnology scientists from Kazakhstan, as part of a tour of the United States. The visit was organized through the U. S. Department of State's International Visitor Leadership Program. Two interpreters accompanied the scientists. Locally, the group was hosted by Mr. Brock Hotaling, Executive Director of the International Visitors Committee of Connecticut. The Station was the last destination for the scientists who had visited agricultural biotechnology centers at the University of California at Davis, Iowa State University in Ames, Iowa, and Monsanto in St. Louis, Missouri. Dr. Marra introduced the history and mission of the Station and discussed his research on boxwood blight and Ramorum blight, the use of molecular biology in the diagnosis of plant diseases, and identification of the associated pathogens through phylogenetic analysis. The visitors also met with Dr. Neil P Schultes, who talked about transgenic plants in U. S. agriculture and the C4 rice project; Dr. Donald E. Aylor, who talked about the aerobiology of corn pollen dispersal; Dr. James A. LaMondia, who talked about his work developing tobacco and strawberry crops for disease resistance, Dr. Victoria L. Smith, who discussed CAES regulatory and survey responsibilities for invasive pests and diseases, and their impact on international trade; and Dr. Jason White, who explained the state and federal programs for monitoring chemical contamination of food.

BED BUG FORUM VII

On April 11, 2013, Dr. Gale E. Ridge hosted the 7th in a series of forums on bed bugs at Middlesex Community College in Middletown Connecticut. The venue was selected because the Jones auditorium at the Station was occupied by the insect and plant pathology inquiry offices while the Jenkins laboratory underwent renovations. There were two visiting speakers. Andy McGinty from LIPCA Insurance, Baton Rouge, Louisiana, a nationally recognized leader in the insurance industry and the management of bed bugs. He spoke about how to manage financial exposure when bed bug infestations were found. The second visiting speaker was Andrea Obston, winner of an Emmy and award winner from the Public Relations Society of America as well as numerous other awards including outstanding Connecticut woman business owner and the state's best public relations agency for law firms. She spoke about crisis management with bed bugs. Dr. Richard S. Cowles from the Experiment Station presented a talk about the pesticide history of bed bugs and the need to use novel techniques for their management. He talked about the use of desiccating dusts and their effectiveness against bed bugs. Dr. Gale E. Ridge from the Experiment Station additionally talked about bed bug reproduction and behavior. She enforced the need to better understand bed bug biology, because of finding yet before unobserved behaviors by the insect that could undermine its management.

Andy McGinty talking about the insurance

ACTIVITIES 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 18, 2012 in cooperation with the Connecticut Christmas Tree Growers Association. Thirty-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. Yonghao Li, "Disease problems and their management"; Mr. Thomas Rathier, "Care of transplants and young trees"; Dr. Todd Mervosh, "Herbicide evaluations in Christmas trees"; and Dr. John Ahrens, "Christmas tree improvement project." Growers having pesticide applicator licenses received re-certification credits for attending this meeting. Jim Preste helped with preparations for the meeting.

HOPS AND MALT GRAIN CONFERENCE

Twenty-five people attended a lively discussion session at the Connecticut Agricultural Experiment Station's Valley Laboratory Gordon Taylor Conference Room on October 24, 2012 concerning the future production of hops. Representatives of the craft brewing industry, the nursery industry, malt grain producers, hops production, processing and marketing industry representatives, scientists, government representatives, and growers met to discuss the prospects for future hops production in Connecticut. A strategy for investigating the potential for this crop was developed.

ANNUAL TOBACCO RESEARCH MEETING

On February 20, 2013, 110 people attended the morning or afternoon sessions of the Connecticut Agricultural Experiment Station's annual Tobacco Research Meeting held at the Valley Laboratory's Gordon Taylor Conference Room. Dr. James A. LaMondia 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 research on management of tobacco pathogens including poty viruses, black shank, target spot and blue mold fungicide resistance. Thomas M. Rathier spoke about the responsible agronomic practices in tobacco. Dr. LaMondia spoke about the CORESTA pesticide residue program and strategies to reduce pesticide residues in wrapper leaves. 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 R. Salvas, Nathaniel R. Child, and James J. Preste assisted with much of the behind the scenes work for the meeting. The meeting qualified for pesticide applicator re-certification credit in Connecticut, Massachusetts and North Carolina, and 71 persons received credit. The meeting was dedicated to Dr. John F. Ahrens.

SPOTTED WING DROSOPHILA WORKSHOP

Twenty cooperative extension fruit specialists and their assistants from New England attended the second annual regional spotted wing drosophila (SWD) workshop at the Valley Laboratory on April 24, 2013. Dr. Rich Cowles provided an update on advances in attractants and trap designs for monitoring SWD. Following a discussion with the participants, an advanced trap design incorporating the latest improvements in chemical and visual attractants was chosen for coordinated trapping efforts in New England through 2013. Dr. Cowles also provided his research results evaluating insecticides for managing SWD to the participants.

ACTIVITIES AT LOCKWOOD FARM

2012 CONNECTICUT FFA FORESTRY CAREER DEVELOPMENT EVENT

On December 6th, 2012, Lockwood Farm was the site of the 2012 Connecticut-FFA Forestry Career Development Event. This event evaluates students' knowledge of forest management practices, tree and wood products identification, forest mensuration, and industry safety standards. Thirty six students from 9 State FFA Chapters participated in the event. Dr. Scott Williams, Michael Short, Joseph P. Barsky, and Ashley Simpson, all in the Department of Forestry and Horticulture, organized and oversaw the event. Former Station staff members Geoffrey Picard, Emily Picard and Vikki Christian were on hand as teachers. Rich Cecarelli, Research Farm Manager, was instrumental in the group using Lockwood Farm's facilities.

THE EXPERIMENT STATION IN THE COMMUNITY

EXPERIMENT STATION HOSTS NATIONAL PLANT BOARD

From July 21 through 26, 2012, The Connecticut Agricultural Experiment Station hosted the 86th Annual Meeting of the National Plant Board at the Hilton in Mystic, CT. More than 135 people, from36 states, Canada, and Mexico, representing state Departments of Agriculture, the USDA, the US Forest Service, US Customs and Border Protection, Industry, and USDA executives, participated in meetings, discussions, and presentations. A tour of the Monsanto Plant Transformation Research Facility in Mystic and Fort Trumbull State Park in New London were included. Station Director Dr. Louis A. Magnarelli gave the Connecticut welcome, and Dr. Sharon M. Douglas presented a talk on Boxwood Blight. Dr. Victoria L. Smith was the local Arrangements Chair, and Tia Blevins, Sandy Carney, Mark Creighton, Jeff Fengler, Lisa Kaczenski, Steve Sandrey, and Peter Trenchard helped with registration and arrangements. Vickie Marie Bomba-Lewandoski helped with database management and printing.

EXPERIMENT STATION STAFF DETECTS THE EMERALD ASH BORER IN CONNECTICUT

On July 16, 2012, the first emerald ash borer (EAB) was detected in Connecticut in the town of Prospect. The initial detection was by Mioara Scott working for Dr. Claire Rutledge in her Cerceris wasp biosurveillance program, supported, in part, by the U. S. Forest Service. *Cerceris fumipenis* is a solitary, sand-nesting wasp (it doesn't sting people) that stocks her burrows with metallic, wood-boring beetles (Family Buprestidae) for her young. This includes EAB if it is present. Mioara intercepted a female wasp that was carrying an EAB. This is the first detection of a new EAB infestation in a state using the wasp as a surveillance method. Numerous other EAB were recovered from the wasps at this site, as well as at Fusco field in Prospect, and at a ball field in Beacon Falls. The EAB has now been detected in four towns in New Haven County: Prospect, Naugatuck, Bethany, and Beacon Falls. Some of these beetles were also captured by purple prism traps maintained by The University of Connecticut Cooperative Extension Forestry with support from the USDA-APHIS-PPQ. Surveillance for EAB in Connecticut is a statewide, multi-agency effort involving Cerceris wasps (with a network of many volunteer "wasp-watchers"), the purple traps, ash tree traps (tree girdles that are highly attractive to the beetles), inspection of trees, and public outreach and reporting of suspect EAB.

FOOD DONATIONS

DONATION OF VENISON TO FOOD PANTRY PROGRAM

On February 27 and 28, 2013, respectively, Dr. Scott C. Williams and Michael R. Short donated 250 pounds of processed venison to the Food Pantry Program at the First Congregational Church in Redding and 200 pounds of processed venison to the Bridgeport Rescue Mission in Bridgeport.

FOOD DONATIONS FROM LOCKWOOD FARM

A total of 17,569 pounds of basil, eggplant, cucumbers, peppers, melons, tomatoes, sweet corn, acorn squash, winter squash and pumpkins were donated to the CT Foodbank in East Haven, YMCA in Hamden, Brooksvale Park in Hamden, Riverview Hospital, Cub Scouts Pack 472 in North Guilford, Gianelli's Preschool in Middletown, Masonicare Preschool in Wallingford, and Waverly House in New Haven.

FOOD DONATIONS FROM THE VALLEY LABORATORY

A total of 13,315 pounds of tomatoes, potatoes, squash, pumpkins and watermelon grown at the Valley Laboratory were donated to Foodshare of Hartford. Mr. James J. Preste, Drs. Abigail Maynard, David Hill, Todd Mervosh and James LaMondia generated the fresh produce, and Jim Preste and Dr. LaMondia organized the distribution effort. The Valley Laboratory also donated 10 Christmas trees to charities and municipalities, and 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.

STATION SCIENTISTS JUDGE PROJECTS AT THE 2013 NEW HAVEN PUBLIC SCHOOLS SCIENCE FAIR

From May 14-16, at the Yale University Commons, Drs. Douglas W. Dingman, Sharon M. Douglas, Robert E. Marra, Richard B. Peterson, and Joseph J. Pignatello served as special awards judges for the New Haven Public Schools Science Fair, choosing winners on behalf of CAES. Two awards were granted; the first was The Connecticut Agricultural Experiment Station Award ($100) for the "Best project related to food, plants, insects, or the environment." They unanimously chose Lauren Low, an 8th grader from Mr. Robert Rushworth's class at the Engineering & Science University Magnet School for her project titled "Evaluating Lead Levels in Home Water." The second award was the Albert E. Dimond Award of The Connecticut Agricultural Experiment Station ($150) for the "best project demonstrating an innovative approach to discovery in plant science." The awardee was selected by CAES judges and Ms. Susan Dimond Brown, founder of the award and daughter of Dr. Dimond. The recipients of this award were Sophie Edelstein and Rachel Kawall, 6th graders from Ms. Dianna Carter's class at Worthington Hooker School, for their project titled "Plants in Supergravity."

EXPERIMENT STATION ASSOCIATES

FALL TOUR OF BISHOPS ORCHARDS, STONINGTON VINEYARD, AND CHAMARD VINEYARD

On October 18, 2012, the Associates visited three wine producing establishments. The first stop was Bishop's Orchards. The behind the scenes tour included a tour of the cider press facilities, the winery, bakery, the farmers market, and some of the orchards and fields surrounding the market. There was also a wine tasting opportunity. Stonington Vineyards was next on the tour. Lunch was served at the vineyard where participants heard talks by Dr. Louis A. Magnarelli and Dr. William Nail. Afterwards, the vineyard was toured and participants experienced a tasting of the wines produced at Stonington Vineyards. The last stop on the tour was at Chamard Vineyards. One of the winemakers conducted the tour that started in the vineyard to discuss the vines and growing of the grapes. The tank room, barrel room and bottling areas were also on the tour. The tour was concluded with a tasting of wines produced at Chamard.

AWARDS GIVEN TO STATION STAFF

On August 4, 2012, Dr. Wade H. Elmer was awarded a certificate of appreciation from the Divisional Forum of the American Phytopathological Society for his service. He also received a plaque from the Northeastern Division for his service to the division as the DFR

In December, 2012, Dr. Sandra Anagnostakis was presented with the Service Award for 2012 by the Northern Nut Growers Association, Inc. for dedicated and outstanding service. The plaque was made from a chestnut board.

In December, 2012, Drs. Goudarz Molaei, Theodore Andreadis, and Philip Armstrong received the McColgan Grant-in-Aid Award from the Northeastern Mosquito Control Association to support a new research project to investigate the Epidemiology of Eastern Equine Encephalitis in Vermont.

On December 3, 2012, John Shepard was elected to a two year term on the Board of Directors of the Northeastern Mosquito Control Association.

On January 3, 2013, Dr. Louis A. Magnarelli received the CNLA Award of Merit "in recognition of his exceptional leadership and service to Connecticut's nursery, garden center, and landscape industry".

On February 1, 2013, the Journal of Environmental Quality selected Dr. Joseph J. Pignatello one of the 2012 Outstanding Associate Editors for his excellent work in the performance as an Associate Editor.

On February 25, 2013, the American Mosquito Control Association recognized Dr. John F. Anderson's scientific accomplishments and contributions to research in the field of mosquito biology and public health. They presented him with the prestigious John N. Belkin Award in a special ceremony at the Annual meeting of the AMCA in New Jersey.

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 Boards, *Environmental Science & Technology* and *Environmental Science & Technology Letters*.
- Member, Science Advisory Board (SAB), Annual International Conference on Soils, Sediments, Water, and Energy held in October of each year at the University of Massachusetts Amherst.
- Member, Society of Environmental Toxicology and Chemistry (SETAC) Nanotechnology Advisory Group
- Member, USDA "Nanotechnology Risk Assessment" Multistate Research Coordinating Committee.
- Member, Representative to the Association of Public Health Laboratories (APHL) for the Connecticut Agricultural Experiment Station.
- Voting member, with expertise in nanotechnology in food to the Food Advisory Committee, which provides advice to the Commissioner of Food and Drugs on emerging food safety issues.

DR. BRIAN D. EITZER

- Conservation Commission for the Town of Bethany.
- Judge at the Connecticut Science Fair held at Quinnipiac University this past year.
- Organizing Committee for the North American Chemical Residue Workshop.

DR. WALTER J. KROL

- Secretary, New Haven Section of the American Chemical Society (elected for 2 year term).
- Special judge on behalf of the New Haven Section of the American Chemical Society at the New Haven Public Schools Science Fair May 10, 2012.
- Chairman of the New Haven Section ACS National Chemistry Week Program and introduced an Earth Day Poster program.

DR. CHRISTINA S. ROBB

- Board, Eastern Analytical Symposium and Chair of the "Food Analysis" session at the November meeting each year.

- Member, Association of Public Health Laboratories (APHL) Working Group on ELISA Based Methods for the USDA FSIS FERN Network.

DEPARTMENT OF BIOCHEMISTRY AND GENETICS

DR. RICHARD B. PETERSON
- Vice President and Voting Delegate, Quinnipiac Chapter Sigma Xi
- Radiation Safety Officer
- Member, Editorial Board, ISRN Botany Journal

DR. NEIL P. SCHULTES
- Member, Steering Committee at Yale University for Bioethics section of the Institute for Social and Policy Studies
- Member, Masters Research Committee, University of Indiana/Purdue
- Fellow, Linnaean Society of London
- Member, Sigma Xi Executive Committee
- Member, Thesis Advisory and Defense Committee, Indiana – Perdue Ft. Wayne University Department of Biology

DR. DOUGLAS W. DINGMAN
- Member, Sigma Xi Programs Committee (Quinnipiac Chapter)

DEPARTMENT OF ENTOMOLOGY

DR. LOUIS A. MAGNARELLI
- Research Affiliate, Epidemiology and Public Health, Yale University School of Medicine
- Administrative Advisor, Multistate Research Project NE-1040 on nematodes
- Member, Legislative Invasive Plants Council
- Technical Advisor, Connecticut Academy of Science and Engineering

DR. KIRBY C. STAFFORD III
- Chair, Multi-State Activities Committee, Northeastern Region Association of Experiment Station Directors
- Administrative Advisor, Multistate Research Project NE-1931 on potato breeding
- Administrative Advisor, Multistate Research Project NE-1043 on biology disease vectors
- Member, Board, Connecticut Coalition Against Bed Bugs
- Member, U.S. EPA Network for Lyme Disease Prevention

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

TIA M. BLEVINS

- Treasurer, Horticultural Inspection Society, Eastern Chapter

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 of 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, Northeast Area Association of State Foresters Firewood Working Group
- Member, National Plant Board Board of Directors
- Member, National Plant Board Systems Approach to Nursery Certification Committee
- New Pest Advisory Group, Eastern Plant Board Liaison
- Member and Past President, Eastern Plant Board
- Member, USDA-APHIS-PPQ Early Detection-Rapid Response Committee

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

DEPARTMENT OF ENVIRONMENTAL SCIENCE

DR. THEODORE G. ANDREADIS

- Lecturer in Epidemiology and Public Health, Yale University School of Public Health
- Adjunct Professor, Department of Pathobiology, University of Connecticut
- Chairman, Multi-State Research Project NE-1043: Biology, Ecology & Management of Emerging Disease Vectors
- Subject Editor, *Journal of Medical Entomology*
- Member, State of Connecticut Mosquito Management Program
- Member, Peabody Fellows Biodiversity and Human Health Program, Yale University

DR. PHILIP ARMSTRONG

- Visiting Research Scientist, Epidemiology of Microbial Disease Division, Yale University School of Public Health
- Member, Multi-State Research Project NE-1043: Biology, Ecology & Management of Emerging Disease Vectors

GREGORY J. BUGBEE

- Director, Clear Lake Improvement Association
- Editor, *Journal of Aquatic Plant Management*
- Member, Northeast Soil Testing Committee, NEC-67
- Member, Government Affairs Committee, New England Aquatic Plant Management Society

DR. GOUDARZ MOLAEI

- President, Connecticut Entomological Society
- Member, Multi-State Research Project NE-1043: Biology, Ecology & Management of Emerging Disease Vectors

DR. JOSEPH J. PIGNATELLO

- Adjunct Professor in Environmental Engineering, Department of Chemical Engineering, Yale University
- Fellow, Soil Science Society of America
- Associate Editor, *Environmental Engineering Science*
- Associate Editor, *Journal of Environmental Quality*
- President,W-2082 Multi-State Research Project: Evaluating the Physical and Biological Availability of Pesticides and Contaminants in Agricultural Ecosystems
- Past Chair, Division S-11 (Soils and Environmental Quality) Soil Science Society of America
- Member of Advisory Committee, International Biochar Initiative

JOHN SHEPARD

- Member, Board of Directors, Northeastern Mosquito Control Association

MICHAEL THOMAS

- Member, Endangered Species Advisory Committee for Insects and Arachnids, Connecticut Department of Environmental Protection
- Curatorial Affiliate, Department of Entomology, Yale Peabody Museum of Natural History

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

DEPARTMENT OF FORESTRY AND HORTICULTURE

DR. JEFFREY S. WARD
- Secretary, Connecticut Tree Protection Examination Board
- Executive Board Member, Connecticut Urban Forest Council
- Member, Audubon Connecticut Science Committee
- Member, Governor's Council for Agricultural Development, Research Subcommittee
- Member, CT DEEP Endangered Species Advisory Committee (plants)
- Member, Connecticut Invasive Species Council
- Advisor, Fairfield County Municipal Deer Management Alliance
- Ex-Officio Member, Goodwin Scholarship Committee

JOSEPH P. BARSKY
- Consulting Committee, Vernon E. Cleaves Agricultural Science and Technology Programs

DR. MARTIN P. N. GENT
- Official representative, NE1035 Regional Research Committee
- Associate editor, Journal of Plant Nutrition

DR. ABIGAIL A. MAYNARD
- Ex-Officio Member, Connecticut Council on Soil and Water Conservation
- Member, State Technical Committee
- Editorial Board, Compost Science & Utilization

DR. WILLIAM R. NAIL
- Secretary, American Society of Enology and Viticulture- Eastern Section
- Chair, NE-1020: Multi-state Evaluation of Winegrape Cultivars and Clones
- Statistics and Data Collection, Protocol Subcommittees for NE-1020: Multi-state Evaluation of Winegrape Cultivars and Clones
- Member, Connecticut Farm Wine Development Council
- Steering Committee, New England Vegetable and Fruit Conference
- National Risk Management (Sustainable) Guidelines working group, National Viticulture Extension Leadership

DR. SCOTT C. WILLIAMS
- Adjunct Professor, Department of Natural Resources and the Environment, University of Connecticut, Storrs
- Executive Treasurer, Connecticut Urban Forest Council
- Executive Treasurer, The Wildlife Society, Northeast Chapter
- Certified Wildlife Biologist, The Wildlife Society
- 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

DEPARTMENT OF PLANT PATHOLOGY AND ECOLOGY

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. 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. WADE H. ELMER
- Divisional Forum Representative (Ex officio) for Northeastern Division of American Phytopathological Society
- Senior Editor *Phytopathology*
- Associate Editor *Crop Protection*
- Member, Site Selection Committee, Northeastern Division of American Phytopathological Society
- Member, Constitution Committee (Ad Hoc), Northeastern Division of American Phytopathological Society
- Member, Membership Committee (Ad Hoc), American Phytopathological Society
- 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
- Member, Governor’s Advisory Committee for AgriScience and Technology Education

DR. ROBERT E. MARRA
- Chair, Local Arrangements Committee (2013), Northeastern Division of American Phytopathological Society
- Inoculum Book Review Editor, Mycological Society of America

- Member, USDA-APHIS-PPQ Cooperative Agricultural Pest Survey Committee (CAPS) for Connecticut

VALLEY LABORATORY

DR. JOHN F. AHRENS
- Advisor, Connecticut Christmas Tree Growers Association, Chairman of the Fire Safety and Tree Improvement Committees.
- Member, National IR-4 Committee (Interregional Committee No. 4) that prioritizes pesticide registration needs for ornamental crops.

DR. CAROLE A. CHEAH
- Fellow of the Cambridge Philosophical Society, UK
- Member, International Organization of Biological Control

DR. RICHARD S. COWLES
- Japanese Beetle Harmonization Agreement Treatment Committee

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

DR. DEWEI LI
- Member, Environmental Microbiology Proficiency Analytical Testing task force of American Industry Hygiene Association.

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

DR. THOMAS M. RATHIER

- Vice President, Member of the program, tree improvement and merit award committees, The Connecticut Christmas Tree Growers Association
- Member of 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 newspaper, radio and TV reporters interview our staff. These occasions are listed below.

AHRENS, JOHN F.

- Gave a report on the Tree Improvement Committee's activities and goals at the Board of Directors' meeting of the Connecticut Christmas Tree Growers *July 11, 2012*
- Spoke about the Tree Improvement Committee's activities at a twilight meeting at the Valley Laboratory for the Connecticut Christmas Tree Growers Association (35 attendees) *July 11*
- Attended a twilight meeting of the Connecticut Christmas Tree Growers Association held at the Winterberry Farm in Killingworth, CT and spoke on controlling weeds in the plantation (30 attendees) *August 2*

ANAGNOSTAKIS, SANDRA L.

- Gave a talk titled "History of chestnut research at CAES" and spoke to the group walking tour at the CNLA Summer Meeting held at Lockwood Farm (240 attendees) *July 11, 2012*
- Gave a tour of Lockwood Farm to a chestnut farmer from Oklahoma *July 15*
- Gave a talk on "Asian chestnut gall wasp on species and hybrids of chestnut" at the Northern Nut Growers Association meeting in Lexington, KY (200 attendees) *July 23-24*
- Appeared as a guest on Len & Lisa's Garden Talk radio show (WTIC 1080) to promote Plant Science Day 2012 and answer plant questions *July 28*
- Gave two talks "Disease problems for nut trees" and "Nut trees for animal forage" to the New York Nut Growers Association in Hudson, NY (56 adult attendees) *August 11*
- Reported on the progress of CAES breeding of chestnut trees for resistance to Asian chestnut gall wasp at the Chestnut Growers of America meeting in Jackson, MI (83 adult attendees) *August 30-September 2*
- Presented the papers "Chestnut restoration" and "Asian chestnut gall wasp on species and hybrids of chestnut in Connecticut" at the International Chestnut Congress held in Shepherdstown, WV (105 attendees) *September 5-9*
- Met with a group of land owners in Washington, CT who are interested in participating in test plantings of advanced breeding material of timber chestnut trees (8 attendees) *November 20*
- Met with members of the Bauer Park Management Committee to discuss past and future chestnut plantings at Bauer Park in Madison (6 attendees) *December 22*
- Gave a talk on timber chestnut restoration for the CT Chapter of the Society of American Foresters in Middlefield (42 attendees) *February 27, 2013*
- Gave the talk "Growing nut trees" at the CT NOFA Winter Conference in Wilton (38 attendees) *March 2*
- Reported on chestnut survival at the Forest Health Monitoring Workshop at Sessions Woods in Burlington (47 attendees) *March 5*

- Participated in a panel on Gifford Pinchot vs. John Muir (taking the side of Pinchot) for an Eastern Connecticut State University Program at the Voluntown Peace Trust in Voluntown (16 attendees) *March 27*
- Hosted Serap Acikgoz from Adnan Menderes University in Turkey for three months (April – June) and taught her new techniques for working with chestnut trees and chestnut blight disease. The chestnut industry is very important in Turkey, and chestnut blight disease is threatening their trees *April-June*
- With Pamela Sletten, organized and managed the New York Nut Growers Meeting at Lockwood Farm. They led tours of farm plantings and discussed Experiment Station research (43 attendees) *April 6*
- Stood by a table of Plant Pathology information at the Norwalk Regional Tree Festival held at Cranbury Park in Norwalk (900 attendees) *May 11*
- With Serap Acikgoz, attended the Chestnut Growers of America meeting in Gainesville, FL and reported on Experiment Station chestnut work and the importance of chestnuts as a crop in Turkey (40 attendees) *May 17-19*
- Served on a grant review panel for plant breeding grants at the National Institute of Food and Agriculture in Washington, D. C *June 24-28*

ANDREADIS, THEODORE G.

- Presented a lecture entitled "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, 2012*
- Was interviewed about mosquitoes and West Nile virus by Jocelyn Maminta, WTNH TV8 *July 13*
- Was interviewed about the early season detection of West Nile virus in Greenwich and Stamford by Lisa Chamoff of the Stamford Advocate *July 17*
- Was interviewed about the rapid expansion of West Nile virus into 13 towns in early July by Marc Sims of CT Public Radio *July 25*
- Was interviewed about the rapid expansion of West Nile virus into 13 towns in early July by Amanda Cuda of the Stamford Advocate *July 25*
- Was interviewed about the rapid expansion of West Nile virus into13 towns in early July by Bob Miller of the Danbury News Times *July 25*
- Was interviewed about the detection of West Nile virus in mosquitoes collected in Wallingford by Russell Blair of the Meriden Record Journal *July 26*
- Was interviewed about the Mosquito Trapping and Testing Program by John Charlton of Fox 61 News *July 26*
- Was interviewed about the unprecedented buildup of West Nile virus activity in southeastern Connecticut by Fran Schneidau of CBS Radio, New York *July 26*
- Was interviewed by Bill Weir of the Hartford Courant for a feature story on the Station's Mosquito and Arbovirus Surveillance and Research Programs *August 8*
- Was interviewed about the first human case of West Nile virus in Connecticut for the 2012 season by Bill Weir of the Hartford Courant *August 16*
- Was interviewed about the first human case of West Nile virus in Connecticut for the 2012 season by Marc Sims of Connecticut Public Radio *August 16*

- Was interviewed about the first human case of West Nile virus in Connecticut for the 2012 season by Mary O'Leary of the New Haven Register *August 16*
- Was interviewed about the first human case of West Nile virus in Connecticut for 2012 season by WTIC Radio *August 16*
- Was interviewed about mosquitoes, West Nile virus and the Station's Mosquito and Arbovirus surveillance and Research Programs by Mark Sullivan of WHOM Radio *August 20*
- Participated in WNPR Connecticut Public Radio Where We Live, Morning Edition show on mosquitoes hosted by John Dankosky *August 22*
- Was interviewed about the 2012 West Nile virus season in Connecticut and the US and the potential impact of global climate change on future West Nile virus outbreaks by Grace Meritt of the Connecticut Mirror *August 23*
- Was interviewed about the recent human cases of West Nile virus in Bridgeport and Stamford by Steve Kotchko of Connecticut Public Radio *August 24*
- Was interviewed about the recent human cases of West Nile virus in Bridgeport and Stamford by Jim Konrad of the Norwich Bulletin *August 24*
- Was interviewed about West Nile virus activity in the state and human cases in Fairfield County by the Citizens News, New Fairfield *August 27*
- Was interviewed about the human cases of West Nile virus in residents of Greenwich and Stamford by the Geenwich Times *August 28*
- Was interviewed about the human cases of West Nile virus in residents of Greenwich and Stamford by Marc Sims of Connecticut Public Radio *August 28*
- Gave the invited talk "Emission Rates of Bioaerosols" at the Workshop on Bioaerosol Effects on Clouds held in Steamboat Springs, Colorado (45 attendees) *August 5-6*
- Was interviewed about the occurrence of four human cases of West Nile virus in residents of Stamford by Kate King of the Stamford Advocate *September 14*
- Was interviewed about the abundance of human cases of West Nile virus in the Greenwich and Stamford area by Lisa Chamoff of the Greenwich Times *September 17*
- Was interviewed about the 2012 West Nile virus season by Marc Sims of Connecticut Public Radio *September 18*
- Was interviewed about the 2012 West Nile virus season by Steve Sevino of WQUN Radio *September 18*
- Was interviewed about the effectiveness of a West Nile virus horse vaccine by Lisa Chamof of the Greenwich Times *September 19*
- Hosted a formal laboratory rotation for Dr. Melissa Gittman, a Yale New Haven Hospital Microbiology Fellow *September 27*
- Was interviewed about West Nile and Eastern Equine Encephalitis virus activity in Connecticut for the 2012 season by Amanda Cuda of the Connecticut Post *October 3*
- Was interviewed about West Nile virus activity in Connecticut for the 2012 season and the record number of human cases by Sam Gingerella of WTIC Radio *October 4*
- Was interviewed about West Nile virus activity in Connecticut for the 2012 season and the record number of human cases by Ebong Udoma, WSHU Public Radio *October 4*
- Presented the seminar "West Nile virus: a retrospective look at an emerging mosquito-borne disease in the western hemisphere" to students and professional staff at the Yale Occupational and Environmental Medicine Program (15 attendees) *October 9*

- With John Shepard, Michael Thomas, Dr. Philip Armstrong and Dr. Goudarz Molaei, hosted the Mosquito Task Force Group from the Mystic Aquarium and gave an overview of the Station's research and surveillance programs on mosquitoes and mosquito-borne diseases (5 attendees) *October 15*
- With John Shepard and Michael Thomas met with staff from Yale's Peabody Museum to discuss production of a CAES/Metropolitan Business Academy video for teachers on mosquitoes and mosquito-borne diseases *October 22*
- Presented a poster display entitled "Laboratory Transmission and Characterization of a Novel Microsporidian Parasite from the Invasive Rock Pool Mosquito, *Ochlerotatus japonicas* at the 61st Annual Meeting of the American Society of Tropical Medicine and Hygiene held in Atlanta, GA *November 11-15*
- Presented the invited talk "Global Climate Change and Mosquito-Borne Diseases" at the 58th Annual Meeting, Northeastern Mosquito Control Association, held in Mystic, CT (170 attendees) *December 3*
- Presented the talk "Life Cycle, Ultrastructure and Molecular Characterization of a Novel Microsporidian parasite from the Invasive Asian Rock Pool Mosquito, *Ochlerotatus japonicas*" at the Annual Meeting of the American Mosquito Control Association held in Atlantic City, NJ *February 25*
- Lectured on the state mosquito trapping and testing program and West Nile virus to a group of 18 students and 2 teachers from East Hartford High as part of the Yale-Peabody Fellows SEPA NIH Program *March 14*
- Presented information on the state mosquito trapping and testing program and West Nile virus for a video presentation conducted by 7 students and one teacher from the Metropolitan Business Academy in New Haven *March 20*
- Presented the seminar "Global climate change and mosquito-borne disease" to a meeting of the Experiment Station Associates at Edgerton Park, New Haven (15 attendees) *April 3*
- Was interviewed about the impact of the dry spring on anticipated mosquito populations and West Nile virus activity this summer by Amanda Cuda, Connecticut Post *May 17*
- Was interviewed about the State Mosquito Trapping and Testing Program and forecast for West Nile virus and eastern equine encephalitis virus activity this summer by Sam Gingerella of WTIC Radio *May 23*
- Was interviewed about the State Legislature's passage of a bill to ban the use of methoprene for control of mosquitoes in Connecticut by Johanna Somers of the Day *May 31*
- Was interviewed about the start of the State Mosquito and Arbovirus Surveillance Program for the 2013 season by Marc Sims, Connecticut Radio network *June 3*
- Was interviewed about the start of the mosquito trapping and testing program and the projected outlook for the 2013 season by the Connecticut Patch *June 13*
- Was interviewed about passage of House bill 6441 restricting the use of methoprene and resmethrin for control of mosquitoes by John Burgeson, Connecticut Post *June 24*
- Was interviewed about passage of House bill 6441 restricting the use of methoprene and resmethrin for control of mosquitoes by Greg Ladgee of the New Haven/Hartford Advocate *June 24*
- Was interviewed about passage of House bill 6441 restricting the use of methoprene and resmethrin for control of mosquitoes by Mathew Cambell of WFSB TV3 *June 24*

- Was interviewed about passage of House bill 6441 restricting the use of methoprene and resmethrin for control of mosquitoes by Marc Sims of Connecticut Radio Network *June 25*
- Was interviewed about the Station's research and surveillance programs on mosquitoes and mosquito-borne diseases and the forecast for the 2013 season by Marc Sims of Connecticut Radio Network *June 26*
- Was interviewed about the abundance of mosquitoes this summer and its impact on anticipated West Nile virus activity by Amanda Raus of NBC30 *June 26*
- Was interviewed about the Station's research and surveillance programs on mosquitoes and mosquito-borne diseases and the forecast for the 2013 season by Harlan Levy of the Journal Inquirer *June 28*

ARMSTRONG, PHILIP M.
- Helped host the Mosquito Task Force Group from the Mystic Aquarium and gave an overview of the Station's research and surveillance programs on mosquitoes and mosquito-borne diseases (5 attendees) *October 15, 2012*
- Presented the invited talk "Tracking Eastern Equine Encephalitis Virus Evolution, Overwintering and Spread in North America by Phylogenetic Analysis" at the 58th Annual Meeting, Northeastern Mosquito Control Association, held in Mystic, CT (170 attendees) *December 3*
- Presented research findings at the Northeast Multistate Annual Meeting NE-1043 on mosquitoes and mosquito-borne pathogens in Atlantic City, NJ *February 27, 2013*
- Presented the invited talk "Tracking Eastern Equine Encephalitis Virus Evolution, Overwintering, and Spread in North America by Phylogenetic Analysis" at the Annual Meeting of the American Mosquito Control Association held in Atlantic City, NJ *February 28*

ARSENAULT, TERRI
- Attended the annual FDA FERN Chemistry Cooperative Agreement Program Meeting in Cincinnati, OH *September 10-14, 2012*
- Visited Thermo Fisher Headquarters in Somerset, NJ for a demonstration of the Thermo Triple Quad Gas Chromatograph for pesticide residue analysis *October 26*
- Participated in an Ohio Department of Agriculture FDA ISO Accreditation Mentor-Mentee Laboratory Program and co-presented a lecture entitled "Connecticut Agricultural Experiment Station Department of Analytical Chemistry – ISO accreditation Update" *April 25*
- Was an instructor for the FDA FERN Training Course LB508 entitled "Toxin Screening using GC/MS" at the Commonwealth of Virginia Division of Consolidated Laboratory Services in Richmond, VA *June 4-6*

AYLOR, DONALD E.
- Spoke on "Aerobiology of corn pollen dispersal" to a group of visiting scientists at the Station (7 attendees) *February 7, 2013*
- Participated as a judge for the finalists in 7th grade physics projects at the Connecticut Science Fair held at Quinnipiac University in Hamden (11 student and 3 adult attendees) *March 14*

BARSKY, JOSEPH P.

- Staffed a CAES display during the Brooksvale Fall Festival in Hamden (1,000+ attendees) *October 13, 2012*
- Spoke on tree measurements to students from Coop High School, New Haven (11 students, 2 teacher attendees) *October 26*
- With Dr. Scott Williams and Mr. Michael Short, hosted the 2012 Connecticut FFA Forestry Career Development Event and oversaw the competitive examinations *December 6*
- Participated in the New York/New England Society of American Foresters annual meeting in Saratoga Springs, NY *January 31, 2013*
- Assisted in staffing the CAES display at Van Wilgen's Garden Center's "Escape to Spring" event in Branford (5,000 attendees) *March 15-18*
- Gave the talk "A short history of the forests of Connecticut" to the Coventry Garden Club at the Booth-Dimock Memorial Library (15 attendees) *March 19*
- Participated in a panel discussion highlighting differences between preservation and conservation for students from Eastern Connecticut State University (20 attendees) *March 27*
- With Dr. Scott Williams and Michael Short, was interviewed by videographer Steve McGuire for an online news segment focusing on current forestry and wildlife research in Guilford *March 28*
- With Drs. Jeffrey Ward, James LaMondia, Carole Cheah and Ms. Jordan Gibbons, hosted an exhibit on innovative research by the Connecticut Agricultural Experiment Station in the Capital Corridor in Hartford *May 15*
- Served as a judge for the state-wide FFA Agri-Science Fair at Southington High School (50 students) *May 17*
- Gave a presentation on safe work habits at an invasive control workshop for the East Haddam Land Trust (12 attendees) *May 21*
- Participated in an Environmental Science Career Fair at North Branford High School (500 attendees) *May 24*
- Along with Michael Short, staffed a display titled "CAES Research at the White Memorial Foundation" and led a guided hike during the 100th Anniversary Celebration of the White Memorial Foundation and BioBlitz 2013 held in Litchfield (120 attendees) *June 1*
- Gave a presentation on "How Trees Grow" to students at Brown-Tufts Montessori School in Woodbury (15 student and 3 teacher attendees) *June 3*

BERGER, WILLIAM

- Gave the platform presentation "Effect of Hydrogen Peroxide on the Uptake of POPs by Curcurbitaceae" at the 9th Annual International Phytotechnology Society Conference, Hasselt, Belgium (45 attendees) *September 11-14, 2012*
- Initiated collaborative experiments at the University of Massachusetts with Professor Om Parkash to study the molecular mechanism of pesticide uptake by transgenic and wild type *Arabidopsis thaliana December 20*

BLEVINS, TIA M.

- Participated in an interstate inspection training program in Riverhead, NY sponsored by the Horticultural Inspection Society, Eastern Chapter (HIS), the National Plant Board. The group visited two local nurseries for mock inspections; Half Hollow Nursery in Laurel, NY

with 625 acres of container and field grown nursery stock and Van de Wetering Greenhouses in Jamesport, NY comprised of 38 acres, 20 of which are under glass to create optimum growing conditions for annual plugs and rooted lines *October 15-16, 2012*
- Participated in the 39th Annual Meeting of the Horticultural Inspection Society, Eastern Chapter, as the chapter's Treasurer. She presented the financial report to the members at the business meeting held in Harrisburg, PA *April 8-11*

BRAVO JOAN L.
- Attended and assisted with administrative duties at the annual meeting of NE-1020: Multi-State Evaluation of Winegrape cultivars andClones in Mystic, CT *November 14-15, 2012*

BUGBEE, GREGORY J.
- Spoke to the Southbury Garden Club on Improving Soil in the Home Garden (50 attendees) *July 13, 2012*
- Spoke at the annual meeting of the Bashan Lake Association in East Haddam on Control of Variable Milfoil in Bashan Lake (50 attendees) *July 28*
- Spoke at the special meeting of the Crystal Lake Association in Weston on Surveillance and Control of Hydrilla (25 attendees) *July 29*
- Participated in a meeting called by the First Selectman of New Fairfield, at the New Fairfield Town Hall, on controlling Eurasian milfoil in Candlewood Lake with herbicides (8 attendees) *August 1*
- Spoke on Container Gardening Indoors and Out to the Branford Garden Club (25 attendees) *September 10*
- Participated in a meeting of public officials at the New Fairfield Town Hall on Using Herbicides to Control Eurasian Watermilfoil in Candlewood Lake" (10 attendees) *September 19*
- Was interviewed by Bob Miller of the Danbury News Times on the 2012 aquatic survey results and using herbicides to control Eurasian Watermilfoil in Candlewood Lake *September 19*
- Was a guest speaker on The Easy Organic Gardener Radio Show with Sheri Frey *September 23*
- Presented a talk entitled "Improving Soil in the Home Garden" as part of a lunchtime seminar series at the South Central Regional Water Authority in New Haven (25 attendees) *September 26*
- With Jordan Gibbons and Jennifer Fansutti, presented the results of the aquatic vegetation survey of Laurel Lake in New Hartford to members of the Laurel Lake Association (15 attendees) *September 30*
- Spoke at the Connecticut Invasive Plant Working Group Conference at UCONN on "Native Aquatic Plants – Friend or Foe?" (60 attendees) *October 25*
- Was interviewed by Will Roland of the Connecticut Gardener Magazine on salt damage to plants after hurricane Sandy *November 5*
- Presented a seminar entitled "Connecticut's Invasive Aquatic Plants: Searching for Solutions" at Western Connecticut State University in Danbury (40 attendees) *November 8*

- Spoke on “Connecticut’s Invasive Aquatic Plants and Climate Change” at the annual meeting of The Connecticut Association of Conservation and Inland Wetland Commissions, held in Middletown, CT (40 attendees) *November 17*
- Spoke to a 2nd grade class at L.W. Beecher School in New Haven about Soil (25 students) *January 7, 2013*
- Spoke to a class at the COOP High School in New Haven about Soil Testing (20 attendees) *January 9*
- Spoke to a 2nd grade class at L. W. Beecher School in New Haven about Soil (25 attendees) *January 15*
- Was interviewed about soil testing by Kristen Dimer of Serendipity Magazine *January 15*
- With Jordan Gibbons and Jennifer Fanzutti, presented a poster entitled “New Nuisance Aquatic Plants for New England” at the 14th Annual Northeast Aquatic Plant Management Society Conference in Westbrook, CT (150 attendees) *January 23*
- With Jordan Gibbons, presented an Invasive Aquatic Plant Identification Seminar at Connecticut IB Academy in East Hartford (40 attendees) *February 2*
- Presented a seminar on Soil Science for Arborists at the Bartlett Arboretum in Stamford (30 attendees) *February 9*
- With Jordan Gibbons and Dr. Mark June-Wells, presented an Invasive Aquatic Plant Identification Seminar at the Connecticut Envirothon at Sacred Heart University in Fairfield (70 attendees) *February 18*
- Met with members of the Fence Rock Lake Association in Guilford to discuss the Station’s discovery of *Egeria densa* in Fence Rock Lake and arrange control strategies (7 attendees) *February 29*
- Staffed the CAES booth at the Escape to Spring event at Van Wilgen’s Garden Center in Branford *March 17*
- With Michael Cavadini, proctored the Forestry event at the Middle School Science Olympiad in Farmington (40 attendees) *March 23*
- With Jordan Gibbons, presented the results of the 2012 aquatic plant monitoring of Lakes Candlewood, Lillinonah and Zoar to stakeholders at First Light Power headquarters in New Milford (25 attendees) *March 27*
- Spoke on “Improving soil in the home garden and landscape” at Whitney Center in Hamden (20 attendees) *April 3*
- With Jordan Gibbons, gave an Invasive Aquatic Plant Workshop to an environmental science special projects program at Glastonbury High School (20 attendees) *April 5*
- Spoke on “Inner City Gardening in Raised Beds” to prospective gardeners at the United Way Headquarters in Shelton (40 attendees) *April 11*
- Participated in a meeting of the Bashan Lake Dam Rebuilding Committee at CT DEEP Headquarters in Hartford (12 attendees) *April 18*
- With Jordan Gibbons, gave an Invasive Aquatic Plant workshop to residents of the town of Middletown that are concerned about the condition of Lake Beseck (30 attendees) *April 22*
- With Jordan Gibbons, presented the results of the 2012 aquatic plant survey of Mono Pond at a public meeting sponsored by Columbia Conservation Commission (25 attendees) *May 2*
- Presented the results of the 2012 aquatic plant survey of Fence Rock Lake in Guilford at the annual meeting of the Fence Rock Lake Association (25 attendees) *May 13*

- With Jordan Gibbons, presented the findings of the aquatic plant survey of Moodus Reservoir at a town meeting in East Haddam (50 attendees) *June 3*
- Participated in a committee meeting including members from CT DPH and CT DEEP that is drafting protocol for protecting the public from blue-green algal toxins in lakes *June 4*
- Participated at a committee meeting of the Connecticut Aquatic Nuisance Species at Avery Point in Groton *June 6*
- Hosted 15 students from the Bridgeport Horticultural Training Program and discussed soil testing and lawn care *June 6*
- Spoke on Techniques for controlling nuisance aquatic vegetation at the annual meeting of the Lake Quassapaug Association (60 attendees) *June 26*
- Spoke on "How drawdown during reconstruction of the Bashan Lake Dam will effect variable watermilfoil" at a town meeting in East Haddam (75 attendees) *June 27*

CHEAH, CAROLE A.

- Gave a presentation on biological control of hemlock woolly adelgid and mile-a-minute weed to a group of students and staff from NY City for the Christadora Summer Ecology Program at the Yale Camp, Great Mountain Forest, Norfolk, CT (17 attendees) *July 16, 2012*
- Presented a poster on "Other hemlock species for Connecticut" at the CNLA summer Field Day at Lockwood Farm, Hamden *July 11*
- Gave a short talk on biological control of mile-a-minute weed at Plant Science Day 2012 at Lockwood Farm (153 attendees) *August 1*
- Was interviewed at Plant Science Day by John Burgeson of the Connecticut Post *August 1*
- Was interviewed and filmed on mile-a-minute weed threats to power lines by John Charlton of Fox News, CT at the Valley Laboratory, Windsor *August 2*
- Together with Dr. Todd Mervosh and Donna Ellis of the University of Connecticut was interviewed on weevil releases and mile-a-minute weed by Robert Miller of the Danbury News Times and Kendra Bobowick of the Newtown Bee at a Newtown weevil release site during field monitoring August 21
- Was interviewed during field monitoring by Frank MacEachern of the Gimbel Audubon Sanctuary, Greenwich, for the Greenwich Time, the Stamford Post and the Connecticut Post *August 21 and 28*
- Was filmed during field monitoring at weevil release sites by Cablevision Channel 12, Rockrimmon Country Club, Stamford *August 22*
- Attended and presented a poster on "Biological Control of Mile-a-Minute Weed in Connecticut" at the Connecticut Invasive Plant Working Group 2012 Symposium, University of CT, Storrs, *October 25*
- Gave a presentation on 5 years of USDA Forest Service Northeastern Area funded biological control projects on hemlock woolly adelgid and mile-a-minute weed to USDA Forest Service program reviewers and state officials at the DEEP HQ Forestry Division, Hartford during the USDA Forest Service NA Cooperative Management Review (15 attendees) *January 2, 2013*
- Gave a webinar on the use of artificial diets for rearing of HWA predators for the USDA Forest Service (18 attendees) *January 30*
- Gave a presentation on biological control projects on hemlock woolly adelgid and mile-a-minute weed to students and professors from Central Connecticut State University at the Valley Laboratory, Windsor (12 student attendees) *February 25*

- Gave a presentation on the threats to hemlock by elongate hemlock scale and resurgence of Hemlock Woolly Adelgid, and an update on mile-a-minute biocontrol at the Forest Health Monitoring Workshop at DEEP Sessions Woods, Burlington (45 attendees) *March 5*
- Was interviewed about the status of hemlock woolly adelgid infestations in Connecticut and the biological control program by Jesse Leavenworth of the Hartford Courant *April 11*
- Manned a display at the Legislative Office Building/Capital corridor and answered questions about Station activities *May 15*
- Conducted a webinar titled "Biological control of hemlock woolly adelgid: a Connecticut Perspective" as part of the 2013 New York Statewide Invasive Species Series on June 26, 2013 (20), to be posted to YouTube NY Invasives Channel *June 26*

COWLES, RICHARD S.

- Presented "Black vine weevil" in a walking tour for the CT Nursery and Landscape Association meeting in Hamden, CT (18 attendees) *July 11, 2012*
- Was interviewed about spotted wing drosophila by Rudy Hempe of the University of Rhode Island College of Natural Science Public Relations *July 12*
- Presented "Spotted wing drosophila" for the walking tour for pesticide credits at Plant Science Day, Hamden (25 participants) *August 1*
- Presented "Bed bugs" as a poster exhibit with Dr. Gail Ridge at Plant Science Day, Hamden *August 1*
- Discussed insects and diseases of Christmas trees at the CT Christmas Tree Growers' Association twilight meeting, Killingworth (40 attendees) *August 4*
- Participated in a meeting of the Connecticut Environmental Council to discuss difficulties that municipalities have been having with the ban of pesticide use on K-8 school grounds, Wethersfield (12 participants) *September 12*
- Presented a 2 hour walking tour of "Pests of Christmas trees" in Belchertown, MA for the Massachusetts Christmas Tree Growers' Association (50 attendees) *September 15*
- Presented "Preserving ash trees" at a special meeting of the CTPA focused on emerald ash borer, New Haven (50 participants) *September 18*
- Participated as a virtual attendee for "eFly", an organizational meeting for scientists east of the Mississippi on current research and identifying additional research needs for spotted wing drosophila management, North Carolina State University (30 attendees) *September 20*
- Lectured on "Insect pests of athletic turf" for Dr. Jason Henderson's Athletic Turf Management Course at UConn, Storrs (10 attendees) *September 25*
- Spoke on "Christmas tree management" at the fall meeting of the CT Christmas Tree Growers' Association, Easton (40 attendees) *October 6*
- Discussed "Spotted wing drosophila management" at a twilight fruit growers' meeting sponsored by the University of Massachusetts Cooperative Extension, Westfield, MA (20 attendees) *October 11*
- Moderated a meeting sponsored by the Coalition to Conserve Urban Ash Trees, and presented "Overview of emerald ash borer management" to municipal leaders from four states, Eden Prairie, MN (120 participants) *October 22*
- Met with collaborators at Rainbow Tree Care and Rainbow Pest Control at a meeting sponsored by the Coalition to Conserve Urban Ash Trees, Minnetonka, MN *October 23*

- Gave the talk “CT report on spotted wing drosophila” and “Research update” SWD meeting for extension, research, and grower representatives, Geneva, NY *November 1*
- Gave the talk “Spotted wing drosophila” at the University of Rhode Island Cooperative Extension Grower’s Meeting (30 attendees) *November 16*
- Gave the talk “Facts and fallacies of organics” at the CT Environment Council (150 attendees) *November 20*
- Spoke on “Spotted wing drosophila: research update” at the New England Vegetable and Berry Growers’ Association, Portsmouth, NH (120 attendees) *December 1*
- Spoke on “Spotted wing drosophila: research update” at the Connecticut Pomological Society, Glastonbury (80 attendees) *December 4*
- Participated in a Masters’ Degree defense at the University of Connecticut *December 5*
- Presented “Exotic drosophilids” at the CAPS meeting, Valley Laboratory (12 attendees) *December 10*
- Presented “Spotted wing drosophila: research update” as a webinar with extension specialists across Canada (12 attendees) *December 18*
- Met with the Deputy Commissioner of DEEP to discuss the pesticide ban on K-8 school grounds, and ways to improve upon existing legislation (7 attendees) *December 19*
- Provided 1.5 hours of pesticide training on the subject of “Optimal pesticide selection” to growers at Summerhill Nursery, Madison (5 attendees) *January 22, 2013*
- Spoke on “Exotic insects and their management” to the Connecticut Grounds Keepers Association, Cromwell (200 attendees) *January 23*
- Presented “Spotted wing drosophila: research update” at the Vermont Vegetable and Berry Growers’ Association, Montpelier, VT (200 attendees) *January 28*
- Spoke on “Insecticides and pollinators” at New England Grows in Boston, MA (500 attendees) *February 7*
- Helped with plans for upcoming field trials for managing bed bugs with Rainbow Pest Control, Minnetonka,MN (5 participants) *February 11*
- Discussed Emerald ash borer with a roundtable discussion, Minnetonka, MN (25 attendees) *February 11*
- Presented “Environmental toxicity and systemics for trees” at an EAB forum for municipal managers and arborists in Hopkins, MN (250 attendees) *February 12*
- Gave an update on the Connecticut Christmas Tree Growers Association project “Genetic improvement of true firs” (5 attendees) *February 13*
- Presented a webinar on “Chemical control of spotted wing drosophila” to New York State Extension personnel and fruit growers (60 participants) *February 14*
- Gave the talk “Invasive insects” at the Hartford Flower and Garden Show (15 attendees) *February 22*
- Discussed “Hemlock woolly adelgid chemical control and spotted wing drosophila” with ecology students from Central Connecticut State University, in Windsor (12 students) *February 25*
- Participated in conference calls to revise the National Plant Board’s Japanese Beetle Harmonization Agreement *February 8* and *22*
- Instructed arborists on “Emerald ash borer chemical control” at the Sav-A-Tree educational training conference, Southbury (60 attendees) *March 6*

- Presented “SWD: A glimmer of hope for advanced IPM” to a Red Tomato grower meeting, Annandale-on-Hudson, NY (25 attendees) *March 12*
- Spoke on the subject “Phagostimulants to improve SWD chemical control” at a fruit entomology symposium, Eastern Branch Entomological Society meeting, Lancaster, PA (60 attendees) *March 17*
- Participated in an SWD insecticide needs conference call initiated by the US EPA (35 participants) *March 28*
- Participated in a Japanese Beetle Harmonization agreement review conference call (15 participants) *March 28*
- Gave the talk “Chemical control of bed bugs” at the Bed Bug Forum, Middletown (100 attendees) *April 11*
- Hosted “SWD research update” for New England small fruits entomology extension specialists in Windsor (15 attendees) *April 24*
- Presented "Research at the Kogut Farm" at the Connecticut Christmas Tree Growers' Association evening meeting, Somers (30 attendees) *June 11*
- Discussed systemic insecticide effects on plants at the Valent Corporation Ornamentals Workshop, Moran, WY (20 attendees) *June 17* and *18*
- Taught the subject "Diagnosing invertebrate pest damage" for the CT Nursery and Landscape Association Plant Diagnostic Workshop, Southington, (43 attendees) *June 26*

CREIGHTON, MARK H.

- Discussed urban beekeeping and honey bee health on the Colin McEnroe Show on WNPR Radio in Hartford (audience of 200,000 in the tri-state area) *July 9, 2012*
- Assisted the New Haven Fire Department by removing honey bees from the attic of their firehouse. The story was covered by Channel 3, Fox News, and the Hartford Courant *July 31*
- Gave a presentation on honey bee health and hive registration to members of the Eastern Beekeepers Association in Brooklyn, CT (75 attendees) *September 16*
- Was interviewed about honey bees and beekeeping by Scott Tucker of Expedition Earth Productions, Inc. Mr. Tucker did some filming at the apiary at Lockwood Farm for a video he is producing about honey bees *September 19*
- Gave a presentation on honey bee health and urban beekeeping to the Wethersfield Garden Club in Wethersfield (25 attendees) *September 24*
- Spoke about honey bee hive registration and honey bee health at the Backyard Beekeepers Association meeting in Weston (75 attendees) *September 25*
- Spoke about honey bees, beekeeping, and honey bee biology to students at Montessori School in New Hartford (20 students) *September 28*
- Set up an information booth and observation hive for Family Fun Day at Massaro Community Farm in Woodbridge (200 attendees) *October 13*
- Participated in the Winter Prep Workshop for the hive at Massaro Community Farm in Woodbridge (20 attendees) *October 20*
- Spoke with members of the Southern New England Beekeepers Assembly on beekeeping and honey bee registration at their Assembly in East Lyme (125 attendees) *November 12*
- Spoke about beekeeping at the Menunkatuck Audubon Society meeting in Branford (80+ attendees) *January 9, 2013*

- Discussed and planned for the Bee School to be held in February 2013 at the Executive Meeting of the Connecticut Beekeepers Association *January 23*
- Participated in the Eastern Connecticut Beekeepers Association Bee School in Mansfield (75 new student beekeeper attendees) *January 24*
- Spoke with new beekeepers and handed out honey bee registration forms to approximately 50 students at the Bee School presented by the Eastern Beekeepers Association at the Middlesex County Extension Center in Haddam *February 12*
- Gave a talk on honey bee disease to the Connecticut Beekeepers Association Annual Bee School in Windsor (120+ new beekeeper attendees) *February 16*
- Participated in the Eastern Connecticut Beekeepers Association Bee School held at the Middlesex County Extension Office in Haddam (35 new beekeeper attendees) *March 5*
- Participated in a Webinar sponsored by the American Bee Federation *March 12*
- Participated in a panel discussion on honey bees after viewing "Queen of the Sun" presented by the Simsbury Land Trust (40 attendees) *March 21*
- Spoke to members about honey bee health and the registration process at a meeting of the Backyard Beekeepers Association held in Weston (125 attendees) *March 26*
- Was interviewed about honey bee decline and its impact on CT businesses by Fox Business News *April 5*
- Presented a Power Point talk titled "History of Beekeeping in Connecticut" at the Connecticut Beekeepers Association meeting and also spoke with members and provided registration forms, Windsor (120 attendees) *April 13*
- Participated in a panel discussion at the 2013 Environmental Film Festival at Yale University in New Haven (130 attendees) *April 14*
- Spoke with approximately 120 members of the Backyard Beekeepers about bee health and honey bee registration in Weston *April 30*

De La TORRE ROCHE, ROBERTO
- Gave a platform presentation entitled "Fullerene-enhanced accumulation of DDE in agricultural crops" at the 9th Annual International Phytotechnology Society Conference in Hasselt, Belgium (45 attendees) *September 11-14, 2012*
- Visited Thermo Fisher Headquarters in Somerset, NJ for a demonstration of the Thermo Triple Quad Gas Chromatograph for pesticide residue analysis *October 26*

DINGMAN, DOUGLAS W.
- Participated in the American Phytopathological Society annual meeting in Providence, RI *August 4-7, 2012*
- Participated in the annual southern New England Beekeepers Assembly, East Lyme, CT *November 10*
- Presented a seminar entitled "Honey Bee Basics" to a group of Connecticut citizens in Enfield, CT *February 19, 2013*
- Presented a seminar entitled "Food Safety, Escherichia coli O157:H7" to Avon senior citizens at the Avon Senior Center, Avon, CT *March 11*
- Participated in the CT Beekeepers Association quarterly meeting in New Haven, CT *April 13*
- Participated as one of five judges from CAES in the annual New Haven Public Schools Science Fair held at Yale University, New Haven, CT *May 14-15*

- Participated as a judge in the FFA AgriScience Fair held at the Southington High School Vo-Ag Department, Southington, CT *May 17*
- Hosted a hands on workshop at CAES for the Backyard Beekeepers Association focusing on identification of Nosema infestation by light microscopy *May 25*
- Participated in the CT Beekeepers Association's Field Day at Lockwood Farm *June 8*
- Discussed collaborative efforts with Yale students to analyze and map mitochondrial DNA diversity of Connecticut honey bees when he met with Dr. Iain Dawson of Yale University *June 18*

DOUGLAS, SHARON M.

- Was interviewed about the report of a natural infection of pachysandra by boxwood blight by Bob Miller of the Danbury News Times *July 3, 2012*
- Was interviewed about how the Connecticut tree fruit crop is doing in light of winter storms, freeze, insects, and drought by Laurie Rich Salerno of the Meriden Record Journal *July 3*
- Was interviewed about the recent hot weather and its impact on late blight of tomato and potato and on boxwood blight by Justin Muszynski of the Bristol Press *July 6*
- Gave the presentation "Boxwood blight update", moderated the afternoon Education Session, served on the Meeting Planning Committee, and organized a booth and disease quiz for the CNLA Summer Meeting at Lockwood Farm (240 attendees) *July 11*
- Organized and moderated Education Sessions for the CTPA Summer Meeting at the Farmington Club (810 attendees) *July 19*
- Was interviewed about sago palm and other toxic plants regarding their toxicity to animals and children and the need to label plants as toxic by Randall Beach of the New Haven Register *July 25*
- Gave a presentation on "Boxwood blight – Implications for Trade in the U.S." at the National Plant Board's Annual Meeting in Mystic (60 attendees) *July 25*
- Appeared as a guest on Len & Lisa's Garden Talk radio show (WTIC 1080) to promote Plant Science Day 2012 and answer plant questions *July 28*
- Was interviewed about boxwood blight by Jan Ellen Spiegel of the Connecticut Mirror *August 3*
- Participated in the Diagnostics Committee Meeting and attended the Annual meeting of the American Phytopathological Society in Providence, RI *August 4-7*
- Participated in the monthly meeting of the CTPA Board of Directors meeting *August 14*
- Was interviewed about boxwood blight in the U.S. by Adrian Higgins of The Washington Post *August 23*
- Participated in the monthly meeting of the CTPA Board of Directors in New Haven *September 11*
- Participated in the CT Tree Protection Examining Board's September meeting and assisted with the oral exam required to become a licensed arborist *September 12*
- Organized and moderated the CTPA evening seminar "Emerald ash borer in Connecticut" in Jones Auditorium (53 attendees) *September 18*
- Was interviewed about fall color and the impact of the quirky weather this season by Brigitte Ruthman of the Waterbury Republican-American *September 20*
- Gave a presentation titled "*Sphaerobolus* – the artillery fungus" for the Rivercrest Condo Association in Cheshire (25 attendees) *September 20*

- Participated in the monthly Board of Directors' Meeting of the CTPA in New Haven *October 9*
- Organized and facilitated a CTPA Workshop titled "The Soil Food Web – Healthy Soils for Healthy Trees" featuring Dr. Elaine Ingham of the Rodale Institute, at the Farmington Club (54 attendees) *November 6*
- Participated in the CT Tree Protection Examining Board's December meeting to assist with the oral exam required to become a licensed arborist *December 5*
- Participated in the CAPS meeting at the Valley Laboratory in Windsor *December 10*
- Participated in the monthly meeting of the CTPA Board of Directors at Aqua Turf in Plantsville *December 11*
- Gave the presentation "Update on boxwood blight and impatiens downy mildew in Connecticut" at the CNLA/CGGA Winter Symposium at Manchester Community College (120 attendees) *January 4, 2013*
- Organized and participated in the CTPA Annual Meeting and coordinated the CAES booth at Aqua Turf in Plantsville (880 attendees*) January 17*
- Was interviewed by Melanie Box, producer of "Breakthroughs" a Public TV program hosted by Martin Sheen. They were exploring the possibility of featuring CAES and its services and research programs in their upcoming segment on agriculture *January 28*
- Was interviewed about climate and the timing of flowering of woody plants in Connecticut by John Burgeson of the Connecticut Post *January 28*
- Gave two presentations of "Diseases of conifers – What arborists need to know" and answered questions from attendees about current tree health problems at the Annual Meeting and trade Show of ISA Ontario in Niagara Falls, Ontario, Canada (235 attendees) *February 13-15*
- Was interviewed about white pine and symptoms caused by injury from Hurricane Sandy and road salt spray by John Burgeson of the Connecticut Post *February 21*
- Participated in a webinar, "Boxwood Blight Update" sponsored by ANLA, and reported on research at CAES (216 attendees) *February 25*
- Gave the presentation "Downy mildew of impatiens" and answered questions about boxwood blight at Shemin Nursery in Greenwich (45 attendees) *February 28*
- Gave a presentation to SavATree titled "Boxwood blight – A new threat to boxwood in North America" at their annual sales meeting in Southbury (180 attendees) *March 6*
- 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 13*
- Participated in the March meeting of the CTPA Board of Directors in New Haven *March 19*
- Was interviewed about white pine and aerosolized sea salt and wind damage to coastal trees by Dan King of Channel 3 *March 26*
- Gave an invited presentation titled "Boxwood blight – A new threat to boxwood in North America" at the Maryland Invasive Insect and Disease Species Workshop in Derwood, MD (75 attendees) *March 28*
- Was interviewed about the current status of impatiens downy mildew, boxwood blight, and white pine with salt and wind damage from Hurricane Sandy by Will Rowlands of Connecticut Gardener *April 1*
- Gave a presentation titled "Eco-friendly Management of Diseases of the Perennial Garden" for members of the Redding Garden Club in Redding (48 attendees) *April 8*

- Gave an invited presentation as part of a workshop for Master Gardener mentors titled "Diseases in the Landscape." The workshop was held at the Bartlett Arboretum in Stamford (67 attendees) *April 11*
- Organized a lecture series "Playing in the Dirt" for the Institute of Learning in Retirement, and gave the lecture "Eco-friendly Management of Diseases in the Landscape" (16 attendees) *April 17*
- Participated in a panel organized by the CT Tree Protection Examining Board to review questions for the written exam for arborists *April 17*
- Participated in a conference call of the boxwood Blight Working Group *April 24*
- Participated in a second panel organized by the CT Tree Protection Examining Board to review questions for the written exam for arborists *May 1*
- Was interviewed about boxwood blight by Marilyn Van Norse for the Buffalo, New York Master Gardener Newsletter *May 10*
- Participated in a conference call for the NEPDN to discuss the FY13 budget *May 10*
- Participated in the monthly meeting of the CTPA Board of Directors in the CAES Board Room *May 14*
- Coordinated judging and served as a judge for CAES special awards at the 2013 New Haven Public Schools Science Fair at Yale University *May 14-15*
- Served as a judge for the 2013 CT FFA Agri-Science Fair held at the Southington High School Vo Ag Building *May 17*
- Met with Assistant Attorney General Michael Bullers to discuss tree failure and how CAES can assist his office with pathogen identification *May 21*
- Was interviewed about impatiens downy mildew and its impact on growers and homeowners in CT by Steve Grant of the Hartford Courant *May 22*
- Participated in a conference call of the Boxwood Blight Working Group to discuss research projects *May 29*
- Was interviewed about impatiens downy mildew in CT by Tyler Morrissey of the Waterbury-Republican American *May 29 and 31*
- Gave a presentation on "Boxwood Blight – A New Disease for North America" to the Southbury Garden Club at the Southbury Public Library (52 attendees) *June 7*
- Participated in the monthly meeting of the CTPA Board of Directors to plan the summer meeting, at The Farmington Club *June 11*
- Assisted the CT Tree Protection Examining Board with administering the oral exam to candidates for the arborist license *June 12*
- Was interviewed about impatiens downy mildew and implications for the future of this popular bedding plant by Nancy Crevier of the Newtown Bee *June 21*

DUGAS, KATHERINE

- Staffed a table about Asian longhorned beetle and emerald ash borer at the CNLA Summer Meeting held at Lockwood Farm (240 attendees) *July 11, 2012*
- Staffed the CAES insect inquiry table at the CTPA Summer Meeting in Farmington (810 attendees) *July 19*
- Staffed a table in the Agricultural Exhibits Building about emerald ash borer and Asian longhorned beetle at the Woodstock Fair *September 3*

- Staffed a table about emerald ash borer and Asian longhorned beetle at the Hebron Harvest Fair *September 7*
- Spoke about invasive plants and insects to the Madison Garden Club (50 attendees) *September 11*
- Staffed a table in the Connecticut Building about emerald ash borer and Asian longhorned beetle at the Big E in West Springfield, MA *September 25*
- Staffed the Tolland County Extension Master Gardeners table and provided information about the emerald ash borer and Asian longhorned beetle at the Durham Fair *September 29*
- Hosted a Forest Pest Volunteer Appreciation Night at the Valley Laboratory in Windsor *November 8*
- Staffed an information booth about emerald ash borer and Asian longhorned beetle at the annual CT Association of Conservation and Inland Wetland Commissions winter meeting in Meriden, CT *November 17*
- Participated in the CT Cooperative Agricultural Pest Survey meeting held at the Valley Laboratory in Windsor (17 attendees) *December 10*
- Staffed a Forest Pest and CAPS booth at the Connecticut Nursery and Landscape Winter Meeting at Manchester Community College *January 3-4, 2013*
- Staffed a Forest Pest display table supported jointly by DEEP Forestry and USDA APHIS PPQ staff in the RV and Camping show at the Connecticut Convention Center in Hartford *January 11-13*
- Staffed a Forest Pest and Question and Answer Booth at the Connecticut Tree Protective Association Winter Meeting at Aqua Turf in Plantsville *January 17*
- Staffed a Forest Pest display table at the Connecticut Grounds Keepers Association Conference in Cromwell *January 22-23*
- Staffed a Forest Pest and CAPS booth at North Haven Earth Day held at North Haven Middle School *April 13*
- Staffed a Forest Pest display table at Hamden Earth Day held at Hamden Middle School *April 20*
- Presented information about Asian longhorned beetle and Emerald ash borer at Earth Day events at Two Rivers Magnet School in East Hartford *April 24*
- With Dr. Gale Ridge, produced a public awareness poster and a series of lapel buttons that played on a well-known World War II notice which read “Keep Calm and Bedbugs Begone” which proved to be very popular *April*
- Staffed a Forest Pest booth at the New Britain Youth Museum *May 4*
- Staffed a Forest Pest display table at the Norwalk Regional Tree Festival at Cranbury Park in Norwalk *May 11*
- Participated in the spring CAPS meeting at the Valley Laboratory in Windsor *May 22*
- Spoke to two preschool classes at Nathan Hale School in East Haven about insects and periodical cicadas *May 31*

EITZER, BRIAN D.

- Presented the talk “The Use of High Resolution Liquid Chromatography/High Resolution Mass Spectrometry in Screening Produce for Pesticide Residues” at the 49th Annual Florida Pesticide Residue Workshop, St. Petersburg Beach, FL (150 attendees) *July 15-18, 2012*

- Participated in an FDA FERN Chemistry Cooperative Agreement (cCAP) Laboratory conference call *July 19*
- Presented lectures entitled “2012 Laboratory update – Department of Analytical Chemistry – Connecticut Agricultural Experiment Station” (50 attendees) and “QuEChERS-Exactive Pesticide Screening Protocol and Validation” (39 attendees) at the annual FDA FERN Chemistry Cooperative Agreement Program Meeting in Cincinnati *September 10-14*
- Presented a seminar entitled “The Use of High Performance Liquid Chromatography/High Resolution Mass Spectrometry in Screening Produce for Pesticide Residues” at the Thermo Scientific LC/MS Users Meetings in Somerset, NJ (40 attendees) *October 9*
- Visited Thermo Fisher headquarters in Somerset, NJ to discuss use of a Thermo Triple Quad Gas Chromatograph for pesticide residue analysis *October 9*
- Presented a seminar entitled “The Use of High Performance Liquid Chromatography/High Resolution Mass Spectrometry in Screening Produce for Pesticide Residues” at the Thermo Scientific LC/MS Users Meetings in Cambridge, MA (80 attendees) *October 11*
- Participated in an FDA conference call about the FERN cCAP Exactive LC/MS Project *October 18*
- Participated in the monthl y Laboratory Preparedness Network meeting at the Department of Public Health in Rocky Hill *November 5*
- Participated in a North American Pesticide Residue Workshop Organizing Committee phone call *November 8*
- Participated in an FDA conference call about the FERN cCAP Exactive LC/MS project *December 6*
- Participated in the PI meeting of the Coordinated Agricultural Program on Sustainable Solutions to Problems Affecting Health of Managed Bees, the NC1173 Multi-State Hatch Meeting on Sustainable Solutions to Problems Affecting Bee Health, and the American Bee Research Conference in Hershey, PA *January 8-11, 2013*
- Was interviewed about his research on the effects of neonicotinoid pesticides on bees by June Stoyer of The Organic View Radio Show, an internet based talk radio show *January 16*
- Participated in the Clinical/Analytical “Toxi-Rounds” at the CT Department of Public Health in Rocky Hill and contributed information to a seminar on drug adulteration *January 31*
- Met with Professor Nicolas Carrasco of Quinnipiac University to assist in the identification of a synthesized compound *February 1*
- Participated in the Principal Investigators Meeting for the SCRI-funded grant “Pollination Security for Fruit and Vegetable Crops in the Northeast” at the University of Massachusetts, Amherst *February 2*
- Participated in an FDA FERN cCAP Exactive Working Group phone call *March 7 and 28*
- Served as a judge at the Connecticut Science Fair held at Quinnipiac University *March 13-14*
- Was interviewed about bees and neonicotinoid pesticides by Elizabeth Grossman, a freelance writer developing a story for Yale Environmental 360 *April 17*
- Was interviewed about bees and pesticides by Siobhan Crise, a writer for the Fairfield County Weekly *April 30*
- Gave a laboratory tour and discussed possible future collaborations with Dr. Michael A Tarselli and Dr. Chris Schneider of Biomedisyn Corp., and then visited their facility in Woodbridge, CT *May 8*
- Participated in the NACRW Organizing Committee Teleconference Call *May 9*

- Participated in the FERN Northeast Regional Teleconference Call *May 14*
- With Kittipath Prapayotin-Riveros, Dr. Walter Krol, Dr. Christina Robb, Terri Arsenault, Craig Musante, Michael Cavadini, and William Berger, participated in an FDA ISO Accreditation Conference Call *May 16*
- Gave a laboratory tour and discussed CAES's use of high resolution mass spectrometry in the analysis of pesticide residues in food with Phil Epstein and Joe Doktorski of AB Sciex *May 16*
- With Kittipath Prapayotin-Riveros, Dr. Walter Krol, Dr. Christina Robb, Terri Arsenault, Craig Musante, Michael Cavadini, and William Berger, participated in an FDA FERN Chemistry Cooperative Agreement Program Conference Call *May 17*
- Participated in the NACRW Organizing Committee teleconferencne call *June 6*
- Discussed the detection of pharmaceutical compounds by LC-MS/MS with Yingqing Deng of the University of Massachusetts *June 12*

ELMER, WADE H.

- Organized and sponsored an MSA satellite meeting to discuss the taxonomy of *Fusarium* and the Hypocreales in Jones Auditorium (22 attendees) *July 19, 2012*
- Discussed his research in root rots of ornamental trees with Lorraine Graney of Bartlett Tree Company *July 26*
- Presented the paper "Influence of *Fusarium palustre*, drought, and DMSO on herbivory of *Spartina alterniflora* by marsh crabs" at the Annual Meeting of the American Phytopathological Society in Providence, RI. He also attended the Senior Editors committee meeting for Phytopathology, the Divisional Forum meeting, and the Committee on Widely Prevalent Fungi meeting. In addition, he attended the APS Northeastern Division meeting and presented the Divisional Forum Representative Report. He was awarded a certificate of appreciation from the Division Forum for his service and a plaque from the Northeastern Division for his service to the division as the DFR *August 4-8*
- Gave an invited seminar titled "Sudden vegetation dieback along the Atlantic and Gulf Coasts" at the University of Maryland's Horn Point Laboratory (25 attendees) *October 3*
- Gave a presentation on "Sudden vegetation dieback" to the Junior and Senior classes of the Sound School in New Haven (23 student attendees) *October 10*
- Gave a presentation titled "Comparison of the Fusarium species composition between a New England and Chinese salt marsh affected by dieback" at the biennial meeting of the New England Estuarine Research Society on Block Island, RI (35 attendees) *October 11-13*
- Gave an oral presentation titled "The incidence of *Fusarium palustre*, a new endophyte/pathogen of *Spartina alterniflora*, in Chinese salt marshes" (70 attendees) and a poster presentation titled "Comparison of abiotic and biotic stressors on herbivory of *Spartina* spp. by marsh crabs in North and South American salt marshes" at the Coastal Estuarine Research Foundation meeting in Mar del Plata, Argentina *November 9-15*
- Presented a demonstration on how to isolate plant pathogenic fungi from plants to a biology class at Greenwich High School (9 student attendees) *December 6*
- Moderated and spoke on a panel session on "Good cultural practices" at the CNLA/CGGA Winter Symposium at Manchester Community College (75 attendees) *January 3, 2013*
- Gave the invited seminar "Sudden vegetation dieback along the Atlantic and Gulf Coasts" at the Fisheries and Wildlife Research Institute in St. Petersburg, FL (32 attendees) *January 11*

- Gave the talk “Update on emerging diseases and new fungicides for spring crops” at the CAES-UCONN Bedding Plant Meeting held in Tolland (43 attendees) *February 14*
- Gave the talk “Update on emerging diseases and new fungicides for spring crops” at the CAES-UCONN Bedding Plant Meeting held in Torrington (45 attendees) *February 20*
- Spoke about “Earthworms and Soil Health” to the Lunchtime Gardening Club Seminar Series at the Regional Water Authority in New Haven (8 attendees) *March 12*
- Took and passed a one-day marine helicopter egres training class in Lafayette, LA *March 14*
- Presented a seminar titled “Sudden vegetation dieback along the Gulf and Atlantic Coasts” at the USGS National Wetlands Research Center in Lafayette, LA (32 attendees) *March 18*
- Participated in a helicopter survey and sampling of dieback sites along Louisiana’s coastal marshes *March 19*
- Visited with plant pathologists in the Department of Plant Pathology and Crop Physiology at Louisiana State University in Baton Rouge, LA *March 20*
- Participated as a judge for the AgriScience Fair held at Southington High School (50+ student attendees) *May 17*
- Participated in Career Day at North Branford High School (100 student attendees) *May 24*
- Co-organized and spoke about “Diagnosing and identifying root diseases” at the Diagnostic Workshop, sponsored by the Connecticut Greenhouse Growers’ Association, and held at Southington High School’s Vo-Ag Center (40 participants) *June 26*

FANZUTTI, JENNIFER

- Manned the Invasive Aquatic Plant Identification Table at the Connecticut Invasive Plant Working Group symposium (60 attendees) *October 25, 2012*

FERRANDINO, FRANCIS J.

- Presented the paper “Latent period and infectious period: Useful concepts or vague notions” at the Annual Meeting of the American Phytopathological Society in Providence, RI *August 5-7, 2012*

GENT, MARTIN P. N.

- Presented a poster on “Rate of change of composition of lettuce in response to nitrogen depletion and resupply” at the American Society for Horticultural Science meeting in Miami, FL (1200 attendees) *July 31, 2012*
- Moderated a workshop on “Environmental effects on whole plant long distance transport” at the American Society for Horticultural Science meeting in Miami, FL (1200 attendees) *August 2*
- Presented a talk on “Diurnal variation in water potential and xylem and phloem transport” (20 attendees) at the American Society for Horticultural Science meeting in Miami, FL *August 2*
- Met with a Cheshire High School student to discuss hydroponics experiments for a science fair project *August 23*
- Presented a poster “Effect of daily integrated irradiance on composition of lettuce” at the International Horticultural Society Symposium on Light in Horticulture held in Wageningen Netherlands and moderated a poster session (250 participants) *October 15-18*

- Gave the talk "Life in the Greenhouse at The Connecticut Agricultural Experiment Station" at a seminar on Environmental Studies Careers at Mitchell College, New London, CT (10 attendees) *February 21, 2013*
- Gave the talk "A carbohydrate supply and demand model of vegetative growth: Response to temperature and carbon dioxide" at the 42nd Biological Systems Simulation Group Meeting in University Park, PA (40 participants) *April 23-25*

GIBBONS, JORDAN

- Manned the Invasive Aquatic Plant Identification Table at the Connecticut Invasive Plant Working Group symposium (60 attendees) *October 25, 2012*
- With Jennifer Fanzutti, gave the workshop "Identifying Invasive Aquatic Plants in Connecticut" at the 2013 Envirothon, Goodwin College, East Hartford (80 attendees) *March 23, 2013*
- With Greg Bugbee, presented the results of the 2012 aquatic plant monitoring of Lakes Candlewood, Lillinonah, and Zoar to stakeholders at First Light Power headquarters in New Milford (approximately 25 attendees) *March 27*
- With Greg Bugbee, presented the results of the 2012 aquatic plant survey of Mono Pond at a public meeting sponsored by the Columbia Conservation Commission (25 attendees) *May 2*

HAWTHORNE, JOSEPH R.

- Visited Thermo Fisher Headquarters in Somerset, NJ for a demonstration of the Thermo Triple Quad Gas Chromatograph for pesticide residue analysis *October 26*
- Participated in a webinar entitled "Pushing the Boundaries of Nanoparticle Characterization: Ultra-fast, Simultaneous Dynamic Light Scattering and Zeta Potential" presented by Dr. Joshua Robinson of Beckman Coulter *April 9*
- Participated in a Webinar hosted by Perry Johnson Laboratory Accreditation, Inc. entitled "Critical issues Related to the Purchasing Function IS)/IEC 17025-Section 4.6" May 1
- With Dr. Roberto de la Torre Roche, attended a training workshop entitled "Light Scattering and GPC/SEC Technologies: Theory and Applications" at the Malvern Corporation in Framingham, MA May 14
- Discussed collaborative experiments investigating the acute toxicity of nanoparticles to plant species with Yingqing Deng of the University of Massachusetts *June 12*

HISKES, ROSE T.

- Gave a talk on forest pests at the Buck Nature Center in Wethersfield *July 5, 2012*
- Led a group of Vernon Greenways Volunteers to survey trees along the Rails to Trails in Vernon for Asian longhorned beetle and emerald ash borer *July 7*
- Participated in a Forest Pest conference call *July 11*
- Staffed a forest pest and CAPS table at the Connecticut Nursery and Landscape summer meeting held at Lockwood Farm *July 11*
- Was interviewed about forest pests by Nancy Barnes of Patch.com *July 16*
- Volunteered as a Wasp Watcher at Lake Street School in Vernon *July 21 and 22*
- Was interviewed about forest pests by Bill Doak of the East Hartford Gazette *July 24*
- Gave talks on insects and forest pests to 6 groups of Girl Scouts at the International Jamboree at Camp Laurel in Lebanon *August 9*

- Gave a lecture on forest pests to the Natural Resource Conservation Service Training Day at the Tolland Agricultural Center in Vernon (44 attendees) *August 28*
- Organized and staffed a Forest Pest table at the Hebron Harvest Fair in Hebron *September 6-9*
- Organized and staffed a Forest Pest table at the Four Town Fair in Somers *September 13-16*
- Gave an emerald ash borer update at the Connecticut Groundskeepers Association meeting in Windsor (11 attendees) *September 17*
- Participated in a CAPS state survey coordinator conference call *September 20*
- Staffed a Forest Pest table at the Big E in West Springfield, MA *September 25*
- Participated in a Connecticut Invasive Plant Working Group Symposium Planning Committee Meeting in Windsor *September 26*
- Organized and helped staff a plant identification workshop for students in the Connecticut Nursery and Landscape Accreditation course in the gardens at the Valley Laboratory in Windsor (32 attendees) *September 29*
- Gave the talk "Forest pests" to the Sierra Club at Westmoor Park in West Hartford (13 attendees) *October 11*
- Gave the talk "Forest pests" with Oscar Najera, to arborists and the public at Neighbor's Link in Stamford (8 attendees) *October 11*
- Participated in a CAPS state survey coordinator conference call *October 18*
- Moderated an afternoon breakout session on aquatic invasive plants at the Connecticut Invasive Plant Working Group symposium in Storrs (100 attendees) *October 25*
- Hosted a Forest Pest Volunteer Appreciation Night at the Valley Laboratory in Windsor *November 8*
- Participated in a Forest Pest Webinar in Windsor *December 5*
- Organized and ran a statewide CAPS Committee Meeting at the Valley Laboratory in Windsor (17 attendees) *December 10*
- Participated in the Connecticut Invasive Plant Working Group annual and steering committee meetings at Goodwin College in West Hartford *December 12*
- Staffed a Forest Pest and CAPS booth at the Connecticut Nursery and Landscape Winter Meeting at Manchester Community College *January 3-4, 2013*
- With James Preste, met with Hartford County Master Gardener Coordinator to set up a program where Master Gardeners, under supervision, use our Connecticut Nursery and Landscape Discovery and Education Gardens as a hands-on place to practice what they have learned in their classroom lectures *January 10*
- Set up and staffed a Forest Pest display table supported jointly by DEEP Forestry and USDA APHIS PPQ staff at the RV and Camping Show at the Connecticut Convention Center in Hartford *January 11-13*
- With Katherine Dugas, Dr. Claire E. Rutledge, and Dr. Kirby C. Stafford, III, staffed a Forest Pest and Question and Answer Booth at the Connecticut Tree Protective Association Winter Meeting at Aqua Turf in Plantsville *January 17*
- Gave the talk "Butterfly Gardening" to the Home Garden Club at the Pitkin Community Center in Wethersfield (16 attendees) *February 6*
- Participated in a State Survey Coordinator conference call for the Cooperative Agricultural Pest Survey Program *February 21*

- With Katherine Dugas, Peter W. Trenchard, Steven J. Sandrey, and Diane Riddle, staffed the forest pest booth at the Connecticut Flower and Garden Show held at the Connecticut Convention Center in Hartford *February 21 and 24*
- Gave the talk "Invasive Plants" to the Long Hill Garden Club at the Trumbull Public Library in Trumbull (52 attendees) *February 25*
- Gave a talk on "Butterfly Gardening" to the Olde Ripton Garden Club in Shelton (28 attendees) *March 8*
- Staffed a Forest Pest display table at the Forest Health Workshop held at the DEEP Wildlife Center in Burlington (47 attendees) *March 5*
- Participated in a regional conference call for the Forest Pest Outreach and Survey Program *March 13*
- Participated in a State Survey Coordinator regional conference call for the Cooperative Agricultural Pest Survey Program *March 21*
- Staffed a Forest Pest Display Table at the Perennial Plant Workshop at the Rome Ballroom at UConn in Storrs (375 attendees) *March 21*
- Staffed a Forest Pest Display Table at the Annual Master Gardener Symposium at Manchester Community College in Manchester (355 attendees) *March 23*
- Gave a lecture on Forest Pests to an arboriculture class at Naugatuck Valley Community College in Waterbury (16 attendees) *March 26*
- Participated in a meeting of the Connecticut Invasive Plant Working Group at Goodwin College in East Hartford *March 27*
- Participated in the Cooperative Agricultural Pest Survey regional meeting along with the Eastern Plant Board in Harrisburg, PA *April 9-11*
- Gave a talk on "Butterfly Gardening" to the People Empowering People program at Calvary Presbyterian Church in Enfield (47 attendees) *April 16*
- Participated in a State Survey Coordinator conference call for the Cooperative Agricultural Pest Survey Program *April 18*
- Participated in a Master Gardener Outreach Fair at the Haddam Extension Center in Haddam presenting opportunities to volunteer in the Forest Pest Program and the CNLA Discovery and Education Garden April 23
- Gave a talk on "Butterfly Gardening" at the Craigin Memorial Library in Colchester (53 attendees) *April 25*
- Gave a talk to, and did an activity on Forest Pests with two Brownie troops at the Marlborough Elementary School in Marlborough, CT (18 participants) *May 1*
- Participated in a State Survey Coordinator Conference Call for the Cooperative Agricultural Pest Survey Program *May 16*
- Participated in a State Survey Coordinator conference call for the Cooperative Agricultural Pest Survey Program *June 20*
- Gave the talk "Plants Out of Place" to the Orchard Valley Garden Club at the public library in Southington (47 attendees) *June 25*

INMAN MARY K.

- Gave the talk "Maintaining healthy perennials" to the Hill and Dale Garden Club of Glastonbury, at the home of Paula Arnold (24 attendees) *October 11, 2013*

- Gave an overview of the Plant Disease Office to twenty biology students from Southern Connecticut State University Plant Physiology class DATE?
- Gave the talk "Maintaining healthy perennials" to the Long Hill Garden club at the Trumbull Public Library (56 attendees) *November 26*
- Gave the presentation "Recognition and Management of Plant Diseases in the Landscape" at Hollandia Nursery in Bethel (43 adult attendees) *April 13*

KROL, WALTER J.
- Visited Thermo Fisher Headquarters in Somerset, NJ for a demonstration of the Thermo Triple Quad Gas Chromatograph for pesticide residue analysis *October 26*

LAMONDIA, JAMES A.
- Spoke about research on management of boxwood blight with fungicides at the CNLA Summer Meeting at Lockwood Farm (65 attendees) *July 11, 2012*
- Was interviewed about wrapper tobacco culture for the National Agricultural Worker Survey *July 12*
- Spoke about research on management of boxwood blight with fungicides on the Pesticide Re-Certification Credit Tour on Plant Science Day (55 attendees) *August 1*
- Participated in the annual meeting of the Society of Nematologists held in Savannah, GA. He led the Executive Board meeting as President, participated in the Board Meeting of the N. A. Cobb Foundation, led a Colloquium on "Nematodes and the Gardens of Savannah", participated in the Journal of Nematology Editorial Board Meeting, Participated in a meeting of the Finance Advisory Committee, and presented the poster "Biochar inhibits host recognition by *Globodera tabacum*". He co-authored a symposium paper with John Halbrendt of PSU entitled "Dagger nematodes and perennial fruit crops", led the annual Society Business Meeting, and participated as Past President in the second Executive Board Meeting *August 12-16*
- Participated in the Connecticut Vegetable and Small Fruit Growers Conference Steering Committee meeting in Tolland *October 10*
- Taught a class on identification, biology, and management of tree diseases to students in the Connecticut Tree Protective Association's Arboriculture 101 Class in North Haven (40 attendees) *October 24*
- Participated in a hops and malt-grain conference held at the Valley Laboratory (25 attendees) *October 24*
- Spoke on research results at the annual meeting of the Northeast Regional Multistate Nematology Technical Committee (NE-1040) held in Knoxville, TN (15 attendees) *October 29-30*
- Was interviewed about the history and culture of shade and broadleaf tobacco and the Station's role in the history of tobacco in Connecticut by author Mark Sullivan *November 9*
- Examined candidates for the Connecticut arborist license and participated in the quarterly meeting of the Connecticut Tree Protection Examining Board in New Haven *December 5*
- Was interviewed about the history and culture of shade and broadleaf tobacco by author Mark Sullivan for a book about the history of tobacco in Connecticut *December 7*
- Was interviewed about research plans for hop production and disease management by Will Rowlands of Connecticut Gardener Magazine *January 7, 2013*

- Presented a poster and spoke to growers on "Bloat Nematode (*Ditylenchus dipsaci*) Infecting Garlic" at the Connecticut Vegetable and Small Fruit Growers Conference in Vernon (197 attendees) *January 17*
- With colleagues George Abawi of Cornell-Geneva and Beth Gugino of Penn State University, conducted a day-long SARE funded workshop on the identification, assessment and management of soil-borne plant pathogens in vegetable systems held in Hershey, PA (940 attendees) *January 28*
- Was interviewed about vegetable pathology and the importance of outreach by Jamie Klein of the Reading Eagle newspaper *January 28*
- Spoke about breeding for plant resistance to pathogens and pests in tobacco and strawberry to scientific visitors from Kazakhstan *February 7*
- Welcomed growers to the Annual Tobacco Research Meeting and spoke about research topics and recent developments at the Station, and spoke about research on management of tobacco pathogens, including poty viruses, black shank, target spot and blue mold fungicide resistance. He also spoke about the CORESTA pesticide residue program and strategies to reduce pesticide residues in wrapper leaves (110 attendees) *February 20*
- Discussed planning and goals for a hops research project at the Valley Lab with Farm Managers James J. Preste and Richard M. Cecarelli, and grower Victor Triolo *February 21*
- Participated in a meeting of the Connecticut Agricultural Information Council to select the Connecticut Outstanding Young Farmer Award winner and prepare for AG Day at the Capital *February 22*
- Participated in a Boxwood Blight Update Webinar conducted by the ANLA and spoke about host range and management of the boxwood blight pathogen (200 participants) *February 25*
- Conducted a tour of the Valley Laboratory and spoke about the Experiment Station and plant pathology research to Dr. Barbara Nicholson and students from Central Connecticut State University (12 students and one professor participants) *February 25*
- Taught a class on identification, biology and management of tree diseases to students in the Connecticut Tree Protective Association's Arboriculture 101 class in New Haven (40 attendees) *March 6*
- Examined candidates for the Connecticut arborist license and participated in the quarterly meeting of the Connecticut Tree Protective Examining Board in New Haven *March 13*
- Participated in Agriculture Day at the Capitol, speaking about the Century Farm Award and the 2012 Award recipients, the Futtner Family Farm *March 20*
- Spoke about "Phytophthora, the plant destroyer" at the Crop Production Services Fruit and Vegetable Growers Meeting held in Windsor Locks (80 participants) *March 26*
- Was interviewed about the historical and economic importance of the Connecticut tobacco industry by Ben Van Duyne and three other ninth grade students from the Greenwich Country Day School *April 12*
- Was interviewed about root lesion nematode biology, sampling, extraction, and management by University of New Hampshire graduate student Matt Kochka *April 16*
- Participated in a Connecticut Tree Protection Examining Board subcommittee meeting to review written exam questions *April 17*
- Conducted a tour of the Valley Lab and discussed gardening and ongoing research with developmentally disabled adults from a nonprofit agency in Windsor, Vinfen (8 attendees) *April 18*

- Participated in a Connecticut Tree Protection Examining Board subcommittee meeting to review written exam questions *May 1*
- Participated in a meeting of the Connecticut Agricultural Information Council to select the Connecticut Century Farm Award finalists *May 3*
- Was interviewed about the diseases affecting the cigar wrapper tobacco crop and the economic importance of the Connecticut tobacco industry by Jason Marchi of Elan Magazine *May 7*
- Spoke to nursery staff about progress and updates concerning boxwood blight management at Prides Corner Farms in Lebanon (10 attendees) *May 10*
- Spoke to nursery staff about progress and updates concerning boxwood blight management at Imperial Nurseries in Granby (3 attendees) *May 14*
- Manned a display at the Capitol Corridor and answered questions about Station activities and research *May 15*
- Spoke about Oomycete diseases at Revays Garden Center in East Windsor, CT (12 attendees) *May 16*
- Was interviewed about hops by Will Rowlands of Connecticut Gardener Magazine *May 28*
- Spoke about the Experiment Station, the Valley Laboratory and plant pathology research with Calvin Brodersen and 12 graduating senior students from the Rockville Agriculture Education Center *June 11*
- Examined candidates for the Connecticut arborist license and participated in the quarterly meeting of the Connecticut Tree Protection Examining Board in New Haven June 12

LI, DEWEI

- Presented the poster "Two new hyphomycetes *Strelitziana windsorensis* sp. nov. and *Zeloasperisporium toonae* sp. nov. from *Toona sinensis* in Connecticut, USA" (50 attendees) *July 14-15, 2012*
- Participated in the Fungal Environmental Sampling and Informatics Network Workshop" held at the Station and Yale University *July 14-15*
- Traveled to China for collaborative research from mid-August to mid-September. During his visit, he and two of his collaborators, Dr. Giuhua Zhao and Dr. Junfeng Liang, made one-week field trip to the tropical rain forest in Jianfengling and Wuzhishan, Hainan Island to collect hyphomycete specimens and 126 specimens were collected. He worked on the specimens at Professor Xhao's laboratory. He spent the following two weeks at Nanjing Forestry University to plan his sabbatic leave and adjunct professor appointment with the university and collaborators Drs. Jianren Ye and Xiaoqin Wu. He also gave a presentation "Development of Research on Systematics of Stachybotrys and Memnoniella" at College of Forest Resources and Environments NJU (35 attendees) September 8. He met Dr. Jianhui Xue, Vice President of NJFU September 11. He visited Beijing Forestry University from September 16-18, and met Dr. Youqing Luo, an expert on the longhorn beetle. He also met with Dr. Junchang Liu, Director of the Department of International Collaboration, and had discussions with numbers of faculty members. A presentation on Stachybotrys was also given at JFU with (27 attendees). When Dr. Li was in Nanjing, he was visited by Dr. Yong Wang, Associate Professor at Guizhou University to work on a manuscript on a new species proposed by Dr. Wang, Dr. Li, and other co-authors.

LI, YONGHAO

- Assisted at the CAES Booth at the CNLA Summer Field Day held at Lockwood Farm *July 11, 2012*
- Gave the talk "Disease problems and their management" at the Connecticut Christmas Tree Growers Association Twilight Meeting in Windsor (30 attendees) *July 18*
- Assisted at the CAES Booth at the CTPA Summer Meeting in Farmington *July 19*
- Presented the poster "Effects of light density on resistance of bigleaf hydrangea to Cercospora leaf spot" at the annual meeting of the American Phytopathological Society in Providence, RI *August 5-8*
- Gave the talk "Plant Disease Information Office and National Plant Diagnostic Network" for graduate students and researchers at the Northeast Institute of Geography and Agroecology, Chinese Academy of Science, in Harbin, China (15 attendees) *July 12*
- Gave the talk "Plant disease diagnostics" for students, faculty, and staff at Northeast Agricultural University in Harbin, China (60 attendees) *November 12*
- Gave the talk "Anthracnose of *Miscanthus sinensis* caused by *Colletotrichum graminicola*" for students and faculty at Northeast Forest University in Harbin, China (18 attendees) *November 14*
- Gave the talk "Plant disease diagnostics and pathogen detection" for researchers at Heilongjiang Academy of Agricultural Science in Harbin, China (25 attendees) *November 15*
- Staffed the hands-on table for tree diseases for Arboriculture 101 in North Haven (30 attendees) *November 28*
- Staffed the CAES booth at the CTPA Winter Meeting held at Aqua Turf in Plantsville *January 17, 2013*
- Staffed the "Tree diseases" table at Hands-on Night for Arboriculture 101 in North Haven (45 attendees) *March 13*
- Participated in the 2013 UConn Perennial Plant Conference in Storrs *March 21*
- Gave the talk "Common Diseases of the Perennial Garden" for the Institute of Learning in Retirement in Hamden (9 attendees) *May 1*
- Gave the talk "Diagnosis and Control of Vegetable Diseases" to members of the Bethany Garden Club in Bethany (19 attendees) *May 13*
- Gave a talk on "Downy mildew of impatiens" at Chamard Vineyards in Clinton, as part of the ESA Tour (30 attendees) *June 11*
- Gave a talk titled "How to diagnose foliar diseases" and assisted with hands-on disease diagnosis at the CGGA Workshop on diagnosing Plant Diseases and Disorders held at Southington High School Vo-Ag Center (40 participants) *June 26*

MAGNARELLI, LOUIS A.

- Was interviewed about mosquitoes and West Nile virus by Mark Simms of CT Public Radio *July 6, 2012*
- Was interviewed about mosquitoes and West Nile virus by Matt Dwyer of WTIC Radio *July 6*
- Was interviewed about mosquitoes and West Nile virus by Bill Wier of the Hartford Courant *July 6*
- Was interviewed about mosquitoes and West Nile virus by John Lucas of the Stamford Advocate *July 6*

- Was interviewed about mosquitoes and West Nile virus by Peter Buzzeo of the Stamford Daily Voice *July 6*
- Gave an update on Experiment Station research and other activities at the CT Nursery and Landscape Association meeting at Lockwood Farm *July 11*
- Was interviewed about ticks and Lyme disease by Mark Simms of CT Public Radio *July 13*
- Was interviewed about emerald ash borer by Matt Dwyer of WTIC Radio *July 20*
- Was interviewed about emerald ash borer by Dianne Orsi of WNPR Radio *July 20*
- Was interviewed about emerald ash borer by Bob Miller of the Danbury News Times *July 20*
- Was interviewed about emerald ash borer by Nancy Cohen, a freelance reporter *July 20*
- Was interviewed about emerald ash borer by the Waterbury Republican at a press conference in Prospect, CT *July 20*
- Welcomed the National Plant Board members in Mystic, CT *July 23*
- Was interviewed about emerald ash borer by the CT Post *July 24*
- Provided oral testimony on the emerald ash borer to the Legislative Regulation Review Committee *July 24*
- Was interviewed about Experiment Station research and other activities by Ray Andrewsen of WQUN Radio in Hamden *July 25*
- Was interviewed about mosquitoes and the West Nile virus by Bob Miller of the Danbury News Times *July 27*
- Was interviewed about Plant Science Day and Station research by the New Haven Register *August 1*
- Was interviewed about emerald ash borer by Jan Spiegel *August 2*
- Was interviewed about the emerald ash borer quarantine by Mark Simms of CT Public Radio *August 6*
- Was interviewed about the emerald ash borer quarantine by Fox-TV *August 6*
- Was interviewed about the emerald ash borer quarantine by Ann Dematteo of the New Haven Register *August 6*
- Was interviewed about the emerald ash borer quarantine by Bill Leukhardt of The Hartford Courant *August 8*
- Was interviewed about the emerald ash borer quarantine by Quannah Leonard of the Republican American *August 8*
- Was interviewed about the emerald ash borer quarantine by WFSB-TV *August 9*
- Was interviewed about the emerald ash borer quarantine by WTNH-TV *August 9*
- Gave a report on Station research, the emerald ash borer quarantine, and progress being made on building projects to the Experiment Station Associates *August 28*
- Was interviewed about the new FDA grant for the Station by Amanda Cuda of the CT Post *August 29*
- Gave a report to Landscape architects on Station research in Jones Auditorium *September 13*
- Welcomed the participants in the Garden Study School course in Jones Auditorium and gave them a report on Station regulations concerning the emerald ash borer *September 24*
- Gave a presentation on Station research and other activities at a meeting of Working Lands Alliance in Windsor, CT *October 9*
- Participated in an Invasive Plants Council meeting in Hartford *November 13*
- Participated in an Invasive Plants Council meeting in Hartford *December 11*

- Met with members of the Experiment Station Associates and presented an update on Station activities *January 8, 2013*
- Hosted and participated in a meeting of the Station's Board of Control *January 16*
- Participated in a meeting of the Connecticut Tree Protective Association *January 17*

MAIER, CHRIS T.

- Was interviewed about invasive insects by John Burgeson of The Connecticut Post *August 1, 2012*
- Displayed new entomological books at a meeting of the Connecticut Entomological Society at Middlesex Community College in Middletown *October 19*
- Presented the talk "Return of the Periodical Cicadas (2013): A Brief Review of Biology" at the Annual New England, New York, and Canadian Fruit Pest Management Workshop in Burlington, VT (45 attendees) *October 23*
- Presented the poster "Apparent Asynchronous Emergences of Brood II of Periodical Cicadas, *Magicicada* spp. (Hemiptera: Cicadidae), in Connecticut and Eastern New York" while attending the Annual Meeting of the Entomological Society of America in Knoxville, TN *November 13*
- Displayed Connecticut specimens of the brown marmorated and other stink bugs, extension material on how to separate the brown marmorated stink bug from other brown stink bugs, and a graph of the annual number of reports of the brown marmorated stink bug since its discovery in Connecticut in 2008 at a meeting of the Connecticut Entomological Society at Yale University (25 attendees) *November 16*
- Spoke about the distribution and trapping of the brown marmorated stink bug in Connecticut at a multistate Hatch meeting held at Rutgers University in New Brunswick, NJ (10 attendees) *December 3*
- Presented a display titled "Return of the Periodical Cicada" at the Annual Meeting of the Connecticut Pomological Society in Glastonbury (88 attendees) *December 4*
- Spoke about the status of the brown marmorated stink bug at the CT Cooperative Agricultural Pest Survey Committee meeting held at the Valley Laboratory in Windsor (15 attendees) *December 10*
- Discussed the distribution and life cycle of the periodical cicada at a meeting to design an exhibit about the insect for the Peabody Museum, Yale University, New Haven *January 28, 2013*
- Displayed new entomological literature at a meeting of the Connecticut Entomological Society at Wesleyan University in Middletown *February 15*
- Was interviewed about the brown marmorated stink bug by Julie Curtis of the Norwalk Daily Voice *February 28*
- Spoke about the "Return of the Periodical Cicada" at the Forest Health Monitoring Workshop at Sessions Woods in Burlington (47 attendees) *March 5*
- Exhibited new entomological literature at a meeting of the Connecticut Entomological Society at UConn in Storrs (30 attendees) *March 15*
- Gave the talk "Periodical Cicadas: Natural History, Evolution, and Impact" to the Branford Garden Club in Branford (60 attendees) *April 4*
- Was interviewed about the 17-year periodical cicada by John Burgeson of The Connecticut Post *April 9*

- Was interviewed about the 17-year periodical cicada by Alissa Smith of the Fairfield Daily Voice *April 10*
- Was interviewed about the 17-year periodical cicada by Anya Winslow of News 12 *April 11*
- Was interviewed about the 17-year periodical cicada by Kim Primicerio of the Meriden Record-Journal *April 11*
- Was interviewed about the 17-year periodical cicada by John Charlton of Fox Connecticut News *April 12*
- Was interviewed about the 17-year periodical cicada (2nd article) by Kim Primicerio of the Meriden Record-Journal *April 12*
- Was interviewed to help in the development of a map on periodical cicada distribution for the Wall Street Journal by Renée Rigdon *April 12*
- Was interviewed about the 17-year periodical cicada by Mike Puffer of the Waterbury Republican-American *April 15*
- Was interviewed about an article on 17-year periodical cicada by Pamela Weil for the Federated Garden Club's newsletter *April 15*
- Was interviewed about the 17-year periodical cicada by Robert Miller of the News-Times of Danbury *April 17*
- Was interviewed about the 17-year periodical cicada by Judy Benson of The Day of New London *April 22*
- Was interviewed about the 17-year periodical cicada by Steve Grant, a freelance writer and contributor to the Hartford Courant *April 22*
- Was interviewed about the 17-year periodical cicada by Zach Howard, contributing writer with Reuters *May 2*
- Was interviewed about the 17-year periodical cicada by Dana Whelan of WTIC Radio *May 3*
- Was interviewed about the 17-year periodical cicada by Kate Mattiace, a reporter for the Citizen News of New Fairfield *May 7*
- Was interviewed about the 17-year periodical cicada by Jim Elliot of Channel 3 News (WFSB) *May 7*
- Was interviewed about the 17-year periodical cicada by Lara Landa, a producer with the Discovery Channel in Toronto, Canada *May 9*
- Was interviewed about the 17-year periodical cicada by Will Rowlands of Connecticut Gardener Magazine *May 10*
- Was interviewed about the 17-year periodical cicada by Eliza Clare for an article in the newspaper of Staples High School in Westport *May 10*
- Conducted a workshop on surveying periodical cicadas at Sessions Woods in Burlington (16 attendees) *May 13*
- Was interviewed about the 17-year periodical cicada by John D'Andre of WQUN Radio *May 14*
- Was interviewed about the 17-year periodical cicada by Patricia Brown of the New York Times *May 24*
- Was interviewed about the emergence of periodical cicadas by Danielle Fried of the North Dutchess News *May 28*
- Was interviewed about the emergence of the 17-year periodical cicadas by Darryl Fears of the Washington Post *May 31*

- Was interviewed about the emergence of periodical cicadas by Patricia Gay of the Weston Forum *June 7*
- Was interviewed about the emergence of periodical cicadas by Nancy Schoeffler of the Hartford Courant *June 7*
- Was interviewed about periodical cicadas by Ed Stannard of the New Haven Register *June 18*

MARRA, ROBERT E.

- Assessed white pine concerns with officials from DEEP at Winding Trails in Farmington *July 2, 2012*
- Spoke about boxwood blight research plans at the CNLA Sumer Meeting held at Lockwood Farm (240 attendees) *July 11*
- Hosted the final meeting of FESIN (Fungal Environmental Sampling and Informatics Network) in Jones Auditorium (80 attendees) *July 14*
- Hosted the Annual Meeting of the Mycological Society of America, taking place in the Omni Hotel as well as various other venues on the Yale campus (340 mycologists from universities and research institutions in the United States, Canada, as well as other countries) *July 15-18*
- Presented a talk at the Annual Meeting of MSA entitled "Mixed Mating and Biparental Inbreeding in the Forest Pathogen, *Neonectria ditissima*" (100 attendees) *July 16*
- Hosted Dr. Rytas Vilgalys, and six members of his lab, along with Professor Dai Yu-cheng, a visiting mycologist from Beijing Forestry University, for field research on the species diversity of mycorrhizae associated with white pines *July 19-20*
- Co-authored and delivered a poster presentation titled "Real-time PCR detection of the boxwood blight pathogen *Calonectria pseudonaviculata*" at the annual meeting of the American Phytopathological Society in Providence, RI *August 5-7*
- Gave the talk "Important Plant Diseases of the Northeast" at the New York Botanical Gardens in the Bronx, as part of a training program for landscape professionals (75 attendees) *September 13*
- Presented the talk "Fungi of Forest and landscape: Friends and Foes" to the Orchard Valley Garden club at the Southington Public Library (40 attendees) *October 23*
- Participated in the MassMyco Meeting, a one-day conference of New England Mycologists, at Clark University in Worcester, MA (60 attendees) *October 27*
- Participated in the "Improving Tree Health" working group for its first organizational meeting *December 17*
- Helped staff the Plant Pathology table at the CTPA Winter Meeting held at Aqua Turf in Plantsville *January 17, 2013*
- Participated in a meeting of the "Improving Tree Health" working group *January 29*
- Hosted a day-long visit by four agricultural biotechnology scientists from Kazakhstan *February 7*
- Participated in the webinar "Boxwood Blight Update" sponsored by ANLA, and reported on research at CAES (216 participants) *February 25*
- Presented a talk on the ecology of fungi in the forest titled "Fungi: friends and foes of the forest" to the Branford Garden Club in Branford (35 attendees) *March 11*
- Met with the members of the West Haven Tree Commission to choose and assess sites for street-tree plantings in CDA-zoned sections of the city *March 23*

- Participated in a meeting of the Plant Science Day Organizing Committee at the Station *March 26*
- Gave the talk "Fungi of the Forests: Friends and Foes" to the Olde Ripton Garden Club at the Plumb Memorial Library in Shelton (30 attendees) April 1
- With Dr. Sandra Anagnostakis, represented the Department of Plant Pathology at the Norwalk Regional Tree Festival held at Cranbury Park in Norwalk. Dr. Marra fielded questions relating to trees, tree diseases, and tree care and presented information on the use of sonic and electrical impedance tomography to assess the internal condition of trees (900 attendees) *May 11*
- With Drs. Sharon Douglas, Douglas Dingman, Richard Peterson, and Joseph Pignatello, was a judge in the New Haven Public Schools' Science fair, held at Yale University's Woolsey Hall *May 14-15*
- Participated, as Local Arrangements Chair, in a phone conference to discuss planning for the upcoming October meeting in Southbury of the Northeastern division of the American Phytopathological Society *June 3*
- Met with the West Haven Tree Commission to discuss the upcoming street tree inventory *June 18*

MAYNARD, ABIGAIL A.

- Reported on Station activities at a meeting of the State Technical Committee in Tolland (33 attendees) *July 25, 2012*
- Appeared as a guest on Len & Lisa's Garden Talk Show (WTIC 1080) *July 28*
- Was interviewed about vegetable farming in Connecticut by Steve Grant of the Hartford Courant *August 20*
- Judged fruits and vegetables at the North Haven Fair *September 6*
- Discussed Connecticut agriculture and the New Crops Program on the talk show "Where We Live" on WNPR *September 7*
- Lectured on "The Experiment Station's New Crops Program: Helping Connecticut's Farmers" as part of the Biology Department's Seminar Series at Southern Connecticut State University in New Haven (45 student and 5 faculty participants) *September 24*
- Spoke to an Environmental History class at Quinnipiac University about the New Crops Program at Lockwood Farm (1 teacher and 20 student attendees) *October 4*
- Hosted the Prekindergarten and third grade classes from Hamden Hall Country Day School at Lockwood Farm (4 teachers and 33 student attendees) *October 16*
- Assisted in planning a Lower School garden for Hamden Hall Country Day School (4 teacher attendees) *November 15*
- Reported on Station activities at a quarterly meeting of the Soil and Water Conservation District in Windsor (16 attendees) *December 13*
- Gave an update on Station activities at a meeting of the State Technical Committee in Tolland (32 participants) *January 23, 2013*
- Assisted AP Biology students with their projects at Hamden Hall Country Day School (16 students, 1 teacher attendees) *January 24*
- Gave the talk "Composting and Utilization of Compost" to the Institute of Learning in Retirement at Whitney Center in Hamden (18 attendees) *April 10*

- Helped the prekindergarten class at Hamden Hall Country Day School plant their spring garden (15 children, 2 adults) *April 17*
- Assisted with the establishment of a preschool garden at Hamden Hall Country Day School (12 children, 2 adult participants) *May 7*
- Spoke about the New Crops Program to students from the Common Ground High School at Lockwood Farm (15 student, 3 adult participants) *May 22*
- Reported on Station activities at a quarterly meeting of the Council on Soil and Water Conservation in Windsor (16 attendees) *May 30*
- With Dr. David Hill, was interviewed by Rosemarie Anner of Edible Nutmeg Magazine about Brazilian vegetables and the New Crops Program *June 24*

MCHALE, NEIL A.
- Discussed current objectives in plant molecular biology with twenty visiting biology students from Southern Connecticut State University Plant Physiology Class run by Dr. Rebecca Silady *November 13 and 15*
- Participated in Career Day at the North Branford High School *May 24, 2013*

MERVOSH, TODD L.
- Gave the presentation "Weed management in the nursery" at the Connecticut Nursery and Landscape Association's Summer Field Day at Lockwood Farm (40 attendees) *July 11, 2012*
- Spoke about weed control in Christmas tree fields at the twilight meeting of the Connecticut Christmas Tree Growers Association at the Valley Lab (35 attendees) *July 18*
- Spoke about weed management at a meeting of the Connecticut Christmas Tree Growers Association, Killingworth (30 attendees) *August 2*
- Hosted a Board Meeting of the Suffield Land Conservancy at the Valley Laboratory in Windsor (7 attendees) *August 16*
- Participated in a symposium planning meeting for the Connecticut Invasive Plant Working Group at the Valley Laboratory (11 attendees) *August 20*
- Was interviewed about biological control of mile-a-minute weed by Frank MacEachern of The Greenwich Time *August 20 and 28*
- Was interviewed about biological control of mile-a-minute weed by Kendra Bobowick of the Newtown Bee *August 21*
- Was interviewed about biological control of mile-a-minute weed by a reporter from News 12 Connecticut of Norwalk *August 22*
- Presented a display about invasive insects and plants at Hilltop Farm Fest in Suffield *September 3*
- Spoke about invasive plants at a meeting of the Sierra Club of Greater Hartford in West Hartford (20 attendees) *September 13*
- Was interviewed about control of bamboo by Richie Rathsack of the Meriden Record-Journal *September 14*
- Delivered a truckload of pumpkins grown at the Valley Laboratory to Northwest Park in Windsor for use at their Country Fair *September 19*
- Spoke about management of invasive plants at a meeting of the Branford Land Trust (15 attendees) *September 25*

- Participated in a symposium planning meeting for the Connecticut Invasive Plant Working Group at the Valley Laboratory (9 attendees) *September 26*
- Spoke about weed management at the fall meeting of the Connecticut Christmas Tree Growers Association in Easton (20 attendees) *October 6*
- Assisted three classes of Suffield High School science students and their teacher with plant identification during field walks (60 students) *October 11*
- Spoke about control methods for invasive plants at the Connecticut Invasive Plant Working Group Symposium at UConn-Storrs (100 attendees) *October 25*
- Taught a program sponsored by UNH Cooperative Extension on weeds and weed management in rights-of-way in Concord,NH (25 attendees) *November 14*
- Participated in a meeting at Goodwin College in East Hartford to review attendee evaluations from the October 25th symposium sponsored by the Connecticut Invasive Plant Working Group *December 12*
- Participated in the first meeting of the Native Plant Advisory Group at UConn in Storrs *December 13*
- Gave the research talks "Pre and post budbreak applications of indaziflam in field-grown conifers" and "Indazflam granules and dimethenamid-p sprays for container-grown ornamentals" (co-author Dr. John F. Ahrens for both papers); presented a poster on "Biological control program for mile-a-minute weed (*Persicaria perfoliata*) in Connecticut" (co-authored by Dr. Carole Cheah and Donna Ellis of UConn-Storrs); served as a judge of the student poster contest; delivered a eulogy with a slide show on Dr. John F. Ahrens at the business meeting; and began serving as Public Relations Representative for the Northeastern Weed Science Society (NEWSS) at the combined annual meetings of NEWSS and the Weed Science Society of America in Baltimore, MD (520 attendees) *February 4-7*
- Taught a program sponsored by UNH Cooperative Extension on weeds and weed management in rights-of-way in Concord, NH (20 attendees) *February 12*
- Spoke about "Weeds and invasive plants" at the Connecticut Flower and Garden Show in Hartford (30 attendees) *February 22*
- Presented research on management of Japanese stiltgrass and mile-a-minute weed at a workshop held at Westfield State University in Westfield, MA (25 attendees) *February 25*
- Participated in the annual meeting of the Connecticut Christmas Tree Growers Association in Middletown *March 9*
- Participated in a general meeting of the Connecticut Invasive Plant Working Group at Goodwin College in East Hartford *March 27*
- Participated in a scholarship selection committee meeting for the Connecticut Nurserymen's Foundation at the Valley Lab *March 27*
- Served on the Connecticut Nurserymen's Foundation Scholarship Committee as four student finalists were interviewed and two were selected as scholarship recipients at the Valley Laboratory (13 attendees) *April 10*
- Talked on weed management strategies with rosarian Christine Paul and members of the Elizabeth Park Conservancy during a walk through the Elizabeth Park Rose Garden in West Hartford (7 attendees) *May 10*
- Spoke about weed management at a twilight meeting of the Connecticut Christmas Tree Growers Association in Somers (20 attendees*) June 11*

- Gave a presentation on weeds and invasive plants to the Enfield Garden Club (25 attendees) *June 26*

MOLAEI, GOUDARZ

- Gave the invited talk "Vector-Host Interactions of *Culex pipiens* Complex Mosquitoes in the United States" to the Department of Evolution, Ecology and Organismal Biology, The Ohio State University *August 30, 2012*
- Helped host the Mosquito Task Force Group from the Mystic Aquarium and gave an overview of the Station's research and surveillance programs on mosquitoes and mosquito-borne diseases (5 attendees) *October 15*
- Presented the invited talk "Vector Host Interactions and Transmission of Arboviruses in the United States" at the 58th Annual Meeting, Northeastern Mosquito Control Association, held in Mystic, CT (170 attendees) *December 3*
- Presented the invited talk "Vector-Host Interactions that Govern Transmission of Arboviruses in the U.S." to the Yale Occupational and Environmental Medicine Program *February 19, 2013*
- Presented the invited talk "Vector-Host Interactions and Resurgence of Eastern Equine Encephalitis virus in Northeastern USA" at the Annual Meeting of the American Mosquito Control Association held in Atlantic City, NJ *February 28*
- Was Skype interviewed by the University of Toronto Career Centre on current research activities in his laboratory and at the CAES Center for Vector biology and Zoonotic Diseases *May 2*
- Attended the 2013 Northeastern Eastern Equine Encephalitis Conference held in Concord, NH and discussed potentials for regional collaborations *May 10*
- Presented the invited talk "Mosquito-Borne Infections: An Emerging Public Health Challenge in New York City and the Metropolitan Area" to the New York City Department of Health & Mental Hygiene, NYC, NY *May 16*
- As President of the Connecticut Entomological Society, organized a "Student and Postdoc Symposium" involving Yale, UConn and Wesleyan Universities held at Wesleyan University, Middletown, CT *May 17*

NAIL, WILLIAM R.

- Participated as secretary at the pre- and post-conference Board of Directors meetings at the American Society for Enology and Viticulture – Eastern Section (ASEV-ES) annual meeting in Traverse City, MI *July 15, 19, 2012*
- Presented a poster "Training Effects on St. Croix Grapevines in Connecticut" at the ASEV-ES annual meeting held in Traverse City, MI *July 18*
- Presented the Secretary's Report to ASEV-ES members at the annual business meeting *July 18*
- Inspected the vineyards at Stonington Vineyards and Saltwater Farms Vineyards in Stonington *August 21*
- Participated in a meeting of the Connecticut Farm Wine Development Council at the Department of Agriculture in Hartford *August 28*
- Hosted the Eastern Viticulture Workshop in Mystic (59 attendees) *November 13*

- Hosted the annual meeting of NE-1020: "Multi-State Evaluation of Winegrape Cultivars and Clones" in Mystic *November 14-15*
- Hosted a tour of NE-1020 participants to Sharpe Hill Vineyards in Pomfret, Priam Vineyards in Colchester, and Stonington Vineyards in Stonington *November 15*
- Participated in a meeting of PIs and stakeholders for the USDA/NIFA SCRI project: Improved Grape and Wine Quality in a Challenging Environment: An Eastern US Model for Sustainability and Economic Vitality in Mystic *November 16*
- Participated in a meeting of the Steering Committee of the New England Vegetable and fruit Conference in Manchester, NH December 7
- Participated in a meeting of the Connecticut Farm Wine Development Council at the Connecticut Department of Agriculture in Hartford *December 13*
- Evaluated a site for a potential vineyard and discussed various aspects of vineyard establishment in Chester, CT *December 20*
- Participated in a New England Vegetable and Fruit Conference Steering Committee Conference Call *January 14, 2013*
- Gave the talk "Cultivar and rootstock Selection for New England" at the Sixth Annual Meeting of the Massachusetts Farm Wineries and Growers Association in Sturbridge, MA (31 attendees) *February 12*
- Participated in the annual business meeting of the Connecticut Vineyard and Winery Association at the Connecticut Farm Bureau in Windsor *February 25*
- Participated in a meeting of the Connecticut Farm Wine Development Council at the Department of Agriculture in Hartford *March 14*
- Participated in a meeting of the steering committee of the New England Vegetable and Fruit Conference in Manchester, NH *March 18*

PETERSON, RICHARD B.

- Presented joint research undertaken with De. Neil Schultes in a poster at the 11th Nordic Photosynthesis Congress Turku, Finland, detailing the genetics and function of Arabidopsis LHCB7 locus *September 11-14, 2012*
- Participated in the Nordic Photosynthesis Conference in Turku, Finland, and presented a poster detailing the genetics and function of Arabidopsis LHCB7 locus *September 11-12*
- Conducted research on chlorophyll fluorescence characteristics in leaves of C3 and C4 species in the laboratory of Dr. Agu Laisk of the Institute of Cell and Molecular Biology at Tartu University in Tartu, Estonia *September 15-October 27*
- Performed and discussed photosynthesis experiments for twenty biology students from SCSU Plant Physiology class *November 13 and 15*
- Discussed current research concerning C4 photosynthesis with a visiting delegation of agricultural scientists from Kazakhstan as part of a US Department of State International Visitor Leadership Program in Agricultural Biotechnology *February 7*
- Served as a judge for a student research conference sponsored by Quinnipiac Chapter of Sigma Xi held at Quinnipiac University *April 10*
- Presented results of the joint research he conducted in Estonia at the annual Eastern Regional Photosynthesis Conference in Woods Hole, MA *April 12-14*
- Served as a judge at the New Haven Public Schools Science Fair held at Yale University *May 8-9, 2013*

- Discussed current research with Dr. Tomas Vanek, a visiting scientist from the Institute of Experimental Botany, Prague, Czech Republic *May 31*

PIGNATELLO, JOSEPH J.

- Presented three talks at the Eurosoil 2012 Conference held in Bari, Italy: "Adsorption of Weak Organic Acid Anions to Black Carbon: Proton Exchange-Enabled Adsorption and Elevation of the pKa on the Surface", "Effect of Biochar Properties and Weathering on Sorption of the Swine Antibiotic Sulfamethazine in Biochar-Amended Soils", and "Sorption Selectivity of Neutral Organic Compounds by Soil Organic Matter Probed with Nitroxyl Paramagnetic NMR Relaxation Probes" *June 30-July 6, 2012*
- Was the keynote speaker at the International Humic Substances Society National Meeting held in Hangzhou, China where he presented the talk "Role of Natural Organic Matter as Sorption Suppressant in Soil, or, What Contribution Does Environmental Black Carbon Make to Sorption of Organic Contaminants in Soil?" *September 9-13*
- Presented the invited talk "Environmental Function of Black Carbon in Soil" at the School of Geographical Sciences, Fujian Normal University, Fuzhou, China *September 17*
- Attended and chaired the program and gave the lecture "Sorption Selectivity in Natural Organic Matter Studied with nitroxyl paramagnetic relaxation probes" at the Annual Meeting of the USDA Multistate W2082 Group held in Ft. Collins, CO *January 22-24, 2013*
- Co-organized and presided over two scientific sessions, "Symposium on Sorption Reversibility of Organic" and "Inorganic Pollutants in Natural Solids: The Elephant in the Room?" and presented a talk entitled "Sorption reversibility: introduction and perspective" at the 245th ACS National Meeting in New Orleans, LA *April 7-11*
- Judged posters at the New Haven Science Fair for The Connecticut Agricultural Experiment station Award May 14-15
- Talked on "What's in a Handful of Soil?" to the 6th grade science class at St. T homas's Day School, New Haven *May 30*
- Participated in an NSF grant review panel (CBET-Environmental Engineering) held in Arlington, VA *June 6-7*

PRAPAYOTIN-RIVEROS, KITTIPATH

- Participated in a webinar on FDA/eLEXNET Interface and Reports Training *July 12, 2012*
- Participated in an FDA FERN Chemistry Cooperative Agreement (CCAP) Laboratory conference call *July 19*
- Participated in an FDA ISO Chemistry Cooperative Agreement Laboratory Conference Call *December 20*
- Participated in ISO/IEC 17025:2005 Lead Assessor training by ANSI(ASQ National Accreditation Board/ACLASS at the Oklahoma Department of Agriculture February 25-March 1, 2013
- Participated in a visit to the Ohio Department of Agriculture as part of the FDA ISO Accreditation Mentor-Mentee Laboratory Program and co-presented a lecture entitled "Connecticut Agricultural Experiment Station Department of Analytical Chemistry – ISO Accreditation Update" *April 25*
- Participated in an FDA ISO 17025 Cooperative Agreement Face-to-Face Meeting with FDA ISO assessor at Raleigh, North Carolina *June 5-6*

RIDGE, GALE E.

- Traveled to London, England and Prague, Czech Republic, to work with experts in bed bug taxonomy. She confirmed a 5th form of *Cimex lectularius L*. which has unusually long legs. Populations of these insects can be found in Eastern Europe *August 4-17, 2012*
- Spoke about bed bugs to the Connecticut Community Providers Association in Rocky Hill (60 attendees) *August 28*
- Was filmed for a Connecticut nature program by Scott Tucker and talked about the European paper wasp, *Polistes dominulus*, carpenter bees, and other Hymenoptera *August 29*
- Along with other panelists, talked about ants with her focus on ants of New England on the Colin McEnroe Show on WNPR *September 12*
- Trained mattress recycle and refurbish employees on self-protection against bed bug infestation in Bridgeport (20 attendees) *September 13*
- Spoke about bed bugs and their management in multi-unit housing at the International Real Estate Managers New England meeting in Wallingford (90 attendees) *September 27*
- Spoke about bed bugs and the health industry at the Connecticut Environmental Health Association fall conference in Mystic (115 attendees) *September 27*
- Spoke about self-protection and how to manage bed bug issues in clients' homes to the Connecticut Community Providers Association in Hamden (38 attendees) *October 12*
- Set up a bed bug display and table at the annual University of Bridgeport Health Fair (200 visitors) *October 25*
- Was interviewed about bed bugs and a psychological disorder known as delusions of parasitosis by Harrison Monsky from the Yale Daily News *October 25*
- Spoke to Yale New Haven Hospital homecare givers for new mothers about self-protection and mother and baby protection in low income housing against bed bugs (25 attendees) *November 8*
- Spoke about bed bugs to the staff of HART United in North Haven, a non-profit organization that serves citizens with developmental disabilities in group homes throughout Connecticut (20 attendees) *November 15*
- Gave a talk on bed bugs to the Northwest Mental Health Network staff in Torrington (35 attendees) *November 15*
- Spoke about the biology, history, and management of bed bugs in the library system. She spoke in the main hall of the Connecticut State Library in Hartford (70 attendees) *November 19*
- Spoke about bed bug biology, their behavior and how residents should communicate and cooperate in the management of the insect to the senior citizen residents of Woodview in East Haven (135 attendees) *November 21*
- Gave a talk about managing bed bugs in Connecticut libraries at the Russell Library in Middletown and participated in a training panel with other experts to help librarians manage the insect in their libraries (90 attendees) *December 5*
- Spoke about how to deal with bed bugs for the handicapped to staff at HART United in Waterbury (15 attendees) *December 10*
- Spoke about bed bugs and staff self-protection against bed bugs at the Capitol Region Mental Health Center in Hartford (55 attendees) *December 10*

- Spoke about bed bug management in senior apartment complexes at the Woodview Senior Center in East Haven (50 attendees) *December 19*
- Was interviewed about bed bugs by Canadian Public Television, and was the narrator for their documentary on bed bugs scheduled to be broadcast later in 2013 *February 4*
- Presented a talk on bed bugs to the staff at Saint Francis Hospital in Hartford (60 attendees) *February 19*
- Was consulted by State Legislators regarding bed bug bills 334 (landlord and tenant responsibilities), 5619 (exterminating bed bugs in public housing), and 5621 (establishing guidelines and procedures to address bed bug infestations) *February*
- Talked about bed bugs at Lincoln Middle School in Meriden, sponsored by the Meriden Department of Health and Human Services (100 attendees) *March 14*
- Participated as an ad-hoc member sitting on the EPA FIFRA Scientific Advisory Panel as the expert entomologist, in Washington, DC *March 19-21*
- Spoke about bed bugs to health department officials, sanitarians, and representatives from the military at Southern Connecticut State University in New Haven. The talk was sponsored by the SCSU Department of Public Health (50 attendees) *March 27.*
- Spoke at Yale/St. Raphael's Hospital regarding managing bed bugs in their emergency rooms and rehabilitation centers (30 attendees) *April 16*
- With Katherine Dugas, produced a public awareness poster and a series of lapel buttons that played on a well-known World War II notice that read (Keep Calm and Bed Bugs Begone), which proved to be very popular *April*
- Gave a talk about her research on bed bug reproduction and behavior to the New England Resident Service Coordinators Conference in Brewster, MA (150 attendees) *May 2*
- Talked about the emergence of the 17-year periodical cicada on the Chaz and AJ radio show in Milford *May 13*
- Addressed staff about bed bug management in hospitals at St. Raphael's Hospital in New Haven (40 attendees) *May 16*
- Spoke about bed bugs to the Adult Day Care Directors Organization of Connecticut in Berlin (49 attendees) *May 21*
- Spoke about bed bugs to the Southeastern Mental Health Authority in Norwich (40 attendees) *May 28*
- Was filmed for a future broadcast about the 17-year periodical cicada by Scott Ticker of Expedition New England
- Led a cicada walk through the Magicicada Preserve on River Road in Hamden where filmmaker Samuel Orr, known for his time-lapse photography, was also visiting the preserve and spent some time with the group (20 attendees) *June 9*
- Presented a webinar about bed bugs to the Connecticut Association for Healthcare at Home, staff and administrators in Wallingford *June 12*

ROBB, CHRISTINA

- Attended the annual FDA FERN Chemistry Cooperative Agreement Program Meeting in Cincinnati and presented lectures entitled "Guidelines for Working with Powdered Products in a Portable Glovebox" (50 attendees) and "FSIS Capacity Exercise-Lessons Learned" (30 attendees) *September 10-14*
- Participated in MassHunter training for the new Agilent 7700x ICP-MS *November 1*

- Received eLEXNET Data Submission training *November 5*
- Participated in the 2012 Eastern Analytical Symposium and annual board meeting in Somerset, NJ *November 11-14*
- Participated in a conference call of the Eastern Analytical Symposium Board *February 22*
- Participated and contributed to the Department of Public Health, First Responder, Table Top Exercise *April 9*
- Participated in a Board meeting of the Eastern Analytical Symposium *May 10*
- Participated in the North Branford High School Environmental Career Fair *May 24*

RUTLEDGE, CLAIRE E.

- Staffed the CAES table and answered questions about insects including emerald ash borer and Asian longhorned beetle at the CTPA Summer Meeting in Farmington (810 attendees) *July 19, 2012*
- Spoke with members of the press at the Prospect Town Hall at a press conference announcing the emerald ash borer's presence in Connecticut (45 attendees) *July 20*
- Was interviewed for an article on the Wasp Watcher's program by Glen Rosenholm of the US Forest Service *July 26*
- Was interviewed about emerald ash borer and *Cerceris fumipennis* by News Channel 12 *July 31*
- Conducted 15 training sessions for Wasp Watchers at sites throughout Connecticut during the last week of June and first two weeks of July. Wasp Watchers is a volunteer group that monitors colonies of *Cerceris fumipennis* for exotic buprestid beetles like emerald ash borer. There are over 50 watchers in the program ranging from 7 years old to retirees, covering 37 colonies. *JULY*
- Presented a table display "Wasp Watchers: Citizen Scientists at Work" *August 1*
- Met with US Representative Rosa DeLauro at CAES to discuss emerald ash borer *August 6*
- Was interviewed for the article "Citizen Scientist Used Wasp to Locate Ash Borer" by Laraine Weschler of the Waterbury Republican-American *August 6*
- Gave talks on emerald ash borer trapping and biosurveillance at a field day on emerald ash borer sponsored by the Connecticut Tree Protective Association in Prospect (80 attendees) *September 6*
- Gave the talk "Who's eating our trees?" at a program titled "Saving Connecticut's Trees" jointly sponsored by the Experiment Station Associates and the Connecticut branch of the American Society of Landscape Architects, in Jones Auditorium (40 attendees) *September 13*
- Gave the talk "Four invasive insects to watch out for" at a "Hot Topics" class for master Gardeners in Bethany (50 attendees) *September 25*
- Taught the class "Insects that attack trees" for Arboriculture 101 in North Haven (45 students) *October 10*
- Participated in the annual Forest Health Cooperators Meeting in Brattleboro, VT *October 23-24*
- Gave the talk "Emerald ash borer and *Cerceris fumipennis*: Why wasps are our friends" to the Federated Garden Clubs of America Ecology Course at Kellogg Environmental Center in Derby (20 attendees) *November 8*
- Gave the talk "Emerald ash borer in Connecticut" to the Pomperaug Valley Garden Club in Woodbury (30 attendees) *November 13*

- Gave the talk “Emerald ash borer in Connecticut” to the Naugatuck Audubon Society at Kellogg Environmental Center in Derby (18 attendees) *November 13*
- Taught the “Tree Conditions Laboratory” class for the Connecticut Tree Protective Association in North Haven (45 attendees) *November 28*
- Gave the talk “An Update on Emerald Ash Borer” at the Winter Symposium of the Connecticut Greenhouse Growers Association and Connecticut Nursery and Landscape Association held at Manchester Community College(50 attendees) *January 4, 2013*
- Presented a table on “*Cerceris fumipennis*, the beetle hunting wasp” at the Winter Meeting of the Connecticut Tree Protective Association at Aqua Turf in Plantsville *January 17*
- Taught the course “Insects that attack trees” for the CTPA Arboriculture 101 course held in North Haven (45 attendees) *February 20*
- Was interviewed about emerald ash borer by the Waterbury Republican-American *February 21*
- Gave an interview about Emerald ash borer to Fox, CT which aired on the 4 and 5 PM news *March 1*
- Gave the talk “The Emerald ash borer in Connecticut” at the New Hartford Land Trust Annual Meeting in New Hartford (30 attendees) *March 3*
- Gave the talk “Wither Emerald ash borer? Biological control” at the Forest Health Workshop at Sessions Woods in Burlington (45 attendees) *March 5*
- Taught the class “Insects that Attack Trees” for the Arborists’ Class held at the Bartlett Arboretum in Stamford (17 attendees) *March 5*
- Gave the talk “Emerald ash borer in Connecticut” to the Greater Norwalk Area Master Builders Association in Wilton (30 adult attendees) *March 12*
- Taught the “Tree Conditions Laboratory” class for the CTPA’s Arboriculture 101 in North Haven (45 attendees) *March 13*
- Moderated the symposium “The Thin Green Line: Updates on EAB Detection and Management on the Eastern Edge of the Infestation” at the Annual Meeting of the Eastern Branch of the Entomological Society of America in Lancaster, PA. She also gave the talk “A little wasp told me: Biosurveillance and the Emerald ash borer in Connecticut” (35 attendees) *March 16-19*
- Presented a “Wasp Watchers” table at the Master Gardeners’ Opportunity Fair in Bethel (40 attendees) *March 21*
- Participated in review night for the CTPA’s Arboriculture 101 course in North Haven (45 attendees) *April 10*
- Participated in the Master Gardener’s Outreach Fair held in Brooklyn, CT (25 attendees) *April 12*
- Presented the talk “The Emerald Ash Borer in Connecticut” to the Annual Meeting of the Prospect Land Trust in Prospect (35 adult attendees) *April 24*
- Gave the talk “Emerald Ash Borer in Connecticut” to the Norfolk Land Trust in Norfolk,CT (10 attendees) *May 19*
- Gave the talk “Wasp Watching” to the sleeping Giant Park Association, Hamden, CT *June 25*

SALVAS, MICHELLE

- Assisted with registration at the CT Vegetable and Small Fruit Growers Conference held in Vernon, CT *January 17, 2013*

SANDREY, STEPHEN J.

- Participated in an interstate inspection training program in Riverhead, NY sponsored by the Horticultural Inspection Society, Eastern Chapter (HIS), the National Plant Board. The group visited two local nurseries for mock inspections; Half Hollow Nursery in Laurel, NY with 625 acres of container and field grown nursery stock and Van de Wetering Greenhouses in Jamesport, NY comprised of 38 acres, 20 of which are under glass to create optimum growing conditions for annual plugs and rooted lines *October 15-16, 2012*
- Answered questions from the public on Asian longhorned beetle and Emerald Ash Borer and manned the Station display at the Hartford Flower Show in Hartford, CT *February 23, 2013*

SCHULTES, NEIL P.

- Participated as a committee member on thesis examinations for three Masters level students in the laboratory of Dr. George Mourad in the Department of Biology, Indiana-Purdue University, Ft. Wayne, IN *July 8-14, 2012*
- Presented the talk "Genetic Modification of Plants in Agriculture: A Scientists Perspective" to the Polish University Club of Connecticut at Central Connecticut State University *September 19*
- Taught a course on "Plant Taxonomy" to the Federated Garden Club in Jones Auditorium *September 24*
- Performed and discussed photosynthesis experiments, and discussed the use of modern genetic techniques in studies of plant metabolism for twenty biology students from SCSU Plant Physiology class *November 13 and 15*
- Delivered two lectures on "Genetically Modified Plants in Agriculture" to a Yale University course Sci031 "Current Topics in Science *January 25 and February 1, 2013*
- Discussed current research on C4 photosynthesis with agricultural scientists from Kazakhstan as part of a US Department of State International Visitor Leadership Program in Agricultural Biotechnology. The tour was hosted by Dr. Robert Marra *February 7*
- Served on a Master Thesis Defense Committee for Jessica Schein at the Department of Biology, Indiana-Perdue University, Ft. Wayne, IN *April 10*
- Discussed current research in the Department of Biochemistry and Genetics with Dr. Tomas Vanek, a visiting scientist from the Institute of Experimental Botany, Prague, Czech Republic *May 31*
- Served on a Master Thesis Defense Committee for Kevin Ann Hunt at the Department of Biology, Indiana-Perdue University, Ft. Wayne, IN *June 12*
- Spent a week in the laboratory of colleague and collaborator De. George Mourad in the Department of Biology, Indiana-Purdue University, Ft. Wayne, IN. During the week he held meetings with undergraduate and graduate students discussing results and planning experiments for the upcoming year *June 9-15*

SHEPARD, JOHN J.

- Helped host the Mosquito Task Force Group from the Mystic Aquarium and gave an overview of the Station's research and surveillance programs on mosquitoes and mosquito-borne diseases (5 attendees) *October 15*
- Met with staff of Yale's Peabody Museum to discuss production of a CAES/Metropolitan business Academy Video for teachers on mosquitoes and mosquito-borne diseases *October 22*
- Participated in an Executive Board Meeting of the Northeastern Mosquito Control Association in Mystic, CT (12 attendees) *November 9*
- Presented the invited talk, "West Nile Virus and Eastern Equine Encephalitis in Connecticut, 2012", at the Annual Meeting of the Connecticut Environmental Council in Southington, CT (150 attendees) *November 20*
- Gave the invited talk "Arbovirus Activity in Connecticut, 2012" at the 58th Annual Meeting of the Northeastern Mosquito Control Association, held in Mystic, CT (170 Attendees) *December 3*
- Conducted a hands-on workshop for a group of 18 students and 2 teachers from East Hartford High as part of the Yale-Peabody Fellows SEPA NIH program on mosquito biology *March 14, 2013*
- Presented information on mosquito biology and demonstrated mosquito rearing techniques for a video presentation conducted by 7 students and one teacher from the Metropolitan Business Academy in New Haven *March 20*
- Presented the invited talks "Arbovirus Activity in Connecticut 2012" and "The Mosquitoes of Connecticut" at the Clarke Mosquito Control Workshop at Cabela's in East Hartford (60 attendees) *April 12*
- Participated in a conference call on mosquito evolutionary relationships with the HURI/SURI Program *April 17*
- Presented a display on the Mosquito Trapping and Testing Program, mosquito biology, and vernal pools at "Bitten! Bloodsuckers and Climate" at the Yale Peabody Museum of Natural History (1,457 visitors) *April 18*
- Hosted Siddartha Bhanderay, Nicole West, and Chelsea Savit of the Department of Epidemiology and Microbial Diseases, Yale University, and presented a two day training course of adult mosquito identification and mosquito trapping techniques *May 14-15*

SHORT, MICHAEL R.

- Attended the public hearing concerning emerald ash borer infestation in Prospect *August 8, 2012*
- Participated in a CT Tree Protection Association emerald ash borer day-long talk and field tour in Prospect *September 6*
- Participated in the Forest Health Monitoring Workshop at Sessions Woods WMA in Burlinton *March 5*
- With Dr. Scott Williams, donated 300 pounds of processed venison to the Bridgeport Rescue Mission, Bridgeport, CT *March 6*
- With Joseph P. Barsky, staffed a display entitled "CAES Research at The White Memorial Foundation" at bioBlitz 2013 at The White Memorial Foundation in Bantam (120 attendees) *June 1*

- Was job-shadowed by Eliza Alder, a recent biology graduate of The University of Southern Maine *June 24-28*

SMITH, VICTORIA L.

- Participated in a meeting of the Yale Biosafety Committee in New Haven (18 participants) *August 16, 2012*
- Participated in a meeting of the Emerald Ash Borer Compliance Agreement Working Group at USDA-APHIS-PPQ Headquarters in Wallingford (6 participants) *August 20*
- Participated in a meeting of the Emerald Ash Borer Incident Management Team held at USDA-APHIS-PPQ Headquarters in Wallingford (10 participants) *August 21*
- Participated in a *Phytophthora ramorum* Safeguarding Meeting, as the representative for the Eastern Plant Board, sponsored by the National Plant Board, USDA-APHIS-PPQ, and Oregon Department of Agriculture, held at the Red Lion Hotel in Salem, OR and on the Oregon State University campus at Corvallis, OR (30 participants) *September 24-28*
- Gave the presentation "Working Within a Quarantine: What you Need to Know" at the Connecticut Urban Forest Council's 24th Annual Conference and 8th Annual Forest Forum, Southington (200 participants*) October 4*
- Was the Eastern Plant Board's representative to the National Plant Board's Board of Directors, and participated in discussions on plants for planting regulations, chrysanthemum white rust, *Phytophthora ramorum*, and emerald ash borer at the 36th Annual Meeting of the North American Plant Protection Organization, Louisville, KY (200 participants) *October 15-18*
- Gave a presentation on forest health surveys, aerial survey results, and emerald ash borer at the annual NE/NY Forest Health Cooperators Meeting, held in conjunction with the US Forest Service Northeast Area Field Office in Durham, NH, at the World Learning/School for International Training, Brattleboro, VT (30 participants) *October 23-24*
- Participated in a meeting of the National Plant Board, Board of Directors and the USDA-APHIS Plant Protection and Quarantine Leadership Team, held at the Center for Plant Health Science and Technology Headquarters in Raleigh, NC with discussion on *Phytophthora ramorum*, chrysanthemum white rust, quarantine and budget issues, and plant health policy (20 participants) *November 5-8*
- With Steve Sandrey, Tia Blevins, Peter Trenchard and Jeff Fengler, participated in a webinar on improvements to the PExD Export Certification System *December 6*
- Participated in the fall meeting of the CT Cooperative Agricultural Pest Survey Committee held at the Valley Laboratory in Windsor (17 participants) *December 10*
- With Peter Trenchard and Tia Blevins, participated in a webinar on the trapping program for Emerald ash borer *December 19*
- Gave the talk "Working Within a Quarantine: What You Need to Know" at the Winter Meeting of the CT Nursery and Landscape Association at Manchester Community College (200 participants) *January 4, 2013*
- Participated in a Cooperative Management Review, in conjunction with DEEP and the US Forest Service, of CAES-DEEP-USFS cooperative forestry programs, held in the Russell Conference Room in Hartford (20 participants) *January 22-25*
- Participated in the International visitor Leadership Program – Agricultural biotechnology: A Project for Kazakhstan, with a presentation titled "CAES Regulatory and Survey

Responsibilities for Invasive Pests and diseases" held in the Johnson-Horsfall Atrium *February 7*

- Participated in a meeting of the committees of the Systems Approach to Nursery Certification Working Group, as co-chair of the Laws Subcommittee, held in Greenbelt, MD (40 participants) *February 26-28*
- Organized and participated in the Annual Forest Health Workshop, and gave the talk "Winter Moth – A New Survey Target" held at Sessions Woods Wildlife Management Area in Burlington (47 participants) *March 5*
- Gave the talk "Pest and Disease Threats to our Forests" at the Tree Health Care Seminar, sponsored by Rainbow Tree Care that was held at The Inn in Middletown (30 attendees) *March 12*
- Participated in the 88th Annual Meeting of the Eastern Plant Board as President of the EPB, and with a presentation on Boxwood Blight, held at the Crowne Plaza in Harrisburg, PA (approx.. 100 participants) *April 8-11*
- Participated in a meeting of the Yale Biosafety Committee in New Haven (20 participants) *April 18*
- Conducted a training session on permitting and inspections with Eric Chamberlain, USDA-APHIS-PPQ Plant Health Safeguarding Specialist, in conjunction with the Yale Biosafety Committee in New Haven (24 participants) *May 6*
- Met with officials of the Connecticut Department of Agriculture, to discuss harmonization of inspection efforts for invasive plants, at the Department of Agriculture in Hartford *June 27*

STAFFORD, KIRBY C., III

- Was interviewed about army worms and other invasive insects by Brigitte Ruthman of the Waterbury Republican-American *July 3, 2012*
- Participated in the joint meeting of the Northeastern Regional Association of Experiment Station Directors (NERA) and Extension Directors (NEED) *July 8-10*
- Participated in a conference call for the Forest Pest Survey and Outreach Project *July 11*
- Interacted with growers at the meeting of the Connecticut Nursery and Landscape Association at Lockwood Farm *July11*
- Participated in a conference call between the Station, USDA Animal Plant Inspection Service, US Forest Service, and the CT Department of Energy and Environmental Protection about the Station's confirmed detection of the emerald ash borer in Prospect and Naugatuck *July 19*
- Participated in an emerald ash borer press conference in Prospect *July 20*
- Interacted with other state regulatory officials at the National Plant Board meeting in Mystic *July 23-25*
- Participated in Senator Richard Blumenthal's press conference on a proposed Lyme disease bill at the Experiment Station *July 27*
- Participated in a conference call with the CT Department of Energy and Environmental Protection on the handling of wood waste or storm debris *July 31*
- Was interviewed about the emerald ash borer by Sara Hagen, Channel 12 News, Norwalk *July 31*
- Spoke on ticks and Lyme disease at the Eleanor Buck Wolf Nature Center in Wethersfield (8 attendees) *August 2*

- Was interviewed about honey bees in a New Haven firehouse by Denise Bufa of the Hartford Courant *August 2*
- Participated in a conference call on the emerald ash borer with USDA-APHIS-PPQ, Department of Energy and Environmental Protection and the US Forest Service *August 3*
- With Drs. Louis A. Magnarelli and Claire E. Rutledge, participated in a tour for Representative Rosa DeLauro and the press on the emerald ash borer *August 6*
- Was interviewed about the emerald ash borer by the New Haven Register and Channel 3 Fox News *August 6*
- Participated in a hearing on the emerald ash borer quarantine in Prospect (170 attendees) *August 8*
- Was interviewed about the emerald ash borer quarantine by Lucy Nalpathanchil of WNPR *August 9*
- Was interviewed about the emerald ash borer by Denise Coffey of Reminder News *August 10*
- Participated in a conference call with the National Research Support Projects Review Committee *August 13*
- Was interviewed about the new tick and Lyme disease grant from the Centers for Disease Control and Prevention by Susan Wolf of the Redding Pilot *August 20*
- With Dr. Victoria L. Smith, participated in a meeting with the USDA-APHS-PPQ staff on the regulatory aspects of the emerald ash borer infestation (4 attendees) *August 20*
- Was interviewed about the emerald ash borer by Bill Leukhardt of the Hartford Courant *August 21*
- Participated in a meeting between the Experiment Station, Department of Energy and Environmental Protection, the U.S. Forest Service, and APHIS-PPQ to plan and structure the delimiting survey for the emerald ash borer (8 attendees) *August 21*
- Was interviewed for additional information on the emerald ash borer by Bill Leukhardt of the Hartford Courant *August 23*
- Conducted diversity training for new employees in Jones Auditorium (19 attendees) *August 27*
- Was interviewed about the emerald ash borer, its impact and control by Mike Puffer of the Republican American *August 29*
- Testified on a panel at a Senate hearing in Stamford, sponsored by Senator Richard Blumenthal, on Lyme disease and the federal response to Lyme disease (360 attendees) *August 30*
- Was interviewed about deer and tick management by Kaomi Goetz of WSHU Public Radio *August 30*
- Was interviewed about ticks by Beau Berman of Fox CT News *August 30*
- Participated in a Department of Energy and Environmental Protection, and Forestry emerald ash borer and firewood update conference call *August 31*
- Was interviewed about the gypsy moth by Bob Miller of the Danbury News Times *September 4*
- With Dr. Louis A. Magnarelli, met with Chris Martin and Kenneth Collette, CT Department of Energy and Environmental Protection, to discuss firewood regulations *September 13*
- Spoke on ticks, Lyme disease, West Nile virus, and Emerald ash borer at a meeting of the Spring Glen Garden Club held at the cottage at Lockwood Farm (12 attendees) *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 in Jones Auditorium (52 attendees) *September 18*
- With Dr. Scott C. Williams, met with the Town of Redding's First Selectman, Health Officer, Land Use Coordinator, and officials from White Buffalo, Inc., to discuss the Centers for Disease Control and Prevention-funded tick management study in Redding titled "An Integrated and Individual Tick Management Program to Reduce Risk of Lyme Disease in a Residential Endemic Area" *September 19*
- 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 Portsmouth, NH (102 attendees) September 24-26
- Participated in a national emerald ash borer conference call *October 3*
- Participated in a Board Meeting of the Connecticut Coalition Against Bed Bugs (5 attendees) *October 3*
- Participated in a USDA-NIFA Webinar on the new REEport project system *October 11*
- Spoke on the emerald ash borer quarantine and then on the firewood regulations at an infor mational forum for the CT Professional Timber Products Association at Sessions Woods in Burlington (100 attendees) *October 17*
- Spoke on the emerald ash borer quarantine and then on the firewood regulations at an informational forum for the CT Professional Timber Products Association at the Middlesex County Extension Center in Haddam (52 attendees) *October 24*
- Participated in an emerald ash borer agency lead team conference call with the Department of Energy and Environmental Protection, U. S. Forest Service, and USDA-APHIS-PPQ (4 attendees) *October 31*
- Presided over a public hearing on proposed firewood regulations in Hartford (9 attendees) *November 2*
- Represented the Experiment Station at the annual meeting luncheon of the Working Lands Alliance in Hartford *November 14*
- Represented the Experiment Station at the Rule of Law Conference in Hartford *November 16*
- Represented the Experiment Station at the annual meeting luncheon of the Connecticut Farm Bureau in Waterbury *November 16*
- Participated in a meeting of the Connecticut Entomological Society in New Haven *November 16*
- With Gregory Bugbee and Dr. John Silander of the University of Connecticut, provided a workshop on "Invasive Species, Climate Change and Other Factors" at the annual meeting of the Connecticut Association of Conservation and Inland Wetlands Commissions in Meriden *November 17*
- Was interviewed about beekeeping by Lisa Lenkiewica of the West Hartford Patch *November 19*
- With Dr. Scott C. Williams, presented the CDC tick management project to residents of select neighborhoods in Redding at the Redding Community Center at a meeting hosted by the Redding Department of Health (35 attendees) *November 28*
- Spoke on the emerald ash borer and related regulations at the Department of Energy and Environmental Protection DEEP) as part of emerald ash borer training for DEEP Personnel (25 attendees) *November 30*

- Participated in a conference call of the lead team (USDA-PPQ) USDA Forest Service, CT Division of Forestry (DEEP), and CAES) on the delimiting survey for Emerald ash borer (4 attendees) *December 3*
- Participated in a Forest Pest Survey and Outreach Project Webinar *December 5*
- Was interviewed about the Emerald ash borer by Rick Ruthman, Quinnipiac University *December 6*
- Participated in the CT Cooperative Agricultural Pest Survey meeting at the Valley Laboratory in Windsor (17 attendees) *December 10*
- Participated and chaired a meeting of the Institutional Animal Care and Use Committee (5 attendees) *December 13*
- Participated in a USDA-NIFA web conference on the new REEport System *December 13*
- Provided training to CT Department of Energy and Environmental Protection personnel on the Emerald ash borer and related regulations in Hartford (18 attendees) *December 14*
- With Dr. Louis A. Magnarelli, attended a meeting of the Legislative Regulatory Review Committee in Hartford for the proposed firewood regulations *December 18*
- Was interviewed about the Emerald ash borer and regulatory and survey activities by Quannah Leonard of the Waterbury Republican-American *December 27*
- Participated in the Connecticut Tree Protective Association Winter Meeting in Plantsville *January 17, 2013*
- Participated in the U. S. Forest Service Cooperative Management Program Review and Forest Health Program Review in Hartford (14 attendees) *January 22, 23 and 25*
- With Dr. Goudarz Molaei and Dr. Scott Williams, met with Dr. Charles B. Beard, Chief of Bacterial Diseases Branch, Division of Vector-Borne Diseases, CDC *January 24*
- Participated in a webinar on site administration of the new USDA-NIFA REEport Project reporting system *January 29*
- With Michael P. Last provided testimony on three house bills to update the language of the Experiment Station's statutes and attended the opening of the bids for the Jenkins-Waggoner Laboratory in Hartford *January 30*
- Participated as administrative advisor at a meeting of the multi-state research project NE1231 in Portland, ME (12 attendees) *February 5-6*
- Spoke on tick and Lyme disease management at the NOFA Organic Land Care Course at Three Rivers Community College in Norwich (66 attendees) *February 13*
- Presented the agency report to the Appropriations Committee in Hartford *February 20*
- Presented the agency report to the Bonding Subcommittee in Hartford *February 25*
- Was interviewed about the new Emerald ash borer detections by Dana Whelan of WTIC Radio February 26
- Participated in a NEED-NERA Conference call to review and discuss planning grant proposals (11 attendees) *February 27*
- Spoke on tick pest management at a Tick-Borne Disease Integrated Pest Management Conference held at EPA Headquarters in Arlington, VA (88 attendees) *March 6*
- Participated in a meeting of the Northeast Area Experiment Station Directors (NRA) and the Multistate Activities Committee in Baltimore, MD *March 11-13*
- Was interviewed about tick bite and Lyme disease prevention by Meaghen Brown of Outside Magazine *March 14*

- Organized and emceed a ceremony of appreciation for former Station Director Paul E. Waggoner in the atrium of the Johnson-Horsfall Laboratory *March 18*
- With Vickie Bomba-Lewandoski, staffed an Experiment Station booth on the Emerald ash borer on Ag Day at the Capitol in Hartford *March 20*
- Presented a talk on Emerald ash borer to the Tree Wardens in Farmington (54 attendees) *March 21*
- Was interviewed on aspects of tick biology by Meaghen Brown of Outside Magazine *March 21*
- Participated in a Connecticut Emerald Ash Borer team meeting in Wallingford (12 attendees) *April 2*
- Provided a Station Update and introduced Dr. Theodore Andreadis at the annual meeting of the Experiment Station Associates at Edgerton Park in New Haven (22 attendees) *April 3*
- Participated in the Board meeting of the Experiment Station Associates at the Experiment Station (8 attendees) *April 9*
- Met with Representative Prasad Srinivasan in Hartford to provide requested information on Lyme disease prevention *April 19*
- With representatives from the CT Department of Construction Services, FLAD Architects, and A. Secondino & Sons Contractors, held an information session on the Jenkins-Waggoner project for Experiment Station neighbors (22 attendees) *April 18*
- Was interviewed about tick control by Cindy McCormik of the Cape Cod Times *May 2*
- Was interviewed about the periodical cicada by Tina Detelj of Channel 8 News *May 6*
- Was interviewed about the periodical cicada by Mary Jones of WDRC Radio *May 7*
- Partricipated in a Jenkins-Waggoner construction project meeting in the Slate Board Room (10 attendees) *May 7*
- Was interviewed about ticks and tick research by Cynthia Drummond of the Westerly Sun *May 13*
- Was interviewed about ticks for a series on Lyme disease by Beth Daley of the Boston Globe *May 16*
- Conducted a meeting of the Cooperative Agricultural Pest Survey Committee at the Valley Laboratory in Windsor (11 attendees) *May 22*
- Was interviewed about ticks, Lyme disease, and the emerald ash borer by Sam Gingerella of WTIC Radio *May 23*
- Was interviewed about the emerald ash borer by Mark Seems of CT Radio Network *May 23*
- Was interviewed about the weather and insects by Kaomi Goetz of WSHU-FM *May 29*
- Participated in a teleconference of the National Research Support Program Review Committee (9 attendees) *June 3*
- Was interviewed about the periodical cicada by Denise Buffa of the Hartford Courant *June 4*
- Provided a Station update to the Experiment Station Associates on their spring 2013 agricultural tour(34 attendees) *June 11*
- Was interviewed about tick image resources by Patrick Hogan, White-Tailed Deer Magazine *June 18*
- Was interviewed about ticks by Harold Lezy, Journal Inquirer *June 24*
- Was interviewed about tick activity by Amanda Cuda, Connecticut post *June 25*

- Participated in and chaired a teleconference call of the Multistate Activities Committee of the Northeastern Regional Association of State Agricultural Experiment Station Directors *June 26*

STONER, KIMBERLY A.

- Was interviewed about research on pollinator decline in general and specifically on pollination of pumpkins and winter squash in Connecticut by Christina DeFranco Taylor of Connecticut Public Television at Dzen Farm in Ellington *July 17, 2012*
- Gave a presentation and answered questions as part of a Public Policy Teach-In, "Where Have All the Bees Gone?" sponsored by the Maine Organic Farmers and Gardeners Association, at the Common Ground Country Fair in Unity, Maine (70 attendees) *September 22*
- Was featured in a story about bees and pollination on "All Things Connecticut" on Connecticut Public Television *October 12*
- Participated in a National Stakeholders Meeting for Honey Bee Health, sponsored by the US Environmental Protection Agency and US Department of Agriculture in Alexandria, VA, and worked with a breakout group on pesticide issues and bees, developing a list of research and extension needs for investigating bee kills possibly caused by pesticides, and for informing growers and other pesticide users about ways to minimize effects on bees *October 15*
- Spoke on pollination and bees at the Flanders Nature Center in Woodbury (122 attendees) *November 13*
- Participated in the Urban Agriculture and Economic Development Working Group of the New Haven Food Policy Council (35 attendees) *November 29*
- Participated in a day-long discussion of the Advisory Team to the "Scaling UP" project, led by Jiff Martin of the University of Connecticut, at the Tolland County Extension Center in Vernon - this is a project to assist farmers who want to increase the size and scope of existing farming operations (9 attendees) *January 10, 2013*
- Spoke on "Pest Management for Organic Farms" at the CT NOFA Getting Started in Organic Farming Conference, held at Goodwin College in East Hartford (60 attendees) *January 26*
- Participated in a meeting of scientists on the multidisciplinary project "Pollination Security for Northeast Specialty Crops" held at the University of Massachusetts in Amherst, MA *February 2*
- Taught the course segment "Principles and Procedures" in the NOFA Organic Land Care Course at Three Rivers Community College in Norwich (60 attendees) *February 11*
- Participated in the Community Garden and Backyard Agriculture Working Group of the New Haven Food Policy Council at City Hall in New Haven (25 attendees) *February 14*
- Taught the course segment "Pest Management Overview" in the NOFA Organic Land Care Course at Three Rivers Community College in Norwich (60 attendees) *February 14*
- Presented the workshop "Birds Do It, Bees Do It – Pollination, That Is" at the CT NOFA Winter Conference held at Wilton High School in Wilton (40 attendees) *March 2*
- Participated in the Urban Agriculture Working Group of the New Haven Food Policy Council at City Hall in New Haven (20 attendees) *March 14*
- Hosted Dr. John Ascher and Eli Wyman of the American Museum of Natural History, who were collecting information from current collections and historical CAES collections of bees

for research on changes in patterns of distribution of native bee species over time *March 20-21*

- Participated in a meeting of the Urban Agriculture Working Group of the New Haven Food Policy Council at City Hall in New Haven (20 participants) *April 11*
- Was interviewed about movement of neonicotinoid insecticides into nectar and pollen of squash by Elizabeth Grossman for Yale Environment 360, an online magazine *April 15*
- Was interviewed about pesticide exposure of honey bees by Siobhan Crise for Fairfield County Weekly *April 30*
- Participated in a meeting of the Urban Agriculture Working Group at the Gateway Community College campus at Long Wharf (15 attendees) May 9
- Participated in leading a tour of Lockwood Farm for students from Common Ground High School in New Haven (13 student and 4 adult attendees) *May 22*
- Gave a talk to coordinators of school vegetable gardens from elementary and middle schools in New Haven and Bridgeport about common insect pests and beneficial insects in vegetable gardens and ways to manage them within the restrictions on pesticide use at K-8 schools at Common Ground High School in New Haven (12 attendees) *May 22*
- Participated in a meeting of the Urban Agriculture Working Group of the New Haven Food Policy Council at Gateway Community College – Long Wharf in New Haven (10 attendees) *June 13*
- Presented a workshop on native bees and methods to protect and conserve them, assisted by Tracy Zarrillo, at Massaro Farm in Woodbridge (10 attendees) *June 22*

THOMAS, MICHAEL C.

- Demonstrated insect collecting and preservation techniques to the UConn Entomology and Yale University Terrestrial Arthropods class at the Yale Forestry Camp in Norfolk, CT (32 students) *September 7-8, 2012*
- Helped host the Mosquito Task Force Group from the Mystic Aquarium and gave an overview of the Station's research and surveillance programs on mosquitoes and mosquito-borne diseases (5 attendees) *October 15*
- Met with staff of Yale's Peabody Museum to discuss production of a CAES/Metropolitan business Academy Video for teachers on mosquitoes and mosquito-borne diseases *October 22*
- Assisted DEEP Wildlife Division staff in protecting critical habitat for the globally rare Frosted Elfin, *Callophrys irus*, in New Hartford *October 25*
- Discussed invertebrate conservation projects and funding priorities at a subcommittee meeting of Connecticut's Endangered Species Advisory Committee held at Wesleyan University, Middletown *January 21, 2013*
- Participated in a meeting with Board members of the Autumn Fields Association, DEEP, and the University of Connecticut addressing the management needs of the state endangered Dune Ghost Tiger Beetle (*Cicindela lepida*) in Enfield, CT *March 5*
- Conducted a hands-on workshop for a group of 18 students and 2 teachers from East Hartford High School as part of the Yale-Peabody Fellows SEPA NIH Program on mosquito biology *March 14*

- Presented information on mosquito biology and demonstrated mosquito rearing techniques for a video presentation conducted by 7 students and one teacher from the Metropolitan Business Academy in New Haven *March 20*
- Presented a display on the Mosquito Trapping and Testing Program mosquito biology, and vernal pools at "Bitten! Bloodsuckers and Climate" at the Yale Peabody Museum of Natural History (1,457 visitors) *April 18*
- Led a bird walk for the Hartford Audubon Society at Bartholomew's Cobble, Ashley Falls,MA (12 participants) *May 11*
- Hosted Siddartha Bhanderay, Nicole West, and Chelsea Savit of the Department of Epidemiology and Microbial Diseases, Yale University, and presented a two-day training course of adult mosquito identification and mosquito trapping techniques *May 14-15*
- Attended the North American Dipterists Society Meeting at the Mississippi Entomological Museum, Mississippi State University *May 17-19*
- Discussed the Mattabassett Regionalization Project and the potential impact to state-listed invertebrates with Paul Stanton of Fitzgerald & Halliday in Cromwell, CT *May 29*
- Participated in a Northeast Regional Conservation Needs grant conducting the first Region-wide conservation assessment of Odonata (Dragonflies and Damselflies) in the Northeastern Region with project director Erin White of the New York Natural Heritage Program *May 29*
- Hosted the Northeast Regional Meeting of the Dragonfly Society of the Americas in Griswold, CT (47 attendees) *June 21-23*

TRENCHARD, PETER W.
- Participated in an interstate inspection training program in Riverhead, NY sponsored by the Horticultural Inspection Society, Eastern Chapter (HIS), the National Plant Board. The group visited two local nurseries for mock inspections; Half Hollow Nursery in Laurel, NY with 625 acres of container and field grown nursery stock and Van de Wetering Greenhouses in Jamesport, NY comprised of 38 acres, 20 of which are under glass to create optimum growing conditions for annual plugs and rooted lines *October 15-16, 2012*

VOSSBRINCK, CHARLES R.
- Visited and spoke with Bill Muzychko of Bill's Fig Farm in Flemington, New Jersey to obtain information on his system of growing figs in self-watering pots with good yields for potential adaptation to Connecticut *July 31*
- Visited Bill's Fig Farm in Flemington, NJ and obtained 6 varieties of 2 year old fig trees which are now located at Lockwood Farm in Hamden *August 23*
- Met with Dr. Richard Kiyomoto at Prides Corner Nursery in Lebanon to discuss cell culture methods for propagation of figs *March 14*
- Met with Bill Muzychko of Bill's Figs in Flemington, New Jersey to discuss the culture and propagation of fig varieties *March 22*

WARD, JEFFREY S.
- Spoke on "Native Woody Shrubs" at the Connecticut Nursery and Landscape Association meeting at Lockwood Farm (15 attendees) *July 11, 2012*
- Chaired the Technical Standards Committee of the CT Statewide Vegetation Management Task Force *July 12 and 23*

- Participated in the CT Statewide Vegetation Management Task Force in Middlefield *July 17*
- Was interviewed about spotting defects in potentially hazardous trees by Erin Cox of WTNH News 8 *July 19*
- With J. P. Barsky, visited Rebekah's Hill Forest in Goshen to advise on forest management options *July 20*
- Discussed growth and control of running bamboo with Mike Johnson of Summer Hill Nursery *July 25*
- Participated in a joint Connecticut Urban Forest Council and Forestry Forum conference planning meeting in New Haven *July 27*
- Appeared as a guest on Len & Lisa's Garden Talk radio show (WTIC 1080) to discuss tree care and running bamboo (30,000 listeners) *July 28*
- Was interviewed about running bamboo growth and control by John Burgeson of the Connecticut Post *August 1*
- Participated in the CT Statewide Vegetation Management Task Force in Middlefield *August 2, 14, and 28*
- Spoke on invasive identification and control to the Student Conservation Association in Bridgeport (8 student and 4 staff attendees) *August 9*
- Inspected running bamboo along the Merritt Parkway in Trumbull with Bruce Villwock of the CT DOT Transportation Landscape Design, and discussed control strategies *August 17*
- Spoke on invasive identification and control to the Norfolk Land Trust (7 attendees) *August 18*
- Met with White Memorial Foundation staff to discuss effectiveness of Japanese barberry control and roadside forest management (3 attendees) *August 30*
- Was interviewed about acorn production by Bob Miller of the Danbury News Times *August 30*
- Administered practical and oral examinations to arborist candidates for the Connecticut Tree Protection Examining Board *September 12*
- Spoke on "Assessing Forest Health" at a workshop organized by the Guilford Conservation Commission (9 attendees) *September 18*
- Assessed the health of Norway maples on Prospect Street at the request of Christy Hass, Deputy Director, New Haven Parks and Recreation *September 19*
- Spoke on "The Biodiversity Crisis: Invasive Plants" for the Harvard Club of Fairfield County in Greenwich (31 attendees) *September 20*
- Was interviewed about the effect of weather on fall colors by Bridget Ruthman of the Waterbury Republican *September 22*
- Discussed invasive plant control with the Parks Coordinator for the Town of Mansfield *September 24*
- Participated in an Executive Board Meeting of the Connecticut Urban Forest Council in Middlefield *September 25*
- Spoke on the role of the Experiment Station in protecting Connecticut's roadside forest at the Connecticut Urban Forest Conference (100 attendees) *October 4*
- Interviewed about the effect of last year's storms on the health of Connecticut's trees and forests by Steve Grant of the Hartford Courant *October 5*
- Was interviewed about fall colors and yellow sugar maples by Steve Grant of the Hartford Courant *October 9*

- Was interviewed about the effect of last year's storms on the health of Connecticut's trees and forests by Bridget Ruthman of the Waterbury Republican *October 12*
- Spoke on "Managing and Regenerating Connecticut's Forest Resource" and led three field exercises on forest management at the Envirothon Forestry Workshop in Tolland (120 students and 30 teachers from 25 schools) *October 13*
- Met with Charlotte Pyle, Landscape Ecologist with CT NRCS, to discuss invasive control at landscape levels in Mansfield *October 18*
- Gave a seminar on "Disturbance and the Connecticut Forest" for the Biology Department at Southern Connecticut State University (26 attendees) *October 23*
- Spoke on tree identification and ecology to students from Coop High School, New Haven (11 students, 2 teacher attendees) *October 26*
- Participated in the Invasive Plant Symposium at Storrs *October 25*
- Participated in a meeting of the Audubon Connecticut Science Committee in Southbury *November 1*
- Met with Kim Dietrich, of Dietrich Gardens-Woodbury, to discuss bamboo control, *Woodbury November 9*
- Met with the First Selectman of Woodbury to discuss invasive control and roadside tree care *November 9*
- Met with Terry Jones of Jones Family Farm, to discuss right-of-way management *November 9*
- Met with Doug Pfenniger of the Winchester Land Trust to discuss forest management *November 19*
- Met with Chris Herold of The Tree Company, to advise on care of the state champion Pepperridge in Madison *November 19*
- Lectured on "A short history of the Connecticut forest" for the Department of Biology 2012-13 seminar series at Western Connecticut State University, Danbury (65 attendees) *November 28*
- Was interviewed about changes in forest composition by Bob Miller of the Danbury News Times *November 28*
- Was interviewed about running bamboo growth and control by John Burgeson of the Connecticut Post *November 29*
- Administered practical and oral examination to arborist candidates for the Connecticut Tree Protection Examining Board *December 5*
- Was interviewed about running bamboos by Linda McIntyre, Landscape Architecture Magazine *December 10*
- Participated in a Connecticut Invasive Plant Council Meeting in Hartford *December 11*
- Was interviewed about storms, trees, and power lines by Laura Modlin of the Easton Courier Newspaper *December 27*
- Participated in the Roadside Management Plan meeting in Middlefield *January 14, 2013*
- Was interviewed about running bamboos by Julie Curtis of the Daily Voice *January 22*
- Participated in a conference call meeting of the Connecticut Urban Forest Council *January 25*
- Was interviewed about climate and leaf-out dates by John Burgeson of the Connecticut Post *January 28*

- Gave the talk “Comparing effectiveness impacts of Japanese barberry control treatments and herbivory reduction on non-native and native plant communities - 4-5 year results” at the New York/New England Society of American Foresters’ annual meeting in Saratoga Springs, NY (80 attendees) *January 30*
- Participated in a Connecticut Invasive Plant Council Meeting in Hartford *February 19*
- Spoke on “Control methods for Japanese barberry and other invasive species” at the Symposium on Lyme Disease/Japanese Barberry Connection in Greenwich (60 attendees) *February 21*
- Participated in the Connecticut Chapter – Society of American Foresters Meeting in Middlefield *February 27*
- Was interviewed about invasive species control by Jessica Mena of Brainerd Communications *February 28*
- Spoke on “Comparing effectiveness and impacts of Japanese barberry control and herbivory reduction” at the 18th annual Forest Health Workshop in Burlington (40 attendees) *March 6*
- Spoke on “The Dynamic Connecticut Forest: An 80-Year Record” at Quinnipiac University Sigma Xi lecture (24 attendees) *March 7*
- Was interviewed about roadside forest management by Laura Modlin of the Easton Courier Newspaper *March 7*
- Spoke on “Impacts of invasive species and deer on our Forests” to the Green Mountain Division, Society of American Foresters 2013 Winter Meeting in Fairlee, VT (54 attendees) *March 8*
- Spoke on “The effects of climate change on Christmas trees” at the CT Christmas Tree Growers Association 53rd annual meeting in Middletown (42 attendees) *March 8*
- Was interviewed about forest dynamics in Connecticut by Michael Bellmore of the New Haven Register *March 8*
- Administered practical and oral examinations to arborist candidates for the Connecticut Tree Protection Examining Board *March 13*
- Participated in a panel discussion on environmental careers at Sophomore Career Day, Cheshire High School (75 students) *April 9*
- Was interviewed about spring tree care after severe storms by Judy Benson of the New London Day *April 10*
- Spoke about invasive species control on the Farmington Canal Trial with Thomas Sheil of Milone and MacBroom in Cheshire *April 11*
- Gave an invited lecture “Impacts of Invasive Species and Deer on Plant Communities” at Paul Smith’s College in Saranac Lake, NY (47 attendees) *April 12*
- Participated in a review and update of the written arborist examinations *April 17*
- Met with board members of Earthplace to advise on forest management and invasive species control *April 23*
- Spoke on “Woodlot forest management” for the Winchester Land Trust (14 attendees) *April 25*
- Hosted a tour of forest management research plots for DEEP-Forestry and Regional Water Authority staff (5 attendees) *April 26*
- Was interviewed about roadside forest management by Tom Fagin of Connecticut Woodlands *April 29*
- Participated in a review and update of the written arborist examinations *May 1*

- Participated in the Urban Forest Council/Forest Forum conference planning committee in Middlefield *May 7*
- Participated in the CT Forest Stewardship Committee in Haddam *May 9*
- Met with Will Hochholzer of CT DEEP Forestry, to discuss beech control strategies *May 9*
- Participated in the urban forest management planning meeting in Middlefield *May 10*
- Met with David Wheeler, Larry Federman and Graham Cox of Audubon, NY to discuss invasive species control in Craryville, NY *May 13*
- Along with Drs. James LaMondia and Carol Cheah, and Joseph Barsky and Jordan Gibbons, hosted an exhibit on innovative research by the Station in the Capitol Corridor in Hartford *May 15*
- Met with Otto Schaefer to examine a stand of declining sugar maples in Branford *May 16*
- Spoke on "What's Next? Mitigating Tree Damage in the 21st Century" at the Connecticut Tree Wardens' Association spring workshop in West Hartford (60 attendees) *May 21*
- Participated in the urban forest management planning meeting in Middlefield *May 23*
- Advised a Fulton Park committee on invasive species control in Waterbury (7 attendees) *May 24*
- Participated in a Research Working Group for the Governor's Council for Agricultural Development in Hartford *June 10*
- Participated in a Connecticut Invasive Plant Council meeting in Hartford *June 11*
- Administered practical and oral examination to arborist candidates for the Connecticut Tree Protection Examining Board *June 12*
- Spoke about managing oak decline with Tim and Jennifer Sprague in somers, CT *June 25*

WHITE, JASON C.

- Met with Kristin Frank of CT DoAg (Aquaculture) and Stacey Kinney of CT DPH (Environmental Microbiology) regarding a joint grant proposal and research program on the detection of contaminants in "farmed" seaweed *July 13, 2012*
- Participated in an FDA FERN Chemistry Cooperative Agreement (cCAP) Laboratory conference call *July 19*
- Participated in the FDA FERN follow-up conference call on a recently completed arsenic proficiency test *July 19*
- Participated in a webinar sponsored by Chemical and Engineering News on the analysis of water samples related to hydraulic fracturing *July 26*
- Presented the lecture "Role of the CT Agricultural Experiment Station Department of Analytical Chemistry and the FDA Food Emergency Response Network in the Deepwater Horizon Oil Spill Response" at the National Conference for Project Food, Land and People in Madison, CT (25 attendees), *August 2*
- Participated in Skype conference calls with the US EPA and Hasselt University (Belgium) researchers on the upcoming 9th International Phytotechnologies Conference to be held in Belgium *August 7 and 27*
- Served as a subject matter expert and one of three examiners during the interview process for the City of New Haven Health Department Laboratory Manager position *August 8*
- Met with Professor Saion Sinha of the University of New Haven regarding a jointly mentored graduate student who will be conducting research within the Analytical Chemistry Department on nanotoxicology *August 9*

- Participated with Department staff in an FDA FERN Chemistry Cooperative Agreement Laboratory conference call *August 9*
- Attended the 244th Annual Meeting of the American Chemical Society in Philadelphia, PA and presented the invited plenary lecture "Nanomaterial contamination of agricultural crops" in the "Nanomaterials in Medicine, Food, and the Environment" session (35 attendees) *August 19-23*
- Was interviewed about a recent publication in the Proceedings of the National Academy of Sciences from a group showing that nanoparticles significantly inhibit nitrogen fixation by Janet Raloff of Science News *August 20*
- Received notification of funding from the US FDA for a competitive proposal entitled "Achieving a nationally integrated food safety system: ISO/IEC 17025 accreditation" which runs for 5-years and totals $1.5 million *August 27*
- Spoke with Allison Dodge from Congresswoman Rosa DeLauro's office regarding a press release focused on a new FDA food safety grant *August 28*
- Was interviewed about our new FDA food safety grant by Amanda Cudo of the CT Post *August 2*
- Was interviewed about our new FDA food safety grant by WQUN radio in Hamden *August 29*
- Was interviewed about a recent publication in the Proceedings of the National Academy of Sciences from a group showing that nanoparticles significantly inhibit nitrogen fixation by Anthony King of Chemical and Industry Magazine *August 30*
- Participated in a Skype Conference call with the US EPA and Hasselt University (Belgium) researchers on the upcoming 9th International Phytotechnologies Conference to be held in Belgium *September 3*
- Attended the 9th International Phytotechnologies Conference in Hasselt, Belgium and gave a plenary lecture entitled "Plants and nanoparticles" (250 attendees); gave a regular platform presentation entitled "Interaction of plants and engineered nanoparticles" (45 attendees), and hosted the International Phytotechnology Society business meeting (65 attendees) *September 11-15*
- Met with Professor Saion Sinha of the University of New Haven and Soumya Mangu, a graduate student, regarding a research project within the Analytical Chemistry Department on nanotoxicology *September 18*
- Hosted two representatives from Thermo Scientific for a presentation on A GC/MS/MS unit that the Analytical Chemistry Department may purchase *September 26*
- Participated with Department Staff in an FDA FERN Chemistry Cooperative Agreement conference call *September 27*
- Was interviewed about the Analytical Chemistry Department's research on nanoparticle interactions with food crops by Naomi Lubick, a freelance science reporter in Sweden *September 27*
- Participated in the monthly Laboratory Preparedness Network Meeting at the Department of Public Health in Hartford *October 1*
- Participated in an instrument demonstration seminar from Agilent regarding a new Triple Quadrapole Gas Chromatograph to be purchased under a new FDA grant *October 3*
- Participated in an FDA FERN Chemistry Cooperative Agreement conference call *October 11*

- Gave a webinar presentation entitled “Phytotechnologies: Use of plants to alleviate environmental contamination” to the General Electric Global Research Sustainable Remediation Team (SRT) (20 attendees), held a teleconference with Dr. Gayathri Gopalakrishnan of Argonne National Laboratory regarding outreach and education efforts for the International Phytotechnology Society. He also co -chaired the “Plant interactions with environmental contaminants” session, and presented the lecture “Nanoparticle exposure increases pesticide residue accumulation by plants” (25 attendees), at the 28th Annual International Conference on Soils, Sediments, Water, and Energy at the University of Massachusetts-Amherst, MA *October 15-18*
- Participated in two FDA ISO Accreditation Cooperative Agreement Program conference calls *October 25, 26*
- With Dr. Christina Robb and Craig Musante, participated in an FDA FERN phone call to plan future activities on the Agilent 7700xICP-MS *November 2*
- Participated in the first annual meeting of the Sustainable Nanotechnology Organization in Arlington, VA and gave a lecture entitled “Nanomaterial interactions with agricultural crops” (40 attendees) *November 4-6*
- With Dr. Brian Eitzer, Dr. Walter Krol, Kittpath Prapayotin-Riveros, Dr. Christina Robb, Terri Arsenault, Craig Musante, and William Berger, participated in an FDA FERN Chemistry Cooperative Agreement conference call *November 8*
- Welcomed Dr. Helmi Hamdi of the Water Research and Technology Center in Tunisia to the Department as part of a five-month Fulbright Scholarship focused on nanomaterial toxicity to plants *November 13*
- Participated with Dr. Brian Eitzer, Dr. Walter Krol, Kittipath Prapayotin-Riveros, Dr. Christina Robb, Terri Arsenault, John Ranciato, William Berger, Craig Musante and Joseph Hawthorne in a monthly FDA ISO Accreditation Cooperative Agreement Program conference call *November 15*
- Gave an invited lecture at the Stockbridge School of Agriculture within the University of Massachusetts entitled “Nanomaterial interactions with agricultural crops” (30 attendees) *November 19*
- Along with Dr. Brian Eitzer, Dr. Walter Krol, Kittipath Prapayotin-Riveros, Dr. Christina Robb, Terri Arsenault, John Ranciato, William Berger, Craig Musante, and Joseph Hawthorne, hosted Special Agent Daniel K. Coleman, the new FBI Weapons of Mass Destruction coordinator in New Haven, for a tour of the laboratories and Department programs related to chemical terrorism and adulteration of food *November 28*
- Gave an invited lecture at the University of Texas-El Paso Department of Chemistry entitled “Nanomaterial interactions with agricultural crops (50 attendees) *November 30*
- Was interviewed for the radio program “Science Studio” by Dr. Keith Pannell and Dr. Russ Chianelli of the University of Texas-El Paso *November 30*
- Served as a dissertation committee member on the Ph.D. proposal defense of Sanghamitra Majumdar of the University of Texas-El Paso Department of Chemistry *November 30*
- Participated in the monthly Laboratory Preparedness Network meeting at the Department of Public Health in Rocky Hill *December 3*
- Gave an invited lecture at the University of Connecticut Department of Plant Biology and Landscape Architecture entitled “Plant interactions with environmental contaminants” (25 attendees) *December 7*

- With Joseph Hawthorne, Terri Arsenault, and Dr. Roberto de la Torre-Roche met with faculty in the Department of Plant Biology and Landscape Architecture at the University of Connecticut to discuss mutual research interests *December 7*
- With Dr. Brian Eitzer, Dr. Walter Krol, Kittipath Prapayotin-Riveros, Dr. Christina Robb, Terri Arsenault, John Ranciato, William Berger, Craig Musante and Joseph Hawthorne, participated in an on-site presentation of the FDA Electronic Laboratory Exchange Network System by Eduardo Lim, US PHS/FDA *December 11*
- With Dr. Brian Eitzer, Dr. Walter Krol, Kittipath Prapayotin-Riveros, Dr. Christina Robb, Terri Arsenault, Craig Musante, and William Berger, participated in an FDA FERN Chemistry Cooperative Agreement conference call *December 13*
- Met with Professor Saion Sinha of the University of New Haven regarding a collaborative project to develop a nanoparticle sensor for food matrices *December 13*
- Hosted the initial meeting of the CAES Crop Protection and Food Safety Working Group (11 attendees) *December 19*
- Participated in an organizational conference call with the Association of Public Health Laboratories regarding a special "Nanotoxicology" session he will co-chair at the upcoming APHL meeting in June 2013 *December 19*
- With Dr. Brian Eitzer, Dr. Walter Krol, Kittipath Prapayotin-Riveros, Dr. Christina Robb, Terri Arsenault, John Ranciato, William Berger, Craig Musante, and Joseph Hawthorne, participated in an FDA ISO Accreditation Cooperative Agreement Laboratory conference call *December 20*
- With Craig Musante, participated in a conference call with the CT Department of Agriculture/Division of Aquaculture, the University of Connecticut, and the CT Department of Public Health regarding the potential contamination and regulation of Long Island Sound-grown seaweed for heavy metals and other agents of concern *December 21*
- Participated in an FDA 50-state conference call describing new regulations as part of the Food Safety Modernization Act *January 3, 2013*
- Participated in the monthly Laboratory preparedness network meeting at the Department of Public Health in Rocky Hill *January 7*
- Along with Joseph Hawthorne, hosted undergraduate student Nicole Cammisa of Muhlenberg College who worked in the laboratory on collaborative experiments *January 7-8*
- With Dr. Brian Eitzer, Kittipath Prapayotin-Riveros, Dr. Christina Robb, Terri Arsenault, Craig Musante, and William Berger, participated in an FDA FERN Chemistry Cooperative Agreement Conference Call *January 10*
- Participated in an organizational conference call with the Association of Public Health Laboratories regarding a special "Nanotoxicology" session to be co-chaired by him at the upcoming APHL meeting in June 2013 *January 11*
- Gave a lecture at the CT Department of Energy and Environmental Protection (DEEP) entitled "Phytotechnologies – The use of vegetation to alleviate environmental contamination" (20 attendees) and met with officials from DEEP and Wesleyan University regarding potential phytoremediation projects *January 15*
- Gave a presentation on recent food safety research at CAES to Dr. Melinda Cep of Congresswoman Rosa DeLauro's Washington, D. C. staff *January 16*
- Gave a lecture at the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland entitled "Nanomaterial interactions with agricultural crop species" (25 attendees)

and met with several NIST research groups to discuss collaborative research projects *January 17*

- Met with Captain Michael McLaughlin of the Public Health Service in Rockville, Maryland regarding FDA Food Emergency Response Network activities *January 17*
- Participated with Dr. Brian Eitzer, Dr. Walter Krol, Kittipath Prapayotin-Riveros, Dr. Christina Robb, Terri Arsenault, John Ranciato, William Berger, Craig Musante, and Joseph Hawthorne in an FDA ISO Accreditation Cooperative Agreement Laboratory conference call *January 24*
- Participated in a conference call for the organizing committee of the upcoming 10th International Phytotechnologies Conference in Syracuse, NY *January 24*
- Along with Dr. Christina Robb, attended an organizational meeting for the annual First Responder Terrorism Response Training Conference at the Department of Public Health in Rocky Hill *January 29*
- Participated in the monthly Laboratory Preparedness Network Meeting at the Department of Public Health in Rocky Hill *February 4*
- Participated in a conference call with Professor Lee Newman of the State University of New York College of Environmental Science and Forestry and her graduate students concerning collaborative nanotoxicology experiments *February 6*
- With Dr. Brian D. Eitzer, Dr. Walter J. Krol, Kittipath Prapayotin-Riveros, Dr. Christina S. Robb, Terri Arsenault, John F. Ranciato, William A. Berger, Craig L. Musante, and Joseph R. Hawthorne, participated in an FDA ISO Accreditation Cooperative Agreement Laboratory conference call with the Ohio Department of Agriculture and the West Virginia Department of Agriculture *February 6*
- Met with participants in the Department of State's International Visitor Leadership Program and discussed research and programs within the Department of Analytical Chemistry *February 7*
- Participated in a conference call for the organizing committee of the upcoming 10th International Phytotechnologies Conference in Syracuse, NY *February 7 and 21*
- With Dr. Brian D. Eitzer, Kittipath Prapayotin-Riveros, Dr. Christina S. Robb, Terri Arsenault, Craig L. Musante, and William A. Berger, participated in an FDA FERN Chemistry Cooperative Agreement Program conference call *February 14*
- Participated in an organizational meeting for the annual First Responder Terrorism Response Training Conference at the Department of Public Health in Rocky Hill *February 15*
- With Dr. Christina S. Robb and Terri Arsenault, participated in an FDA FERN Equipment Working Group conference call *February 20*
- With Dr. Brian D. Eitzer, Dr. Walter J. Krol, Kittipath Prapayotin-Riveros, Dr. Christina S. Robb, Terri Arsenault, John F. Ranciato, William A. Berger, Craig L. Musante, and Joseph R. Hawthorne, participated in an FDA ISO Accreditation Cooperative Agreement laboratory conference call *February 21*
- Participated in an FDA ISO Accreditation Webinar on manual data entry into eLEXNET *February 28*
- Discussed collaborative research on nanoparticle toxicity to plants with Professor Saion Sinha of the University of New Haven *March 1*
- Participated in the monthly Laboratory preparedness network meeting at the Department of Public Health in Rocky Hill *March 5*

- Participated in a conference call for the organizing committee of the upcoming 10th International Phytotechnologies Conference in Syracuse, NY *March 14 and 28*
- With Dr. Brian Eitzer, Kittipath Prapayotin-Riveros, Dr. Walter Krol, Dr. Christina Robb, Terri Arsenault, Craig Musante, and William Berger, participated in an FDA FERN Chemistry Cooperative Agreement Program conference call *March 14*
- Spoke with Dr. Gayathri Gopalakrishnan of the Environmental Program Space Science Institute about the re-design of the International Phytotechnology Society website *March 15*
- Organized and gave a presentation at a CT Association of the Gifted "Minds in Motion" program entitled "Disaster Response" along with the CT DPH bioterrorism Coordinator, CT DEEP Mobile Response Laboratory, and the 14th Civil Support Team (20 children attended) *March 16*
- Gave a joint presentation with Dr. Charles McKay of Hartford Hospital entitled "Arsenic Food and Water Contamination" at the CT Department of Public Health (25 attendees) *March 28*
- Participated in an FDA FERN 50-state call on the FDA CORE Program *March 28*
- With Dr. Christina Robb, participated in the annual State of Connecticut Department of Public Health First Responder Training in Rocky Hill, and gave the talk "Connecticut Agricultural Experiment Station Department of Analytical Chemistry" (180 attendees) *April 9*
- Participated by teleconference in the annual Editorial Advisory Board meeting for the journal Environmental Science and Technology (25 participants) *April 9*
- With Dr. Brian Eitzer, Kittipath Prapayotin-Riveros, Dr. Walter Krol, Dr. Christina Robb, Terri Arsenault, Craig Musante, Michael Cavadini, and William Berger, participated in an FDA FERN Chemistry Cooperative Agreement Program conference call *April 11*
- Participated in a teleconference call for the organizing committee of the upcoming 10th International Phytotechnologies Conference in Syracuse, NY *April 18*
- With Dr. Brian Eitzer, Kittipath Prapayotin-Riveros, Dr. Christina Robb, Terri Arsenault, John Ranciato, William Berger, Craig Musante, Michael Cavadini and Joseph Hawthorne, participated in an FDA ISO Accreditation Cooperative Agreement Laboratory conference call *April 18*
- Participated in Skype teleconference calls of the organizing committee for the upcoming 10th International Phytotechnologies Conference in Syracuse, NY in October *May 2 and 23*
- Participated with Dr. Brian Eitzer and Dr. Christina Robb in FDA cCAP organizing calls for the upcoming annual technical meeting in Minnesota in September *May 2 and 23*
- Was a delegate at the 23rd Annual SETAC Europe meeting in Glasgow, Scotland and presented two posters entitled "Nano material toxicity to Agricultural Crops" and "Nanoparticle Exposure Alters Pesticide Residue Accumulation by Agricultural Plants" and also participated in the SETAC Nanotechnology Advisory Group Meeting *May 12-16*
- Participated in an outreach event at Lockwood Farm and described Department of Analytical Chemistry research and program for Common Ground High School students *May 22*
- Participated in a meeting at the Legislative Office Building in Hartford with Mr. Erik Williams of Gaia-Plant Based Medicine and Mr. Armando P. Paolino, III of Paolino Public Affairs Consulting, Inc. concerning analytical testing of medical marijuana *May 24*

- Hosted Professor Tomas Vanek of the Institute of Experimental Botany in Prague, Czech Republic and discussed current and future collaborations related to the molecular response of plants to nanoparticle exposure *May 29-31*
- Hosted Professor Lee Newman of the State University of New York College of Environmental Science and Forestry and discussed ongoing collaborative research *May 30*
- Presented the invited plenary lecture entitled "Nanomaterial Use in Agriculture: Benefits and Potential Risks" at the 2013 Association of Public Health Laboratories Annual Meeting and Environmental Laboratory Conference (200 attendees) *June 3-5*
- With Kittipath Prapayotin-Riveros and Dr. Walter Krol participated in the annual FDA ISO Accreditation "Face-to-Face" Meeting *June 5-6*
- Participated in a USDA AFRI webinar on grant panels and the peer review process *June 18*
- Gave a lecture at the University of New Haven entitled "Nanoparticle Interactions with Agricultural Crops" (6 attendees) *June 19*
- With Dr. Brian Eitzer, Kittipath Prapayotin-Riveros, Terri Arsenault, Craig Musante, Michael Cavadini, Dr. Walter Krol, and William Berger, participated in an FDA ISO Accreditation Conference call *June 20*
- Participated in a USDA AFRI Grant review Panel in Washington, DC *June 25-26*
- Participated in an NSF Nanotechnology Environmental Health and Safety Webinar *June 28*

WILLIAMS, SCOTT C.

- Met with Drs. Ortega and Rittenhouse at the Department of Natural Resources and the Environment at the University of Connecticut about possible collaborative research projects *August 29, 2012*
- Participated in an Executive Committee, Northeast Section of The Wildlife Society conference call *August 31*
- With Dr. Kirby Stafford, was interviewed by science writer Carl Zimmer about blacklegged ticks and Lyme disease in Connecticut for Outside Magazine *September 18*
- With Michael Short, hosted the University of Connecticut's Natural Resources and the Environment's Wildlife Techniques class in demonstrating vegetation regeneration sampling, East Haddam, CT *September 21*
- Met with the Health Officer from the Town of Redding, and officials from White Buffalo, Inc. to discuss a Centers for Disease Control-funded study "An Integrated and Individual Tick Management Program to Reduce Risk of Lyme Disease in a Residential Endemic Area" in Redding, CT *September 27*
- Participated in the combined meeting of the 24th Connecticut Urban Forest Council Conference and the 8th Annual Forest Forum *October 4*
- Co-led an ecological interpretive hike with Guilford Land Conservation Trust President Sarah Williams into the heart of Westwoods (27 attendees) *October 14*
- Gave an invited lecture to the annual meeting of the Dudley Farm Foundation about the negative ecological impacts of overabundant white-tailed deer, in Guilford (32 attendees) *October 25*
- Gave an invited lecture about deer capture techniques to students in the Introduction to Wildlife Management class in the Department of Natural Resources and the Environment at the University of Connecticut, Storrs (18 attendees) *November 1*

- Participated in an Executive Board Meeting of the Connecticut Urban Forest Council, Southbury *November 9*
- Participated in an Executive Board Meeting of the Connecticut Urban Forest Council, Middlefield *November 27*
- With J. P. Barsky and Michael Short, hosted the 2012 Connecticut FFA Forestry Career Development Event and oversaw the competitive examinations *December 6*
- Met with Dr. Morty Ortega and Megan Floyd of the Department of Natural Resources and the Environment at the University of Connecticut to discuss collaborative research on small rodent populations in Connecticut *December 13*
- Met with Dr. Anthony DeNicola to establish residential research sites in the Town of Redding *December 27*
- Participated in a conference call meeting of the Connecticut Urban Forest Council *January 25, 2013*
- Gave the talk "Invasive plant species, blacklegged ticks, and Lyme disease" at the Symposium on Lyme Disease/Japanese Barberry Connecicut in Greenwich (60 attendees) February 21
- With Michael Short donated 300 pounds of processed venison to the Bridgeport Rescue Mission, Bridgeport, CT *March 6*
- Presented a lecture titled "Japanese Barberry Control Treatments and Herbivory Reduction on Non-Native and Native Plant Communities" at the Connecticut Conference on Natural Resources, University of Connecticut (27 attendees) *March 18*
- Hosted the Executive Meeting of the Connecticut Urban Forest Council at Lockwood Cottage *March 22*
- Participated in a graduate committee meeting for University of Connecticut student Megan A. Floyd in Storrs *April 1*
- Attended and served as Executive Treasurer at the Executive Committee Meeting of the Northeast Section of the Wildlife Society, Saratoga Springs, NY *April 7*
- Presented research titled "Evaluation of Organized Hunting as a Management Technique for Overabundant White-tailed Deer in Suburban Landscapes" at the 69th Annual Northeast Fish and Wildlife Conference, Saratoga Springs, NY (65 attendees) *April 9*
- Gave an invited lecture titled "White-tailed Deer Research at The Connecticut Agricultural Experiment Station" at the annual meeting of the South Central Connecticut Regional Water Authority recreation permit holders, New Haven (18 attendees) *April 10*
- Participated in a planning meeting for the annual Connecticut Urban Forest Council Conference in Middlefield, CT *May 7*
- Met with Christine Witkowski, Assistant Professor at Middlesex Community College, about a possible graduate internship for her student *May 15*
- With Michel Short and Joseph P. Barsky, held an invited invasive control workshop for members of the East Haddam Land Trust, East Haddam, CT (15 attendees) *May 21*
- Participated in the executive meeting of the Connecticut Urban Forest Council in New Haven *May 24*
- Met with South Central Connecticut Regional Water Authority Forester Bill Van Doren to demonstrate forestry sampling protocols *June 6*
- Met with University of New Haven graduate student Moises Torrent regarding supervising a graduate research project involving seed dispersal by White-tailed deer *June 7*

- Supervised the “Science Tent” at the Town of Guilford’s Baldwin Middle School’s Outdoor Adventure Day (75 students) *June 20*

ZARRILLO, TRACY

- Visited Dr. John Ascher at the American Museum of Natural History in New York City to discuss future collaborations on bees *February 26, 2013*
- Hosted Dr. John Ascher and Eli Wyman from the American Museum of Natural History for the purpose of updating and verifying the bees in the CAES historical and recent collections *March 20-21*
- Participated in the “Identification of Northeastern Bee Species” workshop given by Dr. John Ascher, held at the University of Massachusetts in Amherst, MA, where she taught participants how to identify the northeastern species in the genus *Ceratina*, and was also available to answer questions from participants regarding bee identification (16 attendees) *March 22-24*
- Published “Native Bee Monitoring at White Memorial Conservation Center” in “Sanctuary, newsletter of the White Memorial Conservation Center *May 2013*
- Participated in the 2013 White Memorial BioBlitz as taxonomic team leader for the bee working group – 18 species of bees were recorded *June 1*
- Assisted Dr. Kimberly Stoner give a talk about native bees at Massaro Community Farm in Woodbridge (10 attendees) *June 22*

ADVANCES IN KNOWLEDGE

DEPARTMENT OF ANALYTICAL CHEMISTRY

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

Source of Sample	Numbers of samples analyzed
Department of Agriculture	243
Department of Consumer Protection	363
Department of Energy and Environmental Protection	190
FDA, Health Depts., Cities/Towns, University Research Collaborators	724
CAES Departments	527

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.
- From July 1, 2012 to June 30, 2013 we received and initiated analysis of 167 feed samples. These samples are analyzed for parameters such as protein, fat, moisture, fiber, and select micronutrients. Of the 167 submitted samples, analysis has been completed on 68 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 37 (54.4%). 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.
- From July 1, 2012 to June 30, 2013, we received and initiated analysis of 59 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 59 submitted samples, analysis has been completed on 29 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 23 (79.3%). Analytical findings are turned over to the CT Department of Agriculture for regulatory response.
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c. Analysis of seaweed samples

A new collaborative project was initiated with the DoAg Bureau of Aquaculture involving the simultaneous 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 simultaneously on split samples at the Department of Public Health (DPH) Laboratory Environmental Microbiology Section. During the current reporting period, 7 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 released for sale.

d. DoAg Investigation samples

The Analytical Chemistry Department assisted the DoAg Bureau of Regulation and Inspection on two investigations related to tainted milk. The first complaint involved a request for sodium hypochlorite analysis in December 2012 related to potential residual contamination with a sanitizer fluid used on processing equipment. We reported levels of sodium and chlorine in the anticipated nutritional range of the product and the investigation was closed. In March 2013, the DoAg Bureau of Regulation and Inspection requested assistance on a milk container that was partially consumed by a citizen prior to the discovery of a dead rodent in the container, as well as green pellets that resembled common commercially available rat poison. The milk and pellets were screened for toxins and poisons; none were found and the investigation was closed by DoAg.

Impact: Results from the Analytical Chemistry Department's analyses were used to demonstrate a lack of chemical contamination in commercially available milk products and regulatory action was avoided.

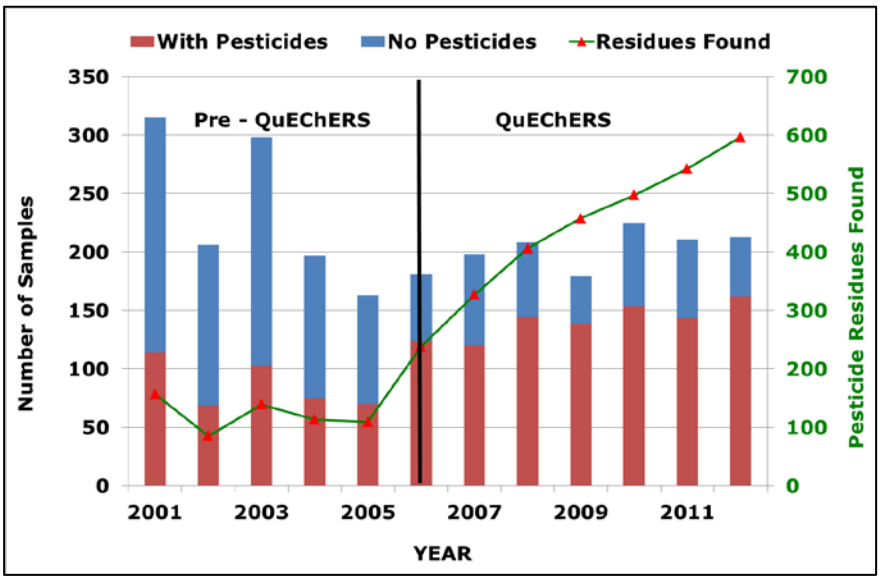
2. ANALYSES ON BEHALF OF CONNECTICUT DEPARTMENT OF CONSUMER PROTECTION, FOOD AND STANDARDS DIVISION

Analyses conducted by the Analytical Chemistry department 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
- Goal: As part of a Market basket program, determine concentrations of agrochemicals in fresh and processed foods from local, domestic, and imported sources offered for sale in CT and to assure compliance with established tolerances.
- Market basket survey samples are collected by Inspector Ellen Sloan of the DCP.
- Results are published in an annual Station bulletin available by mail and at www.ct.gov/caes.
- From July 1, 2012 through June 30, 2013 a total of 118 samples of fresh (80; 67.8%) and processed (38; 32.2%) food were analyzed for pesticide residues. 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 118 samples analyzed, 90 (76.3%) contained a total of 339 residues. There were 37 different pesticide active ingredients found. The three most commonly detected residues were the fungicide thiophanate methyl and its metabolite carbendazim (22: 18.6%), the fungicide boscalid (16; 13.6%) and the insecticides acetamiprid and phosmet, both of which were found thirteen times (11.0%). The average residue found was 0.022 ppm, and the average number of pesticide residues per sample was 3.77. The impact on our program of fully implementing QuEChERS is shown graphically to the right. 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.



• Beginning in 2012, we added the mycotoxin patulin to our agrochemical screen. Patulin is typically found in apple juice, and the EPA has set a tolerance of 0.050 ppm. Patulin was detected seven times in the time period in question all below the allowable limit.

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

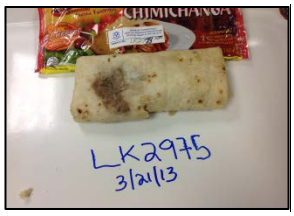
FDA U.S. Food and Drug Administration

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, 120 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

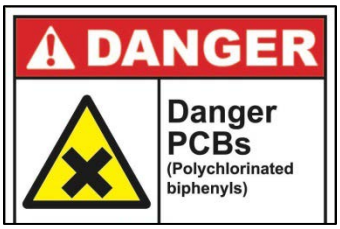
- Analyst: Terri Arsenault
- Goal: To provide % ethanol content for label registration and taxation purposes.
- Summary: We analyzed 46 products such as beers, wines, and liquors for ethanol content. The average % ethanol content for beers, wines and liquors were 6.62, 13.1, and 26.9%, respectively.

b. Beverage authenticity

- Analyst: Brian Eitzer, Terri Arsenault
- Goal: To determine if products offered to customers at CT establishments are authentic as to brand.
- Summary: 79 alcoholic products were examined for authenticity; 7 samples were found to not match the chromatographic profile of comparison authentic samples. These results are returned to the Division of Liquor Control, who determine appropriate regulatory action. A research project has been initiated to investigate the potential use of conductivity measurements, which can be made with field portable probes, to screen samples for adulteration and authenticity.

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

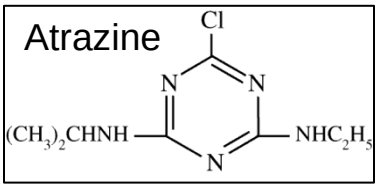
a. Analysis of PCBs (polychlorinated biphenyls)



- Analysts: William Berger, Brian Eitzer
- Goals: To ascertain the extent of polychlorinated biphenyl (PCB) contamination. Common matrices include soils, water, oil, sediments, and surface wipes.
- Summary: From July 1, 2012 to June 30, 2013, 48 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, Christina Robb, William Berger
- Goals: To ascertain pesticide concentration 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, 2012 to June 30, 2013, 100 samples were analyzed under this program.

Impact: All ground- and surface water samples are now subjected to simultaneous GC-MS and LC-MS analysis, enabling a much more thorough, sensitive and comprehensive assessment of pesticide occurrence in state waters.

5. Analyses on behalf of Municipal and Federal Agencies

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

- Analysts: Terri Arsenault, William Berger, Brian Eitzer, Craig Musante, Christina Robb, Walter Krol, Kittipath Prapayotin-Riveros, Michael Cavadini

- 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. The Department analyzed food samples from the summer 2012 National Political Conventions. The surveillance included analysis for ricin in ice cream desserts from the Tampa FL Republican National Convention and analysis for pesticides/poisons in tomatoes for the Democratic National Convention in Charlotte NC.

Impact: The negative findings of ricin or other poisons/toxins/pesticide adulterants in food samples submitted by the FDA from the two National Political Conventions helped to ensure the safety of participants in these high profile events.

b. Analysis of samples for municipalities

- Analysts: Terri Arsenault, William Berger, Brian Eitzer, Walter Krol, Craig Musante, John Ranciato
- Summary: From July 1, 2012 through June 30, 2013, Department staff analyzed 14 samples for municipalities. 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 the school lunches. Separately, one set of samples was submitted through the Town of Berlin Animal Control Officer as a suspected dog poisoning. A Berlin resident had a previous dog die under suspicious circumstances, and there was concern that was the situation with this dog as well. A screen for toxins, pesticides and poisons revealed no suspicious chemicals of concern.

Impact: The negative findings of the pesticide, toxin and poison screen alleviated law enforcement and citizen concerns over foul play and allowed valuable town resources to be appropriately focused.

c. Analysis of lead (Pb) content in children's soap

- Analysts: Craig Musante, John Ranciato
- Summary: The New Haven Health Department routinely purchases novelty glycerin soaps for distribution to children. The Health Department became concerned that changes in the supplier resulted in substitution with low quality toys containing lead paint on the product. A number of samples were delivered, digested and the lead content was measured by inductively coupled plasma mass spectrometry (ICP-MS); no detectable lead was found.

Impact: In response to our findings, the New Haven Health Department was able to safely continue an important hygiene outreach program to children in the city of New Haven.

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 agrochemicals in pollen, bees and wax to ascertain possible relationship to bee health. LC-MS methods have been developed for low level detection of pesticides. See Research section below.

b. Analysis of pesticides in tobacco leaves- Valley Laboratory

- Analysts: Brian Eitzer
- Summary: We are cooperating with Dr. James Lamondia at the Valley Laboratory who is testing strategies that will reduce pesticide residues on tobacco leaves while providing protection from pathogens of concern. During the first year of this project, a total of 126 samples of dried tobacco leaves were tested for two pesticidal chemicals. Additional information can be found in the Department of Plant Pathology narrative statement.

c. Analysis of nutrients in plant tissues- Department of Forestry and Horticulture

- Analysts: Craig Musante
- Summary: In a cooperative project with Dr. Martin Gent of the Department of Forestry and Horticulture, we analyzed digests of 311 plant samples for nutrient and element content. Additional information can be found in the Department of Forestry and Horticulture narrative statement.

7. ANALYSIS OF CHECK SAMPLES

- Analysts: Walter Krol, Terri Arsenault, William Berger, Christina Robb, Brian Eitzer, Craig Musante
- Summary: Annual performance evaluation samples required by our certifying agency, CT DPH, as well as annual proficiency testing samples related to our FDA FERN work and the AAPCO Check Sample program (pesticide formulations), were completed during the reporting period. Our reported results exceeded 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

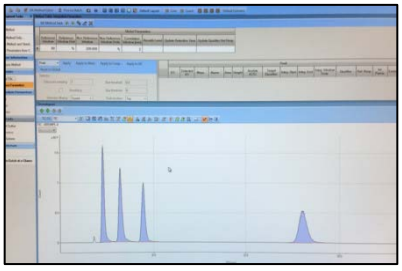
Project 1: *Improvement of analytical methods for determination of pesticide residues in food*

- Investigators: Brian Eitzer, Walter Krol
- Summary: In a series of FDA coordinated research projects, we are seeking to use new and more sensitive analytical equipment for the improved detection of pesticide residues, toxins and poisons in food. Two projects involve validating a new High Resolution LC-MS

for a broad pesticide screen (up to 500 analytes) and for an FDA developed poison/toxin screen. A peer review manuscript describing the findings from the pesticide screening study is currently being prepared. A third 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).

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.

Project 2: *Development of analytical methods for the detection of arsenic and arsenic species in food*



- Investigators: Craig Musante, Christina Robb
- Summary: As part of our FDA FERN program, we received several surveillance and research assignments during this past year related to the detection of arsenic in food. One assignment involved participation in a multi-laboratory validation using a draft FDA method to determine the total arsenic content in a new rice reference material being developed by the FDA Forensic Chemistry Center. As second ongoing assignment involves implementation of arsenic speciation capability using an FDA CFSAN (Center for Food Safety and Applied Nutrition) method and new FDA purchased equipment. Once we have completed the validation exercise for speciation capability, both state and federal samples can be evaluated for inorganic and organic arsenic species.
- Impact: Using new and sensitive FDA purchased equipment to test for total and speciated arsenic will promote the safety of food in the state and inform residents about levels of such elements in the products they consume.

Project 3: *Improvement of analytical methods for the detection of fraudulent liquor and other alcoholic beverages*

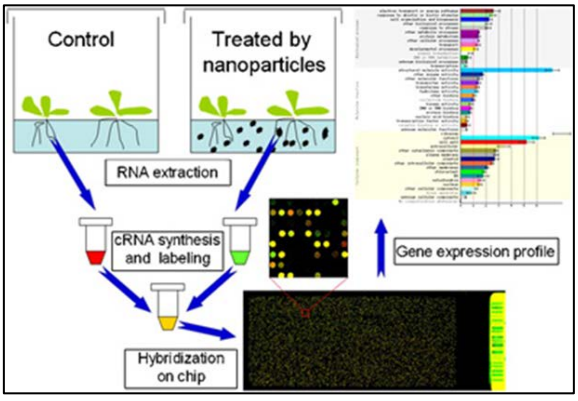
- Investigators: Terri Arsenault, Craig Musante
- Summary: The Department of Consumer Protection Liquor Control Division conducts investigations related to potential fraudulent activities by establishments serving alcoholic beverages. The current methods for determining the authenticity of a sample include ethanol determination by GC with flame ionization detection (FID) and solid phase microextraction (SPME) followed by headspace GC-MS. Neither test is definitive, and the latter test is both labor and resource intensive. We are conducting investigations along two lines; additional mass spectrometry based techniques (ICP-MS, GC-MS with a volatiles column) to increase the robustness of our analytical tool box and also development of a potential field portable conductivity system for investigators to use as a screening tool in establishments of concern.

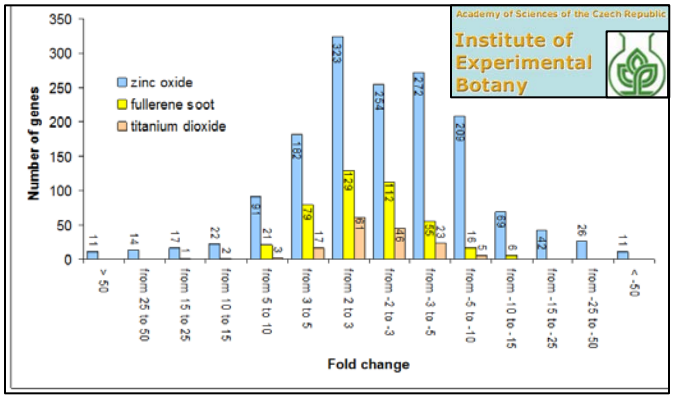
Impact: By increasing the analytical capability for authenticity determination as part of liquor control investigations, valuable state resources can be appropriately utilized and fraudulent activity can be minimized.

2. ENVIRONMENTAL MONITORING/REMEDIATION

Project 1: *Nanoparticle contamination of agricultural crops*

- Investigators: Craig Musante, Roberto De La Torre-Roche, Joseph Hawthorne, Jason C. White
- Summary: Nanomaterials (NM) are substances with at least one dimension less than 100 nm (one billionth of a meter), and this tremendously 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 ubiquitous; over 1300 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. From a regulatory perspective, nanomaterials are considered to have the same risk and toxicity profile as the equivalent bulk material. 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. Co-investigators on this grant include Professors at the University of Massachusetts, State University of New York College of Environmental Science and Forestry (SUNY ESF), and Southern Illinois University-Carbondale. Additional informal collaborative experiments are be conducted with the University of Texas El Paso, the US National Institute of Standards and Technology, The Institute of Experimental Botany in the Czech Republic, Hasselt University in Belgium, 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. 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: William Berger, Jason C. White, Joseph Hawthorne
- Summary: This project is focused on investigating the mechanisms by which certain *Cucurbita* species (*C. pepo*- zucchini, pumpkin) accumulate much higher amounts of weathered hydrophobic organic chemicals than do other plants and if this ability can prove to be an effective phytoremediation strategy.
- Current work is focused on laboratory based hydroponic investigations to evaluate the role of aquaporins, membrane-based water channel proteins in plant root cells, for providing POPs entry into the cell. Aquaporins are known to transport a variety of small organic chemicals and preliminary data suggests a role for contaminant accumulation. Hydrogen peroxide is known to temporarily close aquaporin channels and glycerol is known to competitively displace other potential molecules for transport. Current investigations are focusing on the effect of a range of peroxide and glycerol concentrations on the uptake of DDE and chlordane by different zucchini and squash cultivars. Additional studies may involve collaboration with a University of Massachusetts colleague who possesses a number of *Arabidopsis* knock-outs for aquaporins, as well as two lines that overexpress these genes.

Impact: The ability to accumulate and translocate weathered POPs is a unique ability seemingly restricted to zucchini/pumpkin. Mechanistic studies will enable characterization underlying molecular basis for this phytoextraction ability, which will then permit optimization of this ability in zucchini or transfer of the gene(s) to other plant species.

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

- Investigators: Yale Occupational and Environmental Medicine (OEMP) staff, Jason C. White, Terri Arsenault, Craig Musante
- Summary: In a large multi-institution study headed by the Yale OEMP, 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 turned over 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 (Dept. 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 (see photos). The pollen is being collected from the same locations for a period of several years so as to allow us to look at temporal trends within the data. During the past year we have started 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: Coordinated agricultural program on honey bee health

- Investigators: Brian Eitzer, Keith Delaplane (University of Georgia, Principal Investigator [PI])
- Summary: This is a large multi-institution project (over 20 funded investigators from 15 different institutions) that is considering issues related to the health of honey bees and other native pollinators. These issues relate to various pathogens and parasites (colony collapse disorder, *Nosema*, *Varroa* mites, etc.), as well as management practices. One of the threats to honey bees is use of pesticides in agricultural settings, as well as within the beekeeping community. The role of the CAES within this project has been the analysis of pesticide residues. These residues were examined as a part of several separate research projects included within the overall program. Pesticide residues were examined in pollen taken from sentinel apiaries (apiaries maintained by University researchers) on a monthly basis so that pesticide exposure can be examined as a co-factor in studies on honey bee health. In addition, the wax from these hives was also examined. Our results from the apiaries

have shown that the pesticide content varies not only with sampling date and location but also within hives from the same location and time. The pesticide data is currently being correlated against various measures of hive health. All data from this project have been collected and is currently undergoing various analyses.

Impact: Analysis of pesticide residues from apiaries that are being intensively monitored for infectious agents and colony health will allow us to determine if they are a co-factor in some of the problems being faced by honey bees.

Project 6: 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 – Dr. Krupke is the PI)
- 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. Talc or graphite is often added to the planters to insure good seed flow during large scale automated planting. We are monitoring for these neonicotinoid pesticides in samples of honey bees, pollen, soil, talc dust from seed planters, and dandelions from fields surrounding corn fields to try to determine possible exposure routes. We have found that the talc dust can contain very high concentrations of these pesticides. During the past year we have analyzed dosimeters placed around fields in the four cardinal directions at 0, 10, 50, and 100 meters from the fields during planting so to examine how the dust moves off site. Our results show that elevated concentration of these pesticides can be found at all distances tested.

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 will be tested during the current year.

Project 8: Pollination security for fruit and vegetable crops in the northeast

- Investigators: Brian Eitzer, Kim Stoner (PI; Department of Entomology); Anne Averill (University of Massachusetts); Frank Drummond (University of Maine), Bryan Danforth (Cornell University)

- Summary: We are participating in a new multi-year grant to examine the 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. 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, with examples focusing on issues such as wood preservatives, persistent organic pollutants, and removal of pesticide residues from produce. 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 genetic mechanisms governing growth and development in plants. Just as in animals, plants use mobile signal molecules known as hormones to regulate their pattern of growth. The most versatile of the plant hormones is indole-3-acetic acid (IAA) also known as auxin, the discovery of which dates back to the time of Charles Darwin. Our work in auxin biology began with the isolation of the LAM1 gene in tobacco, which is required for formation of leaf blades. The DNA sequence of LAM1 indicated that it was a member of the WOX super family of homeodomain transcription factors, which control developmental events throughout the plant. Previously we determined that LAM1 was 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. Progressive loss of transgene function during plant development set up unique opportunity to examine partial loss of LAM1 function, as opposed to mutant plants where the function is missing altogether. Partial loss of LAM1 still supports blade formation, but the mesophyll tissue proliferates in a highly disorganized manner, failing to maintain the normal balance between the upper adaxial and lower abaxial domains. To examine this apparent polarity disruption more closely, we employed our 35S-GUS-miR166 reporter gene (pRH178) which distinguishes between cells with adaxial vs. abaxial identity. The pRH178 transgene confirmed a major imbalance in the distribution of adaxial vs. abaxial tissue in the AtSUC2::LAM1 transgenics. The results indicate that LAM1 operates as a regulator of the antagonistic interplay between the adaxial and abaxial domains, which is essential for organized growth of a thin laminate leaf blade. New investigations underway include investigation of the functional significance of tandem MADS binding domains positioned in the untranslated tail region of the LAM1 gene, which are identical to those found in WUS where they impose transcriptional repression. We are also pursuing the auxin connection, with a new 9xDR5::antisense LAM1-NOS transgene designed to eliminate LAM1 expression specifically in regions of auxin accumulation.

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 initiated investigations into metabolism of glycolic acid in *Zea mays*. However, the main activity over the past year was conducted in collaboration with Dr. Agu Laisk of Tartu University in Estonia concerning chlorophyll fluorescence in developing maize seedlings. Photosystem I (PSI) emits an invariant fluorescence at room temperature comprising about 30% and 50% of F_o in C_3 and C_4 plants, respectively. We characterized invariant emission in developing leaves of *Zea mays* (maize, C_4), *Sorghum bicolor* (C_4), and *Helianthus annuus* (sunflower, C_3). Emission spectra of mature maize and sunflower leaves showed that the F_m/F_o was maximal and typically ≥ 10.5 suggesting that PSI does not fluoresce at 680 nm. This constituted a basis for derivation of the entire PSI emission spectrum. Minimum (F_o) and maximum (F_m) fluorescence yields were simultaneously measured at 680 and 750 nm from room temperature fluorescence induction transients excited with 595-nm light using dark-adapted (12 h) leaves of differing developmental state. Compared to fully mature leaves, immature leaf tissue from both maize and sunflower showed lower F_m/F_o ratios at 680 nm suggesting occurrence of photosystem II (PSII) precursor complexes lacking variable fluorescence. A procedure was devised to separately quantify emission from PSI, PSII, and these non-functional, precursor complexes. After subtraction of non-functional complex emission, PSI emission was close to 50% of the remaining F_o at all positions along the expanding maize leaf consistent with reported expression of O_2-insensitive C_4 photosynthesis in all green tissues. Assessment of PSII/PSI ratios based on chlorophyll *a* and *b* contents revealed sharply contrasting patterns of photosystem formation in developing sunflower and maize. The buildup of non-variably-fluorescing PSII precursors during greening in maize leaf tissue is associated with lagging chlorophyll *b* accumulation. Optimization of the chlorophyll *a/b* ratio at full maturity is indicated by full integration of these pigments into completed photosystems with a low, but finite, fraction of active PSII residing in the bundle sheath compartment.

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 begun work to examine the genetic diversity of honey bees within Connecticut through the use of microsatellite and mitochondrial DNA analysis.

- For two apiaries in CT, long-term examinations for infection profiles of AFB and nosemosis have been continued. These profiles demonstrate time-line comparative analysis of infections within an apiary.
- The genomic RFLP analysis investigation of *P. larvae* isolates has been completed. Isolates collected within Connecticut were analyzed via *Xba*I and I-*Ceu*I digestion of genomic DNA, grouped by RFLP profile, and mapped for production of a geographic distribution profile. These isolates have also been compared to isolates collected outside of the United States for a determination of genotype relatedness. All Connecticut isolates grouped within one pathogenicity profile (ERIC I) but were separated into 3 RFLP groups using *Xba*I digestion. I-*Ceu*I RFLP profiling demonstrated only one grouping.
- Database entry of registered beekeepers in Connecticut for the years 2007-2011 has been updated. Apiary registrations for 2012 are being added to the database.
- Samples of 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. No hives have tested positive for *N. apis*.
- 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 in collaboration with Mr. Mark Creighton (CT State bee inspector).
- Work with Mr. Mark Cooper (Director of Health, Westport/Weston Health District), Michael Pascucilla (Director of Health, East Shore District Health Department), Timothy Callahan (Director of Health, Norwalk Health Department), Dr. Adalgisa Caccone (Yale Institute for Biospheric Studies), and Lauren Brooks (Research Assistant, Yale Institute for Biospheric Studies) relating to microbial source tracking has been suspended indefinitely pending identification, and granting, of a funding source.
- An investigation to monitor genetic diversity of honey bees in a Connecticut hive is being investigated through mitochondrial DNA sequence analysis and microsatellite profiles. Initial results from this apiary show mitochondrial profiles Type C1 and Type C11.

- PCR amplification of six potential pathogenicity genes in *P. larvae* for comparing DNA sequences and amino acid sequences across different pathogenicity groupings of the bacterium are underway.
- *P. larvae* enolase has been PCR amplified and sequenced for 7 bacterial strains representing the various pathogenicity groups. Between the genotype groupings, a single amino acid variance was determined. Further work to determine whether this difference has effects on the bacterial phenotype is ongoing.

Impact

American foulbrood and nosemosis diseases of honey bees continue to cause significant economic losses to beekeepers and agriculture, worldwide. This long-term investigation continues to show a high presence of AFB and nosemosis within Connecticut beehives. Beekeepers, by being informed of the prevalence of these two diseases, are able to make informed decisions on control and treatment procedures of the diseased hives. Advancing molecular knowledge pertaining to *P. larvae* will provide information on host-pathogen interactions and possibly result in new approaches to lower the impact of the disease. Beekeepers are receiving training on how to monitor hives for nosemosis. This training is helping them obtain better control of this disease. Understanding the genetic profiles of bees will aid attachment of phenotypic traits to genotypes; making tracking and propagating the genetics of healthy bees easier.

Plant Nucleobase Transporters

Dr. Neil Schultes assisted by Regan Huntley investigates the movement of plant metabolites across biological membranes. Plants display robust biochemistry directing the synthesis of needed metabolites from scratch (e.g. amino acids, proteins, DNA, starch, lipids, hormones etc.). Metabolites are in a constant state of flux in regards to concentration and distribution within plant cells and tissues. Understanding the rules governing this flux is aim of biochemistry. 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. As a reflection of how important transport for plants – some 10 – 15% of genes in a plant genome encode for transporters.

Our work concerns the movement molecules called nucleobases. Nucleobases are essential for plants being the building blocks of DNA and RNA, key intermediates in the synthesis of plant hormone cytokinin and secondary metabolites such as caffeine and main sources of nitrogen storage in seed endosperm and often transport throughout plants. In plants there are six different

families of transporters just for moving nucleobases. During the past year we have focused our research on determining the function of transporters from two of the six nucleobase transporter families: the nucleobase-ascorbate transporter (NAT), and nucleobase-cation symporter1 (NCS1) classes. Our methods include mutational analysis of plant genes – in essence disrupting specific plant transporter genes and monitoring the consequence of nucleobase transport. In addition, we engineer plant NCS1 or NAT genes to be expressed in brewers yeast (*Saccharomyces cerevisiae*) and test the ability to transport nucleobases. Each plant nucleobase transporter is characterized using radio-labeled nucleobase molecules in a series of tests designed to quantitative different biochemical characteristics of a particular transporter. These tests allow us to determine the metabolite-specific transport profile and associated kinetic parameters for each nucleobase transporter. For the NCS1 transporters 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. NCS1 transporter genes from algae (*Chlamydomonas reinhardtii*); moss (*Physcomitrella patens*); gymnosperm (*Picea glauca*); monocots (*Zea mays* and *Setaria viridis*) and dicots (*Nicotiana sylvestris*) are investigated. The analysis of all but the gymnosperm NCS1 is near completion. Our data will complement the ongoing research in structure-function of NCS1 transporters actively pursued in fungal and bacterial systems. In a separate series of experiments 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.

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 regulatory activities. The primary service activities are provided through the Kenneth A. Welch Insect Inquiry 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, and honey bees and other bee pollinators.

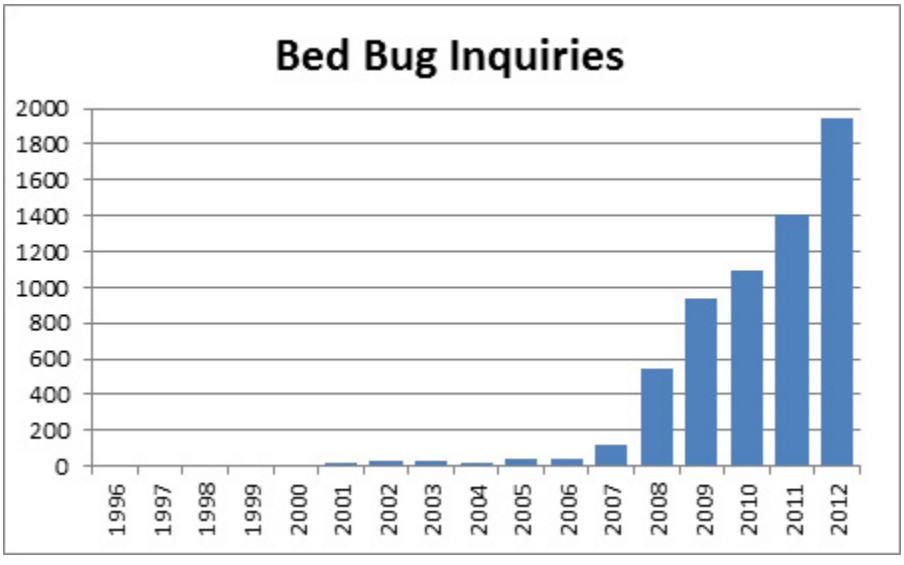
The Office of the State Entomologist at the Connecticut Agricultural Experiment Station, created by the Connecticut General Assembly in 1901, is part of the Department of Entomology with responsibility, in part, to ensure our nursery industry is free of plant pests and certify their products for shipment 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. Examples are Ramorum blight (aka Sudden Oak Death), a fungus-like pathogen that can affect many plants, but that can be particularly devastating to rhododendron, azalea, and kalmia (the state flower of Connecticut), and two beetles, the Asian longhorned beetle and emerald ash borer, that represent a threat to our maples (and other trees) and ashes, respectively. In addition, we participated in a regional 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 a gypsy moth egg mass survey. The results of our plant and forest surveys for 2012 may be found later in the Department's research activities along with summaries of our regulatory activities.

The staff of the Department of Entomology also takes 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, 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.

SERVICE ACTIVITIES

Insect Inquiry Office: **Dr. Gale Ridge** and **Rose Hiskes**, with the assistance of **Katherine Dugas** on Forest Health and CAPS**,** answered questions from the public. The insect inquiry office in its present form has provided services for over 40 years. Insect identification services date back to the earliest days of the institution starting with the first Annual Report of the Connecticut Agricultural Experiment Station published in 1877. The station announced that was offering to "identify useful or injurious insect…..and to give useful information on the various subjects of Agricultural Science for the use and advantage of the citizens of Connecticut". The insect inquiry office moved temporarily into the Jones Auditorium in the fall of 2012 from the top floor of the Jenkins Laboratory for renovations to the Jenkins Building. The insect inquiry office received thousands of inquiries each year. For the past few years there has been a trend from traditional communications such as mail and visitors to phone-cellphone calls and the internet.

Katherine Dugas with Lingren funnel, 2013



Number of bed bug inquiries from 1996 – 2013 (2013 based on 2012-2013 Fiscal Year data).

The office serves private citizens, pest control 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, 2012 and June 30, 2013 the insect inquiry office handled at least 7,633 recorded inquiries. There were 672 categories of inquiries including insects, arachnids, animals, use of pesticides, insect damage, general entomology, and horticultural issues. Of these 2278 (30%) were related to man and medical issues, 164 undetermined/general inquiries (3%), 4772 (63%) as natural resources, and 269 (4%) food related. Bed bug/bat bug inquiries remain the leading inquiry for the office with 1,939 (25.5%) of the identifications performed by the office. The bed bug webpage additionally had the highest level of insect related activity. In order of numbers, the second most queried webpages were ticks, followed by those concerned with solitary bees and wasps, carpenter ants, hemlock woolly adelgid, white grubs, carpenter bees, Indian meal moths, carpet beetles, yellow jackets, squash vine borers, cicada killers, and the Periodical seventeen year cicada.

The office continued to lead in public outreach with numerous State and New England wide presentations and training programs for bed bugs, the emerald ash borer, and the Asian longhorn beetle. The office continued to build collaborative relationships and led several projects with local, state, and federal agencies, which better serve the needs of the citizens of Connecticut.

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 observed 17 different butterfly species, 1 species of moth, 18 species of birds, and 8 other animals around the garden on Plant Science Day August 7, 2012.

Butterflies & Moths	*Birds*	*Other*
Spicebush Swallowtail	American Crow	European Honeybee
Cabbage White	Mourning Dove	Green Frog
Monarch	Northern Mockingbird	Bumblebee spp.
Dun Skipper	Barn Swallow	Small Milkweed Bug
Tawny-edged Skipper	Bluejay	Green Darner
Peck's Skipper	American Robin	Carpenter Bee
Silver-spotted Skipper	Song Sparrow	Cicada Killer wasp
Eastern Tiger Swallowtail	Northern Flicker	Carolina Locust

Orange Sulphur
American Lady
Hobomok Skipper
Eastern Tailed-Blue
Common Sootywing
Fiery Skipper
Leonard's Skipper
Zabulon Skipper
Wild Indigo Duskywing
Hummingbird Clearwing

Tufted Titmouse
American Goldfinch
Gray Catbird
Ruby-throated Hummingbird
European Starling
Red-tailed Hawk
Turkey Vulture
Rock Dove
Chimney Swift
Northern Cardinal
American Crow

Sponsored Meetings and Conferences: A Forest Health Workshop, organized annually by **Dr. Victoria Smith**, was held March 5, 2013 at Sessions Woods Wildlife Management Area, Burlington, 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.

The Connecticut Agricultural Experiment Station hosted the 86th annual meeting of the National Plant Board at the Hilton in Mystic CT, July 21 through July 26. Over 135 people, from 36 states, Canada and Mexico, and representing state Departments of Agriculture, USDA, US Forest Service, US Customs and Border Protection, industry, and USDA executives, participated in meetings, discussions, and presentations. A tour of the Monsanto Plant Transformation Research Facility in Mystic and Fort Trumbull State Park in New London were included. Station Director **Louis Magnarelli** gave the Connecticut welcome, and Sharon Douglas presented a talk on Boxwood blight. **Victoria Smith** was the Local Arrangements Chair, and **Tia Blevins**, **Sandra Carney**, **Mark Creighton**, **Jeff Fengler**, **Lisa Kaczenski**, **Steve Sandrey**, and **Peter Trenchard** helped with registration and arrangements. **Vickie Marie Bomba-Lewandoski** helped with database management and printing.

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 2,363 ticks feeding on humans were submitted for identification in 2012, of which 1,958 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 2012, 951 (48.5%) were tested for the presence of *Borrelia burgdorferi*, the causal organism for Lyme disease, and 189 (19.5%) were found to carry this organism.

EMERALD ASH BORER DETECTED IN CONNECTICUT

The Connecticut Agricultural Experiment Station (CAES) detected the emerald ash borer (*Agrilus planipennis*) (EAB) in Connecticut in the Town of Prospect on July 16, 2012. The identification was confirmed by insect taxonomists in the USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA-APHIS-PPQ). The insects were recovered in Prospect from a ground-nesting, native wasp (*Cerceris fumipennis*), which hunts beetles in the family *Buprestidae*, including the emerald ash borer, as part of an EAB "biosurveillance" program. The developing wasp larvae feed on the beetles provided by the adult wasp. Additional specimens in Prospect and Naugatuck were recovered from purple prism traps maintained by the University of Connecticut Cooperative Extension Service via an agreement with the USDA APHIS PPQ. The CAES quarantined New Haven County for the EAB, ash and ash products, and all hardwood firewood, on August 9, 2013, which was followed by a federal quarantine on the county in September. The beetle was subsequently found in eight other towns during this reporting period, all in New Haven County, as part of surveys conducted by CAES, The Department of Energy and Environmental Protection (DEEP), and the University of Connecticut Cooperative Extension or from reports by the public in joint efforts to detect the presence of EAB or the extent of the current New Haven County infestation. The other eight towns are Naugatuck, Bethany, Beacon Falls, Waterbury, Cheshire, Oxford, Middlebury, and Hamden (see section on *Cerceris* biosurveillance).

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 first part 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. **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. **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. Data collected during this experiment will be used to fulfill this objective, as well as three others related to the management of tick-borne diseases, for a project funded in September 2012 by Centers for Disease Control and Prevention through a 3-year cooperative agreement (i.e., grant).

Ticks and a blood sample are collected from each mouse, and an identifying ear tag is attached. The animals are released after recovering from anesthesia.

Treatments in the experiment are 1) natural product application (rodent bait box placement and the spray applications of the entomopathogenic fungus *Metarhizium anisopliae*) on individual residential properties, 2) reduction of white-tailed deer (*Odocoileus virginianus*) populations within residential areas through sharpshooting, and 3) a combined treatment with both natural product application on individual properties and deer population reduction in neighborhoods. David Whiteman (Connecticut Tick Control, LLC) and Dr. Anthony J. DeNicola (White Buffalo, Inc.) managed natural product application and deer population reduction treatments, respectively, within assigned residential areas. Natural product application reduced nymphal *Ixodes scapularis* populations on residential properties by an average of 75%. Deer populations were reduced by 86% in treatment areas where sharpshooting occurred. Effectiveness of deer reduction and combined treatments on tick populations and disease parameters will be estimated in future project years.

Impact: Lyme disease continues to be a major public health concern with around 300,000 cases 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.

Bed bugs fungal pathogen treatments and reproductive studies: **Drs. Gale E. Ridge, Kirby C. Stafford III**, and **Dr. Anuja Bhardwaj** conducted several experiments on the use of entomopathogenic fungi as a control on the Common bed bug, *Cimex lectularius* L. More specifically, *Metarhizium brunneum* strain F52 was used and proven effective against *C. lectularius* in the laboratory. Dr. Ridge additionally ran a study on *C. lectularius* fecundity, reproductive strategies, and viability using two populations, a laboratory strain (the Harlan line) and a New Haven "wild" strain (the Ridge line). Results revealed here-to-fore unobserved behaviors and fecundity traits that may impact management of this rapidly increasing pest problem.

Honey Bees and Native Pollinators: There is great concern across the U.S. and around the world about annual heavy losses of honey bee colonies, the decrease in diversity of bumble bee species, and the more general decline of many other species of pollinators. **Dr. Kimberly Stoner**, with assistance from **Tracy Zarrillo**, **Morgan Lowry**, **Jess Gambel**, **Amelia Tatarian**, and **Erica**

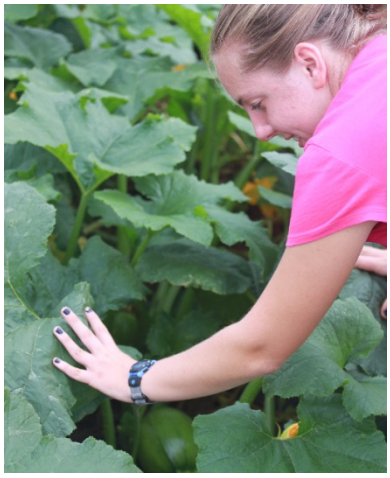
Carbone is studying several aspects of pesticides in pollen, pollination, bee health, and diversity of bee species.

Pesticides in Pollen Trapped from Honey Bee Hives: **Dr. Brian Eitzer** of Analytical Chemistry and **Dr. Kimberly Stoner** analyzed the data from five years of testing pollen collected from honey bees as they returned to the hive. The pollen was collected from five locations, representing urban, suburban, mixed agricultural, and orchard sites. The pesticides were put on a scale of acute toxicity by calculating a Pollen Hazard Quotient, a ratio of the concentration of pesticide residue in pollen divided by the dose lethal to 50% of the honey bees (LD_{50}) in laboratory testing. The pesticides with the greatest Pollen Hazard Quotients at the maximum concentrations found in this study were (in descending order): phosmet, imidacloprid, indoxacarb, chlorpyrifos, fipronil, thiamethoxam, azinphos-methyl, and fenthion, all with at least one Pollen Hazard Quotient over 500. At the maximum rate of pollen consumption by nurse bees, a Pollen Hazard Quotient of 500 would be approximately equivalent to consuming 0.5% of the LD_{50} per day.

Sampling Alternative Floral Resources on Vegetable Farms: One of the factors that determines the abundance and diversity of wild bees in an area and the suitability for managed honey bee colonies is the availability of flowering plants to provide nectar and pollen over the season of bee activity. **Dr. Stoner** and her team observed and collected bees on 125 species at 10 private farms, including cut flowers, herbs, cover crops and weeds. This project is funded by the Natural Resources Conservation Service of the U.S. Department of Agriculture. Plants with the highest counts of bumble bees per minute of observation were: common motherwort, *Leonurus cadiaca;* raspberry, *Rubus ideaus;* catnip, *Nepeta cataria;* various species of peppermint and spearmint, *Mentha sp.*; Mexican sunflower, *Tithonia rotundifolia;* various

species of basil, *Ocimum sp.*; lavender, *Lavandula sp.;*and anise hyssop, *Agastache foeniculum.* Plants with the highest counts of honey bees per minute were: chives and garlic chives, *Allium sp.;* vegetables in the cabbage family allowed to go to flower, *Brassica sp.;* buckwheat, *Fagopyrum esculentum;* cilantro allowed to go to flower, *Coriandrum sativum;* catnip; and bachelor button, *Centaurea cyanus*. Notable for their abundance of other bees were boxwood, *Buxus sp.;* raspberry; feverfew, *Tanacetum parthenium;* Joe Pye weed, *Eutrochium purpureum; Calendula officinalis;* chamomile, *Chamaemelum nobile;* and strawflower, *Helichrysum sp.*

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. Stoner** and her team are counting bee numbers per 100 flowers on 20 farm fields across the state; measuring pollen deposition on stigmas in relation to the bee counts the same morning, also on 20 farm fields; and comparing fruit set,fruit weight, and seed numbers on flowers with natural and supplemental pollination at three sites. In addition, they are studying factors that may be affecting bee numbers; including pesticides in nectar and pollen; potential pathogens in honey bees, bumble bees, and squash bees; and landscape factors that could affect nesting habitat and alternative food sources at different sites.



Summer research assistants Erica Carbone, checking pumpkin seed set at Lockwood Farm (left), and Amelia Tatarian, collecting stigmas (right).

Impact: With both honey bees and native pollinators under decline, the quantification of pesticides in pollen, studies of the best floral resources, and pollination of specialty crops will help homeowners and farmers provide better habitat and management of our pollinators.

Surveys for Invasive Insects: The brown marmorated stink bug (*Halyomorpha halys*) is an Asian insect that has an exceptionally broad host range, with the adults and nymphs often feeding on the same high-value host plants. **Dr. Chris Maier** and his assistants, **Morgan Lowry** and **Tracy Zarrillo**, have continued to investigate the distribution of this invasive stink bug. They have obtained new distributional records especially from citizens who found adults in their homes during the fall and the winter months. Currently, this alien stink bug is known from 64 towns distributed in the 8 counties of the state.

In 2012, a blacklight trap was operated in the center of Lockwood Farm in Hamden to monitor the seasonal abundance of adults. A total of 15 adults were captured between the end of July and early September. Based on captures in light traps operated in other states, the number of adults captured in Hamden would be below the level that is correlated with crop damage. Indeed, no crop damage was reported in Connecticut in 2012.

The invasive spotted wing drosophila (*Drosophila suzukii*) poses a serious threat to many fruit crops. The larva1infestations of this vinegar fly can destroy especially small fruits, such as strawberries, raspberries, and blueberries, which are commercially grown on many Connecticut farms. Over the past 2 years, Dr. Maier and his assistants have sampled fruits on wild and ornamental plants to discover which ones are infested by larvae. Thus far, they have reared adults of the spotted wing drosophila from 32 fruiting species distributed in 14 plant families. Larval infestations commonly occur in American pokeweed (*Phytolacca americana*), autumn olive (*Elaeagnus umbellata*), blackberries and raspberries (*Rubus* spp.), and dogwoods (*Cornus* spp.). The wild hosts of the spotted wing drosophila may contribute to the buildup of populations that later injure agricultural crops.

The Eurasian spruce needleminer (*Batrachedra pinicolella*) is an invasive pest of spruces, particularly Norway spruce (*Picea abies*). Dr. Maier and his assistants are developing improved methods to determine the distribution and the seasonal flight activity of this moth. In 2012, they discovered that adult males are highly attracted to traps baited with *Z*-5-decen-1-ol and *Z*-5-decen-1-yl acetate, probable components of the sex pheromone of the female. The male flight period extended from late May to mid-July. Traps baited with the two-chemical blend can be used immediately to monitor male flight activity.

Impact of the Lily Leaf Beetle: The lily leaf beetle (*Lilioceris lilii*) is a highly destructive pest of Asiatic and Oriental lilies that are grown in flower gardens in Connecticut. Both the larvae and the adults of this European beetle feed upon the foliage and flowers of lilies, sometimes causing the death of plants. Although this invasive beetle prefers Asiatic true lilies, it has spread 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*).

In spring 2013, **Dr. Maier** and his assistants started an experiment to assess the impact of the lily leaf beetle on the Canada lily in northwestern Connecticut. Based on initial observations, as few as five larvae can completely defoliate individual plants of this wild lily. The effect of larval feeding on flower formation and plant survival will be evaluated in late summer of 2013.

Seventeen-year Periodical Cicadas: Periodical cicadas have amazed scientists and others for centuries because they have a very lengthy life cycle, undergo highly synchronized mass emergences, and form large choruses of singing males. The nymphs of these insects spend nearly 17 years underground where they feed upon the xylem fluid in tree roots. In late May and June of 2013, nymphal cicadas emerged from the ground and transformed to adults. **Dr. Chris Maier**, assisted by **Morgan Lowry**, **Tracy Zarrillo**, and citizen scientists, has begun a survey to determine precisely where populations of these cicadas occur in Connecticut. During the last emergence in 1996, Dr. Maier found the 17-year periodical cicada (*Magicicada septendecim* [brood II]) in 22 towns located in central and south-central Connecticut. Based on the initial results of the 2013 survey, this cicada has disappeared from 2 of the 22 towns where it had emerged in 1996.

Although periodical cicadas have been observed and collected in Connecticut since at least 1843, only one species (*Magicicada septendecim*) of the three known 17-year species has been found in the state. During the 2013 survey, however, Dr. Maier discovered a small population of a second species (*M. septendecula*) on Totoket Mountain in North Branford. This population was associated with pignut hickory (*Carya glabra*) in an area that previously also had butternut (*Juglans cinerea*). This type of forest is similar to ones where other populations of this species have been found in eastern New York.

Adult female of the 17-year periodical cicada, *Magicicada septendecim.*

Longhorned Beetles of Connecticut: **Dr. Maier** and his assistants have continued to examine the distribution and host range of longhorned beetles (Cerambycidae). 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 specimens in museums. In the spring and the summer of 2013, they determined the seasonal flight activity of over 20 species of adults by capturing them in panel traps baited with various sex pheromones and host volatiles. To date, they have reared 85 species from dead wood; many of the host associations are new to science. They also have developed a database, which now has over 8,540 entries. Biological data stored in this database will assist in developing future management plans for pestiferous species of longhorned beetles.

Agrilus species – The genus *Agrilus* (Coleoptera: Buprestidae) contains several species of economic importance, both native and invasive. **Dr. Claire E. Rutledge** is pursuing several lines of research with two members of this genus. The bronze birch borer (BBB), *Agrilus anxious* Glory, a native insect, requires stressed, living trees to develop, and thus frequently attack birches in landscape and nursery settings. The beetles cause considerable aesthetic and financial damage to homeowners and nurserymen in Connecticut. The emerald ash borer (EAB), *A. planipennis* Fairmaire, an invasive pest, is a native of Asia that was discovered in Detroit MI in 2002 and has spread widely. In July 2012 EAB was discovered in Prospect, CT by a member of Dr. Rutledge's team, Mioara Scott, through biosurveillance (see below).

In collaboration with Dr. Melody Keena USDA FS, **Dr. Rutledge** is pursuing a multi-faceted approach to studying the reproductive behavior of BBB and EAB which encompasses mating behavior, mate choice, and the kinetics of sperm transfer and storage. A study of the impact of mating frequency on fecundity in EAB published this year showed that EAB females need to mate more than one time to ensure fecundity. A similar study with BBB, which has been accepted for publication, showed that BBB females can achieve full fecundity with just one mating. The results of this research are being used to improve laboratory rearing of EAB, as well as to understand the population dynamics of both species.

Surveys are also being conducted on the natural enemies of BBB and other species in the Buprestidae. This work has two main goals; 1) to document current natural enemies in advance of the

probable release of non-native parasitoid wasps for the control of EAB when it arrives in the state; and 2) to search for potential natural enemies that could be used against EAB here. One technique used in this survey is dissection of *Cerceris fumipennis*-caught buprestid beetles for pathogenic organisms such as nematodes and microsporidia. Another approach is girdling birch trees in a number of habitats throughout the state to make them more attractive to egg-laying BBB. The infested trees are then left in situ and the next fall the trees are collected and any larvae dissected out of the tree, collected and examined for parasitoids and pathogens.

Reproductive Biology Agrilus: In collaboration with Dr. Melody Keena USDA FS, **Dr. Rutledge** is pursuing a multi-pronged approach to studying the reproductive behavior of BBB and EAB which encompasses mating behavior, mate choice, and the kinetics of sperm transfer and storage. A study of BBB, which was published this year, showed that BBB females can achieve full fecundity with just one mating. This is in contrast to EAB, which need several matings to achieve full fecundity. The results of this research are being used to improve laboratory rearing of EAB, as well as to understand the population dynamics of both species.

Cerceris fumipennis biosurveillance: **Dr. Claire Rutledge** with the assistance of **Mioara Scott** has several studies on the buprestid hunter *Cerceris fumipennis* (Hymenoptera: Crabronidae) underway. This native, solitary hunting wasp 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 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.

Discovery of Emerald Ash Borer -In July 2012, a female wasp carrying an EAB was captured in Prospect, CT. Subsequently, EAB were captured at wasp colonies in Beacon Falls, and another Prospect location. After the initial find, combination of detection techniques, including use of the purple prism traps (conducted by the University of Connecticut Extension), public reporting, and a delimiting survey led by the Division of Forestry in the Department of Energy and Environmental Protection showed that the beetle was established in 9 towns in New Haven County. Survey efforts will continue in summer 2013.

Wasp Watcher Program: The wasp watcher program was begun in the spring of 2010. The program had several goals. The first is to increase our ability to monitor colonies of *C. 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. In the summer of 2010 we had 23 watchers at 21 colonies. In the summer of 2011, many of the original watchers returned. We were also joined by volunteers at the White Memorial Conservation Center in Litchfield and the Bartlett Arboretum in Stamford. We concentrated on colonies with many nests, and 29 watchers monitored 21 colonies. In 2012, we were again joined by the White Memorial Conservation Center in Litchfield. We were also approved as an 'outreach activity' by the University of Connecticut Extension Master Gardeners Program. We had 17 Master Gardeners join the Wasp Watchers for a total of 55 volunteers. The colonies were distributed throughout CT. No invasive buprestid beetles were found in

2010 and 2011. Emerald ash borer was detected independently by station staff and a Wasp Watcher in July 2012 at the Prospect site. Results from the 2013 season are pending.

Cerceris fumipennis research: Two lines of research in addition to the 'bio-surveillance' efforts were finished this past year and are in preparation for publication. The first project by **Dr. Claire Rutledge** 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. 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 and Philip Careless (Canada Food and Agriculture). Wasps will grasp, and attempt to paralyze buprestid beetles, but not beetles in other families. A test of the composition of cuticular hydrocarbons of 10 species of Buprestidae showed that their hydrocarbon profile is relatively simple, including only 2 to 3 major classes of hydrocarbons, whereas other beetle families tested include up to 8 or 9. The presence of hydrocarbons in classes that do not appear in Buprestidae causes wasps to reject beetles that are not buprestids.

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. Two sites with appropriate conditions were identified by **Dr. Claire Rutledge** in fall 2012, in collaboration with Dr. Juli Gould of USDA APHIS. In May 2013, the first release of two species of hymenopteran parasitoids was made at the two sites. The parasitoids released were a gregarious endoparasitoid, *Tetrastichus planipennisi* and the egg parasitoid *Oobius agrili*. The parasitoids are shipped from a USDA APHIS mass-rearing facility in Brighton Michigan. There are several releases planned for summer 2013.

Dr. Rutledge nails up a container with the parasitoid *Oobius agrili* provided by the USDA.

NURSERY AND PLANT INSPECTION ACTIVITIES

Plant inspection and regulatory services are coordinated and conducted by State Entomologist **Dr. Kirby Stafford**, Deputy State Entomologist **Dr. Victoria Smith**, Plant Inspectors **Peter Trenchard**, **Stephen Sandrey**, **Jeffrey Fengler**, **Tia Blevins**, and Apiary Inspector **Mark Creighton**.

NURSERY INSPECTION AND CERTIFICATION. Three-hundred six nurseries were certified to conduct intra- and interstate business. There were 697 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, Fletcher scale on *Taxus* and arborvitae, imported willow leaf beetle, and lily leaf beetle.

JAPANESE BEETLE CERTIFICATION. We observed treatments of 39 plants at two nurseries and issued phytosanitary certificates to comply with states that quarantine nursery stock from Connecticut because of the Japanese beetle, *Popillia japonica*.

Seven nurseries met other requirements of the United States Japanese Beetle Harmonization Plan and shipped 2,749 plants to states that quarantine plants from Connecticut.

JAPANESE BEETLE CERTIFICATION TO CANADA. Six Connecticut nurseries, which met the inspection requirements of the US/Canada Japanese Beetle Harmonization Plan, shipped 32,678 plants to Canada in 2012.

NURSERY DEALER PERMITS. Nursery dealer permits were issued to 159 firms. One-hundred twenty six of these companies operate individual outlets. The remaining businesses have more than one outlet each. In total, there were 575 outlets.

PHYTOSANITARY CERTIFICATES. Three-hundred and eighty phytosanitary inspection certificates were issued covering the shipment of the following plant materials to destinations outside the United States:

Product	Quantity
Apples (Cartons)	2,000
Bulbs & Tubers (Dahlia & Gladiolas)(# Bags)	331
Chinese tree peonies (plants)	36
Greenhouse plants	276
Nursery stock (containers - B & B)	31,088
Orchids (plants)	2,955
Perennials (bare root plants)	667
Seeds (cartons & bags)	1,883
Tobacco (bales, boxes, bundles & cartons)	173,064
Walnut shells (bags and drums)	325

SPECIAL INSPECTIONS. Twelve inspections were made for 207 individual plants and bulbs to assist homeowners moving out of state.

One-hundred sixty-three inspections were made to assist nurseries moving the following plants interstate:

Product	Quantity
Perennials (plants)	10
Nursery stock (containers)	1,293
(bare root plants)	1,280
Chinese tree peonies (plants)	5
Greenhouse plants	1,377
Orchids	38
Seed (# Bags)	114

There were two Post-Entry Quarantine sites approved in CT in 2012.

BIOTECHNOLOGY REGULATORY SERVICES INSPECTION ACTIVITY. In cooperation with officers from the Wallingford USDA-APHIS-PPQ office, eight inspections were conducted in 2012 at facilities or laboratories working with recombinant or regulated organisms.

PERMITS TO MOVE LIVE PLANT PESTS, NOXIOUS WEEDS, AND SOIL. In 2012, there were ninety-nine PPQ 526 Permits (Permit to move live plant pests, noxious weeds, and soil) approved in CT. There were two PPQ 525 Permits (Permit to move soil) approved in CT.

ENVIRONMENTAL CONDITIONS. Winter of 2011-2012 was nearly snowless; in some areas of CT there were only one or two measurable snow events. The dry conditions persisted through spring 2012, with less than 2 inches of rain in both February and March. Rainfall levels approached normal through the remainder of the spring and summer.

Superstorm Sandy struck CT on October 29, 2012, with heavy rain, high winds, and strong tide surges in coastal areas. Many trees were toppled and many more sustained damage to branches and crowns, due to easterly winds of 60 to 80 miles per hour. Foliage was tattered and damaged by salt spray, especially in coastal areas. Conifers, such as pine, spruce, and hemlock, sustained the most damage, with many trees breaking off several feet up the trunk. The effects of this hurricane will be felt in years to come, as damage to trees from breakage will be reflected in increased tree mortality and susceptibility to diseases and insect pests.

INSECT AND DISEASE SURVEYS

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 2012, action concerning boxwood blight was taken at 12 nurseries and garden centers; of one hundred thirty four samples, forty three were positive. Disposal of affected plants is ongoing; to date, approximately 100,000 plants have been destroyed by burial or dumpster.

Also in 2012, CAES scientists documented that the fungus also infects *Pachysandra terminalis*, a popular landscape plant often planted with boxwood. Again, this discovery was new to science.

Currently, boxwood blight in landscapes, of both boxwood and pachysandra, are the focus of our efforts. Six inspections of landscapes were conducted, with four hundred ten samples collected; two hundred thirty seven were positive. In most cases, affected plants have been removed and the area disinfected as much as possible by removal of plant material. In at least two cases, entire established landscapes have been removed and replanted with other species of plants. Efforts are under way to educate landscapers about boxwood blight and its consequences.

IMPATIENS DOWNY MILDEW. Downy mildew of impatiens became evident in CT in mid-July, with extensive sudden defoliation of almost all impatiens. This disease, caused by *Plasmopara obducens*, was widespread and severe in both nurseries and residential plantings. Consequently, almost all producers of impatiens decided against growing the plants for the 2013 season, and growers and gardeners alike are searching for a reasonable replacement for this popular shade-loving plant.

CHRYSANTHEMUM WHITE RUST. In 2012, we inspected 87,721 plants for CWR, caused by *Puccinia horiana*. Two hundred seventeen plants were found to be positive, and were destroyed.

GYPSY MOTH. There was no observable defoliation due to Gypsy Moth recorded in CT in 2012. During egg mass surveys in winter 2012-2013, very few viable egg masses were found.

In November and December 2012, a gypsy moth egg mass survey was conducted in 80-95% favorable host sites on a 7-mile grid (102 sites) throughout Connecticut. No viable egg masses were found.

ASIAN LONGHORNED BEETLE. We conducted thirty nine inspections of 3,860 trees in all counties of CT for presence or signs of ALB infestation.

HEMLOCK WOOLLY ADELGID. During 2012, we required all hemlock nursery stock that was being shipped out of Connecticut to be treated for Hemlock woolly adelgid. Three nurseries shipped hemlock trees out of state. Our inspectors observed treatments and issued phytosanitary certificates to cover 1,253 plants in these shipments.

RAMORUM LEAF BLIGHT. As part of the *P. ramorum* National Nursery Survey, we inspected 20 nurseries during 2012. During this survey 179,162 plants were inspected and 180 samples from symptomatic plants were submitted for lab analysis. All samples were cultured and tested by ELISA; DNA from ELISA-positive samples was sent to Beltsville for PCR confirmation. Sixty one samples, about 33 %, were ELISA-positive, indicating the presence of *Phytophthora* sp. All samples from the nurseries were negative for *P. ramorum*.

An aquatic survey was done in conjunction with the US Forest Service. The stream selected for survey surrounds a 400-acre production nursery that has been implicated in *P. ramorum* trace-back activity. One location upstream of the nursery and one location downstream were baited with rhododendron leaves during April through September 2012; the baiting period was about 2 weeks each month, with a hiatus during June and July when the water temperature exceeded 20^{o} C. Leaf baits were submitted for testing to labs at the Pennsylvania Department of Agriculture and at Cornell University. While many leaf baits were positive for *Phytophthora* species, all leaf baits were negative for *P. ramorum*.

There was one trace-forward action involving *P. ramorum* in CT in 2012. Host material was shipped to one nursery. Two samples were collected, and determined to be negative for presence of *P. ramorum*. No further action was taken.

DAYLILY RUST. During 2012, we surveyed daylilies in nurseries and garden centers for signs of daylily rust, caused by *Puccinia hemerocallidis*. Ninety seven inspections (72,543 plants) were carried out; eighty plants were found to be positive and were destroyed.

APIARY INSPECTION. There are currently six hundred ten registered beekeepers maintaining four thousand four hundred eighty six hives. In 2012, four hundred five hives were opened for inspection on 112 site visits to beeyards in CT. Fifty three samples from failing hives were sent to the USDA Bee Lab in Beltsville, MD, for determination. Varroa mite was detected in forty, Nosema in nine, and tracheal mites in one. Four reported chemical kills were investigated. Small hive beetle is a growing problem in CT; with adults overwintering. Small hive beetle has been

confirmed in Fairfield and Middlesex Counties. Colony collapse disorder has never been confirmed to occur.

FOREST HEALTH SURVEY. During the summer and autumn of 2012, 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. Although many plots were damaged during Hurricane/Tropical Storm Irene and the Halloween Nor'easter, our forests remain healthy.

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. In 2012, a total of 7.4 acres in Fairfield County, 1,046.9 acres in Hartford County, 3393.9 acres in Litchfield County, 30.0 acres in New Haven County, 12.5 acres in Middlesex County, and 19.7 acres in New London County were affected by HWA. Statewide, 4510.5 acres were affected by HWA. In fact, many areas of hemlock are healthy, especially in the northwest corner of the state; in many areas hemlocks are recovering due to wet summers and reduction in HWA populations, especially where biological control was implemented.

ASIAN LONGHORNED BEETLE. Asian Longhorned Beetle was a target in the Wood Boring/Bark Beetle survey, through the CAPS Program in 2012. 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, similar to those experienced in late summer of 2012. Damage to trees from anthracnose diseases was sporadic across the state; 1,229.5 acres in Litchfield County and 54.1 acres in Middlesex County were affected.

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 2012, 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. In Hartford County, 4.0 acres were affected; in Litchfield County, 5.6 acres were affected, and in Windham County, 4.0 acres were affected by red pine scale, for a total of 13.6 acres statewide.

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 2012, 570.9 acres in Fairfield County and 115.9 acres in Litchfield County 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, 279.6 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. In Hartford and Litchfield Counties, areas especially hard-hit during winter storms, there were 2,937.3 acres and 311.5 acres showing damage, respectively. In Tolland County, there were 113.1 acres affected. In addition, about 42 acres in Hartford and Litchfield Counties were affected by fire in 2012.

BUTTERNUT RESEARCH. Butternut populations are declining throughout the native range, and efforts to find trees resistant to the pathogens that kill them have been under way for some time. The Connecticut Agricultural Experiment Station has maintained a list of reported butternut trees in the state since 1994, and in the last three years we have been sampling the trees to determine what pathogens are present.

Two pure butternut trees have been identified in the state using a DNA test, and all the rest of the trees sampled have been Japanese walnuts or hybrids. The butternut canker pathogen, *Sirococcus clavigignenti-juglandacearum* has been found twice in CT, and one of the isolates contains a dsRNA virus. Inoculations of small butternut, Japanese walnut, and hybrid trees at Lockwood Farm will be done this winter to compare the virulence of these strains.

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.

APIARY CERTIFICATION

Nine Hundred and Fifty-five beekeepers registered 5,443 colonies in 2011-2012. Our bee inspectors opened and inspected 561 colonies. One case of American foulbrood was detected (see picture of comb with AFB). *Nosema ceranae* was detected in many areas and is an

increasing problem. Varroa mite is generally distributed in almost all beehives across the state. A new apiary inspector, Mark H. Creighton joined the Station on May 18, 2012.

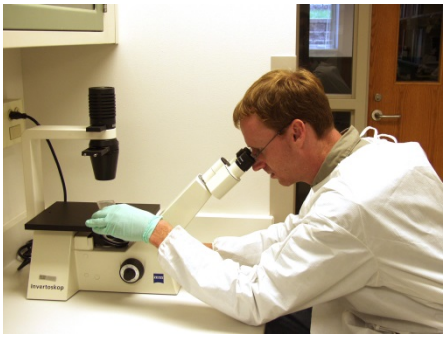
Pest/disease	Positives
Small Hive Beetle	7
American Foulbrood	1
Chalkbrood	7
Die-offs	150
Sacbrood	2
Nosema	7

Photo by M. Creighton.

DEPARTMENT OF ENVIRONMENTAL SCIENCES

Mosquito Trapping and Testing Program

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** and **Dr. Philip Armstrong**, assisted by **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 2012, mosquito trapping was conducted from June 4 to October 18. Traps were set and attended by CAES staff every 10 days at each site on a regular rotation. Two trap types were used at all trapping stations – a CO2-baited CDC Light Trap, designed to trap host-seeking adult female mosquitoes (all species), and a Gravid Mosquito Trap, designed to trap previously blood-fed adult female mosquitoes (principally *Culex* and container breeding *Ochlerotatus* species). Mosquitoes were transported alive to the laboratory each morning where they were identified to species. Mosquitoes were grouped (pooled) according to species, collecting site, and date and frozen at –80^{o}C. A maximum of 50 female mosquitoes were included in each pool. Aliquots of each mosquito pool were inoculated into Vero cell cultures for detection of WN virus and other mosquito-borne arboviruses of public health importance. Virus isolates from mosquito pools were tested for WN, EEE, Jamestown Canyon (JC), Cache Valley (CV), Trivittatus (TVT), Highlands J (HJ), and LaCrosse (LAC), and Potosi (POT) viruses. Isolated viruses were identified by Real Time (TaqMan) polymerase chain reaction (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. Weekly test results were reported to the CDC electronically via ArboNet and to the DPH for dissemination to other state agencies, local health departments, the media, and neighboring states.

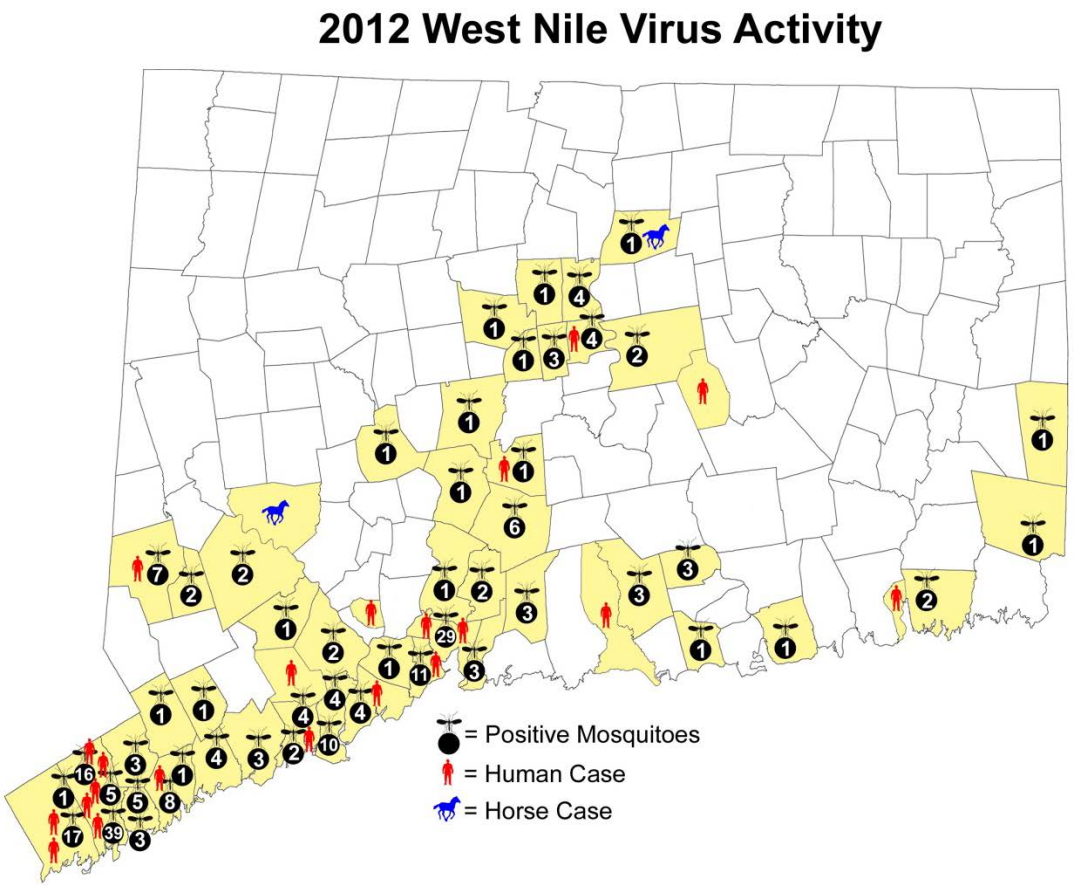
For the 2012 season, a total of 189,379 mosquitoes (14,058 pools) representing 38 species were trapped and tested. A record total of 235 isolations of WN virus were made from 7 mosquito

species: *Culex pipiens* = 195, *Cx. restuans* = 17, *Culiseta melanura* = 11, *Cx. salinarius* = 7, *Coquilletidia perturbans* = 3, *Aedes cinereus* = 1, *Aedes vexans* = 1 collected at 51 sites in 44 towns: Bethel, Bridgeport, Cheshire, Chester, Danbury, Darien, Easton, East Haven, Fairfield, Farmington, Glastonbury, Greenwich, Groton, Hamden, Hartford, Killingworth, Meriden, Milford, Monroe, New Canaan, Newington, Newtown, New Britain, New Haven, North Branford, North Haven, North Stonington, Norwalk, Old Lyme, Orange, Shelton, Southington, South Windsor, Stamford, Stratford, Voluntown, Wallingford, Waterbury, Westbrook, West Hartford, West Haven, Weston, Westport, Wethersfield, and Wilton (Figure 1).

The first positive mosquitoes were collected on June 27, and the last on September 27. As in prior years, the majority of WN virus activity was detected in densely populated urban and suburban regions in southwestern (Fairfield and New Haven counties) Connecticut. A record 21 human cases were confirmed among residents living in 15 different towns (onset dates: July 12 to October 3; age range: 38 yrs. to 84 yrs.) Twelve of these individuals were hospitalized with serious illness, but there were no fatalities. Two equine cases (one euthanized) were also reported from horses stabled in East Windsor and Southbury in late August.

Very little EEE virus activity was detected in 2012. A total of 9 isolations of EEEV were made from mosquitoes collected in Cockaponsett State Forest in Chester in August and September. One equine case of EEE virusV (euthanized) was reported in mid-October from a horse stabled in Lisbon.

Other mosquito-borne viruses isolated included: Highlands J (HJ) = 3 isolations from 1 species (August 13-21); and Jamestown Canyon (JC) = 5 isolations from 3 species (June 12-19).



Mosquito species trapped and tested for arboviruses in Connecticut, 2012

Species	Number Mossquitoes	Number Pools	Virus			
			EEE	HJ	JC	WN
Aedes albopictus	245	102				
Ae. cinereus	5,184	723				1
Ae. vexans	16,377	1,046				1
An. crucians	632	180				
An. punctipennis	4,403	862				
An. quadrimaculatus	838	311				
An. walker	1,470	198				
Coquillettidia perturbans	37,969	1,374				3

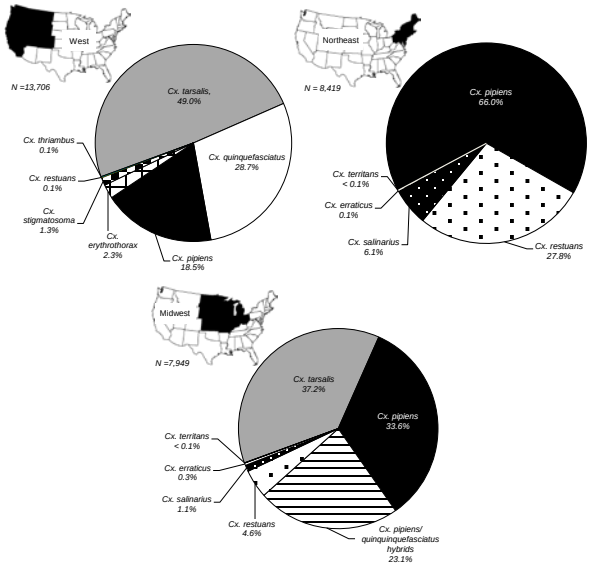
Culex erraticus	24	13				
Cx. pipiens	26,014	1,691				195
Cx. restuans	4,152	773				17
Cx. salinarius	26,130	1,197			1	7
Cx. territans	94	73				
Culiseta melanura	8,759	814	9	3		11
Cs. minnesotae	9	5				
Cs. morsitans	13	11				
Ochlerotatus abserratus	662	85				
Oc. atropalpus	2	2				
Oc. aurifer	493	50				
Oc. canadensis	20,341	889				
Oc. cantator	2,314	289			3	
Oc. excrucians	68	37				
Oc. grossbecki	2	2				
Oc. japonicus	1,882	772				
Oc. provocans	1	1				
Oc. sollicitans	1,475	87				
Oc. sticticus	893	69			1	
Oc. stimulans	393	97				
Oc. taeniorhynchus	10,251	324				
Oc. thibaulti	6,893	299				
Oc. triseriatus	1,559	446				
Oc. trivittatus	3,428	372				
Orthopodomyia signifera	4	4				
Psorophora columbiae	2	1				

Ps. ferox	3,225	339				
Ps. howardii	4	4				
Toxorhynchites r. septentionalis	2	2				
Uranotaenia sapphirina	3,071	476				
TOTAL	**189,193**	**14,008**	**9**	**3**	**5**	**235**

EEE = Eastern Equine Encephalitis, **HJ** = Highlands J, **JC** = Jamestown Canyon, **WN** = 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, assess risk of human infection, inform the public and health care providers of these risks, guide vector control efforts, and prevent disease outbreaks. 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.

Studies on Mosquitoes and West Nile Virus



Mosquitoes within the *Culex pipiens* complex are recognized as major vectors of West Nile (WN) virus in North America due to their vector competence, high field infection rates, local abundance, and close association in time and space with virus foci and human cases. However, the role *Cx. pipiens* complex mosquitoes play in enzootic amplification of WN virus among avian hosts and epidemic transmission to humans appears to vary widely throughout its geographical distribution. **Dr. Theodore Andreadis** examined regional differences in the role of *Culex p. pipiens* L., *Cx. p. quinquefaciatus* Say and their hybrids in transmission, local overwintering and long-term persistence of

WN virus in the US based on national surveillance data compiled by the CDC ArboNet since 1999 and our current knowledge of their population biology and feeding behavior. The contribution of underground populations of *Cx. pipiens* form molestus to the epidemiology of WN virus in urban settings was also explored. In the northeastern US, *Cx. p. pipiens* is recognized as the primary enzootic vector responsible

for amplification of virus among wild bird populations. However, because this mosquito is strongly ornithophilic, its role in transmission to humans appears to be more limited. In the north central and Mid-Atlantic states by contrast, *Cx. p. pipiens* shows an increased affinity for human hosts and has been incriminated as a key bridge vector. In southern regions of the US, *Cx. p. quinquefasciatus* are more opportunistic feeders, and are thought to be principal enzootic and epidemic vectors. In western regions of the US where *Culex tarsalis* predominates, especially in rural areas, *Cx. p. pipiens* and *Cx. p. quinquefasciatus* play roles that are more limited and are recognized as secondary vectors. In the southwestern US *Cx. p. quinquefasciatus* also appears to be the predominant vector in urban habitats, but only a secondary vector in more rural environs. The direct involvement of *Cx. p. pipiens* form molestus in WN virus transmission is largely unknown, but human-biting *Cx. p. pipiens* are more likely to have a probability of genetic ancestry with *Cx. p. pipiens* form molestus.

Drs. Goudarz Molaei and **Theodore Andreadis** investigated the vector-host interactions of *Cx. pipiens* complex mosquitoes by sequencing portions of mitochondrial cytochrome b gene. They found that *Cx. p. pipiens* f. pipiens predominantly feed on avian hosts (93.1%), and focus feeding activity on several key bird species, in particular the American robin, the gray catbird, and the house sparrow in Connecticut. However, *Cx. p. quinquefasciatus* indiscriminately feed on both birds and mammals. *Culex p. quinquefasciatus* in Harris County, Texas and southern California acquired 39.1% and 88.2% of bloodmeals from birds, respectively. Mammalian-derived bloodmeals constituted 52.5% and 9.6% in the two regions, respectively. The most frequent avian hosts for this mosquito species in the southwestern U.S. were the mourning dove, the white-winged dove, the house sparrow and the house finch. Humans infrequently served as the source of bloodmeals for *Cx. p. pipiens* and *Cx. p. quinquefasciatus*. Microsatellite analysis of mosquitoes from Chicago, Illinois showed that *Cx. p. pipiens* f. pipiens with mammalian-derived bloodmeals had significantly higher ancestry and proportion of hybrids from *Cx. p. pipiens* f. molestus than did those with avian-derived bloodmeals.

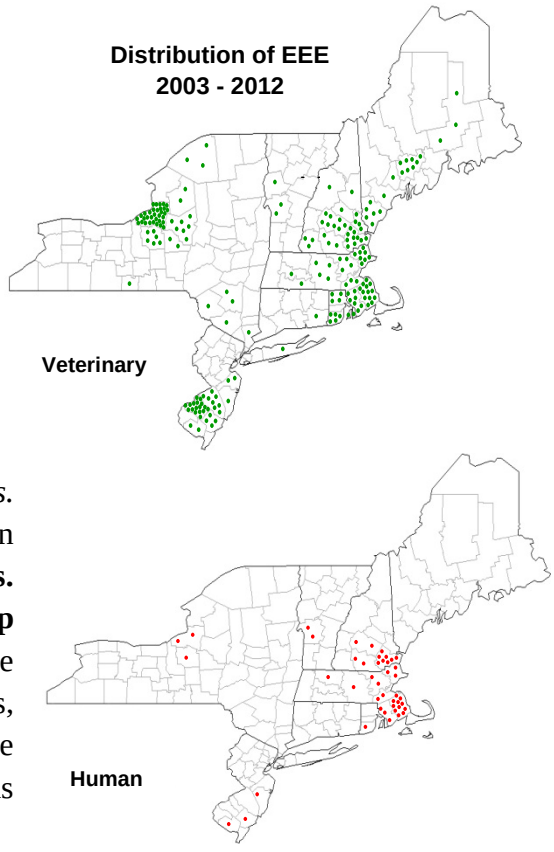
Studies on Mosquitoes and Eastern Equine Encephalitis

The overwintering ecology of the chief mosquito vector of eastern equine encephalitis (EEE) virus, *Culiseta melanura* was studied by **Dr. Theodore Andreadis, John Shepard** and **Michael Thomas** in a seasonally flooded evergreen forest swamp in south central Connecticut in an effort to clarify which larval stages successfully overwinter in the northeastern United States, and to determine the degree to which larval development and/or mortality occur during the winter months. A total of 8,626 immature *Cs. melanura* were collected weekly for analysis from subterranean crypts and cavities located under the roots of trees

from December 13, 2011 to May 31, 2012. Despite the formation of ice on the surface water at the entrance holes to the crypts, water temperatures within the cavities remained above freezing (ave. = 1.8 ^{o}C) throughout coldest winter months of January and February. A heterogeneous population of 2nd, 3rd and 4th instar larvae were recovered throughout the winter and early spring in the same relative proportions (30%, 30%, 40%, respectively) with no significant change in their comparative abundance during this period providing unequivocal evidence that all three instars successfully overwinter in the region. Findings further demonstrate that larvae undergo no development during the winter and do not appear to be impacted by any measurable mortality. The cessation of larval diapause and a resumption of development was observed in mid-April and was coincident with a gradual increase in water temperature within the crypts to 9^{o}C, in agreement with a previously calculated developmental thermal minimum of 8.5^{o}C for *Cs. melanura.* This resulted in a protracted period of pupation that encompassed a minimum of five weeks, followed by a staggered emergence of adults and an overlap of the residual overwintering population with larvae of the first summer generation.

Impact. This study provides essential information on the overwintering biology of the principal vector of EEE virus and provides new insight on how warming winter temperatures associated with climate variability may impact the maintenance and amplification of this virus in the northeastern US.

During the last decade, episodes of EEE virus have reemerged in the northeastern U.S. with recurring frequency in Massachusetts, New Jersey, New York and Rhode Island, and expansion northward into Maine, New Hampshire, and Vermont where it had been historically rare or previously unknown. EEE virus is amplified in an enzootic cycle principally involving *Cs. melanura* and Passeriformes birds in freshwater swamp habitats. Although EEE virus frequently infects *Cs. melanura*, this species is considered an unlikely bridge vector because it feeds mainly on birds. However, recent analyses of *Cs. melanura* populations sampled from EEE virus foci in Connecticut, Massachusetts and New York by **Drs. Goudarz Molaei, Theodore Andreadis** and **Philip Armstrong** revealed that 1-10% of blood meals were obtained from mammals including equines and humans, suggesting the ability of this species to serve as a bridge vector. Other mosquito species are often considered as



bridge vectors, but the supporting evidence is circumstantial. Understanding of the vector-host interactions of mosquito vectors of EEE virus is critical for determining the respective roles of mosquito in enzootic and epidemic/epizootic transmission of the virus. To gain further insights into the recent episodes of EEE virus in this region, **Drs. Goudarz Molaei** and **Theodore Andreadis** have initiated a collaborative research project with Vermont Agency of Agriculture to estimate the frequency of vector contact with candidate reservoir and incidental hosts by examining the blood-fed behavior of *Aedes, Anopheles, Coquillettidia* and *Culiseta* mosquitoes from an EEE virus foci in Vermont using molecular technique,

Evaluation of Aedes albopictus as an Arbovirus Vector

The Asian tiger mosquito, *Aedes albopictus*, is an invasive species and a major pest problem in urban and suburban locales in New Jersey. To assess its potential role as an arbovirus vector, **Drs. Armstrong, Andreadis**, and colleagues from Rutgers University estimated the prevalence of virus infection in *Ae. albopictus* sampled from two New Jersey counties over a three-year period (2009-2011). Mosquitoes were screened for virus infection by Vero cell culture and RT-PCR assays. Three virus isolates were obtained from 34,567 field-collected *Ae. albopictus* and all were identified as Cache Valley virus (CVV) by molecular methods. *Ae. albopictus* (N= 3,138), collected in Mercer County from late July through early September 2011, were also rescreened for West Nile virus (WNV) by RT-PCR and all were negative by this assay as well. These results corroborate prior findings showing that *Ae. albopictus* may occasionally acquire CVV, a deer-associated arbovirus, in nature. In contrast, WNV infection was not detected in *Ae. albopictus* despite concurrent WNV amplification in this region. These findings suggest that *Ae. albopictus* has a limited contribution as an arbovirus vector in this region of the US.

Impact. *Aedes albopictus* is an aggressive human biter that has spread throughout the southeastern portion of the US and expanded further north into New Jersey, New York City and Long Island, New York. This mosquito species could also become established in Connecticut if global warming provides suitable conditions for future colonization. Accordingly, we assessed the ability of *Ae. albopictus* to serve as regional arbovirus vector by testing field-collected mosquitoes from New Jersey for virus infection. This effort will enable us to estimate the prevalence of virus infection in local mosquito populations and evaluate the potential impact of *Ae. albopictus* on the transmission of domestic arboviruses in the region.

Prevalence and Genetic Characterization of Powassan Virus in Ixodes scapularis Ticks

Drs. Anderson and **Armstrong** sampled *Ixodes scapularis* ticks from sites in Connecticut and tested them for Powassan virus infection. A total of 30 Powassan isolates were obtained from Bridgeport and North Branford, CT in 2008, 2010, 2011, and 2012. These viruses were sequenced in addition to one earlier isolate from *Ixodes cookei* collected in Old Lyme, CT in 1979 and compared by phylogenetic analysis. Powassan virus sequences segregated into two major groups termed the Deer tick virus (DTV) and Powassan (POW) lineages. The lineage from *I. cookei* was POW. The remaining viruses from *I. scapularis* grouped with the DTV lineage. Powassan viruses from Bridgeport were nearly-identical and clustered with a virus strain from a human in New York. Viruses from North Branford were homogeneous and grouped with viruses from Massachusetts, northwestern Connecticut, and Ontario. These findings suggest that POWV was independently introduced into these geographical locations in Connecticut and maintained focally in their respective environments.

Impact. Current studies on the genetic relationships of arthropod-borne viruses enable scientists to track the origin, spread, and persistence of viral strains involved in disease outbreaks. This kind of research has enabled us to determine the origin and focal persistence of POW virus within two geographic locations in Connecticut. Ultimately, this research may help us develop more effective public health interventions against the virus by understanding how the virus persists in nature.

A New Microsporidial Parasite from Termites

Dr. Charles Vossbrinck and colleagues at the USDA laboratories in Gainesville, Florida described a new genus and species of microsporidia from adults of the termite *Uncitermes teevani* (formerly *Armitermes teevani*), collected in Ecuador. Morphological and genetic characterization of this new species were completed. Masses of elongate, ovoid, unnucleate spores were localized to the coelomic cavity of adult workers and measured 6.29 x 3.33 µm (fresh) and 5.83 x 3.00 µm (fixed). These spores were individually contained within a multi-layered sporophorous vesicle and contained an isofilar polar filament with 24-28 coils. Blast-n analysis revealed that the small subunit ribosomal DNA (ssrDNA) sequence of this new species exhibited 86% identity with that of a *Varimorpha* species from the fire ant, *Solenopsis richteri*, and slightly less (78-85% identity) to a large clade of microsporidian

parasites from mosquitoes and microcrustacea. The morphological and sequence data support the conclusion that *Multilamina teevani* gen et. sp. nov. is a novel microsporidium and distinct from any previously described genera or species.

Populations of parasites affecting silk moths in China

Dr. Charles Vossbrinck and colleagues in Chongqing, China have been studying *Nosema bombycis*, the most important pests of silk moths around the world and the cause of great economic losses to the silk industry. They made some very interesting findings regarding sex and the single-celled parasite. The microsporidian *Nosema bombycis* is the causative agent of pébrine, a highly infectious disease of the silkworm *Bombyx mori*. Three regions of the multicopy rDNA gene were examined in order to investigate the relationships among five Nosema isolates from various regions of China. Ribosomal DNA alleles are present on each of the 18 chromosomes of *N. bombycis* and show a high degree of variation. In this study the small subunit (SSU) rDNA, internal transcribed spacer (ITS) and intergenic spacer (IGS) regions for up to 10 different rDNA copies from each N. bombycis isolate were cloned and sequenced. As expected we see greater polymorphism in the ITS region (88 variable sites in 179 nucleotides) and IGS (200 variable sites in 279 nucleotides) than in the SSU rDNA (24 variable sites in 1232 nucleotides). Phylogenetic analysis shows greater differences between alleles within an isolate than between the same alleles from different isolates. The data reveal two very different groups, one from the Sichuan province and the other with a broad distribution including four provinces in southeast China and Japan. The Sichuan isolate does not have any rDNA alleles with sequences identical to those in the other isolates, implying that it is a separate, non-intermixing, population or perhaps a separate species from the other isolates. In light of the polymorphic nature of the rDNA alleles in N. bombycis and their presence on every chromosome, the rDNA gene may be useful for understanding the movement and ultimately the source of pebrine infections.

Invasive Aquatic Plant Program

Surveillance and Monitoring Program 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.

In 2012, **Greg Bugbee, Jordan Gibbons,** and **Mark June-Wells** mapped native and invasive aquatic vegetation in 16 new and seven previously surveyed water bodies (Figure 1). We now have complete aquatic vegetation surveys of 201 Connecticut lakes and ponds. A total of 14 water bodies have been resurveyed at least five years later to determine how invasive plants are affecting aquatic plant community's overtime. 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 Zoar, 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).

Figure 1. Jordan Gibbons assessing vegetation in lake.

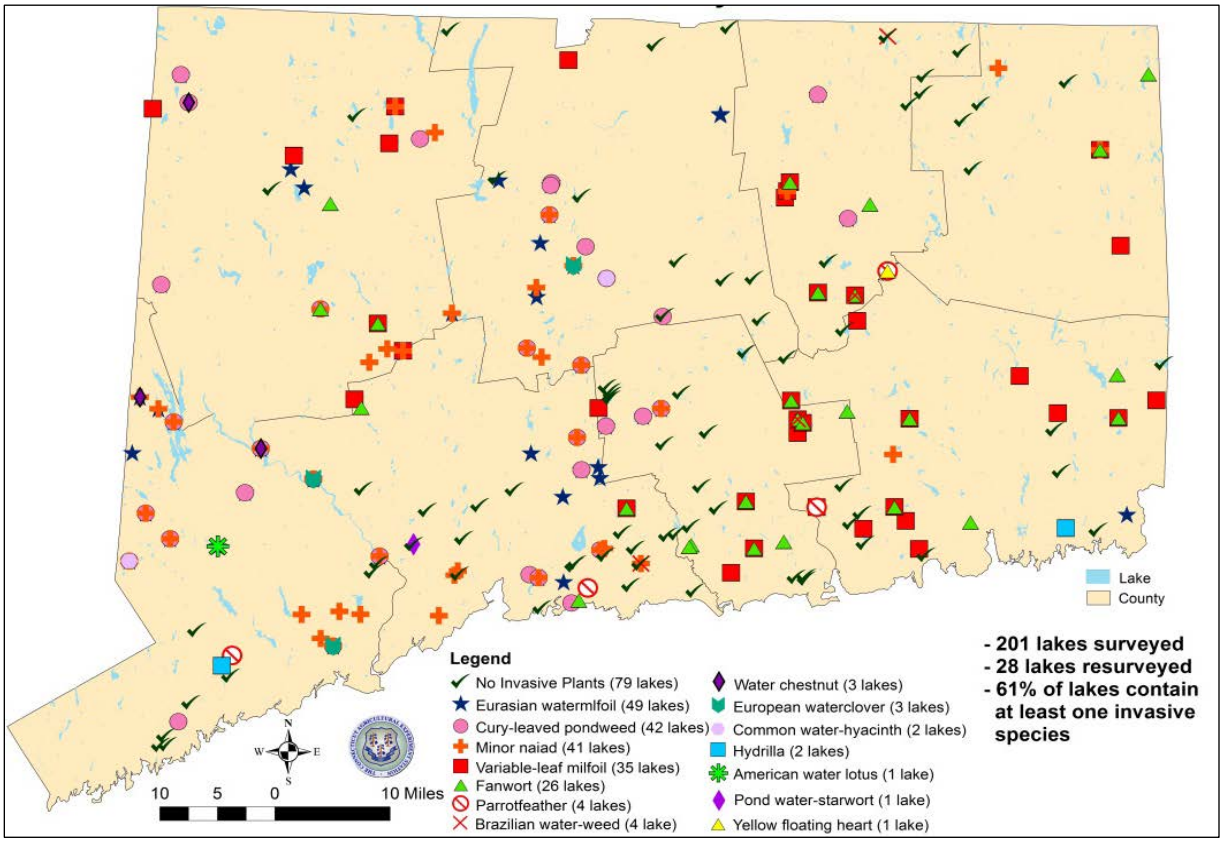


Figure 2. Locations of invasive plants in Connecticut's lakes and ponds as found in CAES IAPP surveys from 2004 - 2012.

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 2). The most common invasive plants are Eurasian watermilfoil, Variable water milfoil (*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 and 2012 found the population expanding. In 2012, we found Brazilian waterweed in Lower Moodus Reservoir (East Haddam), Staffordville Reservoir (Stafford Springs) and Mono Pond (Coventry). These infestations are probably recent as our previous surveys of these lakes did not find the plant. We are working with the local lake associations and the CTDEEP to help develop control strategies.

Impact. Our surveys provide one of the most complete aquatic plant and water chemistry databases available. Our water chemistry and invasive plant database allowed us to assess 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 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.

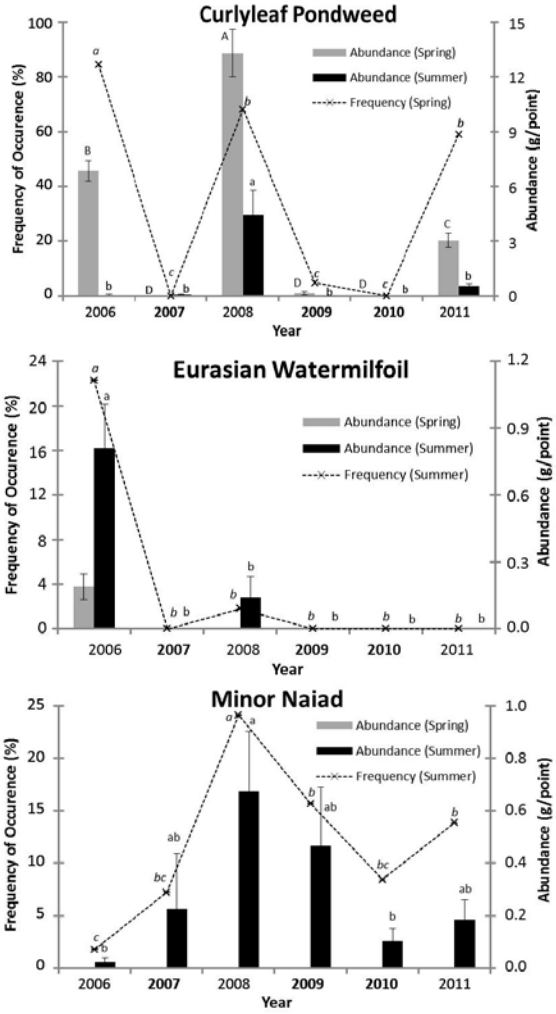


Figure 3. Effects of single and multiyear diquat applications on invasive plants in Crystal Lake.

To prevent the spread of invasive species, Connecticut has enacted laws banning the sale and transport of 20 invasive aquatic plants. CAES IAPP evaluated aquarium retailer compliance with these laws. In 2008 and 2010 we visited 75 aquarium aquatic plant dealers. We purchased plants that looked like a banned species and brought them back to the lab for positive identification. Because we could not conclusively identify many specimens, we obtained their genetic sequences and compared them to known sequences in the GENBANK NCBI database. We found that 30% of the stores are selling banned aquatic species and that fanwort is the most common banned species being sold. Moreover, Brazilian waterweed and various watermilfoil species were mislabeled by the retailer more than 50% of the time. We believe that this noncompliance to State law is primarily due to difficulties in identifying aquatic plant species and ignorance of state statutes. In 2011, CAES IAPP completed a revisited the 75 retailers and provided information on state laws, copies of the CAES IAPP Invasive Aquatic Plant Identification Guide and offered education seminars. In 2012, we returned to many of the retailers that previously sold banned species and all but one were now complying with state regulations.

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

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

Figure 4. Installation of limnobarrier in Crystal Lake.

Bashan Lake – East Haddam, CT - We are in the 12th 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.

Crystal Lake- Middletown, CT. Crystal Lake has extensive growth of curly leaf pondweed and Eurasian watermilfoil that limits recreational uses. We applied the aquatic herbicide diquat to control curlyleaf pondweed prior to turion production in 2007, 2009 and 2010. No herbicides were applied in 2006, 2008 and 2011. We performed spring and summer aquatic vegetation surveys in all years and assessed the efficacy of the single and two consecutive yearly treatments on the invasive and native plant community. The frequency of occurrence and abundance of curlyleaf pondweed was reduced to negligible levels in the treatment years. In the untreated year after one yearly treatment, the frequency of occurrence of curlyleaf pondweed was reduced slightly but the abundance increased. In the year after two consecutive yearly diquat treatments the frequency of occurrence of curlyleaf pondweed was similar to pretreatment levels but the abundance was reduced by over 50%. Invasive Eurasian watermilfoil was eliminated in 2009 and did not return possibly because of increased susceptibility to early season diquat applications or synergistic effects of the herbicide with naturally occurring biological control agents. Native species richness was reduced in the spring surveys of the treatment years but recovered by the summer surveys. Individual native species responded differently but native species richness after the two consecutive diquat treatments was greater than pretreatment.

Diquat concentrations in Crystal Lake, Middletown CT USA were monitored. Limnobarriers were installed around a small island (Figure 4) and a stretch of shoreline to protect Vasey's pondweed (*Potamogeton vaseyi* JW Robbins) which is an aquatic plant listed as "threatened" in CT and therefore in need of protection. Surface and bottom water were analyzed for diquat from treated and untreated lake sites, sites inside and outside limnobarriers, and in the lake's outlet stream until 24 days after treatment (DAT). Mean diquat concentrations in the treated surface

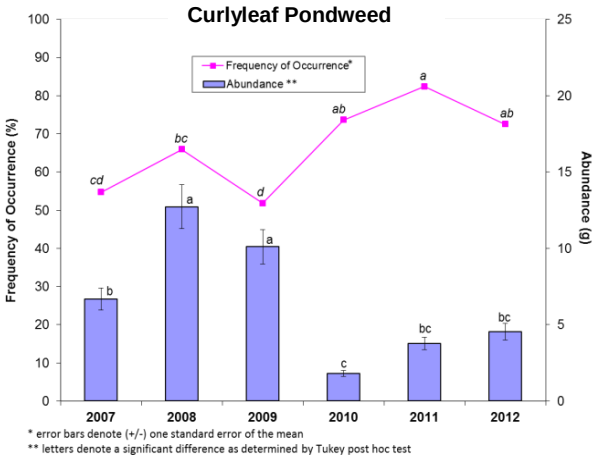


Figure 5. Introduction of grass carp into Grannis Lake (left). Effects on curlyleaf pondweed

water peaked at 327 µg/L 0.2 DAT and were no longer detectable 13 DAT. At 5 DAT the treated and untreated surface sites had similar mean diquat concentrations of 32 and 38 µg/L, respectively. Diquat concentrations in the treated surface sites gradually declined until they were no longer detectable 13 DAT. Vertical movement of diquat into the bottom water at the treated sites peaked at a concentration of only 7 µg/L at 7 DAT. Restricted vertical movement of diquat to the basal portions of curlyleaf pondweed could limit treatment efficacy. Diquat in the downstream water followed a pattern similar to the untreated surface water but the concentration peaked at only 26 µg/L at 3 DAT. Inside the limnobarriers, diquat concentrations were significantly reduced but not eliminated. Diquat concentrations peaked inside the island and shore limnobarriers 2 DAT at 75 and 39 µg/L respectively, and became nondetectable 13 DAT. Diquat movement into the limnobarriers could have been facilitated by imperfect seals where barrier sections connect. Vasey's pondweed was found within the limnobarriers the following summer, demonstrating the effectiveness of this technique for plant protection.

***Biological control* -** Our biological control program has now been in progress for five years. This year's efforts followed two lines of investigation.

Grannis Lake- East Haven, CT. We monitored more than 200 georeferenced sites in Grannis Lake to determine the effects of introducing plant eating fish called grass carp (*Ctenopharyngodon idella*). 2012 was our eighth year of study at Grannis Lake, which has problems with Eurasian water milfoil, curlyleaf pondweed and minor naiad. After many years of unsuccessful attempts to control the invasive species with herbicides we introduced 200 sterile (triploid) grass carp averaging 25 cm (10 inch) in length in October of 2007 (Figure 5, left). The abundance of curlyleaf pondweed increased in 2008 and 2009 apparently because the fish needed time to reach a size sufficient to impact the extensive coverage of aquatic vegetation (Figure 5, right). Our survey in 2010 finally showed the fish were reducing the abundance (mass per point) of the invasive species. Interestingly, the frequency of occurrence was not reduced suggesting that the fish are consuming the suspended vegetation without any appreciable reduction in basal plant parts. From 2011 to 2012 the abundance of curlyleaf pondweed and other invasive species began to rise again probably due to the aging and natural mortality of the grass carp population. Our data is being used to formulate plans to restock Grannis Lake in conformance with CT DEEP guidelines.

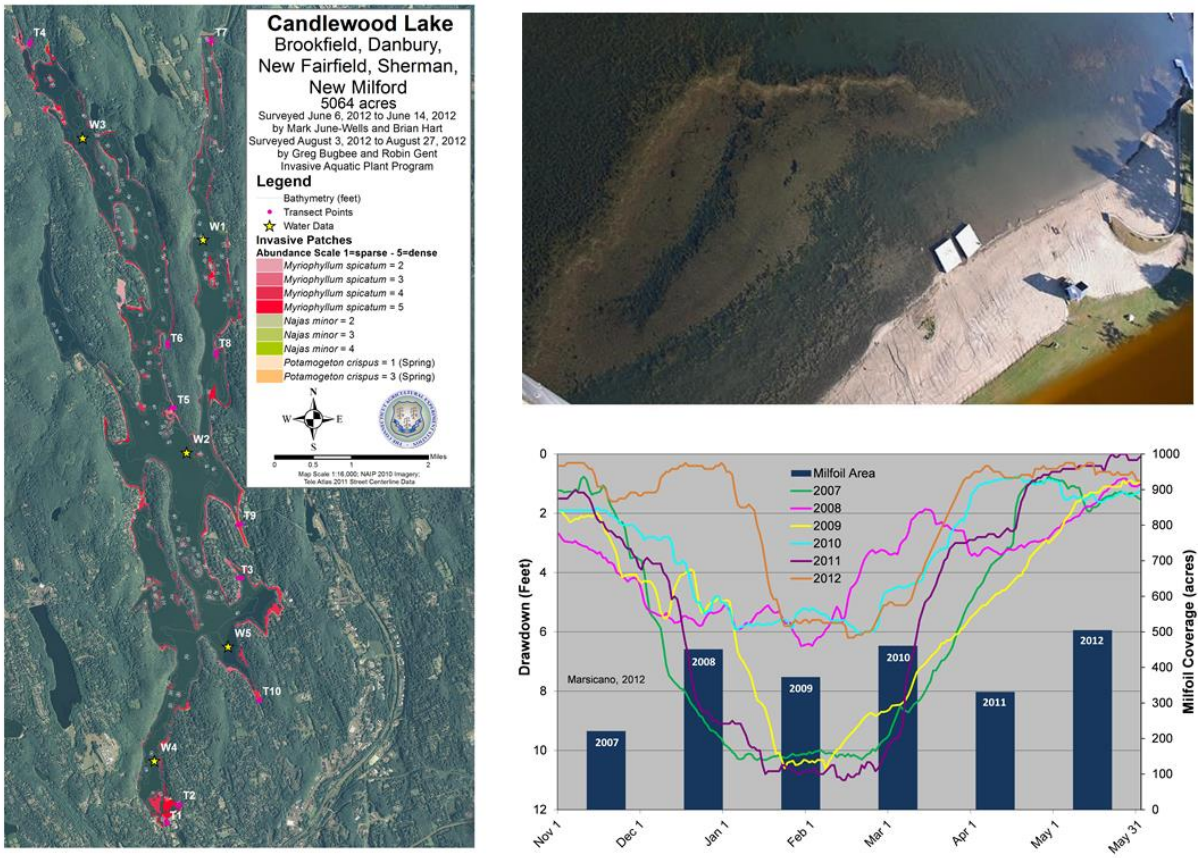


Figure 6. Coverage of Eurasian watermilfoil in Candlewood Lake in 2012 (left). Aerial view of Eurasian watermilfoil the Danbury Town beach (top right). Effects of duration and depth of winter drawdown on coverage of Eurasian watermilfoil in Candlewood Lake (bottom right).

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 position 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 6, bottom right). The coverage of Eurasian watermilfoil in Candlewood Lake was 505 acres in 2012 representing the largest coverage we have found to date. Reasons likely include a shallow drawdown of relatively short duration and a historically mild winter. Tests on sediment containing Eurasian watermilfoil root systems, obtained just prior to the start of Candlewood Lake's refill, showed most root systems were viable and regrew plants when placed in greenhouse tanks. 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.

Microscale Environmental Conditions: The Effects on Aquatic Plant Community Structure - In 2011 and 2012 Dr. Mark June-Wells evaluated the effects of small-scale environmental conditions on the distribution of aquatic macrophyte species and aquatic plant community structure in 30 Connecticut lakes. The following environmental conditions were evaluated: 1) light reaching the bottom, 2) bottom slope, 3) hydrosoil pH, 4) hydrosoil conductivity, and 5) hydrosoil organic matter. A total of 41 aquatic plant species were found during this study. To analyze these data Canonical Correspondence Analysis and Discriminant Function Analysis were used. The constrained ordination suggested that light, soil pH, and soil conductivity are important in determining the distribution of Connecticut's aquatic macrophyte species and that these five conditions could predict with 60 - 80% accuracy the aquatic macrophyte species present. This research also discovered that Eurasian watermilfoil and curlyleaf pondweed are favored by hydrosoils with higher pH and conductivity than fanwort and variable watermilfoil. Finally, the aquatic plant diversity was most strongly related to light and, possibly, disturbance because the shallower areas exhibited higher species diversity. We believe that this finding is due to the high light conditions and the high rate of disturbance related to wave action and varying water levels.

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 on the identification of invasive aquatic plants. We have assembled numerous publications that are freely available in hard or electronic copy via our website (http://www.ct.gov/caes/IAPP). Included are all our digitized interactive lake maps and our complete herbarium. 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 students groups such as the Connecticut Envirothon.

Environmental Chemistry Program

Sorption to Natural Organic Matter

Sorption Selectivity in Natural Organic Matter Studied with Nitroxyl Paramagnetic Relaxation Probes **(Dr. Joseph Pignatello** and **Dr. Charisma Lattao)**

Among the central issues in sorption research is the need for conceptual models that explain the high variability in the organic carbon-normalized partition coefficient (K_{OC}) among whole soils and their isolated humic fractions, and the selectivity and nonideality often observed during sorption manifested as nonlinearity, competition and hysteresis. A sound model must feature SOM as a heterogeneous phase that offers a hierarchy of sites with different affinities and capacities. Three major hypotheses have emerged to explain sorption selectivity: bonding-based selectivity, domain-based selectivity (existence of "microdomains" in NOM), and selectivity based on the physical state of SOM and the conformations of its molecules. Sorption site selectivity and mechanism in natural organic matter (NOM) were addressed spectroscopically by the sorption of paramagnetic nitroxyl compounds (spin probes) of different polarity, TEMPO

(2,2,6,6-tetramethylpiperidine-1-oxyl) and HTEMPO (4-hydroxy-2,2,6,6-tetramethylpiperidine-1-oxyl). The sorbents were Pahokee peat, representing younger, more aliphatic and polar NOM; Beulah-Zap lignite, representing older, more aromatic and apolar NOM; and a polystyrene-poly(vinylmethyl ether) (PS-PVME) polymer blend, representing the mixed aliphatic-aromatic, polar-apolar character of NOM. Nuclear-electron spin interaction serves as an efficient relaxation pathway, resulting in attenuation of the ^{13}C-CP/TOSS NMR signal for ^{13}C atoms in proximity to the N-O· group (r^{-6} dependency). In the natural solids the spin probes sorbed more specifically (greater nonlinearity) and had lower rotational mobility (broader EPR signals) than in PS-PVME. Titration with spin probe indicated almost no selectivity for the different carbons of PS-PVME, and little to no selectivity for the different carbons of Pahokee and Beulah, including aromatic, alkyl, O-alkyl, di-O-alkyl, and O-methyl. In any case, selectivity was always weaker than found in model solvent-water (toluene, hexadecane, anisole, octanol) and cellulose-water partition systems. The results indicate little or no preferential sorption in NOM based on functional group chemistry or putative microdomain character, but rather are consistent with the filling of pores whose walls have an average chemical environment reflecting the bulk chemical composition of the solid. This work demonstrates for the first time the use of paramagnetic probes to study sorption specificity.

Evidence of Micropore-filling for Sorption of Nonpolar Organic Contaminants by Condensed Organic Matter (**Dr. Joseph Pignatello,** Y. Ran, Y. Yang, B. S. Xing, B. S. Kwon, W. Su and L. Zhou**)**

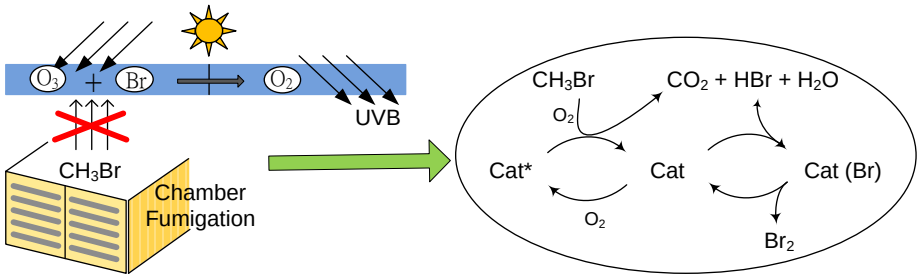
Although microporosity and surface area of natural organic matter (NOM) are crucial for mechanistic evaluation of the sorption process for nonpolar organic contaminants (NOCs), they have been underestimated by the N_2 adsorption technique. We investigated the CO_2-derived microporosity (V_o) and specific surface area (SSA), and related them to sorption behaviors of four NOCs (phenanthrene, naphthalene, 1, 3, 5- trichlorobenzene, and 1, 2- dichlorobenzene) in a wide range of condensed NOM samples. The correlation between micropore volumes (V_o) or SSA and organic carbon contents (OC %) is very significant, demonstrating that microporosity primarily originates from the NOM matrices rather than the mineral components. From the correlation analysis, the average V_o and CO_2-SSA are, respectively, 75.1 μL/g-OC and 185 m^2/g-OC. The rigid aliphatic carbon in the Pahokee peat significantly contributes to the microporosity of NOM. A linear regression is demonstrated between the micropore volume and the sorption capacity for each NOC. The micropore volume is high enough to account for most of the sorption of NOCs. We provide direct evidence that adsorption (micropore-filling), rather than linear partitioning, dominates the mechanism for NOC sorption by the condensed NOM. Our observations on the interaction mechanism of NOCs offers new clues for explaining the often-observed nonideal sorption behaviors of NOCs such as nonlinear sorption, slow sorption/desorption, reduced bioavailability, and long persistence.

Contaminant Remediation

Catalytic Oxidation for Elimination of Methyl Bromide Fumigation Emissions Using Ceria-Based Catalysts **(Dr. Chia-Ying Chen** and **Dr. Joseph Pignatello)**

Methyl bromide (CH_3Br, MB) is an effective chemosterilant in quarantine and pre-shipment (QPS) chamber fumigation applications for food, lumber and other commodities. Efficient methods to destroy or capture and reuse spent MB in QPS operations are required because of the recognized ozone depleting potential of MB. Oxidation of 34000 ppmv MB in simulated QPS

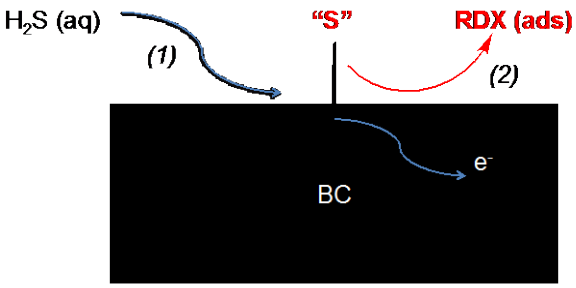
airstreams was examined over catalysts composed of Pt, Pd, Fe_2O_3, CuO, or PbO nanoparticles on oxide (Al_2O_3, SiO_2, and TiO_2) or mixed-oxide (CeO_2-Al_2O_3, CeO_2-SiO_2, and CeO_2-TiO_2) supports, and by self-assembled core-shell catalysts (Pd@SiO_2 and Pd@10%CeO_2-Al_2O_3). The most effective support by far was CeO_2. The effect of noble metal doping was modest; Pt was more active than Pd in CeO_2-Al_2O_3 based catalysts, while Pd was more active than Pt in TiO_2 based catalysts. The most effective catalyst tested was 1%Pt/30%CeO_2-Al_2O_3, with 100%CeO_2 being only slightly less effective. Using 1%Pt/30%CeO_2-Al_2O_3, MB was completely oxidized at 400°C, independent of airstream humidification, to give HBr, which was oxidized with the same catalyst to Br_2 (Deacon-type reaction) in a separate step. The selectivity for Br_2 in MB decomposition increased with temperature, maximizing at ~90% at ~350°C, and was slightly less favored in a humidified air stream. Bromide builds up on the catalyst at temperatures below 300°C, but burns off at higher temperatures. It should be relatively easy to trap HBr nd Br_2 from the gases exiting the reactor. Catalytic oxidation by ceria-based catalysts appears to be a promising approach for eliminating MB emissions from QPS fumigation operations.



Proposed pathway of catalytic oxidation of of MB over synthesized CeO_2-based combustion catalysts. "Cat" represents an activated form of the catalyst with respect to MB.

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 **(Dr. Joseph Pignatello**, W. Xu, and W.A. Mitch**)**

Explosive compounds are troublesome contaminants of soils and sediments in the defense industry. Recent research has demonstrated that black carbon (chars, activated carbon, graphite) can catalyze the transformation of a range of nitrated explosive compounds sorbed to the carbon surfaces in the presence of sulfide ions. Although surface-oxygenated functional groups, particularly quinones, and electrical conductivity have both been hypothesized to promote 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, RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) in the presence of H_2S/HS^- correlated with electrical conductivity. Oxygenated functional groups were apparently not involved, as demonstrated by the elimination of reactivity of an activated

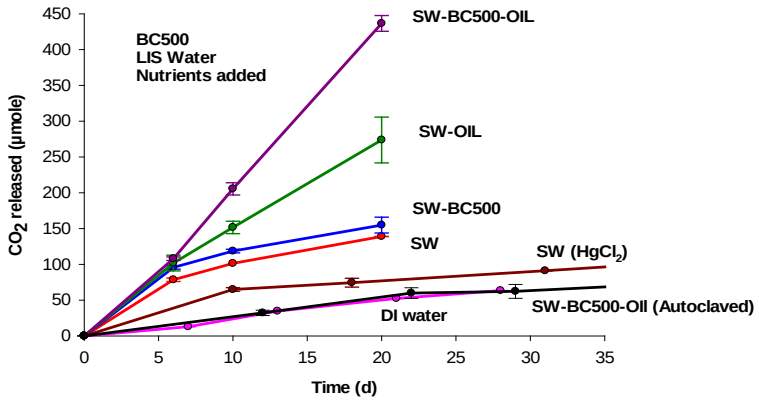


(1) Formation of surface sulfur species.
(2) Nucleophilic attack on RDX.

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.

Laboratory Tests of Biochars as Adsorbents for Use in Recovery or Containment of Marine Crude Oil Spills **(Dr. Joseph Pignatello** and H.N. Nguyen**)**

The 2010 Deepwater Horizon oil spill in the Gulf of Mexico prompted renewed interest in developing effective ways to rapidly respond to marine oil spills. Among the alternatives, absorbents have seen limited use in the containment and recovery of oil spills. The most common commercial or experimental absorbents require expensive starting materials or involve complex synthetic procedures. Also, to be economical or to avoid an objectionable presence in the environment, they typically have to be recovered and reused. We report on a novel carbonaceous absorbents that should be inexpensive to produce and deploy and can be used to aid natural attenuation or to recover the oil in a form suitable as a fuel. The absorbents are produced from pyrolysis of biomass wastes under low oxygen and moderate temperature. This yields carbonaceous materials known as "biochar" that have high porosity and hydrophobic surface area. Biochar has attracted interest for its positive effects on soil fertility and its value as a carbon sink. The use of biochar in efforts to mitigate or stabilize oil spills could advance the latter purpose. When used in oil spill remediation biochar itself is not expected to pose a significant environmental threat, as chars from biomass fires are natural components of the soil and sedimentary carbon pools. The absorption capacity of biochar for crude oil and the mineralization potential of the absorbed oil in seawater were determined in laboratory-scale experiments. Texas, South Louisiana, or Qua-Iboe Nigeria crude oils were contacted with each of four commercial hardwood biochars and six synthesized biochars in seawater from the Gulf of Mexico and Long Island Sound (U.S.). The synthesized biochars were made from maplewood anoxically at different heat treatment temperatures (HTT) from 300 to 700 ^{o}C. The oil absorption capacity of the biochars determined in dip tests using oil on seawater ranged from 3.6 to 6.3 g/g. The oil-imbibed biochar particles are buoyant. Seawater enhanced absorption capacity in relation to the H/C ratio. Oil was less effectively absorbed in the form of weathered water-in-oil microemulsion ('mousse') than in as-received form. Absorption capacity peaked at HTT about 400 ^{o}C and correlated poorly with % C, H/C ratio, O/C ratio, surface area, and porosity. It is proposed that swelling, in addition to macropore filling is responsible for the high capacities of biochar. In biometer tests, CO_2 evolution from sub-capacity levels of Texas crude in biochar suspended in seawater was stimulated relative to oil in the absence of biochar in three tests; stimulation in one test, however, was not statistically significant. Thus, biochar may prime biodegradation by providing a favorable solid support and an interstitial reservoir of hydrocarbons for degrader biofilms. While less absorptive than many experimental high-tech absorbents, biochar may serve as an inexpensive alternative for recovery of marine oil spills in a form suitable as a fuel or as an aid to natural attenuation.



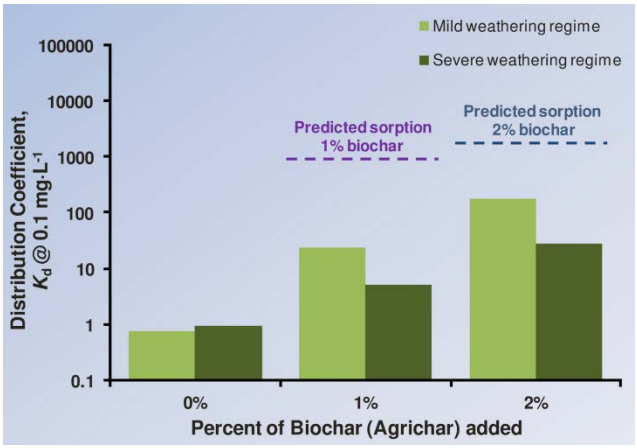
Mineralization curves for seawater (SW) combined with a biochar made from maple wood at 500 oC (BC500) and/or South Louisiana crude oil (OIL) in Long Island Sound water with mineral salts nutrients added. Oil-to-biochar ratio, 1.5. The lower three curves represent autoclaved, mercury-killed or deionized water controls. Error bars represent the range between duplicate measurements. The results of this experiment show that the biochar stimulates bacterial degradation of crude oil.

Adsorption of Organic Contaminants to Black Carbon and Related Materials

Predicting Contaminant Adsorption in Black Carbon (Biochar)-Amended Soil for the Veterinary Antibiotic Sulfamethazine **(Dr. Joseph Pignatello**, M. Teixido, C., Hurtado, J.L. Beltran, M. Granados and J. Peccia**)**

Biochar has attracted interest as a tool for remediating contaminated soil. Due to its strong adsorptive properties, the addition of biochar is proposed to reduce the mobility and bioavailability of chemical contaminants by enhanced adsorption. However, some evidence suggests that soil organic matter may eventually "foul" the surface of biochar by covering sorption sites or clogging pores. Sulfamethazine (SMT) is a heavily-used swine antibiotic of concern in manure-applied soil for its ability to contribute to the proliferation of antimicrobial-resistant pathogens, potentially impacting humans. Commercial hardwood biochars ranging in N_2 specific surface area of 0.1 – 427 m^2/g were added to an agricultural soil at 0, 1, or 2% levels to determine whether they would predictably reduce the pore water concentration of SMT. The soil and biochar-soil mixtures were pre-weathered under mild (2 d, 20 ^oC) or more severe (28 d, 40 ^oC) conditions before spiking. The carbon-normalized biochar-water distribution coefficient (K_{BC}) of the biochars varied by a factor of up to 10^4, depending on biochar properties and SMT concentration. Except for the fast-pyrolysis biochar, K_{BC} greatly exceeded the soil organic carbon-water distribution coefficient K_{OC}. Sorption in the mixtures increased as expected with biochar and dose. However, sorption was dramatically over-predicted (by up to $10^{2.5}$) by the sum of sorption to the individual components, indicating a strong weathering effect even under the mild conditions. The soil-subtracted weathered biochar-water isotherms were more linear, and the K_{BC} values approached or lay within the range of K_{OC} values reported for SMT in 19 soils. Biochars both in intimate contact with soil and placed in a membrane bag suspended in the solution showed reduced N_2-B.E.T. surface area after weathering, implicating fouling of the biochar surface by humic substances transferred through water. The results indicate that only highly surfaceous, carbonaceous biochars would be useful for stabilizing soil contaminated with

compounds such as SMT. They also suggest that weathering may attenuate the contribution of native (environmental) black carbon to sorption of such compounds in soils and sediments.

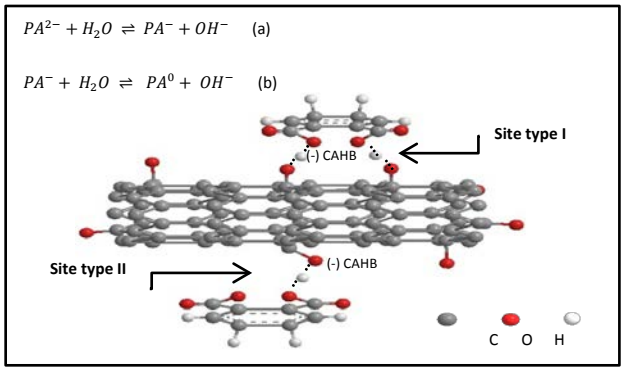


Predicted vs observed biochar-water distribution coefficient (ratio of sorbed concentration to aqueous solution concentration) after either mild or severe weathering of biochar in soil flooded with water compared to the predicted value (no weathering).

New Insight into the Mechanism of Adsorption of Ionizable Compounds on Carbon Nanotubes (**Dr. Joseph Pignatello**, X. Y. Li, Y. Q. Wang and B. S. Xing)

Many pesticides, antibiotics, endocrine disrupting chemicals and other chemical contaminants are ionizable in the environmentally relevant pH range of ~3 to ~9. It is essential to fully understand the forces that drive adsorption of ionizable organic compounds (IOCs) from water to carbonaceous substances including carbon nanotubes (CNTs), activated carbon (AC) and natural and synthetic charcoals. These forces are important in the context of environmental fate of IOCs; the use of carbonaceous materials as adsorbents in sensing and remediation of IOCs; the synthesis and use of surface-altered CNTs in materials and technological applications; and the interactions of carbonaceous materials discharged into the environment with natural organic matter, which has abundant ionizable functional groups. We studied the pH-dependent adsorption of benzoic acid (BA), phthalic acid (PA) and 2,6-dichloro-4-nitrophenol (DCNP) by hydroxylated, carboxylated, and graphitized carbon nanotubes (CNTs). Adsorption is contributed by formation of a charge-assisted H-bond (-) CAHB between a carboxyl group on the solute and a phenolate or carboxylate group on the surface having a comparable pK_a. This exceptionally strong H-bond is depicted as $(RCO_2 \cdot H \cdot O\text{-}CNTs)^-$. Over a limited pH range the free anion undergoes proton exchange with water concurrent with adsorption, releasing hydroxide ion in a stoichiometry of up to 1.0 for BA, 1.7 for PA, and 0.5 for DCNP. Little hydroxide is released upon adsorption by the O-sparse graphitized CNTs. Anion exchange and ligand exchange reactions as a source of hydroxide release were ruled out. The higher stoichiometry for PA indicates involvement of both carboxyl groups with adjacent surface oxyl groups. The lower stoichiometry for DCNP is consistent with steric inhibition of H-bonding by the ortho chlorines. Formation of (-)CAHB helps overcome the unfavorable free energy of proton exchange with water, and results in an upward shift in the pK_a in the adsorbed state compared to the dissolved state from 0.9 to 3.1 units. The proposed mechanism is further supported by additional structure-

activity considerations. The findings provide new understanding of the interactions between ionizable organic compounds and carbonaceous surfaces, which has implications for non-covalent derivatization of CNTs, fate of ionizable pollutants, and associations of natural organic matter with CNTs and other carbonaceous materials in the environment.



Schematic diagram for adsorption of *ortho*-phthalic acid on carbon nanotubes.

Photochemical Reactions of Natural Organic Matter and Pollutants in Natural Waters

Impact of Halide ions on Natural Organic Matter-Sensitized Photolysis of 17β-Estradiol and on Singlet Oxygen Concentration in Saline Waters (**Dr. Joseph Pignatello,** J.E. Grebel and W.A. Mitch)

Estuaries are critical ecosystems, serving as nutrient-rich nurseries for a host of marine life. With increased development estuaries are particularly susceptible to the impact of organic contaminants because they receive the cumulative inputs from upstream communities along with direct local inputs from industry, oil spills, aquaculture, etc. Indirect photolysis of chemical contaminants is an important natural attenuation mechanism protecting these ecosystems, because it leads to destruction of chemicals that do not absorb light, and would otherwise be resistant to photochemical destruction. Indirect (sensitized) photolysis by natural organic matter (NOM), mainly from terrestrial sources, can be an important mechanism for attenuation of organic contaminants in estuarine waters, but the effect of salt gradients has been poorly investigated. We studied Suwannee River NOM-sensitized photolysis of the hormone 17 □ estradiol (E2) in freshwater and saline media. Indirect photolysis by 4 mg-C/L SRNOM was much faster than direct photolysis, and quenching by sorbic acid verified the importance of triplet-excited state of the light-absorbing chromophores in the structure of NOM. Increasing halide concentrations up to seawater levels decreased the photolysis rate by 90%, with approximately 70% of this decrease associated with ionic strength effects, and the remainder with halide-specific effects. Bromide (0.8 mM in seawater) accounted for 70% of the halide-specific effect. Halide promotion of NOM chromophore photobleaching was shown to play a major role in the halide-specific effect. Compared to chromophore bleaching, indirect photolysis of E2 was 230% faster in freshwater, but 63% slower in seawater. The involvement of hydroxyl radical ($HO^{\bullet}$) in indirect photolysis of E2 was ruled out by the lack of suppression by *tert*-butanol. Experiments in D_2O-H_2O demonstrated that $^1O_2$ was unimportant in freshwater, but accounted for 42% of NOM-sensitized photolysis of E2 in seawater. We project that, as a parcel

of water containing E2 moves through the gradient from freshwater to seawater, overall photolysis will decline due to ionic strength, indirect photolysis will decrease due to specific halide effects on NOM photobleaching, and indirect photolysis will decline relative to direct photolysis. Estuarine contaminant fate models may need to account for halide impacts on indirect photolysis of contaminants.

Characterization of Natural and Synthetic Carbonaceous Adsorbents and Fuels

Characterization of Wood Chars Produced at Different Temperatures using Advanced ^{13}C Solid-state NMR Spectroscopic Techniques (**Dr. Joseph Pignatello, Dr. Charisma Lattao,** X. Cao, Y. Li, M.A. Chappell, N. Chen, L.F. Miller and J.D. Mao)

Char is the carbonaceous material that remains after pyrolysis or incomplete burning of organic matter. As part of the black carbon continuum, chars are a ubiquitous component of soils and sediments and their concentrations depend on the frequency of fires or the magnitude of intentional inputs of produced char. Wood chars have been manufactured for millennia. In addition to their traditional use as fuel, they have currently attracted attention as a means to improve soil fertility,1-3 stabilize contaminated soil,4-5 and offset greenhouse gas emissions,6 among other applications. The physical and chemical properties of chars closely depend on feedstock types and processing variables such as temperature, duration of heating, oxygen availability, moisture content, and how efficiently tarry volatiles are swept away. Temperature is the most important controlling factor determining the chemical structure of char. We employed advanced solid-state 13C NMR techniques to characterize maple wood and its chars produced under N2 at temperatures from 300 to 700 °C. Our results indicated that 300 °C char was primarily composed of residues of biopolymers such as lignin and cellulose. Carbohydrates are completely lost for char prepared at 350 °C. At 400 ºC, the char lost most of the ligno-cellulosic features and consisted predominantly of aromatic structures. By 500 ºC, sp3-hybridized carbon had all but disappeared. Protonated aromatic carbons and aromatic C-O groups decreased, whereas nonprotonated aromatic carbons, especially bridgehead carbons, increased as temperature increased. The minimum aromatic cluster sizes estimated from spectral analysis increased from 8 carbons in 300 ºC char, to 20, 18, 40, 64, and 76 carbons, respectively, in 350 ºC, 400 ºC, 500 ºC, 600 ºC, and 700 ºC chars. 1H-13C long-range dipolar dephasing displayed the same increasing trend of aromatic cluster sizes of wood chars with increasing temperature. We show for the first time quantitative changes of different aromatic C forms and aromatic cluster size as a function of heat treatment temperature.

Characterization of Oil Shale, Isolated Kerogen, and Post-Pyrolysis Residues Using Advanced ^{13}C Solid-State Nuclear Magnetic Resonance Spectroscopy (**Dr. Joseph Pignatello,** X.Y. Cao, J.E. Birdwell, M. Chappell, Y. Li and J.D. Mao)

Characterization of oil shale kerogen and organic residues remaining in post-pyrolysis spent shale is critical to understanding the oil generation process and approaches to dealing with issues related to spent shale. The chemical structure of organic matter in raw oil shale and spent shale samples was examined in this study using advanced solid-state ^{13}C nuclear magnetic resonance (NMR) spectroscopy. Oil shale was collected from Mahogany zone outcrops in the Piceance Basin. Five samples were analyzed: (1) raw oil shale; (2) isolated kerogen; (3) oil shale extracted with chloroform; (4) oil shale retorted in an open system at 500 °C to mimic surface retorting; and (5) oil shale retorted in a closed system at 360 °C to simulate in situ retorting. NMR methods applied included quantitative direct polarization with magic angle spinning at 13

kHz, cross polarization with total sideband suppression, dipolar dephasing, CH_n selection, ^{13}C chemical shift anisotropy filtering, and ^{1}H-^{13}C long-range recoupled dipolar dephasing. The NMR results showed that, relative to the raw oil shale, (1) bitumen-extraction and kerogen isolation by demineralization removed some oxygen-containing and alkyl moieties; (2) unpyrolyzed samples had low aromatic condensation; (3) oil shale pyrolysis removed aliphatic moieties leaving behind residues enriched in aromatic carbon; and (4) oil shale retorted in an open system at 500 °C contained larger aromatic clusters and more protonated aromatic moieties than oil shale retorted in a closed system at 360 °C, which contained more total aromatic carbon with a wide range of cluster sizes.

Development of Fig Cultivars for Growth and Production in Connecticut

Fig trees (*Ficus carica*) are a subtropical deciduous plant. They can withstand freezing temperatures but cannot tolerate temperatures below approximately 20 degrees Farenheit (-7 Centigrade). As a result figs cannot be produced in Connecticut without some degree of protection in the winter. **Dr. Charles Vossbrinck** is growing figs in self-watering planters and storing them, pot-to-pot, in a barn in the winter. He brings them outside in the summer with one set in the field and one set in a high tunnel (hoop house). He is testing 6 varieties of figs (Neri, Osborne, Melanzana, Bataglia, Conadria and Verte) and finding some varieties more resistant to the fig mosaic virus than others and some varieties seem to be more productive than others. Future studies are planned to examine the details of fruit production, sugar content and fruit quality.

Soil Testing

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, **Greg Bugbee** tested 5097 samples and answered 1,628 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.

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, grapes, and the effect of the growing deer population on natural and managed landscapes.

NEW CROPS PROGRAM

Investigation of new crops is essential to provide new 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 a 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 fruit, 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 generally sold at these markets. According to the Connecticut Department of Agriculture, there were 125 farmers' markets in 2011, attended by over 400 farmers compared to 87 markets in 2007, a 52% 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 Eggplant Trials: Eggplants are a botanically diverse group that can be divided into two groups based on fruit shape and color. The first group, and more traditional type, is the teardrop-shaped, large-fruited eggplant. Fruit of these eggplants are typically oval or long, and tapered in shape with a black, purplish-black, or purple skin color, often with a green calyx. The second group is collectively referred to as the "specialty" eggplants, some of which are referred to as "Asian" eggplants. Asian eggplants generally have a purple calyx. Fruit shapes of specialty eggplants vary, but are often long and smooth, ball- or bell-shaped. In 2012, **Dr. Maynard** evaluated 10 varieties of specialty eggplants on yield and quality at Windsor and Lockwood Farm.

Impact: Calliope (32 lbs/plant), Hansel (22 lbs/plant), and Fairy Tale (21 lbs/plant) had the greatest yields. At a retail price of $1.49/lb, there is a potential crop value of $173,078/acre. The cost of producing ethnic eggplant varieties at the UMass Research Farm was estimated to be $6,000/acre. Based on this information, the total net receipts for Calliope grown at the UMass Research Farm would have exceeded $167,000/acre. Forty-six percent of Connecticut vegetable farmers responding to our survey are now growing some of these specialty eggplant cultivars. The long-term benefits of growing specialty eggplant include an additional product and revenue for growers who attend farmers markets or have their own roadside stands.

Specialty Pepper Trials: Specialty peppers include both hot and sweet varieties of unusual shape, size, or color. Colored peppers have extra flavor, nutrition, and aesthetic appeal, and therefore command a higher market price. 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 2012, **Dr. Maynard** evaluated 10 varieties of specialty peppers on yield and quality at Windsor and Lockwood Farm.

Impact: Early Sunsation (yellow) had the greatest yields (7.2 lbs/plant) followed by King Authur Hybrid (red) (4.6 lbs/plant) and Chablis (red) (3.9 lbs/plant). At a retail price of $2.49/lb, there is a potential crop value of $97,618/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. Sixty-eight percent of Connecticut vegetable farmers responding to our survey are now growing specialty peppers.

Specialty Melons Trials: Specialty melons may be defined as members of the curcurbit family whose fruit may be large, have unique flavors, and command a high price in the marketplace. In commercial trade, specialty melons are often referred to as "mixed melons" and include canary, Crenshaw, casaba, Christmas, and Persian melons. In 2012, **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 compared to cantaloupe.

Impact: Honey Brew (honeydew) (13.4 lbs/plant), Arava (galia) (9.7 lbs/plant), Tweety (canary) (13.2 lbs/plant), Early Hybrid (Crenshaw) (13.9 lbs/plant), and Savor (charentais) (4.6 lbs/plant) had the greatest yields. Cultivar selection can dramatically increase yields and profits for the grower. For honeydew melons, by growing the cultivar Honey Brew instead of Moon Dew, the grower can produce 14,520 more pounds per acre or 5,808 more melons per acre. At a retail price of $2.50/melon, the grower could potentially gross over $14,500 more per acre by growing Honey Brew instead of Moon Dew. 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. Over half of all vegetable growers in Connecticut grow melons.

Broccoli Trials: Broccoli is one of the most popular vegetables all over the world and has long been regarded as one of the super foods 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: Gypsy (2.0 lbs/head), Imperial (1.6 lbs/head), and Coronado (1.6 lbs/head) had the greatest yields. However, Coronado's quality was poor compared to Gypsy and Imperial. At a retail price of $1.99/lb, there is a potential crop value of $38,527/acre. Cultivar selection can dramatically increase yields and profits for the grower. By growing Gypsy instead of Blue Wind, the grower can produce over 11,400 more pounds per acre or gross about $23,000 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.

Edamame Trials: Edamame are specialty varieties of soybeans that are harvested in the green stage. The word “edamame” means “beans on branches” and it grows in clusters on bushy branches. Edamame is consumed as a snack, a vegetable dish, used in soups or processed into sweets. As a snack, the pods are lightly boiled in salted water, and then the seeds are squeezed directly from the pods into the mouth with the fingers. Outside East Asia, edamame is most often found in Japanese restaurants and some Chinese restaurants, but it has also found popularity elsewhere as a healthy food item. In 2012, **Dr. Maynard** evaluated ten cultivars of edamame for yield and quality at Windsor and Lockwood Farm.

Impact: The cultivar Mojo Green had the greatest yield (1.5 lbs pods/plant) with Sunrise averaging 1.3 lbs pods/plant. At a retail price of $2.49/lb, there is potential crop value of over $54,000/acre. Cultivar selection can dramatically increase yields and profits for the grower. By growing the cultivar Mojo Green instead of the cultivar Envy, the grower can potentially produce almost 19,000 more pounds per acre or gross almost $47,000 more per acre. The long-term benefits include additional revenue for farmers, especially those who attend farmers markets in urban areas and providing a product that has growing consumer demand. Five percent of the Connecticut vegetable farmers responding to our survey are now growing edamame.

Sweet Potato Trials: A 1998 Connecticut Department of Agriculture survey showed that sweet potato is one of the most popular specialty vegetables. In the South, the sweet potato is also called yam, but both are identical species. In the United States, North Carolina and Louisiana are the leading producers but we have found that they can easily be grown in Connecticut. This crop has both a high market value and an expanding market**.** In addition, it is very nutritious, with high values of beta carotene (vitamin A) and vitamin C. In 2012, **Dr. Maynard** evaluated four cultivars that have short maturities (90 days) at Windsor and Lockwood Farm.

Impact: O’Henry (3.9 lbs/plant) and Beauregard (3.2 lbs/plant) averaged the greatest yields. At a retail price of $0.79/lb, there is a potential crop value of $45,044/acre. Beauregard is the most popular cultivar grown in Connecticut with forty-one percent of the surveyed vegetable growers including sweet potatoes at their farms. The long-term benefits of growing sweet potatoes include additional revenue for farmers and providing a product that has growing consumer demand. In addition, there may be health benefits for those who consume sweet potatoes.

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** conducted a 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 1994-2010 and incorporated into the soil by rototilling. In 2012, eggplant was grown with all plots receiving the same amount (1300 lb/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 oak leaves (10.4 lbs/plant) followed by plots amended with maple leaves (9.9 lbs/plant) and the unamended control plots (9.5 lbs/plant).

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. We tested 8 different repellent formulations (Bobbex Deer Repellent® Canadian formulation concentrate, Bobbex Deer Repellent® Canadian ready-to-use (RTU), Bobbex-R Animal Repellent® concentrate, Bonide Repels All® concentrate, Bonide Deer & Rabbit Repellent® concentrate, Liquid Fence® Deer & Rabbit Repellent concentrate, Plantskydd® soluble powder, and Rabbit Stopper® RTU) on Johnny jump-ups (*Viola tricolor*), lettuce (*Lactuca sativa*), and alfalfa (*Medicago sativa*). Three wild eastern cottontails were trapped and relocated to a 24’ x 48’ enclosure, resulting in a density of 113 cottontails/acre. We conducted two 2-week trials on each plant genera using four repellents in each trial. There were six raised beds (four treated, two control) with four flats of plant material within each inside the enclosure and one fenced raised bed outside the enclosure. An equal amount of seed was germinated in flats which were watered equally and randomly assigned treatments. After two weeks exposure to cottontails, remaining plant material was removed, dried, and weighed. Difference between dried plant mass of treated and untreated vegetation was determined. Daily caloric demand for cottontails was calculated and summed for each two-week trial. Repellent

effectiveness was defined as the sum of the product of caloric demand rank and rank of dry mass difference for each repellent. Physical exclusion performed the best, followed by Plantskydd and Bobbex-R.

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 to the recreational gardening public. Formulations to limit rabbit damage are often marketed as limiting deer damage as well and their usage could limit Connecticut nursery loses by $1.1-$1.5 million and could improve sales by $750,000 annually.

Limitations of Hunting as a White-Tailed Deer Management Technique in Suburban Settings: Hunting has been the primary white-tailed deer (*Odocoileus virginianus*) management tool for decades. Regulated hunting has been effective at meeting management objectives in rural areas, but typical logistical constraints placed on hunting in residential and urban areas can cause deer to become overabundant and incompatible with other societal interests. Deer–vehicle collisions, tick-associated diseases, and damage to residential landscape plantings are the primary reasons for implementing lethal management programs, often with objectives of <25 deer/mile^2. There are limited data demonstrating that hunting alone in suburban landscapes can reduce densities sufficiently to result in adequate conflict resolutions or a corresponding density objective for deer. We present data from 3 controlled hunting programs in New Jersey and one in Pennsylvania, USA. Annual or periodic population estimates were conducted using aerial counts and road-based distance sampling to assess trends. Initial populations, some of which were previously subjected to regulated unorganized hunting, ranged from approximately 75–210 deer/mile^2. From 3 years to 10 years of traditional hunting, along with organized hunting and liberalized regulations, resulted in an estimated 44–47 deer/mile^2 at each location. These projects clearly demonstrate that a reduction in local deer densities using regulated hunting can be achieved. However, the sole use of existing regulated hunting techniques in suburban areas appears insufficient to maintain deer densities <44 deer/mile^2 where deer are not limited by severe winter weather. Additional measures, such as sharpshooting or other strategic adjustments to regulations and policies, may be needed if long-term deer-management objectives are much below this level.

Impact: Overabundant herds of white-tailed deer in close proximity to humans results in numerous deleterious impacts to human health, specifically increase vehicle collisions and risk of tick-borne diseases as well as ecological damage. Municipalities often use these facts to justify deer management activities, but are incapable of achieving densities low enough to reduce damage to ecosystems or reduce tick abundance using hunters alone. If additional reduction

measures are not taken, Connecticut residents will continue to have some of the highest tick-borne disease transmission rates, will continue to sustain injuries and fatalities from vehicle collisions, and will continue to degrade their ecosystem.

INVASIVE PLANT CONTROL

Two major threats to natural preserves and managed forests are exotic plant species and browsing by overabundant white-tailed deer (*Odocoileus virginianus*). Therefore, scientists in the Department of Forestry and Horticulture are examining both effects of these two threats, and possible strategies to minimize their impacts and thereby enhance forest ecosystem services.

Interaction of Deer Browse Impacts and Barberry Infestations: 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. Beginning in 2007, **Drs. Ward and Williams** began to study the effectiveness, costs, and impacts of Japanese barberry (*Berberis thunbergii*) control treatments and herbivory (*Odocoileus virginianus*) on nonnative and native plant communities at eight study areas over 4 to 5 year period. Prescribed burning and mechanical mowing by wood shredder or brush saw were utilized as initial treatments to reduce the aboveground portion of established barberry and were equally effective.

Without a follow-up treatment, barberry had recovered to 56 to 81% of pretreatment levels 50 to 62 months after initial treatment. Follow-up treatments in mid-summer to kill new sprouts included directed heating and foliar herbicide applications. Relative to untreated controls, follow-up treatments lowered barberry cover 50 to 62 months after initial treatment by at least 72%. Although all follow-up treatments were equally effective, the labor cost of directed heating was four times higher than for herbicide applications. Follow-up treatment type (directed heating vs. herbicide) had minimal impact on species other than barberry.

White-tailed deer herbivory had a larger impact on other species than did barberry control treatments. Native grass and fern cover was higher outside of exclosures. Areas inside exclosures had higher cover of Oriental bittersweet and multiflora rose, but not Japanese barberry. Thus, recovery of native communities will require more than simply removing the dominant invasive species where deer densities are high. Excellent reduction of Japanese barberry cover can be achieved using either directed heating or herbicides as follow-up treatments in a two-step process, but other invasive plants may become a problem when barberry is removed if deer populations are low.

Impact: Both the invasive shrub Japanese barberry and native white-tailed deer are can have detrimental impacts on Connecticut's native forested ecosystems. During 2012-2013, 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, **Drs. Williams** and **Ward** have 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 1,801 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 (6.0 larvae/mouse). Adult tick densities in dense barberry (237/acre) were higher than in both controlled barberry (129/acre) and no barberry (72/acre) areas. Ticks sampled from full barberry infestations and controlled barberry areas had similar infection prevalence with *B. burgdorferi*, 52 and 53% 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 138 *B. burgdorferi*-infected ticks/acre in dense barberry, 71/acre where barberry was controlled, and 36/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. Applied 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.

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 can 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 add to our enjoyment during throughout the year.

Rehabilitating Poorly Stocked Forests: Poorly stocked stands have too few trees to fully utilize available growing space; resulting in low productivity, including carbon sequestration, compared with fully stocked stands. In addition, poorly stocked oak forests generally have trees of less desired species with lower quality stems and irregular stand structures that are logistically difficult to manage. Poorly stocked stands are a common problem across a broad geographical extent - occupying more than 200,000 acres in Connecticut and 660,000 acres in southern New England. Across a wider region encompassing New England, New York, New Jersey, and Pennsylvania, 3.0 of 18.9 million acres of oak forests are poorly stocked. There are an additional 7.5 million acres of moderately stocked oak forests in the region that are one harvest away from becoming poorly stocked. Oak forests that are not fully stocked are especially at risk of exploitive and unsustainable timber harvesting that can create poorly stocked forests.

In 2012, **Drs. Jeffrey Ward and Scott Williams** began a to evaluate the costs and effectiveness of two systems for rehabilitating poorly stocked stands that could be implemented on family forests (small, privately owned forests), whose owners could accomplish much of the treatments. The first system will be a low intensity, minimal or no cost approach that promotes the desired size class by harvesting firewood and, in some cases, removing cull trees and releasing a limited number of saplings. The second system will be a high-intensity approach with the expense of remediation secondary to the emphasis of maximizing development of the desired size class. Results of this study could be used by many of the 1.3 million owners of 10-50 acre forest parcels in the Northeast and Midwest. Depending on market conditions and management objectives, one of these systems could also be utilized by owners with larger holdings such as state agencies, water companies, or private corporations (e.g., forest industry, timber investment management organizations).

Prescription goals are defined as one of four possible desired conditions after treatment: poletimber, sapling, regeneration, or two-aged stands. TARGET trees are defined as pole or sapling stems selected for release from competition using quality tree criteria. This project will conduct four simultaneous, parallel experiments - one for each prescription goal. Rather than repeat design elements common to all experiments, the project will be described as a single experiment. Plot treatment times –

Five study sites have been established in poorly-stocked forests that had had a significant oak component prior to previous harvests in cooperation with the Town of Guilford, Winchester Land Trust, Rebekah's Hill Flora and Fauna Preservation Society, Weantinoge Heritage Land Trust, and the White Memorial Foundation. Each study site has nine to eighteen 0.04 ha plots for each prescription goal and a total of 91 plots have been established. Data has been collected for all trees with diameters greater than 12.5 cm and subplots have been sampled for smaller stems. Treatments have been randomly assigned and completed, including planting northern red oak, white oak, and eastern white pine on four study areas.

IMPACT: Family forest owners will be provided with management tools to bring their forests up to their full productive capacity. This project emphasizes treatment options that could be implemented by non-professionals with minimal training to increase the likelihood of widespread adaption by landowners without a professional forestry background. A very modest gain of 5% productivity across the three million acres of poorly stocked oak forests would be equivalent to adding 150,000 acres of productive forest and would have the additional benefit of increasing value added by concentrating growth of trees of higher quality species with superior stems.

Oak Stump Sprout Study: When cut down, many tree species develop new sprouts from latent buds below the stump**.** In Connecticut, the interaction of tree age, stump size, and species on the proportion of stumps that produce sprouts is unknown. In addition, the relative damage caused to new sprouts by rabbit and deer browse has been little studied. **Drs. Williams and Ward**, in collaboration with the Wildlife Division of the Connecticut Department of Energy and Environmental Protection and the South Central Connecticut Regional Water Authority, established five sites (Bozrah, Burlington, Guilford, Litchfield, and Madison) after recent clearcuts**.** Three of the five sites were recently managed for New England cottontail 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**.** A 6-foot tall fence was installed around half of the stumps to prevent deer browse. For one-half of the fenced stumps, three 8” x 12” holes were cut into the fence at ground level to permit access by rabbits. After several growing seasons, we will be able to determine the separate and interactive impacts of deer and rabbit browse of new 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-width fencing for maintaining oak as a significant component of forests in areas of high deer population where hunting is prohibited.

Precommercial crop tree release: Sixty million acres of oak-hickory comprise the largest component (35%) of forests in the twenty state northern forest region. However, foresters have been concerned for decades about maintaining a significant oak (*Quercus* spp.) component in these forests. While our knowledge of the conditions and silvicultural practices required to develop competitive oak seedlings has greatly increased in recent years; competition from other, less-valuable species that are initially taller or have faster juvenile height growth rates during the crucial period before and immediately after canopy closure can relegate oaks to subordinate canopy positions from which they are unable to recover

Perhaps because it requires an investment, active management to release oaks in sapling stands from competition is an oft neglected component of oak management, thereby violating the Second Law of Oak Silviculture by not providing 'timely, sufficient release of oak regeneration'. Precommercial crop tree release completed at canopy closure is a potential strategy to provide timely, sufficient release of oak saplings that would otherwise be overtopped by competitors, or in stands with abundant oak saplings, to focus growth on those oaks with good form

In 1988, **Dr. Jeffrey Ward** began a study to examine the effects of precommercial crop tree release on growth and stem quality of red oaks (n=189) was examined on seven study areas that were established in Connecticut in 1988. There were three treatments: uncut controls, 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. This study found that precommercial crop tree release of oak saplings at canopy closure can increase upper canopy persistence and diameter growth with no loss of height growth or increased number of branches on the lower bole. Precommercial crop tree release increased 23-year upper canopy persistence of codominant oaks to 80% compared with 50% for untreated stems. Trees released twice had diameters 1.5 inches greater than unreleased trees with no increased taper. Heights in 2012, 24-years after release, did not differ among treatments. The proportion of original trees without forks or with forks at 32 feet or taller did not differ among treatments. While the presence and number of branches on the lower bole of upper canopy trees did not differ among treatments in 2011, northern red oaks had fewer branches than black/scarlet oaks. 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.

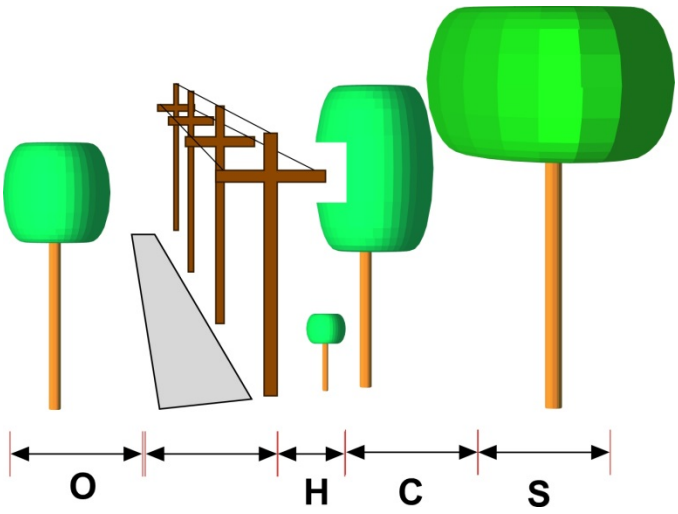
Impact: The increased diameter growth provided by precommercial crop tree release should optimize potential stand value and result in at least a 4% real rate of return by decreasing the time needed to reach minimal diameter of grade or veneer sawtimber.

DEVELOPING STORM RESISTANT ROADSIDE FORESTS

Urban and Suburban Trees: In the past two years, the lives of Connecticut's residents have been disrupted by three major storms that caused trees to fail and destroy utility lines for hundreds of thousands for extended periods: Irene (Aug 2011), Halloween snowstorm (Oct 2011), and Sandy (Oct 2012). Perhaps surprisingly, Connecticut's urban areas have the highest forest cover (67%) in the United States.

Tree-lined streets provide not only the aesthetic 'sense of place' that is Connecticut, but provide many benefits along roadways including reducing traffic speeds, prolonging pavement life, and improving 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. 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.

To reduce disruption of electrical and telecommunication services during severe weather, trees adjacent to utility poles and wires should have mature heights shorter than the wires, or be set back a sufficient distance from the wires that broken branches or wind-thrown trees are unlikely contact them. This strategy will also increase access by public safety officials (police, fire) during and after storms by reducing road debris.

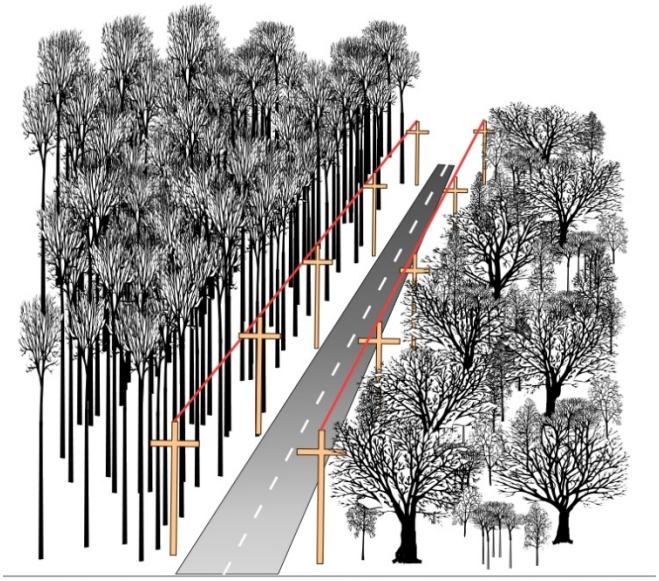


Critical planting zones for Right Tree, Right Place. O-Opposite zone, H-Height reduction zone, C-Clearance zone, S-Strike zone.

Over the next several decades, many of the larger trees in our maturing roadside forests will decline and will to need to be replaced. This will provide an opportunity to replace tall trees that can damage critical infrastructure (utilities and roads) with shorter species that can maintain the forested aesthetic.

As an appointed member of the Governor's State Vegetation Management Task Force, **Dr. Jeffrey Ward** worked with **Glenn Dreyer** (Connecticut College) and **Dr. Sharon Douglas** (Plant Pathology) to develop two lists of woody plants that are appropriate for planting near utility infrastructure (Right Tree-Right Place): shrubs that are an appropriate size for the height reduction zone (H) and small trees that are appropriate for the opposite (O) and side clearance zones (C).

Rural Roadside Trees: 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 largely 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. These roadside biodiversity corridors would support a myriad of mammal, bird, and invertebrate species that depend on small tree and shrub species that are often lacking in unmanaged forests.

Working together with **Thomas Degnan** of Burns & McDonnell, **Dr. Ward** developed proactive management protocols 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 (winds, snow, ice) and are comprised of shorter trees that are less likely to fall on wires and roads then they do fail.

A program which combines arboriculture (individual tree care) and silviculture (forest management) protocols, along with an enhanced outreach programs will be 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.

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 alone were estimated to have caused Connecticut more than $3 billion in economic losses. Replacing urban/suburban roadside trees as they die with shorter Right Tree – Right Place selections will impose not additional costs to property owners and towns. The Governor recently signed Public Act No. 13-298 that amends CGS Sec 16-234a(4) and designates the Right Tree-Right Place lists noted above as the standard of trees and shrubs compatible with utility infrastructure.

VITICULTURE

Winegrape growers and Farm Wineries in Connecticut face many challenges. Farm Wineries are required to grow a minimum of 25% of the fruit in their total output, but are having trouble meeting this standard. Consecutive very cold winters in 2003 and 2004, as well as in 2009 and 2011 resulted in significant plant loss on less cold hardy cultivars, and drove up prices for purchasing Connecticut fruit. Little information is available to growers regarding cultural information for growing more cold hardy and disease resistant cultivars in the state. Growers of more traditional cultivars require more information on cultural practices and their effects on long-term vine health and fruit quality. Disease management is critical during the growing season due to Connecticut's warm, humid summers. The industry requires increased production via better management practices in existing vineyards and improved cultivar selection in newly planted vineyards. Innovative practices need to be tested in Connecticut to assess their viticultural and economic appropriateness.

Winegrapes: Studies have been initiated by **Dr. William R. Nail** help determine cultural practices for growing high quality winegrapes profitably in Connecticut. The winegrape industry in Connecticut is one of the most rapidly expanding categories of agriculture in the state. The first Farm Winery opened in 1979, and there are currently 30 wineries with a Farm Winery license, with two or three more scheduled to open each year in the foreseeable future. The existence of these wineries adds substantially to local economies, as local restaurants, hotels, bed and breakfasts, and other establishments receive increased business due to their proximity. The Connecticut Wine Trail brochure, published by the Connecticut Vineyard and Winery Association, is the most popular brochure in Department of Tourism travel offices.

Cultural practices in Vitis vinifera: **Dr. Nail** established a planting of 288 Pinot Gris vines at Lockwood Farm in 2004. Two different rootstocks were used: 3309C, the most commonly planted rootstock in the state, and 101-14, which may tend to ripen fruit earlier and have better tolerance to severe winter freezes.

Impact: Vines grafted to 101-14 had 32% less mortality due to winter freeze damage than those grafted to 3309C following their first winter. Crown gall in subsequent years continues to be slightly higher in 3309C vines. There were no significant differences in productivity or fruit quality between rootstocks without crown gall through the 2011 growing season. Planting on rootstocks more resistant to winter damage can result in savings of $7.60 for each year of lost production per vine, plus $3.75 replacement cost per vine plus labor involved in removing diseased vines and replanting

Effects of graft union height: Freeze damage to grafted grapevines frequently occurs at the graft union, which is typically very close (one to two inches) to the ground. Crown gall, caused by *Agrobactium vitis*, is a devastating and often lethal disease of grapevines, and frequently occurs on severely freeze-damaged vines, although symptoms may not appear for one or two years after the freeze event. Elevating the height of the graft union may result in less injury. Chardonnay clone 96 budwood was grafted onto 3309C rootstock at standard height and 26 inches higher in 2006, and vines were transplanted in spring 2007 to vineyards at Lockwood Farm and Westport, Massachusetts. Temperature data loggers have been installed at both graft union heights to monitor differences in temperature at the graft unions. Vines have been evaluated for bud fruitfulness, winter freeze damage, and crown gall incidence and severity beginning in 2008. Yield and fruit quality were evaluated beginning in 2009.

Impact: Vines with crown gall typically require replacement. High-grafted vines may result in significant reduction in such losses, which would be approximately $2,150 plus labor per acre for each 10% of vine mortality. In the absence of snow cover, daily minimum temperatures averaged 0.5 to1.5 ºC higher at the higher graft union level. While no significant differences in crown gall incidence or severity have been observed in the experimental vineyards, the high grafted vines have been more economical to manage, as their single straight trunks are less susceptible to inadvertent tractor and herbicide damage. High grafted vines had a high potential yield of high quality fruit during their second year after transplanting, while low grafted vines would traditionally have had no yield. This potential yield of fruit, estimated at $2,000 per ton, would offset the increased cost production of the high grafted vines.

Training and spacing effects on vine performance and fruit quality of hybrid cultivars: Grapevines in most older vineyards in Connecticut are planted on six foot spacing and trained to a vertically shoot positioned system. This has generally worked well for most vinifera cultivars and some hybrids. Recently released hybrid cultivars that are rapidly finding favor frequently have different growth habits that make them unsuitable for this traditional spacing and training.

Within-row spacing of grapevines in the vineyard is one of the most critical decisions to be made at planting. Too close spacing results in excessive competition and excessive vegetative growth,

leading to reduced yields of poor quality fruit. Spacing that is too far apart results in unproductive utilization of valuable vineyard space. The choice of spacing is permanent. However, errors made at planting can sometimes be partially remedied by dividing the canopy to accommodate vine growth. Divided canopies can increase yield per unit of linear row length, but are more difficult and labor-intensive to establish and maintain.

To evaluate spacing and training systems for new cultivars, **Dr. Nail** established a planting of the hybrid cultivars St. Croix and Cayuga White in 2005 at a private commercial vineyard in Wallingford. These cultivars are among the most popular hybrids for new plantings. They have different growth habits and management issues than vinifera cultivars, which may involve fundamental issues both before and after planting. Plants of both cultivars were planted at six and eight foot spacings, and were trained to four different training systems beginning in 2009: Vertically Shoot Positioned, Hudson River Umbrella, Geneva Double Curtain, and Scott Henry.

This experiment is part of The Northern Grapes Project, which consists of 35 scientists from 13 states.

Impact: The results of this study will allow both new and existing growers to help maximize their production, as well as possibly demonstrating that some systems are not efficient in Connecticut. The data collected to date suggest that the vertically divided Scott Henry system was most productive in the first year of full production, while the horizontally divided Geneva Double Curtain was much more productive in the second through fourth years than the other training systems. There were no differences in fruit quality among training systems. However, divided canopies require more intensive management than single canopies. Data were collected beginning in 2010 to determine the relative cost of maintaining these different training systems. This will assist growers in determining if the increased yields per linear unit of row will justify the additional labor and supply costs of divided canopy systems.

Pruning systems: Most grapevines in Connecticut have traditionally been cane pruned. Cane pruning requires skilled labor, which is increasingly in short supply. Spur pruning to a cordon system requires less skilled labor and lends itself to mechanization. A planting of the hybrid cultivars Cayuga White and St. Croix, both trained to four different training systems, was established in 2005. Beginning in 2011, vines on six-foot spacing were pruned to either cane or cordon (spur) pruning to compare the relative efficiencies of these pruning methods. Data on yield and fruit quality parameters were collected beginning in the 2011 harvest season, and will continue for at least three more years. This experiment is also part of The Northern Grapes Project.

Impact: Cordon pruning is a viable alternative to the cane pruning method used in most Connecticut vineyards. Skilled labor costs, essential to cane pruning, are approximately 30% higher than unskilled labor costs. Of equal importance is the increasing unavailability of skilled

labor. Over the course of a previous experiment on hybrid grapevines, there were no differences in yield, fruit quality, or any measured vegetative parameters measured between cane and cordon pruned vines. Therefore, cordon pruning can reduce pruning costs by approximately 30% for growers.

Cultivar and clonal evaluation: Beginning in 2004, **Dr. Nail** has evaluated previously established experimental plots at Lockwood Farm and a private grower's vineyard in Shelton. The results of these trials have been published in station bulletins. New cultivar trials were established at Lockwood Farm and the Valley Laboratory in spring, 2008, in conjunction with the national project "NE-1020: Multistate Evaluation of Winegrape Cultivars and Clones". This project involves over 50 scientists from over 30 states, allowing for evaluation of regional comparisons of vegetative and fruit qualities. The planting at Lockwood Farm is the third largest planting in the Eastern United States. Both plantings contain established cultivars whose characteristics have been documented, as well as unreleased and untested cultivars whose performance in Connecticut are unknown. Data collection on these vines began with pruning data in spring 2010, and will continue for several years. Experimental wines were made from selected cultivars at the Enology laboratory at the New York Agricultural Experiment Station at Geneva in 2011, and will be evaluated for wine chemistry and sensory qualities beginning in 2012 and continue for several years.

Impact: The NE-1020 plots will provide Connecticut growers with valuable information on the suitability of new cultivars if and when they are released. Viticultural and fruit quality characteristics are important when a new cultivar is introduced into a region. The results of these trials will allow growers to make informed decisions as to the selection of appropriate new cultivars and their cultural requirements.

Northern grapes: Many new, very winter-hardy hybrid winegrape cultivars have been developed relatively recently by plant breeders in Wisconsin and Minnesota. Some, such as St. Croix, have found favor with many Connecticut growers. These new cultivars are based on the American species *Vitis riparia*. Riparia-based cultivars typically have much higher acidity than more traditional winegrape cultivars. New, as yet unreleased cultivars are untested in the state. Several new cultivars are being evaluated at Lockwood Farm and the Valley Laboratory. This is in conjunction with the Northern Grapes Project as well as NE-1020. Besides basic fruit quality parameters analyzed at The Connecticut Agricultural Experiment Station, more thorough analyses from all participating states will be conducted at the Midwest Grape and Wine Industry Institute at Iowa State University. Vegetative, fruit, and yield data were collected beginning in 2011, and will continue for at least four more years.

Impact: Fruit quality from new riparia-based cultivars may pose problems for winemakers using traditional methods. By evaluating the fruit chemistry of these new cultivars, decisions regarding cultivar selection based on fruit acidity as well as standard yield and vegetative parameters will assist growers in selecting appropriate cultivars when they are released commercially.

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

Biochar and earthworms

Biochar is a fine-grained, charcoal-like product that when applied to soil, will suppress 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. This increase in beneficial microbes helps to suppress disease through antibiosis, competition, or induction of systemically acquired resistance mechanisms.

In 2010, **Dr. Wade H. Elmer** established asparagus plots designed to examine the individual and combined effects of earthworms and biochar at Experiment Station research farms in Hamden, Windsor, and Griswold. This year (2013), asparagus plots were harvested for the second 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 natural population of earthworms so that additional augmentation was unnecessary. However, this hypothesis needs to be validated. Adding biochar did not differ from the control and may be due to the ability of biochar to bind up nutrients as well as toxins, which led to smaller plants and lower yield.

Impact. These studies may provide evidence that mulching an asparagus field may increase earthworm activity that, in turn, increases soil health and results in increased yields.

Sudden Vegetation Dieback

Sudden vegetation dieback (SVD) of Connecticut salt marshes continued to make serious inroads into marsh systems along Connecticut's shoreline on Long Island Sound (Figure 1). *Spartina alterniflora* (SA) is the dominant species in the low marsh and is the species most affected by SVD. *Fusarium palustre* is a recently described species that is pathogenic on SA, but is not solely responsible for SVD.

Recovery from SVD in certain marshes is hindered by grazing pressure by the purple marsh crab, *Sesarma reticulatum*. We hypothesized that disease caused by *F. palustre* or exposure to drought may increase herbivory of SA. SA plants were exposed to different irrigation regimes and inoculated with FP or left un-inoculated. *In situ* plots were established in 2012 and 2013 and photographed for 3-4 day periods during low tides. Visual estimates of loss due to consumption were then analyzed. Herbivory was greatest on drought-stressed plants and/or plants that were inoculated with FP. Plants exposed to the same treatments and transplanted into a crab-infested SVD site were similarly consumed.

A new hypothesis has emerged that suggests excessive nitrogen may prevent SA from absorbing sufficient silicon. Although not considered an essential element, Si alleviates many abiotic stresses and has been associated with enhanced disease resistance. We are currently growing SA under varying nitrogen and silicon regimes to determine if nutrition affects disease severity by *F. palustre* and herbivory by the purple marsh crab.

Six plots (red circles) of treated *Spartina* transplants set out at Hammonasset Beach State Park in a crab-infested creek bank.

Genetic variation and dispersal dynamics in* Fusarium palustre*, associated with Sudden Vegetation Dieback in salt marshes of eastern United States

Dr. Robert E. Marra continues to explore genetic patterns of dispersal in the newly described fungus, *Fusarium palustre*, a pathogen of *Spartina alterniflora*, a key component of the wetland dieback syndrome. Genetic analyses using Amplified Fragment Length Polymorphisms (AFLP) performed in recent years of 90 isolates collected from marshes ranging from Louisiana to Maine yielded a surprisingly high degree of genetic diversity among isolates, and also resulted in the hypothesis, currently being tested, that the pathogen may have been first introduced into northeastern North America, with subsequent clonal introduction to coastal areas of the southeast and the Gulf. Dr. Marra has most recently been analyzing the genetic profile of a group of approximately 100 more isolates, consisting of isolates from China as well as additional isolates from the Gulf of Mexico, in order to determine the area of highest genetic diversity, and to test hypotheses about dispersal patterns.

***Impact*:** The appearance of SVD in multiple marshes over large areas makes it of considerable ecological and societal importance. Our findings provide insight into the critical factors associated with marsh grass recovery in SVD sites, which include better understanding of how genetics may impact the role of *Fusarium palustre*, and a foundation for understanding how physiological and nutritional changes in *S. alterniflora* may affect its susceptibility to drought, disease, and herbivory. If silicon is limiting in marshes affected by SVD, land use patterns that affect dissolved silica in run-off need to be re-examined.

Nanoparticle studies for root disease management

Materials at the nanoscale—also known as nanoparticles (NP)—possess unique chemical and physical properties not observed in natural bulked materials. Although the effect and fate of NP in plants has just begun to receive attention, the literature clearly demonstrates enhanced availability and transport as a function of nanometer particle size. The micronutrients manganese (Mn), copper (Cu), and zinc (Zn) play important roles in host defense. However, most micronutrients exist at below-optimal levels in most neutral or slightly acidic soils. Topical applications are ineffective in that basipetal translocation of these micronutrients to the roots following foliar application is minimal. As such, nanoparticles may behave differently and allow transport of these micronutrients, thus being of use in disease management by affecting the metabolic production of defense compounds and/or by activating systemic acquired resistance pathways. Topical applications of nanoparticles were applied to tomatoes grown in soil infested with their bulked equivalent, but NP of Mn and Zn were more damaging to tomatoes than the bulked equivalent amounts.

Field plots at Lockwood Farm designed to study the effect of NP on tomato and eggplant diseases.

Impact To date there is no information on how NP micronutrients might uniquely affect root pathogens. The mechanisms of NP absorption in plant leaves and roots could significantly impact plant disease management and may be a promising alternative to conventional pesticides.

Boxwood blight

Disinfectant mitigation strategies

New incidences of boxwood blight, first reported in Connecticut in October 2011, continued to be diagnosed throughout the state. This new disease to North America is caused by the fungus *Calonectria pseudonaviculata* [(*C.ps.*), syn. *Cylindrocladium pseudonaviculatum*]. It has already resulted in significant financial losses in the state, which to date have exceeded $5 million. Growers are concerned about contamination of inanimate objects and how this could initiate new infections of boxwood within and between production nurseries. Current Best Management Practices (BMPs) include general use of sanitizing agents for decontaminating equipment and tools that have come in contact with the pathogen. However, studies have not been conducted that specifically target sanitizer efficacy for this pathogen.

Mycelial Growth

Dr. Douglas has been conducting studies aimed at providing science-based information on the efficacy of sanitizing agents for *C.ps*. She is using two isolates of *C.ps.* obtained from infected plants in Connecticut, Cps CT-S1 (a single-spored isolate from boxwood) and Cps CT-P1 (a single-spored isolate from pachysandra). These studies assessed mycelial growth for the two isolates challenged with log concentrations (1:10, 1:100, 1:1,000, and 1:10,000) 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). Two methods were used to evaluate efficacy of sanitizers on mycelial growth on ½-PDA. For Method 1, plates were amended with set volumes of log concentrations of sanitizers prior to placing uniform plugs of *C.ps.* on each plate. Method 2 involved flooding mature cultures of *C.ps*. with log concentrations of the sanitizing agents. Plugs were removed at 5, 15, 30, and 60 minutes. All plates were incubated at room temperature and radial growth measurements (cm) were made 2, 7, 14, and 21 days after initial transfer. Differences were observed between the methods and among sanitizers and concentrations, and ranged from complete inactivation to slowed growth (Figures 1 and 2).

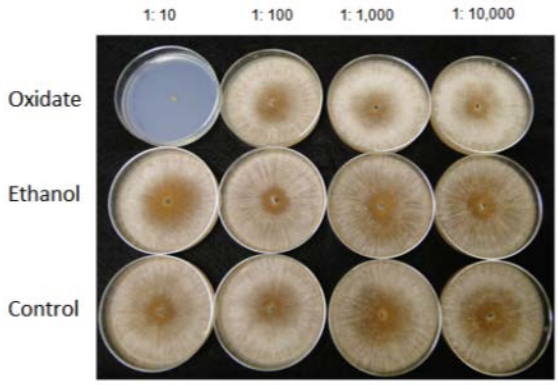


Figure 1. Method 1—effects of log concentration of Oxidate and ethanol on mycelial growth at 21 days.

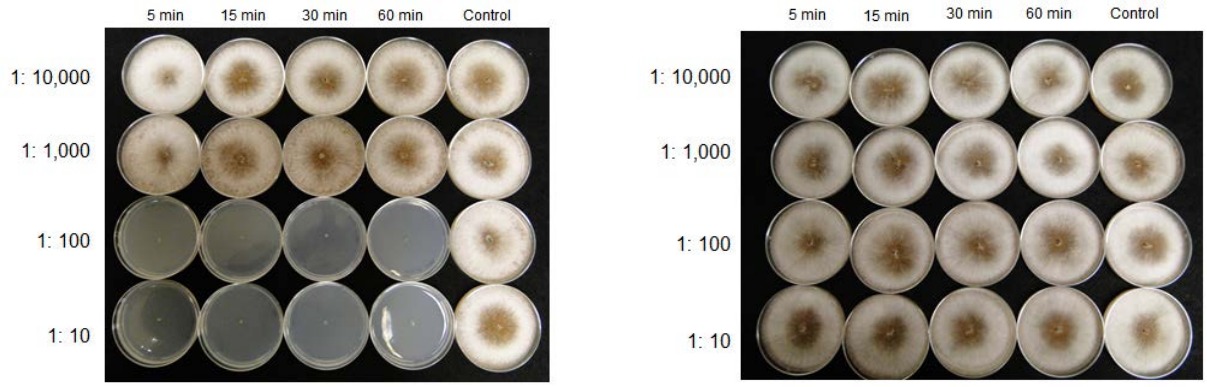


Figure 2. Method 2—effects of log concentrations and exposure times for Oxidate (left) and ethanol (right) on mycelial growth at 21 days.

Both *C.ps.* isolates responded with similar sensitivity to the sanitizers for both methods. However, when comparing the two methods, notable differences were observed in the efficacy of several sanitizers at more dilute concentrations for both isolates. For example, with Method 2, mycelial growth was completely inhibited for all exposure times (5-60 minutes) of ZeroTol, Oxidate, X3, Lysol, and Sanidate for both 1:10 and 1:100 dilutions, whereas Method 1 only showed growth inhibition for the 1:10 dilution. All exposure times and concentrations of ethanol and isopropanol resulted in no inhibition of mycelial growth, which was consistent with results of Method 1 experiments. The differences in efficacy observed with Method 2 suggest that the method of how the mycelia are exposed to a sanitizing agent might be an important consideration when evaluating these products for nursery use.

Conidial Germination

Conidial germination was assessed by exposing conidia to log concentrations of sanitizers (1:10, 1:100, 1:1,000, or 1:10,000) for 5, 15, 30, and 60 min exposure periods. Aliquots of conidia were spread on WA and germination assessed at 24 and 48 h. Results were similar to those obtained with Method 2 for mycelial growth, although conidia were more sensitive to lower concentrations of sanitizers than mycelia. For example, no conidial germination was observed after all exposure/contact times (5, 15, 30, and 60 minutes) to concentrations of 1:10, 1:100, or 1:1,000 of Sanidate and ZeroTol, even for as little as 5 minutes (Figures 3 and 4). This trend was markedly different than measurements of mycelial growth, where only dilutions of 1:10 (Method 1) or 1:100 (Method 2) completely inhibited growth.

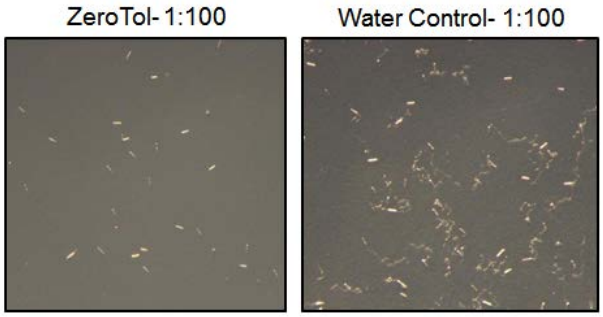


Figure 3. Conidia 48 h after 15-minute exposure time (ZeroTol-no germination; water control-significant germination.

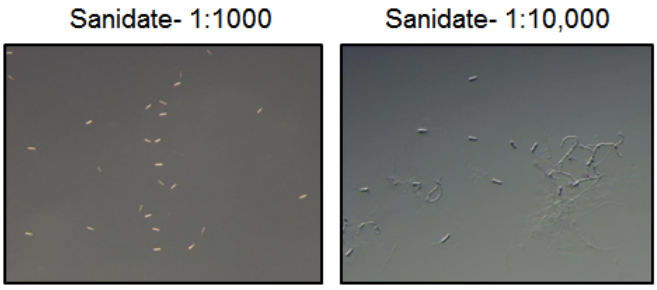


Figure 4. Conidia 48 h after 5-minute exposure to Sanidate (1:1,000-no germination; 1:10,000-some germination).

Refining Best Management Practices

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. Since the confirmation of the first natural infection of pachysandra (*Pachysandra terminalis)* in the landscape by *C. pseudonaviculata* by CAES on 29 June 2012, many additional landscape properties with infected pachysandra have been confirmed in Connecticut and in other states. In most CT cases, the landscapes had plantings of both boxwood and pachysandra, for which both hosts had been confirmed positive for *C. pseudonaviculata.* Pachysandra infections appear to have originated from infected boxwood. There is no evidence of boxwood blight-infected pachysandra in production facilities or in outlets or garden centers. These findings significantly changed approaches to managing this pathogen on properties where both hosts are present and 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 2.0* 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_2_10-12-12.pdf). Management guidelines are now 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.

Early Detection

Dr. Robert E. Marra has been working with Dr. Jo Anne Crouch of the USDA-ARS in developing and optimizing realtime PCR and other nucleic acid-based assays for early and accurate detection of the boxwood blight pathogen, *Calonectria pseudonaviculata* (C.ps.). Drs. Marra and Crouch have achieved high specificity of a dual-labeled probe-based realtime assay for C.ps.; closely related sister species show no specificity. One goal of this work is to be able to detect C.ps. in infected but asymptomatic plant tissue. To that end, Dr. Marra has demonstrated that the C.ps. realtime assay works well in conjunction with primers and probe for the plant-specific cytochrome oxidase gene (COX),

introducing an important and powerful internal control. In experiments in which increasingly small amounts of fungal DNA were added to *Buxus* DNA, Dr. Marra has demonstrated sensitivity of the assay down to as little as 5 picograms of C.ps. DNA. To improve on this level of sensitivity, Dr. Marra has developed a "nested PCR" technique that precedes the realtime assay with a 15-cycle 1st-round PCR utilizing only the amplification primers (i.e., no probe), and using the products of the 1st-round PCR in a second "nested" realtime assay. Preliminary results demonstrate a 1,000- to 10,000-fold increase in sensitivity (see Figure 1 below).

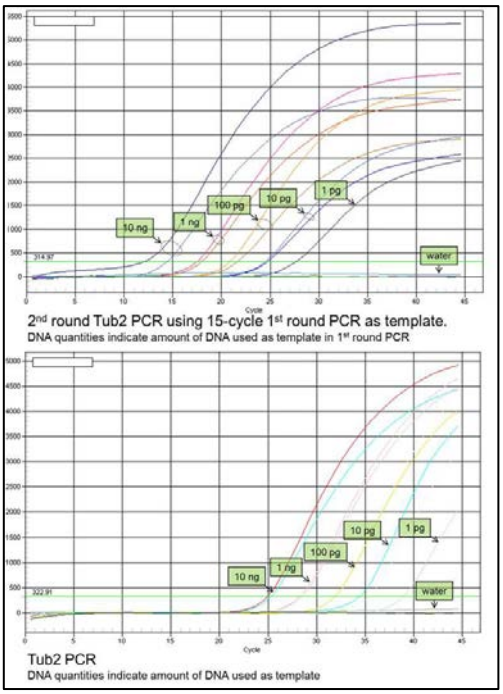


Figure 1. A 15-cycle 1st-round PCR using only primers (i.e., no probe) results in an initial amplification of template for a 2nd round ("nested") PCR, thereby improving detection of low-copy number targets. In this figure, the same template dilution series was used for both the top and bottom graphs. However, in the top graph the template was first amplified for 15 cycles; those reactions were then used as template in the standard (primers + probe) Tub2 realtime PCR protocol, alongside reactions using the initial template dilution series directly. The 10-12 cycle shift in Ct values represents a 1,000 to 10,000-fold increase in sensitivity.

A genotype resistant to certain fungicide classes has been identified in Europe. Researchers in Europe have named this genotype "G2," in contrast to the more commonly found "G1." While the G2 genotype has not yet been identified in the U.S., there is growing concern that its presence could severely limit available control strategies in the U.S. Dr. Marra has succeeded in securing Farm Bill funding to develop a dual-probe allelic discrimination assay based on single-nucleotide polymorphisms (SNPs) at three genes that were identified by Dr. Kurt Heungens (Belgium). Initial work in this area has resulted in successful development of allelic discrimination assays for the calmodulin and histone genes (see Figure 2 below).

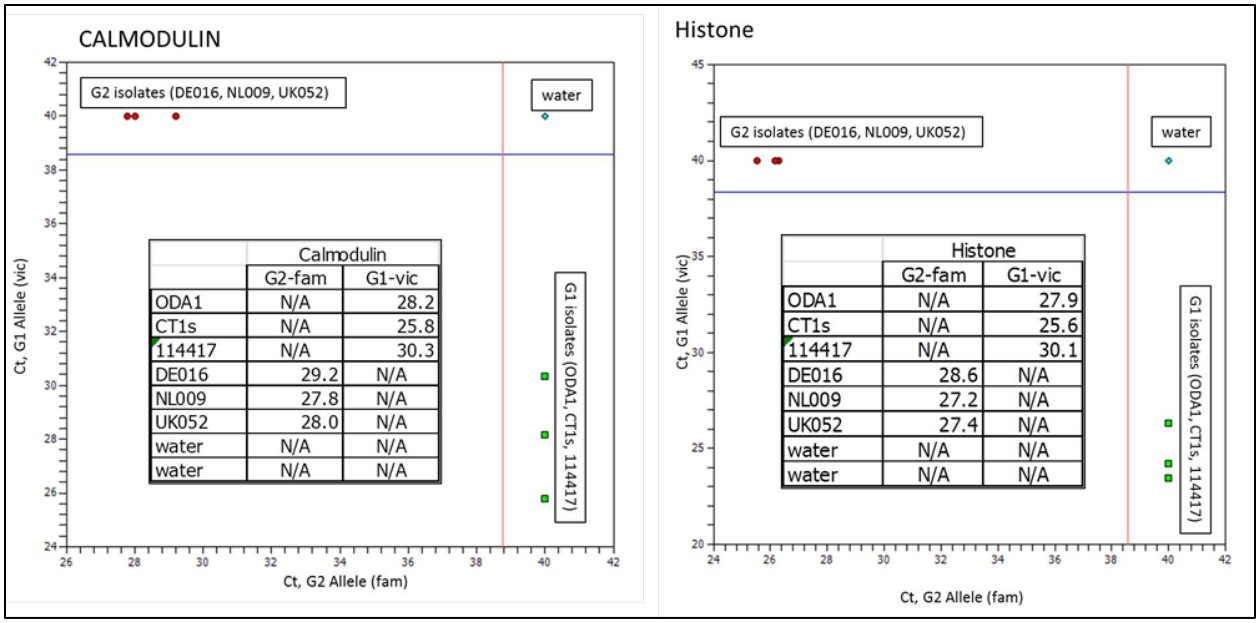


Figure 2. Researchers in Belgium have identified several single-nucleotide polymorphisms (SNPs) in the calmodulin and histone genes that distinguish G1 and G2 isolates. Allelic discrimination assays use a single set of primers with two dual-labeled probes, one for each SNP allele, each labeled with a different fluorophore (6-FAM and VIC). Shown here are data for two such assays. For both genes, the three G1 and three G2 isolates only amplify the SNP probe specific to their genotype. The realtime PCR data are embedded within the allelic discrimination graph. Note that in the allelic discrimination graph, "no amplification" ("N/A") results are positioned at 40 cycles, which is the number of cycles used in the reaction.

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 sanitizing agents helps to refine current BMPs and minimize new infections and carry-over from infected plants, thereby reducing economic losses. Rapid and pre-symptomatic detection and communication about this important new disease of boxwood and decisive regulatory actions by The Experiment Station continue to minimize the economic impact of boxwood blight on the Connecticut nursery industry. Although significant losses have been reported, CAES actions helped to maintain boxwood as a viable and important component of the Connecticut landscape and nursery industry.

Mathematical models of plant disease epidemics

Dr. Francis J. Ferrandino has challenged the usefulness of latent period and infectious period as epidemic descriptors. The dynamics of a plant disease epidemic require an analysis in terms of the mean generation time and the higher order temporal moments of the time course of progeny production. To this end, a Laplace Transform-based analysis has been devised to compare the epidemiological behavior of current theoretical models of spore production in terms of the temporal moments of the reproduction curve. In addition, in order to compare theory to experiment, Dr. Ferrandino has derived a fourth order approximation that accurately and explicitly predicts the initial infection rate in terms of the temporal

moments of the reproduction curve (experimental or theoretical). This work has resulted in an Analytical and Theoretical Plant Pathology research paper published in the March 2013 issue of Phytopathology. Future work will include both the spatial spread and the temporal development of plant disease epidemics.

The dispersal of inoculum is currently being modeled using Lagrangian stochastic simulation models, which must be founded on a thorough knowledge of the nature of turbulence to calculate the form of the dispersal function. To this end, detailed measurements of the three dimensional turbulent flow within and above various agricultural plant canopies are underway.

Impact: Mathematical models of plant disease with parameters, which are directly determined using field data, are essential in evaluating the efficacy and economic and environmental sustainability of IPM programs. This work provides a new method for comparing theoretical and experimental progeny production curves to the time course of the resulting plant disease epidemic.

Environmentally-friendly control of powdery mildew on landscape plants and general fruit and foliar pathogens on vegetable crops.

Dr. Ferrandino is continuing his work on environmentally-friendly controls of powdery mildew on common home landscape plants (e.g., lilac, deciduous azalea, monarda, phlox, peony, and rudbeckia) and vegetable crops commonly planted in the home garden (tomato, pepper, eggplant, muskmelon, and pumpkin). All foliar and fruit pathogens are being monitored on the vegetable plants. The alternatives to conventional chemical controls include sprays of cow's milk, horticultural oil, and potassium bicarbonate products.

Integrated Pest Management for winegrapes in New England

Dr. Ferrandino recently assumed responsibility for all of the CAES vineyards. There is a total of 3.4 acres of vineyards planted to 2,850 vines at the three CAES Experimental Farms (Hamden, Windsor, and Griswold, CT). These plantings include 37 cultivars of winegrape and table grape trained using 6 different pruning/training protocols (Figure 1). Routine scouting for disease and insect pests in these vineyards results in information useful to growers. At each experimental site, comparisons of the susceptibility of the various cultivars and training methods to pathogen and insect pests are obtained. For example, in the spring of 2013 St. Croix (*Vitus vinifera-V. labrusca* black hybrid winegrape) has been observed to be particularly susceptible to infestations by foliar phylloxera and the berries of Skujinsh [Interspecific Latvian white hybrid winegrape (including *V. vinifera, V. amurensis, V. labrusca and V. riparia*)] were observed to be highly susceptible to downy mildew (*Plasmopera viticola*) infection. This type of detailed information is periodically posted on the CAES website and assists growers with making pest management decisions.

Figure 1. Vinifera grape vine (cv Riesling) on right is trained upwards using "Vertical Shoot Positioning" (VSP), whereas hybrid vine (cv Dornfelder) on left is trained downwards in a "Hudson Valley Umbrella" (HVU). Vineyard located at Lockwood Farm, Hamden, CT.

Impact: Awareness of possible problems associated with a particular grape cultivar trained in a certain way informs the overall IPM strategy improving the overall efficiency of pest control.

Butternut research

Dr. Sandra L. Anagnostakis planted more grafted butternut trees at the Experiment Station's Lockwood Farm for her study of butternut canker. Scientists in OH, PA, and VT continue to search for trees that seem to be resistant to this pathogen, and cuttings from the trees are grafted onto black walnut rootstocks in MO. Survival of the grafted trees planted last year was poor, probably due to the harsh winter conditions of 2012-2013. The two cultivar butternuts in the Lockwood Farm nut orchard are nearly dead from infection by the butternut canker fungus (*Ophiognomonia clavigignenti-juglandacearum*).

Chestnut breeding

Orchard chestnuts

Dr. Sandra L. Anagnostakis collected open-pollinated seed from one of the orchard-form trees in the Windsor planting, from an orchard hybrid at Lockwood Farm, and from a planting of Japanese chestnuts in Cheshire, CT. Half of the seeds were grown in the greenhouse, while the remaining seeds were kept in the cold room. In the spring, four plantings were made, alternating germinated seed from the cold room and seedlings from the greenhouse, and all were protected with plastic tree tubes. The four sites were Lockwood Farm in Hamden, with light sandy-loam soil, Griswold Research Farm with Windsor loamy-sand (excessively well drained) soil, and two sites in Warren that were old fields. We will be measuring growth in these plantings to determine whether "direct seeding" of chestnuts is practical, and whether the resulting seedlings can establish as well as seedlings grown in the greenhouse.

Impact: These plantings will allow us to determine whether "direct seeding" of chestnuts can compare favorably in tree survival and growth with planting seedlings.

Asian chestnut gall wasp (*Dryocosmus kuriphilus*) is now well established at Lockwood Farm, and crosses were made of our commercial chestnut cultivar 'Colossal' (which is susceptible to infestation) with a chinquapin hybrid, which is resistant to the insect. We have planted the resulting seedlings in an area at the Farm where infestation is extreme to determine whether first-generation hybrids will demonstrate resistance to this pest.

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

Timber chestnuts

Dr. Sandra L. Anagnostakis examined plantings of back-crossed hybrid timber chestnuts in five Connecticut towns and on Long Island after timber harvests. Trees planted in 2000 in two plots in Prospect, 2002 in Burlington, 2006 in Farmington, 2007 in Hampton, and Vernon in 2009 were compared with a 2000 control planting at the Valley Laboratory in Windsor. The Vernon plot was surrounded by a deer fence, and the plot in Manhasset, NY has no deer in the area, presumably due to proximity to New York City. Chestnut blight cankers on native chestnuts were sampled after the timber harvests, *Cryphonectria parasitica* was isolated from the samples, and hypovirulence viruses moved into the cultures by pairing strains in the laboratory. Mixtures of these biocontrol strains were made to match the virulent strains in each plot, and these were used to treat cankers in each plot for a minimum of four years.

Sandra Anagnostakis with one of the hybrid timber chestnut trees in the Prospect 2 planting.

Survival in the Farmington plot was very poor, presumably due to the heavy soil and poor drainage. Few chestnuts were found in 2013 among the dense raspberries. Survival in the other plots ranged from 18% to 85%, while the control plot in Windsor had only 7% survival. The trees in Windsor, which had no competition from regrowth of forest trees, were much larger.

Results of chestnut tree survival and size (2013)

***Impact*:** The results of this study demonstrate that advanced hybrid chestnut trees can survive and compete in forested areas in Connecticut, with the help of our biological control, and that soil type and competition levels greatly influence this survival. We will now be better able to design experiments to reintroduce timber chestnuts into the forest.

A seed orchard composed of two families of advanced back-crossed timber chestnuts was planted at the Griswold Research Center in 2009. A deer fence was installed around most of the trees, and plastic tree shelters alternating with no deer protection were used on the two sides, outside the fence. No biocontrol was used in this plot so that trees susceptible to chestnut blight disease could be eliminated. Our initial finding was that the trees in shelters had better survival and marginally better growth than trees protected from deer by a fence.

Comparison of fencing and tree tubes *vs*. open plantings of chestnut trees.

Year Planted	# Planted	Type	Survival	Avg. dbh, cm
2009	360	BC2 x BC3 fenced	231 (64%)	1.4
2009	40	BC2 x BC3 tubes	32 (80%)	1.7
2009	20	BC2 x BC3 open	10 (50%)	1.6
2009	300	BC3 x BC3 fenced	147 (49%)	1.3
2009	40	BC3 x BC3 tubes	25 (63%)	3.1
2009	20	BC3 x BC3 open	10 (50%)	2.9

Town	Year Planted	# Planted	Type	Survival	Avg. dbh, cm
Windsor (control)	2000	209	BC2 and BC3	14 (7%)	15.3
Prospect 1	2000	40	BC2 and BC3	7 (18%)	13
Prospect 2	2000	61	BC2 and BC3	20 (33%)	6.8
Burlington	2002	20	BC2 and BC3	17 (85%)	3.2
Vernon	2009	155	BC2 x BC3	110 (71%)	1.5
Manhasset	2009	100	BC2 x BC3	84 (84%)	3.9

We plan to continue removing trees from this planting as they succumb to chestnut blight, and will collect seed from the survivors for reintroduction into Connecticut forests.

Impact: Plastic tree tubes will now be used for all of our chestnut plantings for improving survival as well as for protection from deer.

Biological control of chestnut blight disease

An orchard of 72 three-year-old American chestnut trees was planted at Lockwood Farm in Hamden in 1976 by **Dr. Sandra L. Anagnostakis**. Chestnut blight cankers were first seen in 1978, and from then through 1981 the blight cankers that developed naturally on the trees were treated with virus-containing (hypovirulent) strains of the blight fungus. No treatments have been made since 1981, and roughly half of the trees continue to die and sprout back from the base. However, the others are large trees with swollen blight cankers from the ground to near the top and continue to flower abundantly. Biological control of chestnut blight disease by hypoviruses was clearly still effective in these American chestnut trees 32 years after the last treatment.

American chestnut trees at Lockwood Farm. The trees are 39 years old, and have been kept alive with biological control of chestnut blight disease using a hypovirulence virus in the fungus.

In 2013 we sampled cankers from the trees in the eastern row of these trees, and isolated the blight fungus from the bark samples. The isolates were grown in the laboratory and tested for the presence of virus, and 42 contained viral nucleic acid while 16 did not. We tested the virulence of the isolates by inoculating them into Granny Smith apples and comparing their growth with that of a virulent control strain. Some isolates grew as much as the virulent strain, but 17 of them grew 75% or less than the virulent strain—of the 17 strains, 14 had virus. We will test the virulence of all of these isolates on chestnut stems in the laboratory this winter.

Bacterial Spot of Stone Fruits

Dr. Robert E. Marra continued work on a SARE project on bacterial spot of stone fruits. This project focuses on the development of a biological control method against bacterial spot caused by the bacterium, *Xanthomonas arboricola* pv. *pruni* (Xap), one of the prominent diseases in southern New England, particularly of peach and nectarine. The final goal for this project is to evaluate two potential

biological control strategies–Serenade (*Bacillus subtilus*) and Blight Ban (*Pseudomonas fluorescens*)–alongside the current recommended combination of copper and Mycoshield (oxytetracycline).

Three orchards of 49 trees (variety "Sweet Dream") each were planted in 2010 at the three research farms, Lockwood, Windsor, and Griswold. This peach variety is considered desirable in southern New England, but is too susceptible to Xap to be economically feasible. The trees have been pruned each late spring using the open-center training technique. In each 7x7 planting, the outer border of trees serve as buffers, while the inner 5x5 arrangement, using a randomized "Latin Squares" design, is used for each of the three treatments, plus controls. Once the treatment schedules have been completed this summer, they will be evaluated for incidence of bacterial spot, and the data analyzed for significant differences in outcomes.

Impact: Bacterial Spot 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.

Neonectria Canker* caused by *Neonectria ditissima (prev. N. galligena)

Dr. Robert E. Marra's research on Perennial Canker (also known as Neonectria canker) focuses on the ecology and genetics of the fungal pathogen, *Neonectria ditissima*, with the goal of gaining a fuller understanding of the life history, evolution and population dynamics of the organism and its interactions with its hosts, particularly black birch (*Betula lenta*) and yellow birch (*B. alleghaniensis*). Fundamental knowledge of the natural history of *N. ditissima* is lacking, yet is an essential prerequisite to the development of an effective management strategy. Field techniques and laboratory tools necessary to the study of this fungus and the disease it causes have been developed and are being used 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 biparental inbreeding and very low levels of outcrossing. The results confirm an earlier hypothesis that *N. ditissima* has a mixed mating system, albeit one in which selfing, not outcrossing, is the predominant mating mode. An important result of these findings is that they are the first to demonstrate, in a fungus, support for theoretical models that posit the importance of biparental inbreeding to the evolutionary stability of mixed mating.

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.

Disease Survey

Drs. Yonghao Li and Sharon Douglas, assisted by **Mary Inman,** diagnosed a wide range of plant health problems on trees, shrubs, flowers, lawn grasses, fruits, and vegetables during the past year. The extreme weather events including Super Storm Sandy in October 2012 and heavy snowfall in the winter of 2012-2013 resulted in severe physical damage and salt damage to many plants. The rainy weather conditions in the early summer of 2012 and late spring of 2013 provided favorable conditions for epidemics of infectious diseases caused by fungi, bacteria, and Oomycetes.

Herbaceous and Woody Ornamentals:

A devastating outbreak of impatiens downy mildew caused by *Plasmopara obducens* resulted in early collapse of impatiens throughout the state in early summer of 2012. Although impatiens downy mildew was observed sporadically in the state during 2010 and 2011, the coexistence of favorable weather conditions, high levels of inoculum, and susceptible impatiens varieties contributed to the severe epidemics of this disease in 2012. Bacterial leaf spot of zinnia spread widely on zinnia in greenhouse production, landscapes and gardens due to the rainy and wet weather conditions in the late spring of 2013. The disease not only caused leaf necrosis and early defoliation of zinnia, but also affected the appearance of its showy flowers. Root rot diseases caused by *Thielaviopsis* sp., *Rhizoctonia* sp., and *Pythium* sp. remained major problems in greenhouse flower production. Southern blight caused by *Sclerotium rolfsii*, which is considered a serious disease in warm climates, was found in greenhouses and landscapes in 2012. Since *S. rolfsii* has a wide host range including many vegetable, fruit, and ornamental crops, existence and spread of the pathogen posed a potential threat to agricultural production in the state.

Boxwood blight, caused by *Calonectria pseudonaviculata*, continued to be a hot topic for arborists, landscapers, and nurserymen because the pathogen had been spreading and caused significant economic losses. Gymnosporangium rusts, including cedar-apple rust caused by *Gymnosporangium juniperi-virginianae* were more severe in 2013 because abundant inoculum was formed on cedar trees due to the wet weather conditions in the spring. High levels of powdery mildew (*Erysiphe pulchra)* and anthracnose (*Discula destructiva*) on established flowering dogwood resulted in slowed new shoot growth and reduced tree vigor. Anthracnose also remained a common foliar disease problem in several other deciduous trees including beech, birch, maple, oak, and hornbeam. Canker diseases made major contributions to dieback of many broadleaf ornamentals, such as Botryosphaeria cankers of ash, crabapple, holly, and rhododendron; and Phomopsis cankers of beech, maple, and rhododendron. Higher than usual incidences of Dutch elm disease were observed on American elm trees in 2012.

Bacterial leaf spot of zinnia

Anthracnose of hosta

Botryosphaeria canker of maple

Fungal leaf spot of mountain laurel

Super Storm Sandy caused severe spray damage on white pine trees along the state's coastline in 2012. Although new shoots came out in the spring of 2013, the damage caused significant reduction in tree vigor and appearance. An outbreak of Diplodia tip blight in the summer of 2012 caused reduced and distorted new growth on two-needled pines in 2013. Rhizosphaera needlecast remained a commonly observed disease in spruce trees. Swiss needlecast along with Rhabdocline needlecast were major disease problems of Douglas-fir on Christmas tree farms and in landscapes. Phytophthora root rot was frequently detected in yew plants that were planted in clay soil with poor drainage.

Vegetables:

Although late blight was confirmed on a few tomato and potato samples, fortunately no widespread outbreaks of this disease were observed in 2012. Septoria leaf spot remained the most common disease of tomato, which caused severe early defoliation and yield losses. Powdery mildew of tomato, which is considered a common disease in greenhouses and high tunnels, was found in field tomatoes. A severe epidemic of tomato anthracnose was observed in 2012 because of the wet weather conditions during tomato fruit development and ripening. Cercospora leaf mold, an uncommon disease of

tomato, was confirmed in a commercial tomato farm. Powdery mildew remained a common problem of cucurbits in both commercial farms and vegetable gardens. Xanthomonas bacterial leaf spot of pepper was commonly observed in commercial farms and vegetable gardens.

Tree and Small Fruit:

Powdery mildew, black rot, and downy mildew continued to be major disease problems on grape. The most important disease of peach was brown rot, which causes twig blight, stem canker, and fruit rot.

Black rot on a grape leaf

Black rot on grape berries

Turf:

Super Storm Sandy caused severe flood damage on lawn grasses in coastal properties. The major disease problems on residential lawns and golf courses were red thread, Rhizoctonia brown patch, summer patch, and melting-out although some minor diseases were found, such as snow mold, powdery mildew, slime mold, anthracnose, rust, and Pythium root rot.

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, pigweed, purslane, spurge, red sorrel, and speedwell. Spreading of true 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 2013, 355 vegetable, 7 lawn, and 6 crop seed samples were submitted to **Dr. Douglas** for testing. **Ms. Inman** tests 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 as of the date of this report, tests for 313 of the 355 vegetable seed samples were completed and 18 seed samples failed label claims for germination. Failures were not retested because of insufficient amounts of seed. To date, of the vegetable samples tested, none contained noxious weed contaminants. Lawn seeds are tested for both germination and purity. Of the 7 lawn seed samples tested, five met label claims for both purity and germination. One sample failed purity but passed germination and another sample failed germination but passed purity. No lawn samples contained noxious weed seeds. Of the 6 crop seed samples tested, all met label claims for purity and germination. No noxious weeds were identified in the samples. A *Station Technical Bulletin* will be 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 38 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 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** 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 conduct trace-forward surveys at the request of USDA-APHIS-PPQ in 2013. **Drs. Douglas** and **Marra** supervise assays for testing samples in conjunction with **Dr. Victoria Smith** (Deputy State Entomologist), who supervised the collection of samples by CAES nursery inspectors. Three trace-forward surveys were authorized to date, which resulted in 14 samples. Samples were pre-screened for all *Phytophthora* species using ELISA or immunostrips. All trace-forward samples processed to date have tested negative for *Phytophthora* species.

Citizen Inquiries

Plant Disease Information Office

Drs. Li and Douglas, assisted by **Ms. Inman**, answered 4,256 inquiries about plant health from Connecticut citizens. Although the majority of inquiries were on ornamentals, trees, and shrubs (65%), other categories, such as food crops (17%) and turf grasses (4%), were also well represented. A moderate percentage of inquiries fell into the miscellaneous category (14%), which included identification of plants and poison ivy control and identification. Although the majority of inquiries were from Connecticut homeowners (63%), there were many inquiries from commercial growers and plant care professionals (31%). Inquiries from cooperative extension, health, news, and agricultural personnel (6%) remained consistent with previous years. A further breakdown of inquiries showed that 41% of the questions came in by phone, 13% came in by mail, 6% came as email, and 40% were brought in person. The number of physical samples handled by the PDIO (53%) continued to exceed the number of phone calls (47%)—this is a trend that has been observed for the past 4 years. Over 790 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 246 questions, tested 145 samples, and made 15 site visits. **Dr. Elmer** made 9 site visits to growers and answered 10 phone calls and 7 emails. **Dr. Ferrandino** answered 44 questions, tested 21 samples, and made 12 site visits. **Dr. Marra** made 2 site visits.

Impact: During the period covered by this Report, over **5,157** 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. Wade H. Elmer co-sponsored two Bedding Plant Meetings with Ms. Leanne Pundt and Dr. Richard McAvoy of the University of Connecticut. Topics included "Update on Managing Insects and Mites on Spring Crops," "Update on Nutrition, Chemical Growth Regulators, and other Production Tips," "Update on Emerging Diseases, Nutrition, and New Fungicides for Spring Crops," and "Update on Pesticide Safety." On 8 February 2013 the meeting was held at the Tolland Cooperative Extension Center in Vernon, CT and on 22 February 2013 the meeting was held at the University of Connecticut, Torrington campus, in Torrington, CT.

Dr. Wade H. Elmer co-organized the *Diagnostic Workshop* sponsored by the Connecticut Greenhouse Grower's Association at Southington High School Vo-Ag Center in Southington, CT (26 June 2013). Dr. Elmer spoke on "Diagnosing and identifying root diseases."

Dr. Robert E. Marra hosted Dr. Rytas Vilgalys, a mycologist from Duke University, to sample white pine root tips for mycorrhizae (19-21 July 2012). Dr. Marra joined Dr. Vilgalys and his team of six (two postdocs, two graduate students, two undergraduates) in trips to two sites in Litchfield County (Nepaug State Forest in New Hartford, and Gold's Pines in Cornwall). Dr. Marra and visitors spent each evening in his labs in the Jenkins Building isolating root tips in preparation for transport back to Duke University.

Dr. Robert E. Marra hosted four agricultural biotechnology scientists from Kazakhstan (accompanied by two interpreters and two US State Department personnel), as the last leg of their tour of the United States organized through the US State Department's International Visitor Leadership Program. The visitors heard presentations by Dr. Marra as well as Drs. James LaMondia, Jason White, Neil Schultes, and Donald Aylor (7 February 2013).

Conference Organizing

Dr. Robert E. Marra, the local member of a three-person organizing and arrangements committee, successfully hosted the annual *Mycological Society of America* meeting that took place in New Haven, at the Omni and at Yale University, 13-18 July 2012. He also organized and assisted with the day-long meeting of the Fungal Environmental Sampling and Informatics Network (FESIN) on 14 July, which took place in the Jones Auditorium, and had 75 attendees. On 15 July, Dr. Marra hosted the MSA Meeting's annual Mycological Foray in West Rock Ridge State Park, with over 100 attendees. The foray was followed by a viewing of collected specimens in the Jones Auditorium.

Dr. Robert E. Marra served on a Steering Committee for the *Connecticut Conference on Natural Resources* from 2005 to present. The Conference was held this year on Monday, 18 March 2013, at the University of Connecticut, Storrs, and was attended by over 200 people.

Invited Talks

Dr. Sharon Douglas was invited to speak at the 64th Annual Educational Conference of the Ontario Chapter of International Society of Arboriculture in Niagara Falls, Ontario, Canada. The title of her presentation was "Key Diseases of Conifers." February 13-15, 2013

Dr. Sharon Douglas was invited to speak at the 2013 Maryland Invasive Species Workshop in Derwood, MD. The title of her presentation was "Boxwood Blight j- The Cionnecticut5 Perspective." March 28, 2013

Dr. Wade H. Elmer was invited to speak at the Fisheries and wildlife Research Institute n St. Petersburg, FL on "Sudden Vegetation Dieback Along Atlantic and Gulf coasts." January 11, 2013

Dr. Wade Elmer was invited to speak at the nited Sates Geological survey Institute in Lafayette, LA on "Sudden Vegetation Dieback Along Atlantic and Gulf Coasts." March 14, 2013

Dr. Robert E. Marra was invited to speak at the New York Botanical Gardens in Bronx, NY. The title of his presentation was "Eight Important Plant Diseases of Eastern North America." September 13, 2012

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 Connecticut, was originally established by the Board of Control in Windsor in 1921 to conduct tobacco research. While research on shade and broadleaf tobacco continues today, the mission of the research unit 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 and structural analyses, conduct outreach to growers and homeowners by speaking to professional and community groups, host informational meetings, and assist students.

RESEARCH ACTIVITIES

Activities on the farm: There were a total of 52 experimental plots at the Windsor farm during the past year. Three Windsor-based scientists had 21 of these plots; six New Haven-based scientists and a University of Connecticut graduate student were using 17 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 and State forests. Farm Manager **James Preste** kept the farm and his 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.

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, discovered at the CAES, and *Laricobius nigrinus* (Coleoptera:Derodontidae), originating from the Pacific North West are the primary biological control agents released for HWA management. Projects 1 & 2 are funded by the USDA Forest Service, Northeastern Area State and Private Forestry as technology development projects.

1) Project: Development of artificial diets for predators of hemlock woolly adelgid

Dr. Carole Cheah, in collaboration with Dr. Allen Cohen of North Carolina State University, Insect Rearing Program, and supported by the USDA Forest Service, conducted final testing of the CC diet. The CC diet is a novel artificial dietary supplement developed by Dr. Cohen, tested by Dr. Cheah, to augment and improve the laboratory mass-rearing and production of adelgid predators, *S. tsugae* and *L. nigrinus*, for improving implementation of biological control of HWA. Currently all mass rearing of predators requires healthy HWA-infested foliage. Supplies of the latter are unpredictable and of variable quality and affected by drought, winter extremes and accessible collection areas and HWA quality and quantity deficiencies often result in high mortalities of predators reared under laboratory conditions. Artificial egg diets developed by Dr. Cohen have resulted in equal or superior results to existing diets used for emergency feeds for HWA adult predators, *S. tsugae* and *L. nigrinus*, when abundant, high quality developing adelgids are not available. The CC diet, supplementing dormant adelgid first instar summer feeding promoted high laboratory survival and reproductive function of adult *S. tsugae*. The derodontid, *L. nigrinus* emerges asynchronously under laboratory conditions from soil pupation at a time when only dormant first instar HWA is available from the field, a stage which is not fed on by these adults. During the mid-late summer, early emergence of adult *L. nigrinus* results in major mortality and is an ongoing challenge for the insectaries rearing this species. In August 2012, Dr. Cheah performed long term, definitive, no choice laboratory tests comparing the CC diet with commercially available wheast (a combination of whey and yeast), in combination with honey, for supplemental feeding to promote survival of early emergent *L. nigrinus*, provided by the NJDA Philip Alampi Beneficial Insect Laboratory. In earlier side-by-side trials, *L. nigrinus* adults had shown preference for CC diet over wheast by 2:1. Weekly monitoring of individual weights on either diet showed that adults maintained on CC diet weighed significantly more than those on wheast. Survival on CC diet supplement was far

superior at 50% after 78 days than that on wheast at 15%. Adults that survived were able to feed normally on developing HWA on return to hemlock foliage. Further survival of 70% was recorded for a group of adult *L. nigrinus* kept on CC diet alone for 30 days in a large container, with access to water but without hemlock foliage or HWA. This technique will translate to improved laboratory survival in storage of mass-reared predators until the optimal time for field release. The CC diet mixed with honey also ensured high adult survival during the shipping of field collections of several predator species. The optimal formulation has been provided to 7 federally supported HWA biological control rearing and collection programs in 7 states as a supplement for optimizing adult predator survival before release for biological control.

S. tsugae and *L. nigrinus* feeding on CC diet and honey

Impact: Significant economic cost savings are expected in predator production, especially in terms of labor and handling costs for foliage collections and enhanced survival of adult predators reared and held prior to release.

2) Quality and Process Control for production of HWA predators

Several laboratories (university, state, federal, and private businesses) mass rear predators of HWA. Often these predator releases have failed to provide the expected levels of HWA control and mortality of predators produced has been high during the rearing process. It is not known if these failures are because of 1) inadequate numbers of predators being released, 2) problems in release techniques, 3) the quality of the predators themselves, or 4) questionable quality of the adelgid prey used for rearing. The QC system consists of several tiers of observation and decision-making: 1) behavioral, 2) biomass and linear measurements, 3) biochemical assessments, and 4) internal morphology. This project is led by Dr. Allen Cohen of North Carolina State University who has developed unique product quality control assessment techniques as a basis for improvement of production and process control for mass-rearing of HWA predators. In 2012-2013, biochemical analyses and biomass measurements were continued by Dr. Cohen on samples of HWA collected by Dr. Cheah from various hemlock sites in Connecticut. Initial results showed that individual adult adelgid dry weights were positively correlated with total protein content while other parameters were less indicative of prey nutritional quality. Nutritional content of

adelgids collected for rearing can be estimated with a laboratory technique to determine the optimal HWA for predator rearing.

Impact: Important parameters which influence the production quality of predators have been defined. These parameters are currently being tested and integrated into a Quality Control system which will enable early detection and correction of production and quality problems, thereby optimizing the efficiency of predator production and biological control of HWA in mass rearing insectaries.

- Improved production and survival of predators reared for biological control of HWA will increase numbers available for release.
- Reduction of HWA by predators used for biological control in infested hemlock forests and landscapes will reduce the usage of pesticides, especially in sensitive riparian ecosystems.
- Reducing forest hemlock mortality from HWA will ensure the sustainability of eastern hemlock, an important foundation ecosystem species for many dependent terrestrial, avian and aquatic species, reduce soil erosion and nutrient leaching, and promote long term carbon sequestration.

HWA status in Connecticut 2013: Field surveys of state lands where hemlocks occur in 2012 and 2013 have shown that HWA has dramatically increased and spread in 2012 into 2013, after a long period of patchy low populations. While the survey of *S. tsugae* release sites has just been initiated in 2013, hemlocks in release sites to date generally have full crowns but some trees are showing decline with reinvasion of HWA. Winter mortality of HWA in 2013 was minimal, ranging from 10-30% and many homeowner enquiries on how to control HWA were received in 2012 and 2013.

Impact: Eastern hemlocks in Connecticut are under increased threats again from rising adelgid resurgence with climate change trends toward warmer winters. Prediction of increased populations will allow timely control measures.

MILE-A-MINUTE WEED 1) Diet development for biological controls of invasive weeds

Mile-a-minute weed, *Persicaria perfoliata,* (MAM) originates from Asia, was first discovered in 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 in 1997 in Greenwich. In Connecticut, 35 towns are currently infested and more towns have reported MAM in the past year. 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. In Connecticut, the weevil has been released in 13 towns.

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

This project is a collaboration between the Experiment Station 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 27,000 weevils have been released to date in 13 towns from 2009-2013. 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 (2013). Further releases are scheduled in more towns in 2013. **Dr. Cheah** has participated in the releases and monitoring of all the release sites since 2009. Weevils have been established at all release sites, survived four 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 4 miles from the nearest release site.

Impacts:

- Weevils have overwintered and established at all 2009-2012 release sites in a variety of different habitats
- 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 will 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.

Releasing weevils in Roxbury, June 2013

Early May weevil feeding damage to MAM, Newtown 2013

C. ELONGATE HEMLOCK SCALE

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. However, *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 2012-2013, Dr. Cheah continued to survey for EHS in Connecticut and collected *C. stigma* in the fall for laboratory experiments.

Hemlock foliage heavily infested with elongate hemlock scale populations

Thinning hemlock crowns with heavy *Fiorinia externa* infestations

With the cooperation of Dr. Philip Stansly of the University of Florida/IFAS, Florida red scale, *Chrysomphalus aonidum*, a preferred prey of *C. stigma*, on infested citrus plants, was shipped to Connecticut to initiate laboratory cultures on butternut squash. The transfer and inoculation techniques have been optimized and current cultures of *C. aonidum* are being augmented. Adult and larvae of *C. stigma* have been shown to feed on *C. aonidum* on butternut squash in preliminary trials. A mealybug culture on butternut squash is also being initiated and will be explored as a potential prey culture for *C. stigma*.

Florida red scale infestations on butternut squash;

C. stigma feeding on *C. aonidium*

Impact: 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 and reduce pesticide usage.

Insect Management

Dr. Richard Cowles trapped spotted wing drosophila (SWD) on August 19, 2011, while monitoring activity of strawberry sap beetles in a grower's field. This was the first detection of this exotic pest in New England. Within approximately 2 months, SWD adults were detected as far north as Maine, and there was approximately $500,000 of damage to fruit crops in southern New England, with especially heavy damage to fall bearing raspberries, day neutral strawberries, late varieties of blueberries, and red wine grapes. Dr. Cowles has since 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.

- a synthetic bait developed by USDA ARS scientist Peter Landolt was found to be superior in field trapping tests to the standard apple cider vinegar bait, and equivalent in Connecticut to a vinegar/grape juice/alcohol bait
- actively fermenting bait was superior to other attractants
- addition of whole wheat flour to an actively fermenting bait improves attractiveness
- carbon dioxide appears to be an important attractant cue for SWD
- in laboratory tests, a high-contrast checkerboard pattern was more attractive than solid colors or stripes
-

Spotted wing drosophila trap.

In addition, Dr. Cowles tested a number of insecticides to manage SWD

- malathion, favored for use against SWD in many states, was found to be mediocre in comparative field and laboratory tests
- acetamiprid was found to be quite effective, along with spinosyns
- the addition of sucrose to the spray mixture significantly enhanced the activity of the insecticides by stimulating feeding activity in the presence of the insecticide
- extension specialists throughout New England are 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 manage SWD

Bed Bug Management

Dr. Richard Cowles continued pyrethroid resistance studies in bed bugs in collaborations with **Dr. Anderson**. Managing pyrethroid resistant bed bugs continues to be a challenge to homeowners and the pest control industry. Silica aerogel dust is highly effective against bed bugs, but requires contact with the bugs. Drs. Cowles and Anderson published their finding that dust formulations of insecticides are highly insecticidal to bed bugs, including a population resistant to pyrethroids. A field trial is under way in subsidized housing units in Minneapolis, in cooperation with a commercial applicator business, to determine whether exclusion from beds and use of silica aerogel dust will be adequate for management of bed bugs.

Drs. Cowles and LaMondia had a patent approved for 'Rubicon' strawberry.

- six commercial nurseries are propagating 'Rubicon' strawberries from virus-free foundation mother plants grown for the Connecticut Agricultural Experiment Station by Nourse Farms

Dr. Cowles collaborated with Rainbow Tree Care and Bartlett Tree companies to conduct a field trial on chemical control of winter moth

- trunk injection with emamectin benzoate and a full cover spray of bifenthrin prior to bud break were found to be effective

Impacts:

- Growers in Connecticut have effective management options prior to experiencing damage

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 subcylindrospora was described in collaboration with mycologists from New Zealand, Thailand and China with De-Wei Li as the corresponding author. The epitype material of *Memnoniella subsimplex* proposed by three EPA microbiologists in 2001 was studied recently. The result showed that the epitification is erroneous due to misidentification of the material they used. A new epitype needs to be designated in the future to correct this error. The designation of a wrong epitype material for *M. subsimplex* is having a huge implication on systematic studies of *Stachybotrys* and *Memnoniella*. The phylogenetic studies using this epitype material conducted in the past 12 years should be re-evaulated and any incorrect phylogenetic relationships of *Stachybotrys* and *Memnoniella* with other allies will need to be corrected. The new species, *Stachybotrys subcylindrospora* has added biodiversity and to our understanding of this difficult and important group.

***Impact*:** These results provide significant information for future research to mycologists and biologists.

New fungal taxa:

Specimens were collected throughout the year indoors and outdoors. **Dr. DeWei Li** identified four fungal species new to science collected from indoor environments and natural substrates. Among these fungi, two were collected from Connecticut. Manuscripts to describe these species are under preparation for publication.

***Impact*:** These identifications and the publication of new species are important additions to fungal biodiversity and biosystematics. The roles of these new species in the ecosystem and different environments remain to be studied.

Indoor mold study:

Dr. Li studied indoor mold and a new species of *Bactrodesmiastrum.* A new record of *Myceliophthora verrucosa* were discovered from the USA.

***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** initiated research shortly after the discovery of this disease to determine fungicide efficacy *in vitro* and in plant systems as a first step in the development of disease management tactics. *Calonectria pseudonaviculata* causes leaf spot and stem lesions resulting in defoliation and dieback of boxwood. Fungicides representing twenty different active ingredients from 13 different FRAC groups were evaluated for their effects on conidial germination and mycelial growth using *in vitro* assays and EC_{85} values were determined. A number of fungicides strongly inhibited mycelial growth of *C. pseudonaviculata*. Four demethylation inhibitor fungicides had EC_{85} values of 1.2 µg ai/ml or less. Thiophanate-methyl, fludioxonil, pyraclostrobin, trifloxystrobin, kresoxim-methyl, mancozeb and chlorothalonil also had activity against mycelial growth. Fludioxonil plus cyprodinil had a lower EC_{85} than the same rate of fludioxonil alone, suggesting that cyprodinil had activity against mycelial growth. Fungicides that inhibited *C. pseudonaviculata* conidial germination include pyraclostrobin, trifloxystrobin and kresoxim-methyl as well as fludioxonil, mancozeb, chlorothalonil and boscalid. Quinoxyfen, etridiazole, fenhexamid, hymexazol, famoxadone and cymoxanil did not inhibit either *C. pseudonaviculata* conidial germination or mycelial growth. In comparison to values found in the literature, EC_{50} values for kresoxim-methyl were up to 10 times higher than reported previously, suggesting that fungicide insensitivity may have developed. Protectant fungicides with activity against conidial germination and systemic fungicides with activity against mycelial growth, such as those identified here, may be complementary to achieve the high levels of pathogen management required for control of this disease. In addition, multiple fungicide active ingredients from different mode of action groups used in mixtures or over time may also act to slow selection for fungicide insensitivity.

Management of *Cylindrocladium pseudonaviculatum* on true dwarf boxwood by fungicides. No fungicide control on left.

In planta: A series of greenhouse and container nursery experiments were conducted based on the results of our previous *in vitro* evaluation of fungicide active ingredients against *Calonectria pseudonaviculata* conidial germination and mycelial growth. A number of individual 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. We evaluated disease control on liners, 1-gallon and 3-gallon boxwoods. Boxwood species and cultivars included common boxwood, Green Mountain, Green Velvet, Korean, Winter Gem and True dwarf. Plants were typically inoculated with the pathogen 48 hours after fungicide application (which occurred 3 times at 14-day intervals) and numbers of disease lesions and number of leaves counted. We also tested either thiophanate-methyl or propiconazole alone or in combination with the protectant fungicides pyraclostrobin, fludioxonil, kresoxim-methyl, or chlorothalonil for enhanced activity in combination using the same approach. Our results indicated that boxwood blight management was most successful using a combination of systemic plus protectant fungicides. Boxwood blight was most severe on True dwarf, common boxwood, and Green Velvet. The least amount of disease occurred on Korean boxwood.

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

Salt tolerance of root-knot nematodes.

The root-knot nematode *Meloidogyne spartinae* is a parasite of smooth cordgrass, *Spartina alterniflora*, with a distribution from Florida to Maine and has been associated with sudden vegetation dieback (SVD) of *S. alterniflora* in tidal marshes in Connecticut, Massachusetts and Maine. No single cause has been determined for SVD, but *Fusarium* spp., root-knot nematodes, abiotic factors such as drought and salinity, and herbivory have all been associated with the syndrome. The role of each stressor and possible interactions of stressors in SVD have yet to be determined. The *S. alterniflora* grass and the pathogens in the intertidal marsh areas along marsh creek banks have greater exposure to a range of salinity than in other areas due to freshwater rainfall and drying of salt water. **Dr. LaMondia** conducted experiments to investigate the ability of *M. spartinae* to survive a wide range of salinity over time. The common terrestrial northern root-knot nematode *M. hapla* is closely related genetically to *M. spartinae* and was used in the same experiments for comparison. Juveniles of *M. spartinae* were collected after dissection of naturally infected *S. alterniflora* root galls and *M. hapla* juveniles were recovered from egg masses taken from greenhouse grown *Lobelia*. Juveniles of both species were placed in separate covered counting dishes in 5 ml of 0.0 (distilled water), 0.1, 0.3, 0.5 0.7 and 1.0 M (roughly 1.6 × sea water) NaCl concentrations. Nematode viability was determined after 1, 5 and 12 days by observation of motility. Non-motile nematodes were probed with a pick to encourage movement when evaluating survival. *M. hapla* survived best in distilled water and did not survive past two weeks exposure to 0.3 M NaCl. Maximum survival of *M. hapla* was 100% of juveniles examined. *M. spartinae* survived at all

concentrations tested for at least 12 days; maximum survival was 83.5% of juveniles examined, and survival was approximately 60% or greater in salinity ranging from distilled water to 0.5 M NaCl for all times tested, and up to five days at 0.7 M or one day at 1.0 M. These findings are consistent with the hypothesis that marine organisms in the upper tidal zone that are exposed to extremes in salinity must be able to osmoregulate to withstand a wide range of salinity.

Impact: This research concerning the ecology and fitness of salt marsh pathogens will assist in determination of the role of pathogens in sudden vegetation dieback.

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, a devastating disease caused by a bacterial plant pathogen. Wildfire was eventually eliminated by the development of plant resistance, and ever since, tobacco breeding to incorporate genetic plant resistance to plant pathogens has been ongoing. 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 or even wipe out 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 the tobacco pathogens: *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. Last year 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 root rot, caused by the fungus *Thielaviopsis basicola* has been damaging and increasing in impact in recent years with cool wet springs. We obtained three sources of dark wrapper tobacco with high levels of black root rot resistance from cooperating scientists in Kentucky. A back-cross program is being used to transfer resistance to CT broadleaf. Resistance has been transferred and 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.

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 $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. These same fungicides are widely used in vegetables and our results may have additional impacts. The strategy tested investigated 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.

Blue mold symptoms on a tobacco leaf.

SERVICE ACTIVITIES

Requests for information

A total of 6,294 inquiries were answered at the Valley Laboratory during the past year. The majority of these queries (87%) were answered by **Dr. Mervosh** (2,662) and **Ms. Rose Hiskes** (980) in the inquiry office or by **Dr. LaMondia** (1,824 – 85% commercial). About 59% of the information requests to the inquiry office were from the public sector; the remainder was from commercial growers (33%), government (5%), and nonprofit, educational or other (3%).

Valley Lab scientists made more than 90 presentations to grower, professional and citizen groups, (over 5,000 people), were interviewed 16 times and made 238 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 diagnostics for 224 nematode 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 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 for remediation.

Soil testing

A total of 5,215 soil tests were expertly performed by **Ms. Diane Riddle** during the past year. About 73% were performed for commercial growers, 24% for homeowners, 2% for municipalities, and the remainder for Station research. Of the commercial samples submitted, 73% were for landscapers; 10% for tobacco growers; 7% for vegetable growers, 3% for nursery growers; 3% for golf course superintendents; and 1% for Christmas tree growers. Diane Riddle also conducted inspections to maintain USDA APHIS Authorized Official Certification.

Gordon S. Taylor Conference Room

Many agricultural organizations used the conference room at the Valley Laboratory regularly for their meetings. During the past year 12 different groups used the room on 34 occasions. Our most frequent users were the Connecticut Department of Agriculture, Connecticut Rhododendron Society, Connecticut Invasive Plants Working Group, Connecticut Farmland Trust, Connecticut Nursery and

Landscape association, Connecticut Christmas Tree Growers Association, Co-operative Agricultural Pest Survey, Suffield Land Conservancy and the Forest Pest Working Group. **Ms. Jane Canepa-Morrison** scheduled the meetings and **James Preste** arranged the furniture and ensured that the room was available after hours.

TECHNICAL BULLETINS PUBLISHED DURING 2012-2013

#8 Seed Germination and Purity Analysis 2012. 15 pages. Sharon M. Douglas and Mary K. Inman. (November 2012)

#9 Seed Germination and Purity Analysis 2013. 15 pages. Sharon M. Douglas and Mary K. Inman. (September 2013)

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