# THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

# *Record of the Year*

2005-2006

The Connecticut Agricultural Experiment Station, founded in 1875, was the first 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, and the Valley Laboratory and farm on Cook Hill Road, Windsor 06095. 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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# *INTRODUCTION*

During the past year, there were numerous advances in scientific knowledge. Thousands of state residents received information on trees, crops, medically important arthropods, insect and plant pathogen pests, invasive plants, and soil analyses. New equipment was purchased for the Department of Analytical Chemistry, and persons were trained to participate in the Food Emergency Response Network. Hundreds of food samples were tested for unwanted chemicals. Staff members who work in diagnostic laboratories in the Department of Plant Pathology and Ecology are officially contributing to the National Plant Diagnostic Network. Molecular testing of plant tissues for the DNA of the organism that causes Ramorum blight (Sudden Oak Death) is being relied on to detect the plant pathogen. Forests are surveyed for emerging pest problems.

Research programs, which have high public interest, are being further developed. Soybeans and rapeseed are being grown for possible biodiesel fuel production in the state. These plants offer added value because they can be used for feedstock, as cover crops, fertilizer, or to control plant parasitic nematodes. Community gardens are providing urban and suburban residents with fresh vegetables. Moreover, more than 110,000 mosquitoes were analyzed for West Nile and other encephalitis viruses during this reporting period. New crops, such as personal-sized watermelons, jilo, plums, grapes, and calabaza squash, are being evaluated at both research farms.

Scientists and other staff members have been very active in enhancing our outreach programs. Numerous scientific publications report on new findings. Articles are written for the public as well as scientists. Hundreds of talks and interviews were given to civic groups and reporters to disseminate new technological information. The Station's popular website received more than 1.3 million successful hits.

This Record of the Year reports on a wide range of research topics of interest to a broad base of stakeholders and clearly demonstrates the dedication of the staff. The report has a new look with color pictures to enhance interest.

Louis A. Magnarelli
Director

## *BOARD OF CONTROL*

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

The members of the Board of Control as of June 30, 2006 were

Governor M. Jodi Rell, President
Norma O'Leary, Vice President
Leon Zapadka, Secretary
Louis A. Magnarelli, Director
Commissioner F. Philip Prelli
Dr. Stephen L. Dellaporta
Terry Jones
Dr. Johan C. Varekamp

The Board of Control met on August 3, 2005, October 19, 2005, January 24, 2006, and April 19, 2006.

There were several changes to the Board of Control in 2005-2006. John Lyman, III and Dr. Donald Oliver retired from the Board. Mr. Lyman was replaced by Terry Jones. Dr. Oliver was replaced by Dr. Johan C. Varekamp. A new Commissioner of Agriculture was named in 2005 –F. Philip Prelli. Norma O'Leary replaced Mr. Lyman as Vice-President of the Board. Leon Zapadka replaced Norma O'Leary as Secretary of the Board.

# *STATION STAFF*

The experiment station exists to advance the frontiers of knowledge for mankind, and that advance depends completely upon the quality of its staff. The following was the staff of The Connecticut Agricultural Experiment Station as of June 30, 2006.

## ADMINISTRATION

Dr. Louis A. Magnarelli, Director
Dr. Kirby C. Stafford, III, Vice Director
Michael Last, Chief of Services
Dianne Albertini
Vickie Bomba-Lewandoski
Joan Bravo
Joan Ives-Parisi
Lisa Kaczenski
Roberta Milano-Ottenbreit
Kathryn Soleski

## ANALYTICAL CHEMISTRY

Dr. MaryJane Incorvia Mattina, Department Head
Terri Arsenault
Dr. Brian D. Eitzer
Dr. Lester Hankin, Emeritus
William Iannucci-Berger
Dr. Walter J. Krol
Craig L. Musante
Melissa L. Perrotti
Mamie O. Pyles
Dr. Christina S. Robb
Dr. David E. Stilwell

## BIOCHEMISTRY & GENETICS

Dr. Neil A. McHale, Department Head
Dr. Johan R. Barker-Astrom
Carol R. Clark
Dr. Douglas W. Dingman
Regan Huntley
Cynthia Musante
Dr. Richard B. Peterson
Dr. Neil P. Schultes
Dr. Israel Zelitch, Emeritus

## BUILDINGS AND MAINTENANCE

Bancroft Nicholson, Supervisor
Kareem Dixon
Alfred Gagliardi
Gloria Mach
Ralph Russell
Michael Scott

## ENTOMOLOGY

Dr. Kirby C. Stafford, III, Department Head
Elizabeth E. Alves
Dr. John F. Anderson, Distinguished Scientist
Dr. Anuja Bharadwaj
Rosemarie J. Bonito
Dr. Carole Cheah
Alyson A. Florek
Terrill D. Goodman
Bonnie L. Hamid
Ira J. Kettle
Morgan F. Lowry
Dr. Chris T. Maier
Tia M. Mastrone
Michael J. Misencki
Tanya Petruff
Angela B. Penna
Gale E. Ridge
Dr. Claire E. Rutledge
Stephen J. Sandrey
Eleanor Clare Secker-Walker
Dr. Victoria L. Smith
Dr. Kimberly A. Stoner
Heidi Stuber
Erin S Sturgis
Peter W. Trenchard
Michael P. Vasil
Kenneth A. Welch
Tracy Zarillo

## FORESTRY & HORTICULTURE

Dr. Jeffrey S. Ward, Department Head
Joseph P. Barsky
Dr. Martin P. N. Gent
Dr. Abigail A. Maynard
Dr. William R. Nail
Michael R. Short
Dr. Paul E. Waggoner, Distinguished Scientist
Scott C. Williams

## LOCKWOOD FARM

Richard M. Cecarelli, Farm Manager
Rollin J. Hannan, Jr.
Heide Mizak

## PLANT PATHOLOGY & ECOLOGY

Dr. Donald E. Aylor, Department Head
Dr. Sandra L. Anagnostakis
Dr. Matthew T. Boehm
Mary K. Boucher

Sandra E. Carney
Jason Corwin
Dr. Sharon M. Douglas
Dr. Wade H. Elmer
Dr. Francis J. Ferrandino
Evan M. Lowery
Dr. Robert E. Marra
Brian T. Skelly
Pamela Sletten
Peter W. Thiel

## SOIL & WATER

Dr. Theodore G. Andreadis, Department Head
Dr. Phillip M. Armstrong
Gregory J. Bugbee
Dr. Robert S. Capers
Kirsten Deeds
Shannon L. Finan
Dr. Charles R. Frink, Emeritus
Dr. Seokjoon Kwon
Dr. Michelle D. Marko
Dr. Goudarz Molaei
Dr. Joseph J. Pignatello
Roslyn S. Selsky
John J. Shepard
Michael C. Thomas
Dr. Charles R. Vossbrinck
Dr. Jason C. White

## VALLEY LABORATORY

Dr. James A. LaMondia, Department Head
Timothy M. Abbey
Jane Canepa-Morrison
Dr. Richard Cowles
Jeffrey M. Fengler
Rose T. Hiskes
Richard W. Horvath
Dr. Dewei Li
Dr. Todd L. Mervosh
James Preste
Thomas M. Rathier
John S. Winiarski

## *PLANT SCIENCE DAY 2005*

An extremely hot, humid day was on tap for Plant Science Day 2005. 1,017 visitors participated in the day's activities at Lockwood Farm.

There was good attendance at the following short talks and demonstrations:

| | |
|---|---|
| Gregory J. Bugbee | Lawn Fertilizer and the Environment |
| William R. Nail | Wine Grape Culture in Connecticut |
| Claire E. Rutledge | Biology and Management Strategies for Wood-Boring Insects |
| Brian D. Eitzer | Chromatography and Spectroscopy: Tools of the Analytical Chemist |
| Jeffrey S. Ward | Challenges Met in Connecticut Forest Research |
| Francis J. Ferrandino | Nectria Canker on Black Birch: The Future of Connecticut's Forests |
| James A. LaMondia | Rotation and Green Manure Crops for Nematode Control |
| Timothy M. Abbey | Ecological Landscaping with Native Ornamental Plants |

The following Barn Exhibits were very popular and well attended:

Using Chromatography and Spectroscopy in the Department of Analytical Chemistry
Investigators: Brian Eitzer, MaryJane Incorvia Mattina, Dave Stilwell, and Walter Krol
Assisted by: Craig Musante, Terri Arsenault, and William Iannucci-Berger

Growing Hydroponic Tomatoes
Investigator: Martin Gent
Assisted by: Michael Short and Jim McDonald

Exotic Weeds in Connecticut Lakes
Investigators: Greg Bugbee, Robert Capers, Kirsten Deeds, Roslyn Selsky, Charles Vossbrinck, and Jason White
Assisted by: Alicia Bridgewater, Phil Nista, and Brandon Russell

Cover Crops and the Insects That Live in Them
Investigators: Kimberly Stoner and Wade Elmer
Assisted by: Erin Amezzane, Tracy Zarrillo, Morgan Lowry, and Elizabeth O'Dowd

Ramorum Blight (Sudden Oak Death): Is Connecticut at Risk?
Investigators: Bob Marra and Sharon Douglas

Genetic Engineering of Photosynthesis
Investigators: Richard B. Peterson, Neil P. Schultes, and Neil A. McHale
Assisted by: Carol Clark and Regan Huntley

For the first time, Pesticide Credits were available to those who participated in a guided tour of selected Barn Exhibits and Field Plots. Participants met at the Registration Desk just after noontime. The tour was conducted by Thomas M. Rathier. Stops on the tour included:

Ramorum Blight (SuddenOak Death): Is *Phytophthora Ramorum* a Risk to Connecticut Forests and Landscapes? – presented by Robert Marra and Sharon Douglas

Chemical Control of Hemlock Woolly Adelgid – presented by Richard Cowles

Alien Insects Recently Discovered in Connecticut – presented by Chris Maier

Fusarium (Cultivar Evaluation of Fusarium Wilt of China Asters, Fusarium Corm Rot of Gladiolus, Fusarium Wilt of Basil, and Influence of Earthworms on Fusarium Wilt of Tomato) – presented by Wade Elmer

In an effort to interest children in science and agriculture two programs were offered for the first time at Plant Science Day in 2005:

PASSPORT FOR CHILDREN: This was a special event for children to enjoy and explore Plant Science Day. There were six different stations located throughout the farm that they visited and received a special stamp for their passport. Once the passport was filled, they visited the Registration Desk and received a prize.

PASSPORT FOR BROWNIES: Brownies were invited to complete four activities spread over the farm, and once completed, they receive the Plants Try-It Prize at the Girl Scout tent.

Visitors made their way through the following field plots. The plots are planted and maintained by Station scientists with help from Farm Manager Richard Cecarelli and his assistant Rollin Hannan. Together with summer farm helpers, they prepared Lockwood Farm for the hundreds of visitors that attended Plant Science Day.

CHINESE CHESTNUT TREES. Sandra Anagnostakis, assisted by Pamela Sletten
SHEET COMPOSTING WITH OAK AND MAPLE LEAVES. Abigail Maynard and David Hill, assisted by C. Maxwell
ANNUAL CULTURE OF GLOBE ARTICHOKES. Abigail Maynard and David Hill, assisted by C. Maxwell
JILO TRIALS. Abigail Maynard and David Hill, assisted by C. Maxwell

HEIRLOOM TOMATO TRIALS. Abigail Maynard and David Hill, assisted by C. Maxwell
SOUND SCHOOL AGRICULTURAL SCIENCE PROGRAM. Students from the Sound School
CALABAZA SQUASH. Abigail Maynard and David Hill, assisted by C. Maxwell
EFFECT OF SHADE ON QUALITY OF GREENHOUSE TOMATO. Martin Gent, assisted by Michael Short, J. McDonald
UTILIZATION OF COMPOST IN ONION AND LEEK PRODUCTION. Abigail Maynard and David Hill, assisted by C. Maxwell
MONITORING CABBAGE MAGGOT OVIPOSITION IN TURNIP AND RADISH. Kimberly Stoner, assisted by Erin Amezzane, Tracy Zarillo, Morgan Lowry
CHEMICAL CONTROL OF HEMLOCK WOOLLY ADELGID. Richard Cowles, Carole Cheah, and M. Montgomery
BIOLOGICAL CONTROL OF THE HEMLOCK WOOLLY ADELGID. Carole Cheah, assisted by J. Preste
HYBRID WINE GRAPE VARIETY TRIAL. William Nail, assisted by C. Maxwell
WEST NILE VIRUS IN TREE CANOPY, GROUND LEVEL, AND SUBTERRANEAN HABITATS. John Anderson, Andrew Main, and Theodore Andreadis, assisted by Terry Goodman, Bonnie Hamid, Michael Vasil, Tanya Petruff, Clare Secker-Walker, Leigh Cash, and L. Haibi
COMPOSTING LEAVES USING THE STATIC PILE METHOD. Abigail Maynard and David Hill, assisted by C. Maxwell
CONTROL OF BLIGHT ON AMERICAN CHESTNUTS. Sandra Anagnostakis, assisted by Pamela Sletten
NEW HYBRID CHESTNUT ORCHARD. Sandra Anagnostakis, assisted by Pamela Sletten
EFFECT OF EARTHWORMS ON SOILBORNE DISEASE. Wade Elmer, assisted by Joan Bravo and K. Evancha
QUESTION AND ANSWER TENT. Sharon Douglas, Thomas Rathier, Gale Ridge, Mary Inman, Rose Hiskes, and Jon Winiarski
CAES WEATHER STATION. Part of the NOAA Cooperative Weather Observer Network
ALIEN INSECTS RECENTLY DISCOVERED IN CONNECTICUT. Chris Maier, assisted by J. Daigler, Morgan Lowry, M. Wohstrom, S. Zappulla, and Tracy Zarrillo
ORCHARD CHESTNUTS. Sandra Anagnostakis, assisted by Pamela Sletten
PHYTOREMEDIATION OF AGRICULTURAL SOILS CONTAMINATED WITH DDE. Jason White, assisted by A. Bridgewater
DISPERSAL OF CORN POLLEN IN THE ATMOSPHERE. Donald Aylor and Matthew Boehm, assisted by Peter Thiel and Evan Lowery
HYDROPHOBIC MICROPORES IN SOIL PARTICLES GO UNDETECTED BY THE TRADITIONAL MOLECULAR PROBE, NITROGEN GAS. Joseph Pignatello and Seokjoon Kwon
GIRL SCOUT TENT. Girl Scout and Brownie leaders and members
EXPERIMENT STATION ASSOCIATES. Board members of the Experiment Station Associates
SPIDERS OF CONNECTICUT. Charles Vossbrinck

MOSQUITO SURVEILLANCE FOR WEST NILE VIRUS. Theodore Andreadis and Philip Armstrong, assisted by John Shepard, Michael Thomas, S. Finan, T. Burke, E. Calandrella, M. Calandrella, T. Cloherty, R. Duffy, K. Hendrickson, D. Krause, E. McClure, R. O'Neil, C. Pioli, and D. Robertson

PERSONAL-SIZED WATERMELON VARIETY TRIALS. Abigail Maynard and David Hill, assisted by C. Maxwell

RELEASE AND DISPERSAL OF BASIDIOSPORES FROM BASIDIOMATA OF *AMANITA MUSCARIA* VAR. *ALBA* AND THEIR INFILTRATION TO A RESIDENCE. DeWei Li

CONNECTICUT WEEDS AND WILD PLANTS. Todd Mervosh, assisted by K. Olszewski

PLANT HEALTH CARE FOR THE CONNECTICUT NURSERY AND LANDSCAPING INDUSTRIES. Timothy Abbey

NON-CHEMICAL PLANT DISEASE CONTROL WITH PLANT RESISTANCE. James LaMondia, assisted by Jane Canepa-Morrison

THE "DEER" TICK *IXODES SCAPULARIS*. Kirby C. Stafford, III, assisted by Anuja Bharadwaj, Heidi Stuber, Joseph P. Barsky, C. Stoehr, T. Borgstrom, G. Dunford, and L. Colligan

USE OF A RODENT BAITBOX FOR THE CONTROL OF THE "DEER" TICK. Kirby C. Stafford, III, assisted by Anuja Bharadwaj, Heidi Stuber, Joseph P. Barsky, C. Stoehr, T. Borgstrom, G. Dunford, and L. Colligan

USE OF AN ENTOMOPATHOGENIC FUNGUS FOR CONTROL OF THE "DEER" TICK. Anuja Bharadwaj and Kirby C. Stafford, III, assisted by Heidi Stuber

IMPROVED DIAGNOSTIC TESTS FOR LYME DISEASE IN CATTLE. Louis A. Magnarelli, S. Bushmich (University of Connecticut), J. IJdo (Yale University), and E. Fikrig (Yale University), assisted by Tia Mastrone

LYME DISEASE IN TICKS FROM CONNECTICUT CITIZENS. John F. Anderson, assisted by Bonnie Hamid, Elizabeth Alves, and Michelle Guidone

PROTECTING CONNECTICUT'S LAKES AND PONDS FROM NONNATIVE WEEDS. Greg Bugbee, Robert Capers, Charles Vossbrinck, and Jason C. White, assisted by Roslyn Selsky, K. Deeds, A. Bridgewater, P. Nista, and B. Russell

NON-LETHAL REPRODUCTIVE CONTROL OF WHITE-TAILED DEER. Scott Williams

WHITE-TAILED DEER AND INVASIVE PLANTS. Scott Williams and Jeffrey Ward

MILK AS A CONTROL FOR POWDERY MILDEW ON PUMPKIN, SQUASH, AND MUSKMELON. Francis Ferrandino and Victoria Smith

MINIMUM FERTILIZATION FOR HOME GARDENS AMENDED BY LEAF COMPOST. Abigail Maynard and David Hill, assisted by C. Maxwell

ORGANIC AGRICULTURE AND LAND CARE IN CONNECTICUT. William Duesing of The Northeast Organic Farming Association of Connecticut (CT NOFA)

CONNECTICUT FARMLAND TRUST. E. Moore, Connecticut Farmland Trust (CFT)

USDA, ANIMAL AND PLANT HEALTH INSPECTION SERVICE, PLANT PROTECTION AND QUARANTINE. E. Chamberlain, N. Campbell, and K. Aitkenhead, (APHIS-PPQ)

INVASIVE PLANTS OF CONNECTICUT. D. Ellis and E. Corrigan of CT Invasive Plant Working Group

NEW HAVEN LAND TRUST. C. Benoit
USDA FARM SERVICE AGENCY. J. Breakell
CONNECTICUT DEPARTMENT OF AGRICULTURE – MARKETING BUREAU. R. Olsen
SOUTHWEST CONSERVATION DISTRICT. J. DeRisi
USDA FOREST SERVICE, NORTHEAST RESEARCH STATION. R. Nisley
CONNECTICUT PRE-ENGINEERING PROGRAM. M. Coehlo
THE CONNECTICUT FOREST AND PARK ASSOCIATION. P. Pendergast
THE CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF FORESTRY. Chris Donnelly
CONNECTICUT TREE PROTECTIVE ASSOCIATION. Rita Smith and D. Parrott
NATIVE WOODY SHRUBS. Jeffrey Ward, assisted by Joseph P. Barsky
BIRD AND BUTTERFLY GARDEN. Maintained by the Spring Glen Garden Club – created by Landscape Designer Anne Bell, L. Starr, and B. Payton, assisted throughout the year by Station staff Richard Cecarelli, Lockwood Farm staff and Rose Bonito
CONNECTICUT NURSERYMEN'S GARDEN. Plants donated by members of the Connecticut Nurserymen's Association and planted in 1986-87.
NURSERY AND BEE INSPECTIONS. Victoria Smith, Jeff Fengler, Ira Kettle, Steve Sandrey, and Peter Trenchard.
CHESTNUT SPECIES AND HYBRIDS. Sandra Anagnostakis, assisted by Pamela Sletten
DENSE PLANTING OF AMERICAN CHESTNUTS. Sandra Anagnostakis, assisted by Pamela Sletten
DWARF HYBRID CHESTNUT TREES. Sandra Anagnostakis, assisted by Pamela Sletten
INSECTARY PLANTINGS OF FLOWERS TO ATTRACT BENEFICIAL INSECTS. Kimberly Stoner, assisted by Erin Amezzane, Tracy Zarrillo, and Morgan Lowry
MILK AS A CONTROL FOR POWDERY MILDEW ON TOMATO AND ZINNIA. Francis Ferrandino and Victoria Smith
CAULIFLOWER TRIALS. Abigail Maynard and David Hill, assisted by C. Maxwell
RESISTANCE TO *FUSARIUM* WILT OF CHINA ASTERS. Wade Elmer, assisted by Joan Bravo and K. Evancha
*FUSARIUM* WILT OF TOMATO. Wade Elmer, assisted by Joan Bravo and K. Vancha
BIOLOGICAL AND CHEMICAL SUPPRESSION OF FUSARIUM CORM ROT OF GLADIOLUS. Wade Elmer, assisted by Joan Bravo and K. Evancha
*FUSARIUM* WILT OF BASIL. Wade Elmer, assisted by Joan Bravo and K. Evancha
ROCKY HILL AMERICAN CHESTNUT TREES. Sandra Anagnostakis, assisted by Pamela Sletten
PLANTING OF PINOT GRIS GRAPES. William Nail, assisted by C. Maxwell
PAWPAW AND JAPANESE PLUM VARIETY TRIALS. Abigail Maynard and David Hill, assisted by C. Maxwell
WHITE BIRCH RESEARCH ORCHARD. Claire Rutledge
BEACH PLUM TRIALS. Abigail Maynard and David Hill, assisted by C. Maxwell

Tents were set up and other physical arrangements were made by Fred Gagliardi, Ralph Russell, Kareem Dixon, and Michael Scott under the direction of Bancroft Nicholson of

the Maintenance Department, by Richard Cecarelli and Rollin Hannan of the Farm Crew, and by Roberta M.-Ottenbreit of Administration.

At 11:30AM Dr. Louis A. Magnarelli, Director, welcomed visitors to Plant Science Day 2005.

The Century Farm Award was presented to the Tuller family of Tulmeadow Farm in West Simsbury, Connecticut by former Director Dr. John F. Anderson

Members of the Tuller family have been farming the land in West Simsbury continuously since 1768. Tulmeadow Farm, at 255 Farms Village Road, is currently operated by cousins Oliver "Buzz" Tuller, Jr. and Don Tuller. The 265-acre farm, comprised of fields and woodland, provides rural character to the village of West Simsbury.

Like many New England farms, diversification and changing with the times have been critical to the survival of the Tulmeadow Farm the last 237 years. Dairy production was a major focus until recently. Other past activities included poultry (meat and eggs), broadleaf tobacco, apples, charcoal and cider brandy production, and sand and gravel sales.

Today, sweet corn, tomatoes, greenhouse crops, and other farm-raised produce are marketed at the farm store. In addition, other local fruits, vegetables, food products, plants, and Christmas trees are sold. Premium ice cream is produced and sold at the farm, bringing approximately 90,000 visitors to the farm annually. Hay and beef production are developing product lines.

The Tullers recently sold the development rights on part of the farm to the Simsbury Land Trust. This will enable Tulmeadow Farm to continue for future generations.

The Tullers are active in agricultural organizations, including the Farm Service Agency Board and the Connecticut Farm Bureau, and belong to the Connecticut Greenhouse Growers Association.


Adam R. Moore, Executive Director of the Connecticut Forest and Park Association
Samuel W. Johnson Lecturer, 2005

After the Century Farm Award was presented, Dr. Magnarelli introduced Adam R. Moore, Executive Director of the Connecticut Forest and Park Association who gave the Samuel W. Johnson lecture entitled "Connecticut and the Forefront of Forestry". After his talk, Dr. Magnarelli presented Mr. Moore with a certificate signed by Governor M. Jodi Rell, President of the Board of Control, Leon Zapadka, Secretary of the Board, and himself as Director.

Following the Samuel W. Johnson Lecture, Dr. Magnarelli introduced Otto Schaefer, President of the Experiment Station Associates, who spoke on the activities of the Associates and invited visitors to join.

The combined efforts of the entire staff - Professional, Technical, Clerical, Administrative, Maintenance, and Farm staff - all made Plant Science Day 2005 the successful day it was.

## *EVENTS HELD AT THE STATION*

### Visit by Congresswoman Rosa DeLauro

On July 7, 2005 Congresswoman Rosa DeLauro and a few members of her staff visited the Station. Station scientists reported on the research being conducted on West Nile virus and Aquatic Invasive Weeds. Congresswoman DeLauro then held a press conference announcing her intentions to get funding for the Station to renovate Jenkins Building. A tour was given to Congresswoman DeLauro highlighting the BSL3 Virus Laboratory, the Department of Biochemistry and Genetics, and the Department of Analytical Chemistry. Congresswoman DeLauro and her staff stayed for lunch and visited with all on the staff who attended.

Rosa DeLauro speaking at a visit she made on July 7, 2005

### Plant Science Day in the Spring

On April 20, 2006 Plant Science Day in the Spring was held in Jones Auditorium. There were eighty-seven attendees. Gregory Bugbee was on hand to answer soil and turf questions, Gale Ridge identified insects and answered questions on how to control them, Dr. Sharon Douglas was available to visitors needing advice on plant diseases and plant identification and weed control, and Joan Bravo manned the publications table. Mobile labs were brought to the Station by the DEP and the CT National Guard for attendees to tour. Joseph Barsky and John Shepard assisted in the tours of those labs. Vickie Bomba-Lewandoski hosted the afternoon and introduced speakers and directed attendees to tour guides who then took them around to the various laboratories. The Department of Analytical Chemistry was featured and talks were given by Dr. MaryJane Incorvia Mattina who gave an overview of work done in the Department of Analytical Chemistry and then spoke on "Safeguarding the Nation's Food Supply – and More". Dr. David Stilwell and Craig Musante presented "CCA Pressure Treated Wood in the House and Garden", and Dr. Walter Krol and Terri Arsenault presented "Pesticide Residues in Food – Keeping Current with New Products". After the talks, visitors were guided to laboratories by Regan Huntley, Lisa Kaczenski, Tia Mastrone, and Heidi Stuber. Dr. Mattina and the staff of Analytical Chemistry explained some of the equipment in the

department. Dr. John F. Anderson spoke to visitors from outside the BSL-3 laboratory and explained the
work with mosquitoes and viruses that goes on inside. Dr. Sharon Douglas and Dr. Robert Marra introduced visitors to the newly renovated Molecular Plant Diagnostics Laboratory in the Plant Pathology and Ecology Department and explained the work that goes on there.

## *EVENTS HELD AT THE VALLEY LABORATORY*

### Nursery and Landscape Research Tour

Over 45 Nursery and Landscape professionals attended the annual Nursery and Landscape Research Tour at the Valley Laboratory on July 19, 2005. After being welcomed by Tom Rathier, the group toured the following research plots and displays: conifer transplant survival and nutrition, Tom Rathier; Managing horsetail in landscapes, Todd Mervosh; Use of hydrogen dioxide in landscape soils, Tom Rathier; CAES/CNLA education gardens, Rose Hiskes; Connecticut weed display, Todd Mervosh, Krystle Olszewski, and Dorothy Reiss; Connecticut insect pests display, Rose Hiskes; Exotic pests display, Victoria Smith; Weed management in container grown plants, Todd Mervosh; Inspection procedures for sudden oak death, Victoria Smith. The meeting concluded with the following short talks: Detecting and managing emerald ash borer and Asian longhorn beetle, Claire Rutledge; Managing Japanese knotweed and phragmites, Todd Mervosh; Native plants for Connecticut landscapes, Tim Abbey; Arthropod and pesticides update, Tim Abbey; and Disease/cultural problems update, Tom Rathier. Richard Horvath, Matt Deltenre, Nick Sikorski, Jane Morrison, and John Winiarski provided support for the meeting.

### Christmas Tree Twilight Meeting

Over 65 Christmas tree growers and professionals attended the annual Christmas tree twilight meeting on July 19, 2005 at the Valley Laboratory. The group heard the following presentations: Managing disease and non-disease problems of conifers, Sharon Douglas; Conifer nutrition, Tom Rathier; Managing insects and mites, Tom Rathier; Managing weeds in Christmas tree plantations, Todd Mervosh; Connecticut weed display, Todd Mervosh, Krystle Olszewski and Dorothy Reiss. Richard Horvath, Matt Deltenre, and Nick Sikorski provided support for the meeting.

### Meeting for Beginning Farmers Held at Valley Laboratory

On October 6 and November 8, 2005 a new network called “It’s Not Farmland Without Farmers” met at the Valley Laboratory in Windsor. This network was organized by Dr. Kimberly Stoner with the assistance of Erin Sturgis and from Bill Duesing of CT NOFA. These meetings identified needs of beginning farmers, particularly for information about access to land and credit, business planning, and entrepreneurship.

## Organic Seed Partnership, Seed Production and Seed Cleaning Workshop

On October 20, 2005 the Valley Laboratory hosted the Organic Seed Partnership, Seed Production, and Seed Cleaning Workshop conducted by Teri Ferrin of the USDA-ARS Plant Genetic Resources Unit in Geneva, NY. Growers participating in the workshop learned about seed production and were able to utilize USDA mobile seed cleaning equipment. Farm Manager Rich Horvath assisted with equipment set up.

## Community Farm Coalition Meeting Held at Valley Laboratory

On January 7, 2006, a new Community Farm Coalition, organized by Dr. Kimberly Stoner met for the first time. This group is a coalition of community groups starting farms on public land (owned by towns, land trusts, or nature centers). The organizing meeting drew 40 people from 17 organizations to the Valley Laboratory. Erin Sturgis helped to organize this meeting. Erica Frenay of Cornell University spoke about how to use Holistic Management in planning strategy, making decisions, and monitoring the results of the decisions on farms. The community groups also had a lively exchange of strategies that had helped them get started, establish farming operations, and develop education programs.

## Tobacco Research Meeting Held at Suffield Vo-Ag Center

One Hundred and thirty people attended the Connecticut Agricultural Experiment Station's annual Tobacco Research Meeting held at the Suffield High School Auditorium on February 22, 2006. Dr. James LaMondia and Harrison Griffin, Director of the Suffield Vo-Ag Program welcomed growers. The meeting addressed many topics of concern to growers. Dr. James LaMondia spoke about research on management of tobacco pathogens including blue mold and tobacco mosaic virus and results of the breeding program for pathogen resistance. Thomas Rathier spoke about nutrient management under plasticulture, black root rot and diagnostic problems in 2005. David Stokes of the CT DEP spoke about waste management and pesticide disposal requirements and Brad Robinson spoke about issues and concerns with soil fumigation. Dr. Frank Ferrandino presented research on mist blower spray coverage and crop interactions. Ross Eddy of the Farm Services Administration provided updates on their services to growers. Robin Helrich of the New England Agricultural Statistics Service provided updates on their services to growers. Colleen Killelberg spoke about risk management, crop insurance and other services to growers. Dr. Todd Mervosh was present to discuss weed management with growers. Jane Canepa-Morrison and Rich Horvath assisted with much of the behind the scenes work for the meeting. The meeting qualified for pesticide applicator re-certification credit in both Connecticut and Massachusetts. Posters on "Disease Management Using Plant Genetic Resistance" and "Seed Production to Maintain Resistance and Cultivar Identify" were presented.

## *STATION PARTICIPATION AROUND THE STATE*

### Connecticut Flower and Garden Show

From February 23-26, 2006 the Station had an exhibit at the Connecticut Flower and Garden Show at the Expo Center in Hartford. The booth drew a lot of attention with 4,561 visitors, including many children, over the course of the event. The exhibit featured posters on "Plant Partners: Butterflies and Flowers" and "Invasive Aquatic Plants". Many Station publications were distributed and a live honey bee exhibit was a popular attraction. The booth was staffed by Ira Kettle, Lisa Kaczenski, Peter Trenchard, Rose Bonito, Stephen Sandrey, and Rose Hiskes.

### Fairfield Annual Garden Expo

On February 18-19 the Station displayed an exhibit booth at the annual Garden Expo held in the Fairfield Ludlowe High School. Information on butterfly gardening, aquatic invasive plants and a honey bee demonstration hive was presented. 1,419 people visited the exhibit.

### Farm Tour of Tobacco Road Farm

On March 10, 2006, 35 people gathered for a Farm Tour at Tobacco Road Farm (farmed by Bryan O'Hara, Lebanon, CT) highlighting his system of growing salad greens through the fall, winter, and spring under unheated low tunnels. Kimberly Stoner organized this tour as apart of a project on Improvement of Brassica Production, funded by a grant from the Sustainable Agriculture Research and Education Program. Ruth Hazzard of the University of Massachusetts leads the project. Erin Sturgis helped to organize this tour.

### CPTV Family Science Expo Held in Hartford

The Station hosted an interactive display at the CT Expo Center for the 2006 CPTV Family Science Expo from Thursday, April 27 through Sunday, April 30, 2006. Live honey bees, bird and butterfly gardening, aquatic invasive plants poster, samples of CT native aquatic plants, a display on wood-boring insects, and information on other services the Station offers were exhibited. Ira Kettle, Rose Bonito, Lisa Kaczenski, Tia Mastrone, Vickie Bomba-Lewandoski, Stephen Sandrey, Rose Hiskes, and Philip Armstrong participated in the event. More than 12,000 students from 85 schools attended the event. The Station displays attracted 4,177 children and 1,665 adults.

## *DONATIONS MADE TO THE COMMUNITY*

### Lockwood Farm

A total of 16,615 pounds of produce grown at Lockwood Farm (tomatoes, apples, cantaloupe, eggplant, winter squash, grapes, pumpkins, gourds, peppers, and calabasa squash) were donated to St. Vincent de Paul Food Kitchen in Waterbury, the Connecticut

Food Bank of East Haven, High Meadows in Hamden, the Big E Fair in Springfield, MA, Warren Strong in Bozrah, the Sound School in New Haven, Casa Otonal in New Haven, the Milford/Orange Y.M.C.A., and St. Ann's Church in Hamden. Dr. Frank Ferrandino, Dr. Martin P. N. Gent, Dr. Abigail Maynard, Dr. David Hill, Dr. William Nail, Rollin Hannan and Richard Cecarelli grew and contributed the produce.

Valley Laboratory Research Farm

A total of 10,250 pounds of tomatoes, pumpkins, plums, watermelon and squash grown at the Valley Laboratory were donated to Foodshare of Hartford, the Boy Scouts, the Sound School and Northwest Park of Windsor. Drs. Abigail Maynard, David Hill, Todd Mervosh and James LaMondia generated the fresh produce, and Dr. LaMondia organized the distribution effort. The Valley Laboratory also loaned irrigation equipment to the Connecticut Epilepsy Foundation in support of their Mud Volleyball Tournament Fundraiser. Mr. Horvath coordinated the distribution of the irrigation equipment.

## *LOCKWOOD LECTURES*

On November 14, 2005 Professor Wopke van der Werf, Plant Sciences Department, Wageningen University, Wageningen, The Netherlands, gave the Lockwood Lecture "Potato Late Blight in the Netherlands: The National Research Initiative to Reduce Fungicide Dependence by Increased Resistance and Better Forecasting".

## *AWARDS AND RECOGNITION RECEIVED BY STATION STAFF*

Dr. Wade Elmer was named President of the Northeastern Division of the American Phytopathological Society in October 2005

Dr. Joseph Pignatello was elected to Chair the S-11 Division (Soils and Environmental Quality) of the Soil Science Society of America for 2007 in November 2005

Dr. Joseph Pignatello was named by Thomson Scientific as an ISI Highly-Cited Author in the field of Engineering. He is among the top 250 cited authors worldwide. In 2002 he was also named so in the field of Ecology/Environment, where he maintains this distinction. ISI Highly-Cited Authors comprise 0.5% on average of all publishing research.

Dr. Walter Krol was elected Secretary of the New Haven Chapter of the American Chemical Society in January 2006

## *EXPERIMENT STATION ASSOCIATES*

Behind the Scenes Tour – Goodwin Conservation Center and
Hull's Forest Products, Pomfret, CT

On April 26, 2006 ESA members took a bus ride to the Goodwin Conservation Center where they were greeted by Forester/Supervisor Steve Broderick. The participants were divided into two groups and visited a historic house, a museum, and a small section of the James Goodwin State Forest that demonstrated the issues of a "managed forest" Dr. Jeffrey Ward of the Station addressed the group at lunchtime, as did Steve Broderick. After lunch, members boarded the bus for a ten minute ride to Hull's Forest Products, Inc. Hull's is a modern, hi-tech saw mill that utilizes the entire tree – bark, sawdust, and both high and low grade wood. The operation showed why active forest management makes financial and environmental sense.

## *THE PRESS SPEAKS*

On July 6, 2005 The Hartford Courant carried the article "How Perilous Pesticides? by Kathleen Megan. The article examined the dangers of pesticide residues in food. The Station's program of sampling fresh and processed food in the state was reported on. Dr. MaryJane Incoria Mattina stated that about 300 samples are taken each year and that generally only two or three violate pesticide regulations. She stated "We are always on the lookout for those people who inadvertently or knowingly decide to play outside the rules of the game". Regarding residue levels found she stated "Most of these are at the trace level".

On July 11, 2005 The New Haven Register carried the article "Experiment Station gains $1.3M in federal funds" by Abram Katz. A visit by Congresswoman Rosa DeLauro was reported on. During her visit, Congresswoman DeLauro announced that there would be a $1.3M aid package to the Station, expanding the federal slice of the lab's budget by almost 40 percent. DeLauro helped secure the money which will be used in many areas of the research done at the Station. Congresswoman DeLauro also stated that she was hopeful to get more funding which will be used to renovate Jenkins Laboratory and build a new lab for testing food safety – a major bioterrorism concern. Congresswoman DeLauro stated "The Agricultural Experiment Station remains a national leader in biochemistry, food security and genetics, on entomology, on forestry and horticulture. I want to see that the tradition of groundbreaking research continues".

The Record Journal of July 23, 2005 carried the article "Robins blamed for virus spread". The article reported the finding by Dr. Theodore Andreadis that DNA tests on blood from mosquitoes carrying West Nile virus indicate that robins, and not crows as was believed, are the main culprits in transmitting the virus. He has also reported that salt marsh mosquitoes instead of house mosquitoes, as was previously believed, are the other primary transmitter of West Nile virus.

The Connecticut Post of August 4, 2005 carried the article "Connecting With Nature: Outdoor Defenses – Experts advise on West Nile, weeds during science expo", by John Burgeson. The article reported on Plant Science Day 2005 at Lockwood Farm. Some of the areas reported on in the article were Dr. Theodore Andreadis' display on West Nile Virus, Dr. Todd L. Mervosh's display of 150 invasive weeds, and Dr. Robert E. Marra's Ramorum Blight information. Other displays and information tents and talks were mentioned in the article.

The New York Times of August 7, 2005 carried the article "Another Tick Disease Turning up in Dogs" by Gail Braccidiferro. The same tick that spreads Lyme disease has been found to carry another disease that affects dogs. *Ehrlichia equi* or *Anaplasma phagocytophilum*, almost unknown in the U.S.A. until 10 years ago, is becoming more common. Dr. Louis Magnarelli stated that "Going back to around 1990, no one knew this was even in the United States. Around 1994, some human cases were reported in the Midwest. It is distributed where you find Lyme disease." Dr. Steven A. Levy, a Durham

veterinarian, reported that a 2002 study he conducted found that about 23 percent of the dogs in his study had been exposed to the disease organism.

The Hartford Courant of September 16, 2005 carried the article "Lyme Ticks Show Major Rise in State" by Garret Condon. In summer 2005, there were record numbers of Lyme-disease-causing ticks throughout Connecticut, but especially in Lyme, Old Lyme and East Haddam where Lyme disease got its name. Dr. Kirby Stafford stated "Young tick counts were higher in southwestern and northwestern Connecticut, but the most dramatic increase was in Lyme/Old Lyme, which had an 80 to 90 percent increase over the numbers we picked up last year." Dr. Stafford said that the increase in numbers could be related to last winter's weather. "If you have a lot of snow, it acts like an insulating blanket and the ticks are doing just fine underneath". He predicted an increase in Lyme disease cases for the year.

The New Haven Register of September 16 carried the article "State Joins Suit to Stop Use of Ozone-depleting Pesticide" by Abram Katz. Attorney General Richard Blumenthal has filed suit against the U.S. Department of Agriculture, which requires incoming cargo ships from China to fumigate wooden pallets with methyl bromide. Methyl bromide is highly toxic and damages the environment by eating away the ozone layer. Also, treatment with the chemical is easily faked as it does not alter the appearance of wood in any way. Treatment is necessary to kill beetles and other pests. When asked to alter their policy, the USDA refused. Dr. Kirby Stafford stated that there is little data on the effectiveness of methyl bromide. He said the chemical may penetrate up to four inches in a piece of wood. The gas would not seep as deeply into wood with a high moisture content.

The New York Times of September 25, 2005 carried the article "Weather Suits Mosquitoes Fine" by Jane Gordon. Dr. Theodore Andreadis was interviewed about an article on cases of West Nile Virus in Connecticut and other northeastern states in the 2005 season. Although the weather was unusually hot and dry for most of the summer, which kept the mosquito population down, the rain and hot muggy weather late in the season was perfect for mosquitoes to breed in the state. Several cases of West Nile were reported this year. Dr. Andreadis stated that "mosquitoes are out there, they are biting. … I wouldn't be surprised if we see a few additional cases of West Nile virus before the season is over."

The Hartford Courant of October 7, 2005 carried the article "Elderly Man Dies from West Nile Infection, by William Hathaway. The article reported that an elderly man from New Britain was the first Connecticut resident to die from West Nile virus in 2005. His death indicated that West Nile virus, which was on the wane in the state last year, has made a comeback. Dr. Theodore Andreadis stated that "This death sadly reaffirms once again that this virus is here and it is not going away." This was the third reported case in the state in 2005. Dr. Andreadis stated that the dry weather for much of the season squelched the mosquito population, but many more of the mosquitoes trapped were found to be carrying West Nile. Infected human biting mosquitoes were found in 18 towns in

Connecticut, compared with only five in 2004. Most were found in Fairfield and New Haven Counties.

The Winter 2006 issue of Candlewood Lake News – Annual Report of Candlewood Lake Authority featured the article "Project CLEAR Hits Home With Students, Teachers and Community". The article reported on an in-depth study of Candlewood Lake and its surroundings by 40 students from Danbury, Brookfield, New Milford, New Fairfield and Bethel High Schools. 8 teachers from the school districts and staff from CLA, Education Connection, the CT DEP, the Northwest Conservation District and The Connecticut Agricultural Experiment Station participated in the group teaching, including stream ecology and water quality, lake water quality; aquatic invasive plants; the fish population in the lake, ecology, habitat and erosion of Candlewood's islands; and assessments of the property along developed areas around the lake.

The Spring 2006 issue of OnEarth, a publication of the Natural Resources Defense Council, published the article "Saving an American Icon" by Susan Freinkel. The article was a history of the chestnut blight in the very early 1900's and how, through the years, scientists as well as ordinary citizens have been working hard to bring back the American Chestnut. The work of Dr. Sandra Anagnostakis was highlighted in the article.

The Hartford Courant of March 20, 2006 carried the article "Program to Monitor Invasive Plants". The article focused on a lake monitoring program that will be carried out by volunteers who will try to stem the wave of invasive aquatic plants that are choking out native plants in Connecticut's lakes and ponds. These plants often hinder recreational activities on the lakes then invade and pull property values down. Once established, they are almost impossible to eradicate. Workshops conducted by Station staff will begin in the spring and will teach people how to identify the most serious invasive aquatic plants so problems can be caught in early stages.

The Connecticut Post of March 27, 2006 carried the article "Counting on Fungus to Fight Off Gypsy Moths" by Marian Gail Brown. The article reported that 20 years after the last time that gypsy moths devoured the leaves of over a million acres of trees in CT forests and on private property, they are attacking again. It was estimated that between July 2004 and 2005 gypsy moth caterpillars defoliated 64,373 acres in the state. The caterpillars had been kept in check by a fungus that depends on moisture in the ground. The amount of damage done will depend on the spring rain during mid-May into June. If sufficient rain falls during that period, a bumper crop of the fungus will grow and will combat the caterpillars."

The Hartford Courant's Editorial Page of April 18, 2006 carried the article "A Call to Repel Alien Invaders". The choking off of many of Connecticut's ponds and lakes was reported on. Several kinds of alien plant species have found their way into the water and have grown into both a nuisance to those who use the bodies of water for recreation and a threat to many species of wildlife. The article announced that the Station would be holding two workshops to teach people what kinds of weeds to look for and how to

identify them. Volunteers are needed to recognize the plants and report them to the Station so that an attempt to eradicate them can be made.

The Hartford Courant of April 30, 2006 carried the article "State Lakes Invaded by Plants: Survey Recommends Close Monitoring" by Steve Grant. Dr. Robert Capers was interviewed for the article. He explained a series of workshops being held by the Station recruiting citizens to monitor lakes in Connecticut for invasive aquatic weeds. He said that after a two year study, the weeds were found to be in two-thirds of the 100 Connecticut lakes surveyed. Since the beginning of the study, two new invasive weeds were found to be in the lakes. He stated that the best way to control them was to find them early before they are established. Once established, they can be nearly impossible to eradicate. (At least five other articles in area newspapers carried articles similar to this one.

The Hartford Courant (April) carried the article "Cases of Lyme disease up 34% in state". In a year when the national average of number cases of Lyme disease per 100,000 people was 6.7, Connecticut's number of cases was 39.6 per 100,000 people. Windham County had the highest number of cases in the state. Dr. Kirby Stafford stated that weather conditions influence the populations of animals that ticks feed on, which in turn affects how many ticks get blood meals. He stated "The gross number is kind of tied with the deer population, because the number of deer is one of the main determinants of what the overall number of ticks is".

The Journal News of May 30, 2006 carried the article "Port Chester students learn about saving endangered trees by Greg Clary. Dr. Sandra Anagnostakis, referred to as a modern-day equivalent of Johnny Appleseed, except with chestnuts, visited a Living Science class at Port Chester School and gave them a historical background of how the American Chestnut tree, once a dominant species in the northeast, disappeared from the landscape. Her visit coincided with an Earth Day celebration where the students planted 40 chestnut hybrids on the school grounds.

The Hartford Courant carried the article "Relentless Rain Means Skillions of Skeeters" by William Weir. The article reported that record amounts of rain in the spring will bring an abundance of mosquitoes. Dr. Theodore Andreadis pointed out that even before peak mosquito season started the numbers were well above normal. He stated that all indicators showed that it was going to be a bad summer for mosquitoes and that while the species that was abundant in the spring wasn't a threat for West Nile virus or EEE, species following later on were carriers of EEE. He gave advice to homeowners to use larvicide in any standing water sources in order to keep the mosquito populations down. The article went on to report on research being done in many countries to control mosquitoes.

The Hartford Courant of June 11, 2006 carried a Letter to the Editor entitled "Supporting Dairy Farmers" by Jennifer Frank of the Friends of Town Farm Dairy. She was happy to see an article on Connecticut dairy farms in the Courant and wrote about the support a dairy farm in Simsbury was getting. She mentioned being grateful to several

organizations that helped small farms throughout Connecticut and The Station was one of those organizations.

The Norwich Bulletin of June 18, 2006 carried the article "Expert: Beware Bug-Borne Diseases" by Francesca Kefalas. On June 18, Governor Rell put out a press release alerting the public that The Connecticut Agricultural Experiment Station had trapped more than double the number of biting mosquitoes compared to the same time last year. All the wet spring weather has made the mosquito population explode. Dr. Theodore Andreadis stated that "if you are going to be outside, you're going to have to bring along a can of repellent." Regarding West Nile virus, Dr. Andreadis stated "We know that the virus is still here and we expect it to reemerge." Eastern Equine Encephalitis, another mosquito-borne illness, is also occurring in the northeast. Dr. Andreadis said "We are very, very fortunate. All of our neighboring states have reported it in humans. We have been very lucky here."

The Day of June 25, 2006 carried the article "Sudden Death in the Marsh: Mysterious Dieback Threatens Critical Coastal Ecosystem" by Judy Benson. Something is attacking and killing the salt marshes throughout New England. What is killing the marshes has not been determined yet. Dr. Wade Elmer is one of the scientists looking for the answer. He suspects a form of fusarium is the cause. Upon examination, the spores resemble a form found in the Sudan. Speculation is that the fungus spores were carried on a dust cloud that originated off of the African continent. Dr. Elmer stated that at first he thought the theory was far-fetched, but now he is not so sure anymore. "They seem to be a unique species. It looks like a whole new group of fusaium than what we had been seeing in New England." "It's really a challenge to sort this all out."

The Record Journal of June 30, 2006 carried the article "Mosquitoes are Loving this Swampy Weather" by Ralph Hohman. Dr. Theodore Andreadis was quoted throughout the article on the Station's research on West Nile Virus, the numbers of cases in the state last year, the numbers of mosquitoes captured and tested, and ways to avoid being bitten by mosquitoes that cause the disease.

The Hartford Courant of June 30, 2006 carried the article "Unwelcome Guests: A Field Guide to Household and Garden Pests – and a Battle Plan for Each" by Theresa Sullivan Barger. Methods to prevent or eradicate pests from homes were discussed. Many types of pests – animal and insect – invade thousands of homes every year. Experts were consulted on the various types of pests. Gale Ridge was quoted throughout the article on getting rid of many types of insects.

## *THE PUBLIC SPEAKS*

On July 3, 2005 Alisha Desilva wrote the following to Dr. Kirby Stafford. "Just wanted to inform you that I received your information packet in the mail and was very impressed with the content. Especially useful to me was the repellent information, land management and treatment. On the phone, we had discussed early prophylaxis of Lyme disease – one single 200mg dose of Doxycycline. I actually found the NEJM article on the subject. Thanks again for the informative handbook and all the good work you all are doing at the Agricultural Station and for taking the time out of your busy schedule to answer some of my questions. …"

On July 3, 2005, George Mahl wrote the following to Mary Inman. "Thanks for the useful information on Hydrangeas that you sent me so promptly."

On July 13, 2005, Eva Esposito sent the following note to Dr. Sharon Douglas. "Thank you for your time and information you gave me about my topiaries. I did bring them back and got a refund. As for the wedding centerpieces, I bought tall fuchia color dahlias 3 DAYS prior to the wedding. THANK YOU!"

On July 13, 2005, Edmund S. Morgan wrote the following to Dr. Sharon Douglas. "Many thanks for sending me all the information about collecting rainwater. It will be very useful, and it was a great pleasure to get such a prompt and helpful response to an unusual question."

On August 3, 2005, Kenneth N. Bacon wrote the following to Dr. Sharon Douglas. "Many thanks for all the fascinating reading matter about trees and shrubs that you sent to me and for indicating those trees you think might do the trick for me. I have become so involved in the subject that I'm beginning to feel a bit like what Joyce Kilmer must have to pen that memorable poem, "Trees". My poetry writing has never transcended much beyond the limerick category, so perhaps there's hope for me. So far, the nurseries I have been able to contact have only the usual and commonplace types of trees, the Honeylocust receiving the greatest push, probably because they have a goodly supply of them. In any event, I never give up easily and actually the apparent challenge developing has become sort of fun. Again, my thanks for your help and I do hope you have a pleasant summer despite the current heat and humidity."

On August 8, 2005, Nicholas Wynnick wrote the following to Dr. Sharon Douglas. "Received your letter with enclosures and am very happy to learn my Crab Apple Tree will be providing shade and comfort to us. I can't recall when I planted it. We moved into this place in 1955 and as I wrote, it was the second and longest. Between 30 or 40 years. Thank you."

On September 14, 2005, Michael Glos and Molly Jahn of the College of Agriculture at Cornell University wrote the following to Dr. Kimberly Stoner. "I am writing to thank you for you participation in the organic breeding roundtable discussions that were held in

the fall of 2004. Your participation was vital to the success of getting very useful information straight from those that have specific organic breeding needs. I apologize for taking so long to formally thank each of you and get you the results from the roundtables. Last fall, we held three organic breeding roundtables in Maine, New York, and Pennsylvania. … A total of 56 farmers, 5 breeders, and 7 seed company representatives participated in these successful brainstorming sessions. I have enclosed a copy summarizing and listing what participants had to say. The results from these discussions have already been very useful for several breeders and seed companies. This has included the organic breeding we are doing as part of our 3 year USDA-SAE funded grant "Collaborative Breeding for and in Organic Systems." … Thank you again very much for your participation. …"

On October 6, 2005, Mieke Schuyler wrote the following to Dr. Robert Capers. "Have you found *Nymphaea tuberose* in Granby, or anywhere else in CT yet? (I read your Granby report). The information that you have provided to the LMLMC has been such a huge help. I know I have continued to tell you this, but I cannot stress enough the significance and importance of your work. Our launch is now closed and we have presented 2 classes so far, and we are handing out your information left and right. The class is required by Town regulation to those who wish to gain access using trailers, so we are able to reach people who otherwise would not get involved, and students leave the class with an enlightened, positive attitude and a better understanding of the habitat and its risks. We are creating a little army of more educated lake users! … I hope things are going well for you and I thank you again!"

On October 18, 2005, C.E.A. forwarded by e-mail the following notes of thanks to Dr. Jeffrey Ward.

> "Thanks again for spending time with us, and providing information, practical tools, and good stories. You continue to open doors for my students. Have a good year. See you next fall!" Christin
>
> I just wanted to say thank you for taking the time out to teach us so many interesting facts about the forests. I learned a lot about tools and different types of plants. You opened our eyes to the forest and our mouths to grape leaves yesterday! Thank you." Tabitha
>
> Thanks for the wonderful lesson on wildlife and tree identification. Your great sense of humor made the lesson so much more amusing and engaging. We can tell how much you enjoy your job and sharing such a wealth of knowledge on wildlife." …" Felicia
>
> I learned a lot from you on what a forester does and many neat facts. I felt like a forester. I had fun using your tools such as the increment borer, haga. I learned that you must have strength to be a forester. Thank you or the experience." Mariangel.

On October 20, 2005, Patty Nielsen wrote the following to Roberta M.-Ottenbreit. "On behalf of the Planning Committee, a warm thank you for the use of your wonderful facility. The event was a great success and Kim was wonderfully helpful."

On October 31, 2005, Anu Rangarajan, Associate Professor at Cornell University and Vern Grubinger, Professor at the University of Vermont, both representing the Northeast Organic Network, wrote the following to Dr. Louis A. Magnarelli and to Dr. Kirby Stafford. "We are writing to recognize Kimberly Stoner's outstanding contributions to the 2005 Advanced Training in Organic Crop Production, funded by the Northeast Sustainable Agriculture Research and Education Program. Kimberly was one of 20 professionals from the Northeast whose expertise enriched the training. Not only did she serve on the overall organizing team, but she also participated in all of the training sessions, and gave several presentations, including: Profitability of NEON Focal Crops, Insect Management for Organic Farms, Tarnished Plant Bug, and Organic Materials for Insect Management." … "The knowledge and skills gained from this training are useful for helping underserved groups including small scale and new farmers, as well as established farmers making the transition to organic production. Kimberly's expertise in entomology made an important contribution to the training, and is a valuable resource for farmers in your region. …"

On November 3, 2005, Russell G. Slayback, CPG, LEP, Chairman at Leggette, Brashears & Graham, Inc. wrote the following letter to Governor M. Jodi Rell regarding his experience in working with Drs. Mattina, Mervosh, Kroll, Stafford and Stoner. "I thought you would like to hear of an exceptionally satisfactory experience I had seeking information and assistance from The Connecticut Agricultural Experiment Station. As an Environmental and Hydrogeologic Consultant, I was recently asked by representatives of the Region 14 School District in Woodbury and Bethlehem to assist them in a plan to convert District land, which had been leased for many years to a "cow corn" farmer, to athletic fields for the schools. The issue was whether there are unsafe levels of agricultural chemicals in the soil, which might be a health hazard to children using the fields. I contacted The Connecticut Agricultural Experiment Station in New Haven and eventually spoke to senior scientists at this and their Windsor facility. Every individual I spoke with was courteous, helpful, extremely knowledgeable, and each followed up with specific information for my use. It was gratifying to learn how professional these scientists are – when I raised questions outside an individual's specific area of expertise, I was directed immediately to a different specialist who had the answers. When it was determined that the property owner was a regional school district, in fact a form of municipal government, Dr. Mattina advised that the agency could analyze a reasonable number of soil samples without direct charge to the district. To comply with regulations, the sampling was conducted by the Pomperaug District Health Department. We were asked to make a voluntary contribution to the Station, which was a fraction of the commercial laboratory cost for the analyses required. That contribution will be made. In my work, I deal with numerous departments of the state government, and this was a refreshing change of experience. The individuals copied on this letter are the specific scientists who assisted me. I urge your government to continue its support of this exceptional state asset."

On November 7, 2005, Andy Clark, SAN Coordinator, wrote the following to Dr. Kimberly Stoner. "Many thanks for your help developing the new SAN book, "Manage Insects on Your Farm: A Guide to Ecological Strategies." I really appreciated your contribution while the book was in development. The 128 page book describes ecologically based pest management principles and strategies used by farmers around the world to address insect problems. We hope it will be useful for educators and farmers to better identify beneficial insects, improve their soil management and minimize insect damage. … Again, thanks for your help with the book."

On November 8, 2005, Nick and Cheryl Tanasy wrote the following to Gale Ridge. "We thoroughly enjoyed meeting you last week. Your wealth of knowledge and calming approach has made an impression." … "We will be sure to contact you with any questions."

On November 14, 2005, Katharine P. Schmidt wrote the following to Dr. Louis Magnarelli. "The various committees of the Garden Club of America had a terrific day on Monday, thanks to you and your staff at The Connecticut Agricultural Experiment Station. Roberta was so helpful ensuring that the day would go smoothly. And Freddy, what a gem! He helped me with the auditorium set up and even went the extra mile in making the coffee for me! I had never made coffee in a hundred cup coffee maker before. I think we are going to try to have our meetings in different parts of the state to give each garden club fair shot at driving distances. Next year, we will probably be in New London, and the following year, 2007, we may call Roberta to schedule a meeting in October. Thank you for making my job as Zone Chairman so manageable."

On November 14, 2005, organizers of the NOFA Summer Conference sent the following evaluations on his talk to Dr. Kirby Stafford. "Excellent workshop. Well organized. Presented research results in a very easily understandable form. First hand knowledge concerning Lyme disease and deer ticks. Up to date information – presenter provided not only knowledge of disease transmittal but results on modifying landscape for homeowners to prevent contact. … "This was perhaps the most organized and professional presentation I have experienced at any conference. Very, very good!" "A lot – very well prepared. Great handout. Good information." Excellent – informative, well organized, useful."

On December 1, 2005, Professor Daryll C. Borst of Quinnipiac University sent the following letter to Dr. Francis Ferrandino. "I would like to thank you for taking time out again this year to discuss your research on cankers of black birch. Your discussion on the economic impact of cankers on black birch was very meaningful. Your comments about why the population of black birch has significantly increased because of decreased feeding by animals (such as deer and specific insects) has strengthened my lectures on the complexity of ecosystems. Your injection of the "Kindergarten Effect" clearly explained why population ecology is so important in parasitology. Also your comments of why disturbance in a forest is so important in the spread of the disease also underscored the basic principles of ecology. Few people today have any concept of our environmental history and how things have radically changed. Your enthusiasm really captivates my

students. On our drive to the Station, I mentioned that one of the researchers from the Station would really catch their attention. On the drive back to the university, several students said that I understated your enthusiasm. Students today are so used to professors who often tend to be boring at best, and when an enthusiastic research biologist comes along, they really take note. It is important that students learn that applied, practical research is just as important as pure research. Because biology today emphasizes molecular research, it has become my mission to expose my students to the world of organisms. Exposure to serious plant science research is a crucial segment of any botany course. Thank you again for your enthusiastic talk to my botany students."

On December 2, 2005, Professor Daryll C. Borst of Quinnipiac University sent the following letter to Dr. Robert E. Marra. "I would like to thank you for taking time to discuss your research on *Phytophthora ramorum* - Ramorum Blight, and the concerns of this pathogen for the Northeast. Your discussion on the history of *Phytopthora ramorum* and the importance of the nursery industry in its spread was most appropriate for my students. Your mention of Koch's Postulates and how a disease is detected and diagnosed, reinforced how all of the basic biological principles that are taught in today's biology curricula are important. Your discussion vindicated my insistence on understanding the importance of pathogenic organisms. It is important that students learn that applied, practical research is just as important as pure research. Because biology today emphasizes molecular research, it has become my mission to expose my students to the world of organisms and how they relate to molecular biology. Also your discussion on the phylogeny of *Phytopthora* and why it is important in the control of this pathogen was very relevant to my course. Exposure to serious plant science research is a crucial segment of my botany course. Thank you again for your talk to my botany students."

On December 12, 2005, Brett Schneiderman sent the following e-mail to Mary Inman. "I just received your letter with the results of the testing which you performed. I want to thank you for taking the time to perform the tests and contact me both by phone and letter. I appreciate your thorough and generous assistance. …"

On December 18, 2005, Susanne von Bodman, Associate Professor at UCONN College of Agriculture and Natural Resources, wrote the following to Dr. James LaMondia. "I wish to thank you for contributing to my Fall 05 Plant Pathology class. Your lecture/lab presentation is a valuable addition to my course. We are fortunate to have a Nematology expert in the state who is also willing to assist in teaching Plant Pathology. The students very much enjoy and value your presentation. I hope you can find the time in your busy schedule to contribute again next fall. Thanks again, and all the best."

On December 19, 2005, Martha H. Paull sent the following letter to Dr. Kirby Stafford. "Thank you for your information referring me to the CAES website. I am particularly cheered by your research into a fungus (or parasite) that will attack the tick and keep their population in check. It seems both healthier and more practical than spraying all the brush and woods with permethrin – although I expect I will go that route in my 3/5 of an acre (and also on my clothes) in the meantime. Please let me know when you have something."

In January, 2006, Robert V. Heffernan, Executive Director of the Connecticut Nursery and Landscape Association and Connecticut Greenhouse Growers Association wrote the following to Dr. Victoria Smith. "All of us at CGGA and CNLA are so grateful for your professional, personal effort and time in speaking at our Winter Symposium. We heard many compliments about your presentation, and the evaluations that came in were all positive about your performance. The success of a conference of this type depends entirely on its speakers. And, this was one of the most successful winter meetings we've ever held. We salute you for all the energy and effort you put into making your talk so informative. It says volumes about your good personal character that you would want to share your personal knowledge to help improve the businesses of your fellow green industry colleagues. The officers and Boards of Directors join me in sending our warmest appreciation to you. Thank you!"

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On January 23, 2006, Kathleen Litchfield, NOFA/Mass Organic Land Care Coordinator wrote the following to Dr. Kimberly Stoner. "Thank you so much for coming to speak at the NOFA/Mass 5$^{th}$ Annual Course in Organic Land Care. I really enjoyed hanging out with you the night before the course, frantic though I was, and your energy helped calm me the first morning of the course, too. You are great, and your presentations were also great and received good evaluations – I'll forward to you the students' comments once I get them typed up! It was a pleasure seeing you as always. …"

On January 23, 2006, Kathleen Litchfield, NOFA/Mass Organic Land Care Coordinator wrote the following to Tim Abbey. "Thank you so much for coming to speak at the NOFA/Mass 5th Annual Course in Organic Land Care! Your presentation was great and received good evaluations – I'll forward to you the students' comments once I get them typed up! It was a pleasure seeing you again and I want to thank you very much for donating your speaker fee to the OLC Program. That is very generous of you and appreciated. I hope you'll consider speaking at the 2007 course and I'll be in touch later this year."

On January 31, 2006, Michael D. Johnson, owner of Summer Hill Nursery, wrote the following to Dr. Louis Magnarelli. I was very frustrated last Thursday – making several phone calls, getting machines with nobody calling me back, talking to human beings who then routed me to machines, etc. I then called Sharon Douglas, got her machine and left a message – she had been on another call but she called me back within thirty seconds. I told her of a problem we were having with some spruce, and after some discussion, I was told Vicki Smith would pick up the plants the next morning on her way to work, which she did. What I really want to say is that you and your staff are still doing it right, and we really appreciate the efficient and friendly way the Station operates. Once again, I want to say a big Thank You."

On February 6, 2006, Scott Clark, Nursery Specialist at Cornell University wrote the following to Dr. Kimberly Stoner. "Thanks so much for your support in making this year's conference successful. It doesn't happen by itself but only with the help of folks like you. This was the largest attendance we have had in several years, and judging by the comments, the participants were not disappointed by the quality of the speakers and presentations. Hopefully, you can come back to help out in the future. …"

On February 11, 2006, John C. Howell, Secretary-Treasurer of the New England Vegetable & Berry Growers Association wrote the following to Dr. Kirby Stafford. "The enclosed check for $1,000.00 is provided by the New England Vegetable and Berry Growers' Association. It is in support of Dr. Richard Cowles' work on strawberries. We appreciate the research he is doing which is very important to the Small Fruit Industry in New England."

On February 15, 2006, John Nassif of the CT Nurserymen's Foundation wrote the following to Dr. Sharon Douglas. "Thank you for your participation in the CNF Seminar. Your generous contribution of time and the sharing of knowledge were greatly appreciated by all. Without efforts such as yours, the CF Scholarships would not be possible. Again, thank you very much."

On February 17, 2006, James Toler e-mailed the following to Dr. Kimberly Stoner. "Congratulations on a very well done annual training session. My assessment of the training program was superior across the board. By attending the course, I am able now to better assess our ability to emulate your program. We have a lot of work to do. Your region is ahead of the northwest in the movement to organic landscapes – I have little doubt that your efforts are (at least in part) responsible for this fact. … Again, thank you

for all of the work you have done, for a great workshop and for all the hospitality you showed me over the course of the session. I look forward to hearing from you soon."

On February 20, 2006, Nancy Baker of the CT Master Gardeners wrote the following to Dr. Kirby Stafford. "Many thanks for sharing your expertise and time with us during the recent NOFA Organic Land Care Course. Your passion and enthusiasm is wonderful, and I learned so much. I never thought the subject of deer ticks could be fascinating, but you were able to make it so. And most importantly, your presentation helped me to better understand the importance and relevance of ticks in terms of landscape design and care. The tremendous knowledge gained from this course is so valuable, and your contribution is appreciated. Thank you again!"

On February 20, 2006, Nancy Baker of the CT Master Gardeners wrote the following to Dr. Kimberly Stoner. "Many thanks for sharing your expertise and time with us during the recent NOFA Organic Land Care Course, not to mention developing the course in the first place! Your passion and enthusiasm for organic land care is wonderful, and I learned so much. Your presentations were dynamic and helped me to better understand "Why Organic" and how we can incorporate the mission of the Organic Land Care Program into our own lives and beyond into the landscape business. The tremendous knowledge gained from this course is so valuable, and your contribution is appreciated. Thank you again!"

On February 20, 2006, Nancy Baker of the CT Master Gardeners wrote the following to Dr. Sharon Douglas. "Many thanks for sharing your expertise and time with us during the recent NOFA Organic Land Care Course! Your reputation as the expert in plant pathology precedes you (CT Master Gardener Program), and I was delighted to have an opportunity to witness your passion and enthusiasm in person. I learned so much and your dynamic presentation not only deepened my understanding to plant diseases and diagnosis, but conveyed the importance of and strategies for organic prevention and management. The tremendous knowledge gained from this course is so valuable, and your contribution is appreciated. Thank you again!"

On February 20, 2006, Nancy Baker of the CT Master Gardeners wrote the following to Tim Abbey. "Many thanks for sharing your expertise and time with us during the recent NOFA Organic Land Care Course! Your passion and enthusiasm for your topic is wonderful. I learned so much from you during the Master Gardener class last year, and this presentation helped further my "very basic" understanding and identification of landscape pests. More importantly, it highlighted the importance of an Integrated Pest Management approach and how we can most effectively accomplish this in an organic manner. The tremendous knowledge gained from this course is so valuable, and your contribution is appreciated. Thank you again!"

On February 20, 2006, Nancy Baker of the CT Master Gardeners wrote the following to Dr. Richard Cowles. "Many thanks for sharing your expertise and time with us during the recent NOFA Organic Land Care Course! Your passion and enthusiasm for your topic is wonderful, and I learned so much. Your dynamic presentation helped me to

better understand the turf insect "personalities" so that we may better manage them in an organically acceptable manner. The tremendous knowledge gained from this course is so valuable, and your contribution is appreciated. Thank you again!"

On February 26, 2006, Karen C. Wiswell, Corresponding Secretary for the Hadlyme Hall Garden Club wrote the following to Dr. Jeffrey Ward. "The Hadlyme Hall Garden Club wishes to thank you for a very informative forestry lecture on how to properly plant trees as well as to be on the lookout for destructive and harmful insects. It was interesting to learn that many of us have been planting and pruning trees improperly. Our future and transplanted trees will thank you. We appreciated you driving out to Hadlyme on a cold February night to spend some time with our garden club. Don't be surprised to see an influx of garden soil samples being sent to your soil-testing lab from the gardens of Hadlyme. Thank you for the tip. Thank you again for your time. It was most appreciated."

On March 1, 2006, Richard Tice of the Connecticut Groundskeepers Association, Inc. wrote the following to Dr. Victoria Smith. "On behalf of the Connecticut Groundskeepers Association, I would like to thank you for your participation in our 2006 Conference & Trade Show. You played a big role in the success of the event. Any comments that you have regarding the conference are welcome and we will use them in the planning of next year's conference. …"

On March 5, 2006, Owen Jason(sp.) wrote the following to Dr. Richard Cowles. "Your talk on weevils and scales at Snow School on Saturday, March 4th was right on target. These insects are the most damaging problems on our farm and (as you know) I haven't been able to control them. I have high expectations of getting them under control this Spring. Thank you for taking the time on a weekend morning to educate us! Why more Christmas tree growers didn't come to the meeting is beyond me. It is my sincere opinion that the CAES is a vital component for successful agricultural production in Connecticut. All you guys (both genders) do a great service to all Connecticut growers including homeowners, landscapers, vegetable producers and all others. Much appreciated!"

On March 6, 2006, Attorney General Richard Blumenthal wrote the following to Dr. Louis Magnarelli. "I would like to thank you and your staff for the gracious hospitality shown to us on March 1, 2006 when the Office of the Attorney General sponsored a seminar at the Jones Auditorium for Connecticut municipal attorneys on The Inland Wetlands and Watercourses Act. Your staff, Roberta, Kareem and Freddie, could not have been more helpful in assisting us in setting up all the necessary components for a large conference. We believe the conference was very successful, due in no small part to the generous efforts of your staff and the very comfortable meeting space. We look forward to planning future events with you at the Agricultural Experiment Station."

On March 6, 2006, John Gilbert wrote the following to Dr. Richard Cowles. "Talked it over with some other growers and decided to try at least a trial of ONYX. If that doesn't

work, at least I can go back to the back breaking oil treatment. … Enjoyed your talk very much. You are the best thing that has ever happened to CT growers."

On March 10, 2006, Dr. Victoria L. Smith, Deputy State Entomologist, wrote the following to Dr. Sharon Douglas. "Thanks for participating in the Forest Health Workshop yesterday. This workshop is a useful and informative event for both the DEP personnel and for Station scientists, and your efforts contributed to its success."

On March 13, 2006, Janet P. Brooks, Assistant Attorney General, wrote the following to Dr. Louis Magnarelli. "Please accept my thanks for the outstanding assistance that your staff provided the Attorney General's Office in the planning and carrying out of our inland wetlands conference on March 1, 2006. Your staff was so helpful and gracious in assisting us. I thank you for your commitment to the public by making such wonderful and suitable conference facilities available."

On March 13, 2006, Janet P. Brooks, Assistant Attorney General, wrote the following to Roberta M.-Ottenbreit. "Thank you for your assistance in the Attorney General's conference on Inland Wetlands held on March 1. Your attention to detail and hospitality made it a pleasure to work with the Agricultural Experiment Station. Thank you very much."

On March 15, 2006, Virginia DiCesare of the Easton Garden Club wrote the following to Dr. Kirby Stafford. "Thank you for coming and speaking to our club. I've gotten great feedback following the meeting. I know everyone learned a lot from your presentation."

On March 16, 2006, Anne Bell of the Spring Glen Garden Club wrote the following letter to Governor M. Jodi Rell, expressing gratitude to scientists at the Station. A carbon copy was sent to Dr. Louis Magnarelli. "With pleasure, The Spring Glen Garden Club writes to apprise you of the excellent presentations The Connecticut Agricultural Experiment Station scientists made at our garden club meetings this year. Dr. Sharon Douglas, pathologist, discussed the oak tree Ramorum blight. Dr. Sandra Anagnostakis discussed the chestnut tree blight and other fungi tree diseases. Claire Rutledge, entomologist, discussed the emerald ash borer and elm bark beetle. All these are serious pests of and threats to Connecticut's urban trees as well as our woodlands and forests. Dr. Jeff Ward, the CAES forester, started our year's study about the importance of trees with an introduction to the science and ecology of trees. Last month he led our group on a walk and talk outdoors to ID the trees around the CAES Lockwood Farm in Hamden, including its Bird & Butterfly Garden where the club members have assisted with its maintenance for the past seven years."

On March 19, 2006, Otto Schaefer, President of the Experiment Station Associates, wrote the following to Dr. Kirby Stafford. "Thank you for putting together an interesting and informative presentation at the 16th annual meeting of ESA. Although the information about Lyme disease and its agent for transmission couldn't be classified as a 'good news' event, it is far better for us to be informed about what lies ahead, thanks to you work."

On March 19, 2006, Otto Schaefer, President of the Experiment Station Associates, wrote the following to Dr. MaryJane Incorvia Mattina. "Thank you for giving another superb presentation at the 16th annual meeting of ESA. We especially appreciated and enjoyed the candor of your response to questions from the audience. Also, please let the people who work in your lab know how much we appreciate having them stay late to demonstrate the technologically advanced equipment that is used for making chemical analyses. We look forward to seeing and hearing more about your work at the CAES Open House in the Spring on April 20."

On March 20, 2006, Leanne Pundt of the Program Chair of the Perennial Plant Conference at UCONN wrote the following to Tim Abbey. "On behalf of the Ornamental Plant Extension Team … at the University of Connecticut, I wish to thank you for your help moderating at the 2006 Perennial Plant Conference. The conference was a great success. 100% of the attendees rated the overall conference as good to excellent. This success was largely due to everyone's help and support. Again, thank you for taking the time out of your busy schedule to moderate at the Perennial Plant Conference. …"

On March 22, 2006, Jan Eckhart wrote the following to Dr. Richard Cowles. "Thanks for sharing your research on scale. Scale is becoming a serious problem for several growers in this area. Your presentations at the Keene conference were very helpful. Keep up such useful research. Thanks."

On May 23, 2006, Tish Robinson, Vice President of the Simsbury Garden Club wrote the following to Dr. Sharon Douglas. "What a fabulous program you presented to The Simsbury Garden Club on Monday! You had a captive audience in the palm of your hand discussing plant diseases! Not only was the presentation extremely informative but your teaching ability is first rate. After receiving the most positive responses this year from the members after the program, know that you will be highly recommended by me as VP/Program Chair to my successor. You truly made an academic subject spring to life!"

On March 26, 2006, Bill Duesing, Executive Coordinator of Connecticut NOFA wrote the following to Mike Last. "CT NOFA greatly appreciates the use of the Station facilities and the teaching by its scientists. I am enclosing checks to support the work of Kim Stoner and Rich Cowles. Thank you."

On March 28, 2006, Terri Stern e-mailed the following to Dr. Kirby Stafford. "Thank you so much for your excellent March 22 presentation to the teachers in our Biodiversity and Vector-Borne Disease Program. … At our debriefing over lunch back at Peabody Museum, all the teachers remarked on how much they appreciated the way you presented the information to them in a manner they could absorb. They were all enthusiastic about the concepts you broached and are quite excited about the lessons they will be writing on the topic. Thank you for giving this project such a successful opening session!"

On March 31, 2006, Joan Ives-Parisi sent a memo to Mary Inman, with cc's to Dr. Donald Aylor and Dr. Louis Magnarelli regarding a phone call she received from Sandy Perelli. "She wanted to express her thanks to Mary Inman for getting back to her so quickly about her question regarding the sex of holly plants. She was amazed that there was a message on her answering machine with detailed information answering her question. She stated that in today's world very seldom do you ever get a response so quickly if ever. …"

On April 30, 2006, Lee and Richard Bauerfeld wrote the following to Dr. Jeffrey Ward. "Thank you for your participation in the Experiment Station Associates' April 26, 2006 field trip dedicated to learning more of one of our more important renewable resources, "The Tree". Your presentation certainly informed the group of the many current activities occurring at the Connecticut Agricultural Experiment Station. The review of prevailing damaging insects and diseases that are being addressed at the Station was most interesting and informative. The protection of the tree is indeed one of the most important aspects of forest management. The bus chit-chat on the way to the sawmill was most positive about your comments during your guided tours of the Goodwin Forest. We appreciate your efforts toward making our day a success!"

On May 3, 2006, Aki Ikeda of the Westport Senior Center wrote the following to Dr. Sharon Douglas. "Thank you so much for coming to the Westport Senior Center. I'm sorry we did not have very many attendees, but the ones who were there were very interested in your lecture. I certainly learned much about the various types of diseases of which I certainly was not aware. The photographs were very helpful. I think my plants probably had every one of the diseases and I just didn't recognize them specifically. I needed to hear your lecture a long time ago, but better late than never! Thank you again for coming all the way down to Westport."

On May 8, 2006, Aki Ikeda of the Westport Senior Center wrote the following to Dr. Kimberly Stoner. "Your presentation was so interesting and educational! I certainly will not refer to lady beetles as bugs again. I'm sorry we had such a small audience but those who came were very enthusiastic about your lecture. We all learned a lot about lady beetles. I didn't realize it was the larvae which did most of the aphid consumption. I will watch for them on my coreopcis which seem to get an infestation of aphids. Thank you again for coming all the way to Westport."

On May 12, 2006, Keith and Jon Bishop wrote the following to Dr. Chris Maier. "We appreciate your help to make our 135$^{th}$ Anniversary Celebration a success last Saturday. The response was wonderful, the weather cooperated, and we had a chance to share and enjoy with friends, family, customers and watch kids have fun on the tractors! … Without the wonderful efforts of you and many others, we could not have made this happen. We look forward to many great years ahead."

On May 14, 2006, Chris Donnelly, Secretary-Treasurer of the Connecticut Tree Protective Association, wrote the following to Dr. Louis Magnarelli. "I am very pleased to have the occasion to send you a check in appreciation of the support of all of the work

that the Connecticut Agricultural Experiment Station does, in support of trees and arboriculture in Connecticut. The relationship between CTPA and the Agricultural Station has always been close, for which all of us in the Association are grateful. The work of the Station is very beneficial to all who care for trees in the state, and is welcomed and appreciated. Thank you very much. I would like to acknowledge in particular the support that the Station provides CTPA through your assistance with Arboriculture 101. The use of the auditorium is well appreciated, as is the participation of various staff members, including Dr. Jeff Ward, Dr. Sharon Douglas, Mr. Tom Rathier, Mr. Tim Abbey and Dr. Claire Rutledge. … I hope all is well at the Station, and that positive progress continues with all of the many projects you have going on. All of us at CTPA look forward to the continuation of our relationship with the Station, and to the many good things certainly still yet to come from the CAES."

On May 16, 2006, Lorrie Canas, a teacher at the MYI-School Department, wrote the following to Dr. Jeffrey Ward. "I am very sorry for the delay in getting this to you! Thank you so much for your presentation; we are still reviewing information that you shared with us. Our students remember a lot of what you shared and wanted to thank you for taking time out of your day to spend with us in prison – hence their card. … Thank you again and let me know if you want to come back during the summer to see our progress. We have just about out-grown our current classroom."

> The Students' card read: "On behalf of the students in our Horticulture Class at MYI, we would like to thank you for your presentation on 4/12/06. Many of us were intrigued from what we learned and are anxious to not only learn more, but work hands on in planting the many kinds of plants we have started. Again we greatly appreciate you taking your time out to come and delight us with a Horticulture presentation, we learned a lot, and look forward to seeing you again."

On June 1, 2006, Linda Demichele wrote the following to Dr. Sharon Douglas and Mary Inman. "Thank you both for your help in identifying the tree in New York to which my brother is allergic as Ailanthus. Obviously I was foolish enough not to realize you worked together. I appreciate you both taking the time to answer my identification question. That was very nice of you."

On June 2, 2006, Otto Schaefer e-mailed the following to Dr. Jeffrey Ward. "You and Scott helped make our tour a success. Your and Scott's presentation and the information that ordinary folks could take away about current research into the deer problem, delivered in the field – mosquitoes and all, certainly peaked interest in this little known institution, The Connecticut Agricultural Experiment Station. I appreciate the time you took to help me iron out details in the field. Thank you very much!"

On June 7, 2006, Dr. Robert Pavlica, Director of the Science Research Program at Byram Hills High School, wrote the following to Dr. Theodore Andreadis. "On behalf of the Byram Hills Authentic Science Research Program I would like to express our

appreciation to you for your mentoring of Allison Gardner. People are always amazed that professional researchers would give so generously of their time to mentor a high school student. However, your support and encouragement of the research dreams of Allison illustrate your commitment to advancing the next generation of science researchers. It has been our pleasure to observe the growth in both research skills and self confidence that you have been instrumental in catalyzing. I know that Allison will never forget the rich experiences that she has gained in working with you. Please accept our sincere gratitude."

On June 12, 2006, Rosemary Civitello wrote the following to Dr. Jeffrey Ward. "Many thanks to you for identifying the black birch tree growing on my property. Also, your suggestion that I place some branches in water this winter to add a pleasant fragrance to the house is a grand idea. Again, thank you for your efficient assistance and your courteous response."

On June 12, 2006, Margaret McLaughlin, Darien Director of Health and Vince Proto, Director of Environmental Health wrote the following to Dr. Kirby Stafford. "The Darien Health Department would like to sincerely express our appreciation for your wonderful presentation at the June 6th Lyme Disease Forum. We had a satisfied audience that provided very positive feedback. It is a timely and important subject for our residents as Darien is a prime area for ticks and Lyme disease. We are very grateful for the time that you volunteered assisting us in spreading the word. Please know that our efforts to provide education will continue and we wholeheartedly support the valuable work of the Connecticut Agricultural Experiment Station, you, and your dedicated professional staff."

## *SCIENTIFIC OFFICERSHIPS AND MEMBERSHIPS ON STATE, NATIONAL, OR REGIONAL COMMITEES*

## DEPARTMENT OF BIOCHEMISTRY AND GENETICS

NEIL MCHALE
- Doctoral Research Committees for Jalean Petricka/Tim Nelson (Yale University)
- Chairman, Institutional Biosafety Committee
- Member, American Society of Plant Biologists

RICHARD PETERSON
- Secretary, Quinnipiac Chapter Sigma Xi
- Radiation Safety Officer
- Member, American Society of Plant Biologists

NEIL SCHULTES
- Steering Committee at Yale University for Bioethics section of the Institute for Social and Policy Studies
- Masters Research Committee for a student advised by Dr. George Mourad at the University of Indiana/Purdue
- Member, Institutional Biosafety Committee

DOUG DINGMAN
- Member, Institutional Biosafety Committee
- Member, Station Health and Safety Committee
- Leo F. Roettger Society (CT Valley Branch of American Society for Microbiology)
- Sigma Xi

## DEPARTMENT OF ENTOMOLOGY

LOUIS A. MAGNARELLI
- Research Affiliate, Epidemiology and Public Health, Yale University School of Medicine
- Vice Chair, Invasive Plants Council
- Administrative Advisor, NE-1019, Alternative management systems of plant-parasitic nematodes
- Member, Wine Council
- Councilor, Connecticut Academy of Sciences and Engineering

CHRIS T. MAIER
- Curatorial Affiliate in Entomology, Peabody Museum of Natural History, Yale University
- Member, Advisory Committee, Cooperative Agricultural Pest Survey, USDA
- Member, Archives Committee, Connecticut Entomological Society

- Member, Connecticut Endangered Species Committee, Invertebrate Subcommittee
- Member, Nominating Committee, Connecticut Entomological Society
- Member, Program Committee, Connecticut Pomological Society
- Member, Steering Committee, Connecticut Butterfly Atlas Project
- Research Associate, Division of Plant Industry, Florida Department of Agriculture and Consumer Services

VICTORIA SMITH
- Member, USDA-APHIS-CPHST National Plant Pathogen Laboratory Accreditation Program (NPPLAP)
- Representative, USDA National Cooperative Agricultural Pest Survey; Eastern Region Ad Hoc
- Member, National Plant Board/PPQ *Phytophthora ramorum* Working Group
- Member, Eastern Plant Board 81st Annual Meeting Planning Committee
- Member, USDA-APHIS-PPQ Early Detection-Rapid Response Committee
- Member, Sustainable Agriculture Research and Education (SARE) Program
- Member, Connecticut Pomological Society
- Member, American Phytopathological Society
- Member, New England Wildflower Society, Connecticut Task Force
- Completed, Biotechnology Regulatory Services Inspection Training Program
- Completed, Incident Command System Training, levels 100 through 400 (command level)

KIMBERLY STONER
- Vice-President, and member of the Board of Directors, Northeast Organic Farming Association of Connecticut
- Representative from Connecticut to the Interstate Council of the Northeast Organic Farming Association
- Chair of the Organic Land Care Committee, a joint project of the Connecticut and Massachusetts chapters of the Northeast Organic Farming Association
- Member, Technical Advisory Committee, Regional Research Project NE-9, Conservation and Utilization of Plant Genetic Resources
- Member, Statewide Consulting Committee for Agricultural Education

## DEPARTMENT OF FORESTRY AND HORTICULTURE

JEFFREY S. WARD
- Secretary, Connecticut Tree Protection Examination Board
- Executive Board Member, Connecticut Tree Protection Association
- Executive Board Member, Connecticut Urban Forest Council
- Research Chair, Connecticut Forestland Council
- Ex-Officio Member, Goodwin Scholarship Committee

MARTIN P. N. GENT
- Program Chair, New England Vegetable & Berry Growers Conference.
- Associate Editor, Journal of Plant Nutrition.

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

WILLIAM R. NAIL
- Member, National Risk Management (Sustainable) Guidelines Working Group, National Viticulture Extension Leadership.

## DEPARTMEMT OF PLANT PATHOLOGY AND ECOLOGY

SANDRA L. ANAGNOSTAKIS
- Current Treasurer and Life Member, Northern Nut Growers Association
- Member, Regional Research Project NE-1015, "Biological Improvement, Habitat Restoration, and Horticultural Development of Chestnut by Management of Populations, Pathogens, and Pests"
- Member, Chestnut Growers of America
- Member, American Society for Horticultural Science
- Park Naturalist, Sleeping Giant Park Association
- International Registrar for Cultivars of *Castanea*, International Society for Horticultural Science
- Life Member, Mycological Society of America
- Member, Society of American Foresters
- Member, Connecticut Forest and Park Association
- Member, Sigma Xi

DONALD E. AYLOR
- Member, Connecticut Academy of Science and Engineering
- Editorial Board, *Agricultural and Forest Meteorology*
- Adjunct Professor, Plant Pathology Department, Cornell University
- Research Affiliate, School of Forestry and Environmental Studies, Yale University

SHARON M. DOUGLAS
- Member, Tree Fruit, Nut, and Vine Disease Workers Group, The American Phytopathological Society
- Member, USDA APHIS PPQ Cooperative Agricultural Pest Survey (CAPS) for Connecticut
- Member, Institutional Biosafety Committee, The Connecticut Agricultural Experiment Station

WADE H. ELMER

- President, Northeastern Division, The American Phytopathological Society, 2005-2006
- Connecticut Greenhouse Growers' Association, Program Committee 1988-present
- Connecticut Gladiolus Society
- Member, Northeast Research, Extension and Academic Program Committee for Integrated Pest Management, 2006

FRANCIS J. FERRANDINO

- Member, Epidemiological Committee, National Plant Disease and Pest Detection Network (NPDPDN)

ROBERT E. MARRA

- Member, Steering Committee, Connecticut Conference on Natural Resources, The University of Connecticut

## DEPARTMENT OF SOIL AND WATER

THEODORE G. ANDREADIS

- Lecturer in Epidemiology and Public Health, Yale University School of Medicine
- Adjunct Professor, Department of Pathobiology, University of Connecticut
- Member, Regional Research Project S-1024, "Discovery of Entomopathogens and Their Integration and Safety in Pest Management Systems"
- Member, Editorial Board, *The Journal of Eukaryotic Microbiology*
- Member, State of Connecticut Mosquito Management Program

GREGORY J. BUGBEE

- Director, New England Aquatic Plant Management Society
- Director, Clear Lake Improvement Association
- Member, Northeast Soil Testing Committee, NEC-67

JOSEPH J. PIGNATELLO

- Adjunct Professor in Environmental Engineering, Department of Chemical Engineering, Yale University
- Associate Editor, *Environmental Engineering Science*.
- Member of W-82 Regional Project "Pesticides and Other Organics in Soil and Their Potential for Groundwater Contamination"
- Chair Elect, Division S-11 (Soils and Environmental Quality) Soil Science Society of America

CHARLES R. VOSSBRINCK

- Visiting Assistant Professor, Department of Pathology, Albert Einstein College of Medicine, Yeshiva University, Bronx, New York.
- Member, Regional Research Project S-1024, "Discovery of Entomopathogens and Their Integration and Safety in Pest Management Systems"

JASON C. WHITE
- Managing Editor, The International Journal of Phytoremediation.
- Member, Editorial Board, Environmental Pollution.
- Member, Editorial Board, Environmental Toxicology and Chemistry

## VALLEY LABORATORY

TIMOTHY M. ABBEY
- Member, Connecticut Environmental Industry Council
- Member, Connecticut Groundskeepers Association
- Member, Connecticut Invasive Plant Working Group - Education Subcommittee
- Member, Connecticut Nursery and Landscape Association
- Member, Connecticut Tree Protective Association Education Committee
- Member, New England Pest Management Network
- Connecticut Representative, Northeast Greenhouse and Ornamentals IPM Commodity Work Group
- Member, Entomological Society of America

JOHN F. AHRENS
- Advisor and Director, National Christmas Tree Growers Association
- Member, National IR-4 Committee (Interregional Committee No. 4) that prioritizes pesticide registration needs for ornamental crops.

CAROLE CHEAH
- Member of the International Organization for Biological Control

RICHARD S. COWLES
- Japanese Beetle Harmonization Agreement Treatment Committee
- Member, International Root Weevil Workshop Planning Committee
- Treasurer, Connecticut Entomological Society

ROSE T. HISKES
- Member, Education Committee, Connecticut Nursery & Landscape Association
- Member, Education Subcommittee, Connecticut Tree Protective Association
- Member, Connecticut Invasive Plant Working Group

- JAMES A. LAMONDIA
- Member and Webmaster, Northeast Regional Project NE-1019, "Alternative management systems for plant-parasitic nematodes in horticultural and field crops"
- Senior Editor, Journal of Nematology

- Editor, Tomato & Potato Section; Biological and Cultural Tests for Control of Plant Diseases
- Ex-Officio Member, Connecticut Tree Protection Examining Board.
- Worker Protection Standards Trainer for the Valley Laboratory.
- North American Blue Mold Forecast Center State Coordinator
- Society of Nematologists Honors and Awards Committee Chair
- Society of Nematologists Extension Committee
- Member, Cooperative Agricultural Pest Survey Committee

DEWEI LI
- Board Member of the Analytic Accreditation Board of American Industry Hygiene Association (AIHA).
- Mycological Society of America
- British Mycological Society
- International Aerobiology Association
- Pan-America Aerobiology Association
- American Phytopathological Society
- Canadian Phytopathological Society

TODD L. MERVOSH
- Connecticut Invasive Plant Working Group - Chair of Stewardship Committee, Chair of Symposium Committee
- Weed Science Society of America - Member of Weed Alert Committee and Herbicides for Minor Uses Committee
- Associate Editor for the Journal Weed Science

THOMAS M. RATHIER
- Advisory Board for Community Gardens in Hartford, Knox Parks Foundation
- Advisory Board, Agri-Science, Bloomfield High School
- Member, Cooperative Agricultural Pest Survey Committee
- Science Liaison, Connecticut Christmas Tree Growers Association
- Member, Concentrated Animal Feeding Operation Committee, EPA
- Advisor, USDA Natural Resource Conservation Service.
- Member, Education Subcommittee, Connecticut Tree Protective 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 and occasionally report on their research to elected officials. At other times newspaper, radio and TV reporters interview our staff. These occasions are listed below.

ABBEY, TIMOTHY

- Gave the talk "Arthropod and Pest Management Update" at the CAES Valley Laboratory Tour in Windsor *July 19, 2005*
- Gave the talk "Organic Land Care and Native Plants" at a workshop sponsored by the Ecological Landscaping Network in West Hartford *July 23*
- Helped staff the CAES display at the Connecticut Tree Protective Association Summer Meeting in Farmington *July 21*
- Gave the talk "Ecological landscaping with native ornamental plants" and staffed the display "Plant Health Care for the Connecticut Nursery and Landscaping Industries" at Plant Science Day at Lockwood Farm *August 3*
- Gave the talk "Ornamental plant pest management with an organic focus" to the North Stonington Garden Club *September 20*
- Gave the presentation "NOFA approved organic insecticides" at the CTPA Organic Tree Care Workshop in Burlington, CT *September 27*
- Designed the display that was present in the New England Center building at the Big E from *September 16-October 2*
- Gave the talk "Why Trees Fall Apart: Insects, Diseases and Injury" to the Connecticut Tree Warden School in Middlefield *October 21*
- Gave the talk "Introduction to Plant diseases" and "Introduction to Ornamental Insect Pests" at the Connecticut Nursery and Landscape Association Nursery Accreditation Program in Southington *October 18 and 25*
- Gave the talk "Introduction to Weeds" at the Connecticut Nursery and Landscape Association Nursery Accreditation Program in Southington *November 1*
- Gave the talk "Ornamental Insect Pests" to a pesticide applicator training class at Soundview Landscaping in West Haven *November 3*
- Gave the talk "Designing an Integrated Pest Management Program" for the Connecticut Tree Protective Association Arboriculture 101 class in New Haven *November 9*
- Gave the talk "An Integrated Pest Management Review" at the Environmental Industry Council Annual Meeting in Southington *November 22*
- Participated in a meeting of the Connecticut Invasive Plant Working Group in Windsor *November 29*
- Participated in the NOFA Organic Land Care Update Course at the County Agriculture Building in Tolland *December 8*
- Gave the talk "New Insecticides and Miticides" at the Connecticut Nursery and Landscape Association's Winter Meeting in Wallingford *January 5, 2006*
- Staffed the CAES booth at the Connecticut Nursery and Landscape Association's Winter Meeting in Wallingford *January 4, 5*
- Gave the talk "Organic Pest Management for Ornamental Insect Pests" at the Northeast Organic Farming Association's Organic Land Care Course at the Doyle Conservation Center in Leominster, MA *January 17*
- Staffed the CAES booth at the Connecticut Tree Protective Association's Winter Meeting in Plantsville *January 19*

- Presented "Insect Pests of Trees and Shrubs" to a Pesticide Applicator Training Class in East Haven *February 14*
- Presented "Organic Pest Management for Ornamental Insect Pests" at the Northeast Organic Farming Association Organic Land Care Course at the Station in New Haven *February 14*
- Presented "Woody Plant Pest Management and Care" to a University of Connecticut Master Gardener Class in Torrington *February 15*
- Presented "Insect Pests of Trees and Shrubs" to a Pesticide Applicator Training Class in West Hartford *February 16*
- Presented "Insect Pests of Trees" to an arborist training class at Bartlett Arboretum in Stamford *February 21*
- Presented "Woody Plant Pest Management and Care" to a University of Connecticut Master Gardener Class in Vernon *February 24*
- Presented "Woody Plant Pest Management and Care" to a University of Connecticut Master Gardener Class in Stamford *February 27*
- Served as a moderator at the University of Connecticut Perennial Plant Conference in Storrs *March 8*
- Presented "Woody Plant Pest Management and Care" to a University of Connecticut Master Gardener Class in Norwich (52 attendees) *March 14*
- Presented "Woody Plant Pest Management and Care" to a University of Connecticut Master Gardener Class in North Haven (40 attendees) *March 16*
- Presented "Implementing an IPM Program" to the CTPA Arboriculture 101 Class in New Haven (38 attendees) *March 22*
- Presented "Insect Pest Management with an Organic Focus" to the Connecticut Rose Society in Hartford *May 7*
- Presented "Integrated Pest Management" for the Farm City Program at Lockwood Farm in Hamden *May 16-18*

AHRENS, JOHN
- Presented a paper on combinations of sulfometyron methyl and hexazinone for Fraser fir plantations and co-authored two others at the Northeastern Weed Society in Providence, RI (50 attendees) *January 5, 2006*
- Presented the talk "History of Ornamental Science at a meeting of the Weed Science Society of America in New York City (60 attendees) *February 13*
- Gave a presentation on Weed Management in Christmas Trees and conducted a laboratory on calibrating sprayers at The Pest Management Short Course in Keene, NH (85 attendees) *March 17*
- Discussed our Weed Management Experiment for the CT Christmas Tree Growers Association at Hemlock Hill Tree Farm in Somers (50 attendees) *June 6*
- Gave a presentation on weed management at the spring meeting of the NH/VT Christmas Tree Association in Springfield, VT (50 attendees) *June 24*

ANAGNOSTAKIS, SANDRA
- Helped a writer (Douglas Buege) collect information for a book on chestnut research *July 6-8, 2005*
- Helped Professor Thomas Mione collect samples of chestnuts for his classes at Central Connecticut State College *July 8*
- Presented the paper "Nutrients in chestnuts" and read a paper by Dr. Robert E. Marra entitled "An update on Sudden Oak Death" at the Annual Meeting of the Northern Nut Growers Association in Pella, IA *August 1-3*

- Gave a tour of the chestnut trees planted at Lockwood Farm to William Adamsen of the Connecticut Chapter of The American Chestnut Foundation *September 19*
- Gave a talk entitled "The chestnut story in America" at a chestnut conference in Mayford (Woking), England, *September 23-27*
- Spoke on Experiment Station chestnut research at the Annual Meeting of the Multistate Research Project NE-1015, "Biological improvement, habitat restoration, and horticultural development of chestnut by management of populations, pathogens, and pests," in Hamilton, NY *October 13-16*
- Spoke about "Chestnut research in Connecticut" to a botany class from Quinnipiac University in Jones Auditorium *November 7*
- Judged the nut exhibit at the Pennsylvania Farm Show in Harrisburg, PA *January 6, 2006*
- Gave a talk on chestnuts at the Mashantucket Pequot Museum in Mashantucket (10 attendees) *January 14*
- Participated in a tree health roundtable discussion and presented a discussion about canker diseases on trees for the Spring Glen Garden Club at Lockwood Farm (30 attendees) *January 18*
- Reported on her research on chestnuts and butternuts at the Forest Health Workshop held in Jones Auditorium (40 attendees) *March 9*
- Gave a talk entitled "Chestnut for timber and for food" at the annual meeting of the Eastern Connecticut Land Owners Association in Brooklyn (62 attendees) *March 23*
- Gave a talk entitled "Chestnuts for timber and for food" to the Yale Chapter of the Society of American Foresters in New Haven (15 attendees) *April 5*
- Participated in the Cooperative Agricultural Pest Survey Committee Meeting in Windsor *April 11*
- With Pamela Sletten went to the Port Chester (NY) middle school for their Earth Day celebration. She gave a talk on "Chestnuts in the U.S." to a class of eighth-graders (36 attendees) and then 125 students and teachers attended a panel discussion on trees (Anagnostakis and Sletten), recycling (the head of the Westchester Recycling Facility), solar energy (an architect from Stamford), and participation in local government (the mayor of Port Chester) *May 25*

ANDERSON, JOHN F.

- Spoke to staff when Congresswoman Rosa DeLauro visited the Station *July 7, 2005*
- Participated in a meeting of the Natural Resources Council of Connecticut *September 14*
- Spoke with Chinese visitors about the BSL-3 Laboratory *October 3*
- Represented the Station at the Annual Weantinoge Meeting in New Milford *October 6*
- Met with Drs. Ken Linthicum and Darrell Cole of the USDA *October 27*
- Talked to the Albertus Magus Science Club about West Nile virus and the BSL-3 Laboratory *November 18*
- Hosted and participated in a scientific meeting with scientists from the USDA laboratory, Gainesville, FL *December 1*
- Organized and moderated the symposium entitled "Natural History of West Nile Virus in the United States, Annual Meeting of theEntomological Society of America, Fort Lauderdale, FL *December 15*
- Gave the talk "Natural History of West Nile virus in the Northern Great Plains, Annual Meeting of the Entomological Society of America, Fort Lauderdale, FL *December 15*
- Participatd in the Board meeting of the Natural Resources Council of Connecticut *January 11, 2006*

- Gave a talk on the Natural History of West Nile virus to the Yale West Nile Virus Research Group and gave a tour of the BSL-3 Laboratory *January 17*
- Hosted and participated in the Board meeting of the Lyme Disease Foundation *January 20*
- Was interviewed by Heather Kovac of Channel 12 News *January 23*
- Gave a talk on the Natural History of West Nile virus in North Dakota to the Fargo High School Class of 1953 in Phoenix, AZ *February 21*
- Explained the BSL-3 Laboratory to visitors from the University of Connecticut *February 27*
- Gave a lecture on the Natural History of West Nile virus to biology students at Central Connecticut State University, New Britain *March 13*
- Participated in a Board meeting of the CTPA, Cheshire *March 21*
- Participated in a Board meeting of the NRC, New Haven *April 4*
- Participated in a Lyme Disease Foundation meeting, New Haven *April 7*
- Gave a talk on Natural History of West Nile virus in the Northeastern United States as part of a symposium on West Nile virus, European Society of Vector Ecology, Serres, Greece *April 13*
- Participated in the NRCC Annual Meeting, North Branford *June 1*

ANDREADIS, THEODORE G.

- Met with Congresswoman Rosa DeLauro to discuss the Station's surveillance and research programs on mosquitoes and West Nile virus *July 7, 2005*
- Was interviewed about mosquitoes and West Nile virus by Jessica Schneider of WFSB TV3 *July 19*
- Was interviewed about the Station's research and surveillance programs on mosquitoes, West Nile virus, and Eastern Equine encephalitis in Connecticut by Steve Kotchko of Connecticut Public Radio *July 20*
- Was interviewed about the first detection of West Nile virus in mosquitoes in Connecticut in 2005 by Fran Schneido of WCBS Radio, NY *July 21*
- Was interviewed about the first detection of West Nile virus in mosquitoes in Connecticut in 2005 by Nancy Cohen of Connecticut Public Radio *July 22*
- Was interviewed about the first detection of West Nile virus in mosquitoes in Connecticut in 2005 by Erin Cox of WTNH TV8, New Haven *July 22*
- Was interviewed about the first detection of West Nile virus in mosquitoes in Connecticut in 2005 by Dan Kane of WFSB TV3, Hartford *July 22*
- Was interviewed about the first detection of West Nile virus in mosquitoes in Connecticut in 2005 by Jeff Holtz of the New York Times *July 22*
- Was interviewed about the first detection of West Nile virus in mosquitoes in Connecticut in 2005 by WKOMO AM 1000 in Seattle, WA *July 22*
- Was interviewed about the Station's research studies on the blood feeding preferences of mosquito vectors of West Nile virus by Donna Tommelleo, Associated Press, Hartford *July 25*
- Was interviewed about the history of West Nile virus in Connecticut and the State Surveillance Program by John Burgeson of the Connecticut Post *August 3*
- Was interviewed about mosquitoes and West Nile virus by Jess Wakeman of the Fairfield Citizen *August 4*
- Was interviewed about mosquitoes and West Nile virus by Ryan Jockers of the Stamford Advocate *August 4*
- Was interviewed on Face-the-State to discuss mosquitoes, West Nile virus, and the State Surveillance Program by Al Terzi of WFSB, TV3 *August 5*

- Was interviewed about mosquitoes and West Nile virus by Mark Sims of CT Public Radio *August 12*
- Provided an overview of the Station's research and surveillance program on mosquitoes and mosquito-borne diseases to visitors from NASA's Sandia National Laboratory and gave them a tour of the laboratories *August 16*
- Was interviewed about the detection of West Nile virus in mosquitoes in thirteen towns in CT in 2005 by Fran Schneido of WCBS Radio, NY *August 16*
- Was interviewed about the detection of West Nile virus in mosquitoes in thirteen towns in CT in 2005 by Jim Moore of Metro News in Hartford *August 16*
- Was interviewed about the detection of West Nile virus in mosquitoes in thirteen towns in CT in 2005 by Mark Sims of CT Public Radio *August 16*
- Gave an overview of the Station's research and surveillance program on mosquitoes and mosquito-borne diseases to CAES Board of Control member Dr. Johan Varekamp *August 23*
- Was interviewed about mosquitoes and West Nile virus on the Mary Jones Show on WDRC AM Radio *August 23*
- Was interviewed about the Station's research and survey on the Asian tiger mosquito by Marianne Gail Brown of the Connecticut Post *August 29*
- Was interviewed about the cluster of human cases of Eastern equine encephalitis virus in southeastern MA by Chris Francis of WTIC Radio *September 6*
- Was interviewed about the first human cases of West Nile virus for 2005 in the state by Jane Tillman Irving of WCBS Radio NY *September 8*
- Was interviewed about the first human cases of West Nile virus for 2005 in the state by Bill Hathaway of the Hartford Courant *September 8*
- Was interviewed about the first human cases of West Nile virus for 2005 in the state by Michael Julian of the Darien News Times *September 9*
- Was interviewed about the first human cases of West Nile virus for 2005 in the state by Patrick Lindsey of The Hour Newspaper *September 10*
- Was interviewed about the Station's research and surveillance programs on mosquitoes and West Nile virus by Jane Gorden of the New York Times *September 20*
- Was interviewed about West Nile virus activity in Connecticut in 2005 by George Goodridge of CT Public Radio *October 4*
- Was interviewed about the first human fatality due to West Nile virus in Connecticut by Bill Hathaway of the Hartford Courant *October 6*
- Was interviewed about human cases of West Nile virus in Connecticut by Jessica Schneider of WFSB TV-3 Hartford *October 12*
- Was interviewed about human cases of West Nile virus by Marian Gail Brown of the Connecticut Post *October 12*
- Was interviewed about our mosquito blood meal analysis studies by Jessa Netting of Discover Magazine *October 13*
- Was interviewed about West Nile virus activity in Connecticut in 2005 by Jim Buchanan of WICC Radio October 14
- Presented an overview of the Experiment Station's Mosquito and Arbovirus Research Program to Drs. Darrell Cole and Kenneth Lithicum of the USDA/ARS *October 27*
- Was interviewed about nonviremic transmission of West Nile virus by mosquitoes by Jessica Netting of Discover Magazine *October 28*
- Was interviewed about the first isolation of LaCrosse virus from mosquitoes collected in CT by Marian Gail Brown of the Connecticut Post *November 14*

- Presented an invited seminar entitled "Epidemiology of West Nile virus in the northeastern US: A seven year perspective 1999-2005" to the Department of Epidemiology and Public Health at Yale University *November 17*
- Was interviewed about the first isolation of LaCrosse virus from mosquitoes collected in Fairfield, CT by Bill Bittar of the Fairfield Minute Man *November 18*
- Presented an overview of the Experiment Station's Mosquito and Arbovirus Research Program to a group of Biology Club students from Albertus Magnus College *November 18*
- Presented an invited talk entitled "Host feeding patterns of Culex mosquitoes in relation to enzootic and epidemic transmission of West Nile virus in the northeastern US at the 51st Annual Meeting of the Northeastern Mosquito Control Association, Northampton, MA *November 28*
- Was interviewed about the elimination of mosquito control in shoreline communities in CT by Leon Collins of WFSB-TV3 *March 11, 2006*
- Presented an invited talk entitled "Avian hosts of mosquito vectors of West Nile and Eastern Equine Encephalitis viruses in the Northeastern US" in a forum on Avian Reservoirs of Human pathogens sponsored by the Center for Eco-Epidemiology, Yale Institute for Biospheric Studies (100 attendees) *April 21*
- Was interviewed about West Nile virus by Ronnie Rittenberry, Occupational Health & Safety Magazine *April 25*
- Conducted a workshop on mosquitoes and mosquito-borne diseases with a group of ten science teachers from three urban public school districts as part of a Science Education Partnership Award granted by the NIH to Yale's Peabody Museum *April 27*
- Was interviewed about the gypsy moth by Kevin Hogan WFSB TV3 *May 12*.
- Was interviewed about the impact of the heavy rainfall on anticipated mosquito problems this spring and West Nile virus by Sean Philips NBC 30 TV *May 22*
- Was interviewed about Connecticut's West Nile Virus Surveillance Program by Marc Sims, CT Public Radio *June 5*
- Was interviewed about the role of robins in the transmission of West Nile virus by Nicholas Bakalar, National Geographic News *June 5*
- Was interviewed about Connecticut's West Nile Virus Surveillance Program by Andrew Pergam NBC30 TV *June 7*
- Was interviewed about West Nile virus by University of Massachusetts Radio, Amherst *June 7*
- Was interviewed about mosquitoes and West Nile virus by Sam Gingerella, WTIC Radio *June 8*
- Was interviewed about mosquitoes and West Nile virus by William Weir, Hartford Courant *June 9*
- Was interviewed about mosquitoes and West Nile virus by Kent Pierce WTNH TV8 *June 12*
- Was interviewed about mosquitoes and West Nile virus by Hartford Metro News *June 12*
- Was interviewed about mosquitoes and West Nile virus by Don LoVello WDRC AM Radio, Harford *June 13*
- Was interviewed about the impact of the heavy rainfall on mosquitoes, West Nile virus and eastern equine encephalitis by Francesca Kefalas Norwich Bulletin *June 15*
- Was interviewed about the impact of the heavy rainfall on mosquitoes and West Nile virus by Michael Dinan-Greenwich Times *June 19*
- Was interviewed about Connecticut's Mosquito and West Nile Virus Surveillance Program by Marilynn Moss Connecticut Post *June 21*
- Was interviewed about the impact of the heavy rainfall on mosquitoes, West Nile virus and eastern equine encephalitis by Steve Kotchko Connecticut Public Radio *June 26*

- Was interviewed about the impact of the heavy rainfall on mosquitoes, West Nile virus and eastern equine encephalitis by Eric Zager Fox 61 TV *June 27*
- Was interviewed about Connecticut's Mosquito and West Nile Virus Surveillance Program by the Meriden Record Journal Post *June 28*

ARMSTRONG, PHILIP
- Was interviewed about the recent discovery of LaCrosse virus that was isolated from mosquitoes collected in Fairfield, CT by Marian Gail Brown of the Connecticut Post *November 14, 2005*
- Presented an abstract entitled "First Isolation of La Crosse Virus from New England" at the 54th Annual Meeting of the American Society of Tropical Medicine and Hygiene in Washington, D.C. *December 14*
- Gave a seminar for the Yale West Nile Virus Research Group titled "The Connecticut Surveillance Program for West Nile Virus" at the Connecticut Agricultural Experiment Station *January 17, 2006*
- Assisted in staffing the Station display at the CPTV Family Science expo 2006 at the CT Expo Center (4,177 children, 1,665 adult attendees) *April 27-30*

ARSENAULT, TERRI
- Participated in GC/MS methods training at the Forensic Chemistry Center in Cincinnati, OH *August 9-11, 2005*
- Met with Loralee Jones, granddaughter of Donald F. Jones, and talked with her about work being done in Analytical Chemistry and gave her a tour of the laboratories *September 19*
- Participated in a tour of the chemistry laboratories of the Connecticut Department of Public Health *February 9, 2006*

AYLOR, DONALD E.
- Spoke about "Aerial dispersal of maize pollen" to a visiting delegation from China *October 3, 2005*
- Spoke about "Dispersal of corn pollen" to visiting students from the Metropolitan Business Academy *October 7*
- Gave the talk "Quantifying aerial dispersal of maize pollen" at the Symposium on Biotechnology Risk Assessment, organized by the USDA-APHIS and the US EPA, in Greenbelt, Maryland *November 30*
- Presented an invited seminar entitled "Biophysical and landscape constraints on long-distance spread of plant pathogens" in the Department of Plant Pathology, Iowa State University, Ames, IA *June 9, 2006*

BARSKY, JOSEPH P.
- Served as Chair at the Yankee Division Society of American Foresters Executive Committee Meeting in New Haven *January 10, 2006*
- Presented the Annual Report of the Chair at the Yankee Division – Society of American Foresters Annual Winter Meeting in Enfield *February 23*

BERGER, WILLIAM IANNUCCI
- Met with Loralee Jones, granddaughter of Donald F. Jones, and talked with her about work being done in Analytical Chemistry and gave her a tour of the laboratories *September 19, 2005*

- Met with an official from the Kent Land Trust to discuss analysis of soils bordering the Housatonic River for PCB content *February 2, 2006*
- Participated in an ELISA training course at the Forensic Chemistry Center in Cincinnati, Ohio *April 2-4*

BOEHM, MATTHEW T.
- Spoke about "Dispersal of corn pollen" to visiting students from the Metropolitan Business Academy *October 7, 2005*
- Presented a talk entitled "Coupling Lagrangian surface layer and convective boundary layer models to describe aerial dispersal of particles released near the ground" at the American meteorological Society's 17th Symposium on Boundary Layers and Turbulence and 17th Conference on Biometeorology and Aerobiology in San Diego, CA (50 attendees) *May 22-25, 2006*

BOMBA-LEWANDOSKI, VICKIE
- Attended a meeting for Project Food, Land, and People Coalition at the Department of Environmental protection, Kellogg Environmental Center in Derby *July 21, 2005*
- Helped set up and dismantled Station display for the Goshen Agricultural Fair *July 29, 31*
- Participated in a round table discussion with Congresswomen Rosa DeLauro at Hindinger Farm in Hamden *August 2*
- Helped to organize and run Plant Science Day at Lockwood Farm in Hamden *August 3*
- Participated in a meeting of the Farm City Committee at USDA/FSA in Wallingford *August 10*
- Participated in a meeting of the Farm City Committee at USDA/FSA in Wallingford *September 7*
- Chaired a meeting of the Plant Science Day Committee *September 8*
- Participated in a meeting of the Food, Land and People Coalition Committee at the DEP Kellogg Environmental Center in Derby *September 13*
- Coordinated and helped man the Station exhibit at the Big E in West Springfield, MA *October 1, 2*
- Was a tour guide for visiting students from the Metropolitan Business Academy in New Haven *October 7*
- Was a tour guide for visitors to the Station from the Science Club at Albertus Magnus College *November 18*
- Participated in a meeting of the Farm City Committee at USDA/FSA in Wallingford *January 10, 2006*
- Scheduled, assembled display items, helped set up and manned the Station's display at the Connecticut Flower and Garden Show in Hartford *February 23, 24, 25, 26*
- Helped coordinate the Station booth at the Garden Expo held at Fairfield Ludlowe High School in Fairfield *March 18, 19*
- Coordinated, gathered display items for, and manned the Station's booth at Ag Day at the Capitol *March 22*
- Coordinated a Plant Science Day 2006 planning meeting in Jones Auditorium *April 12*
- Helped coordinate Plant Science Day in the Spring held in Jones Auditorium *April 20*
- Coordinated the booth, helped organize the display, and manned the Station's display at CPTV's Family Science Expo at the Hartford Expo Center (4,177 children, 1,665 adult attendees) *April 27-30*
- Organized and coordinated staff for Farm City at Lockwood Farm *May 16-18*

- Coordinated a Bird and Butterfly Garden tour and Event hosted by Rose Hiskes for the Red Hatter Chapter for Cheshire *May 23*
- Coordinated the Station's attendance at the Coventry Herb fest 2006 *June 3*
- Participated in a defensive driving course sponsored by the CT Department of Labor *June 8*

BONITO, ROSE
- Presented a display at the "Connecticut Agricultural Fair" held at the Goshen Fairgrounds in Goshen *July 30, 2005*
- Presented an exhibit of the Station at "Celebrating Agriculture" held at the Woodstock Fairgrounds *September 17*
- Assisted at the Station's exhibit at the CT Flower and Garden Show, Hartford *February 25-26 2006*
- Set up an exhibit and greeted visitors at the Annual Garden Expo, Fairfield Ludlowe High School in Fairfield. 1,419 visitors stopped by the exhibit. *March 18-19*
- Assisted in setting up and staffing the Station display at the CPTV Family Science expo 2006 at the CT Expo Center (4,177 children, 1,665 adult attendees) *April 27-30*
- Arranged, set up, and staffed an exhibit on the Station, tick control, and native plants at the annual "Topmost Farm Herb Festival" in Coventry (65 attendees) *June 3*

BUGBEE, GREGORY
- Discussed the Station's collaborative project on Invasive Aquatic Plants at the USDA ARS Invasive Plant Research Laboratory in Fort Lauderdale, Florida *August 18-19, 2005*
- Presented a poster on aquatic plant surveys at the New England Invasive Plant Summit in Framingham, MA *September 16*
- Spoke on Turf Care Options for Public Places at a public meeting of the Guilford Green Committee *November 30*
- Hosted a meeting on "Using the NRCS Web Soil Survey" in the Johnson-Horsfall Building *January 1, 2006*
- Gave a seminar on Soil Health in Relation to Tree Care to an arborist class at the Bartlett Arboretum in Stamford *February 9*
- Spoke on "Dredging Options for Connecticut Lakes" to the Stateline Pond Association at the Stafford Springs Town Hall *March 27*
- Hosted a Volunteer Invasive Aquatic Plant Monitoring Workshop in Jones Auditorium (25 attendees) *April 29*
- Spoke on the CAES Invasive Aquatic Plant Program at Candlewood Lake Day in Sherman *June 23*
- Spoke on "Managing Curly Leaf Pond Weed in Crystal Lake" at a town meeting held at the Polish Club in Middletown *June 27*

CAPERS, ROBERT
- Presented a poster on aquatic plant surveys at the New England Invasive Plant Summit in Framingham, MA *September 16, 2005*
- Hosted a Volunteer Invasive Aquatic Plant Monitoring Workshop in Jones Auditorium (25 attendees) *April 29, 2006*

CECARELLI, RICHARD
- Along with Rollin Hannan, dug up and packed up two 6-ft. chestnut trees for the University of New Hampshire. The trees were grown by Dr. Sandra Anagnostakis. A UNH staff

member was on hand with a van to transport the trees, which will be planted in memory of Charles Warren, a staff member who was recently killed in an accident *October 17, 2005*

CHEAH, CAROLE

- Gave a presentation on her research on biological control of hemlock woolly adelgid at the HWA Steering Committee meeting in Windsor Locks *July 7, 2005*
- Gave a presentation on hemlock woolly adelgid to 2 groups of middle and high school students from New York City attending summer forest ecology camps on environmental science and leadership training run by the Christodora organization at Great Mountain Forest, Norfolk *July 11 and 26*
- Gave a joint presentation on the successes and challenges of developing artificial diets for HWA predators with Dr. Allen Cohen at the Insect Diet and Rearing Institute in Tucson, AZ *July 26*
- Gave a joint presentation on the successes and challenges of developing artificial diets for HWA predators with Dr. Allen Cohen at the Southern Forest Insects Work Conference in Austin, TX *July 28*
- Participated in a conference call with program managers, from the USDA Forest Service, Clemson University, and the University of Georgia to discuss and plan for a joint study on sleeve cage assessments of hemlock woolly adelgid predators in 2006 *August 2*
- Discussed hemlock health and pests with an official of the DEP at Burr Pond State park in Torrington, CT *August 16*
- Met with USDA Forest Service scientists at the Northeastern Research Station, Hamden, to discuss research progress *September 12 & 19*
- Met with the Forest Health Supervisor, Massachusetts Department of Environmental Management at Southbridge, MA to discuss cooperation in a winter study of predator survival on hemlock woolly adelgid *September 22*
- Was interviewed about work experiences as a biologist by Claire Pelletier, an undergraduate wildlife ecology student at Saint Joseph College *September 22*
- Participated in an Insect Diet and Rearing Institute Workshop run by Dr. Allen C. Cohen, University of Arizona, Tucson, AZ *October 2-7*
- Met with USDA Forest Service researchers to discuss progress and updates in cooperative research at the Northeastern Research Station in Hamden, CT *October 17 and 24*
- Gave a presentation on biological control of Hemlock Woolly Adelgid to freshmen classes from Trinity College at the Valley Laboratory in Windsor (25 attended) *November 17*
- Presented 3 progress reports and attended the HWA Biological Control Technical Committee Meeting at Annapolis, MD *January 10, 2006*
- Met with USDA Forest Service scientists at the Northeastern Research Station in Hamden to discuss research projects *March 3, 6, and 17*
- Gave an update on biological control of hemlock woolly adelgid at the Forest Health Monitoring Workshop in Jones Auditorium (35 attendees) *March 9*
- Gave a tour of the Insect Rearing Facility at USDA Forest Service in Hamden and gave an update on the *Scymnus* biological control project to the Director of the USDA Forest Service Eastern Forest Environmental Threat Assessment Center of Asheville, NC *March 24*
- Met with the Project Leader at the USDA Forest Service Northeastern Research Station in Hamden to discuss *Scymnus* project progress and future objectives *April 12*
- Gave an introduction to biological control of hemlock woolly adelgid at the USDA Forest Service Northeastern Research Station in Hamden *April 17*
- Met with USDA Forest Service scientists at the USDA Forest Service Northeastern Research Station in Hamden *June 27*

COWLES, RICHARD

- Presented "Chemical control of hemlock woolly adelgids" at Plant Science Day at Lockwood Farm *August 3, 2005*
- Spoke about "Managing black vine weevils with insect pathogenic nematodes" to the Western Australia Grape Growers Association, Manjimup and Margaret River, Western Australia *August 12 and 16*
- Was interviewed by Skye MacArthy from the Bunbury Office of the Australian Broadcasting Corporation on the subject of insect pathogenic nematodes for root weevil control *August 12*
- Presented the talk "Insect management in Christmas trees" to the Connecticut Christmas Tree Growers' Association in Hamden *October 1*
- Spoke about "The world of insects" to the 4$^{th}$ grade class at the Metacomet Elementary School in Bloomfield *October 12*
- Presented the talk "Insect behavior and IPM" to the undergraduate entomology class at Eastern Connecticut State University in Willimantic *October 21*
- Talked on "Chemical Control of Hemlock Woolly Adelgid" at the Annual Meeting of the New England chapter of the International Society for Arboriculture, Burlington, VT *October 25*
- Gave the talk "Chemical control of hemlock woolly adelgid" to students from Trinity College at the Valley Laboratory, Windsor (40 attended) *November 17*
- Gave the talk "Management of annual bluegrass weevil after pyrethroid failure" to golf course superintendents at Harrell's Annual Fall Education Seminar, West Boyleston, MA (160 attended) *November 22*
- Gave the talk "Management of White Grubs and Root Weevils" to strawberry growers at the New England Vegetable and Berry Growers Association meeting, Manchester, NH ( ca. 110 attendees) *December 13*
- Gave the talk "Prospects for Conventional Breeding of Strawberries for Tolerance to Black Vine Weevils" at the Symposium "Biology and Management of Root Weevils" at the National Meeting of the Entomological Society of America, Ft. Lauderdale, FL (30 attendees) *December 17*
- Gave the talk "Organic management of Turf Insects" at the Organic Land Care Seminar for the Massachusetts Northeast Organic Farm Alliance, Leominster, MA (60 attendees) *January 17, 2006*
- Spoke about "Roots: The Saga of White Grubs and Black Vine Weevils" at the New England Growers Meeting, Boston, MA (700 attendees) *January 31*
- Presented "Hemlock Woolly Adelgids: What We Learned From Hemlock Hill" with Peter DelTredici of the Arnold Arboretum) at the New England Grows Meeting in Boston, MA (500 attendees) *February 2*
- Presented "Organic Managementof Turf Insects" to the Organic Land Care Seminar for the Connecticut Northeast Organic Farm Alliance, New Haven (58 attendees) *February 14*
- Presented "Turf Insect Management" at the Connecticut Groundskeepers Association Meeting in Hartford (80 attendees) *February 15*
- Presented "Insect and Mite Pests of Native Plants" for the Connecticut Nursery Foudation Seminar Series (15 attendees) *February 15*
- Attended a meeting jointly sponsored by Bayer, USDA Forest Service, and USDA APHIS to discuss forest use of Imidacloprid, and presented "Optimizing Imidacloprid Dosage for Managing Hemlock Woolly Adelgids and to Protect Aquatic Resources" at Research Triangle Park, NC (25 attendees) *February 23*
- Presented "Update on Christmas Tree Insect Pest Management" at the annual winter meeting of the Connecticut Christmas Tree Growers Association, Middletown (100 attendees) *March 4*

- Presented "Chemical Control of Hemlock Woolly Adelgid" to the Connecticut Forest Health Meeting, New Haven (50 attendees) *March 9*
- Presented Chemical Control of Hemlock Woolly Adelgid" to the Northeast Forest Pest Council in Newport, RI (80 attendees) *March 23*
- Gave 5 presentations (4 jointly presented with Ron Kelley) "Biology of stem and root insects", "Biology of white grubs," "Biology of foliar feeding insects," "Control of soil-swelling and shoot boring insects," and "Control of foliar-feeding insects," at the biennial Christmas Tree IPM Workshop, Keene, NH (85 attendees) *March 16-17*
- Participated in a meeting of the Northeast Regional Turf Workgroup, New Brunswick, NJ *April 19-20*
- Spoke about "Insect pests of Christmas trees" to the CT Christmas Tree Growers, Somers (60 attendees) *June 6*
- Discussed "Exotic pests and the management of hemlock wooly adelgid" to the New Bedford Farmers' Club, New Bedford (30 attendees) NY *June 21*

DOUGLAS, SHARON
- Spoke about two peach canker diseases to be looking for in 2005 at the twilight meeting of the Connecticut Pomological Society held at Lockwood Farm *July 6, 2005*
- Gave a talk entitled "Understanding plant diseases" at the North Stonington Grange in North Stonington *July 15*
- Gave a talk on current Christmas tree diseases at the twilight meeting of the Connecticut Christmas Tree Growers Association at the Valley Laboratory in Windsor *July 19*
- Organized the Station booth, discussed tree diseases, and conducted a tree disease quiz and contest at the summer meeting of the Connecticut Tree Protective Association in Farmington *July 21*
- Was interviewed about the effects of weather on plants in Connecticut and what we might expect for fall foliage by Ed Krauter of the Connecticut Post *August 25*
- Was interviewed about the effects of heat and drought on lawns and other plants in Connecticut by Abram Katz of the New Haven Register *September 2*
- Was interviewed about this season's drought and its impact on plant health by Allan Cohn of WTNH TV-8 *September 7*
- Was interviewed about the pros and cons of organic agriculture in Connecticut and how it might fit into the Farmland Trust Program *October 26*
- Was interviewed about the rains of October and their impact on tree health by Brigette Ruthman of the Waterbury Republican-American *October 28*
- Gave a lecture on tree diseases at the hands-on session of the Connecticut Tree Protective Association's Arboriculture 101 class and assisted students as they examined tree samples *November 2*
- Gave the presentation "Ramorum Blight (a.k.a. Sudden Oak Death) and Connecticut" for members and their invitees of the Durham Garden Club in Durham *November 10*
- Was interviewed about what is killing ash trees in Connecticut by Bob Miller of the Danbury News-Times *November 29*
- Gave two presentations: "Bacterial spot of stone fruits" and "Update on peach diseases" at the annual meeting of the Connecticut Pomological Society in Glastonbury (ca. 62 attendees) *December 6*
- Gave the presentation "Daylily rust: Biology and current status" at the Connecticut NOFA Organic Land Care Update Course in Tolland (ca. 60 attendees) *December 8*
- Gave the talk "Root diseases in the greenhouse" at the CNLA/CGGA Winter Meeting at Mountainside in Wallingford (92 attendees) *January 5, 2006*

- Presented a lecture titled “Introduction to plant pathology” for the Guilford Garden Club in Guilford (45 attendees) *January 11*
- Participated in a tree health roundtable discussion and presented a discussion on Ramorum Blight for the Spring Glen Garden Club at Lockwood Farm (ca. 30 attendees) *January 18*
- Organized and staffed the Experiment Station’s booth at the CTPA Winter meeting at Aqua Turf in Southington (262 attendees) *January 19*
- Gave a lecture on “Introduction to plant diseases” to the 5th Annual Organic Land Care Course sponsored by CT NOFA in Jones Auditorium (65 attendees) *February 14*
- Participated in the Connecticut Nursery and Landscape Association Foundation Lecture Series by giving a lecture entitled “Diseases of native plants” at the Valley Laboratory in Windsor (25 attendees) *February 22*
- Gave a lecture entitled “Diseases of shade and ornamental trees” as part of the Connecticut Tree Protective Association’s Arboriculture 101 class held in Jones Auditorium (55 attendees) *March 1*
- Presented a talk entitled “Ramorum Blight and Connecticut’s rhododendrons” to the Connecticut Chapter of the American Rhododendron Society at the Valley Laboratory 38 attendees *March 7*
- Gave a talk entitled “Update on Ramorum Blight” at the Forest Health Workshop held in Jones Auditorium (40 attendees) *March 9*
- Participated in the hands-on session of the Connecticut Tree Protective Association’s Arboriculture 101 class by discussing tree diseases with live specimens in Jones Auditorium (55 attendees) *March 15*
- Assisted the Connecticut Tree Protection Examining Board with administering the oral exams to arborist candidates at the Station *March 16*
- Gave a lecture entitled “Understanding plant diseases – How they impact our daily lives” to members of the Simsbury Garden Club in Simsbury (53 attendees) *March 20*
- Assisted Vickie Bomba-Lewandoski and Dr. Robert E. Marra with the Experiment Station’s display on Ramorum Blight and the New Molecular Plant Diagnostics Laboratory at Agriculture Day at the Capitol in Hartford *March 22*
- Gave a presentation entitled “Common diseases of perennials” to the Evergreen Garden Club of South Glastonbury (24 attendees) *April 6*
- Gave updates on Ramorum Blight and the Chrysanthemum White Rust surveys at the Cooperative Agricultural Pest Survey Committee Meeting in Windsor *April 11*
- Answered questions about plants and plant health and assisted people with the “Plant Puzzler” at the Spring 2006 Open House at the Station *April 20*
- Was interviewed about some of the current problems in the landscape by Harlan Levy of the Waterbury Republican-American *April 24*
- Gave a talk entitled “Common diseases of the perennial garden” to members of the Westport Senior Center (14 attendees) *May 1*
- Was interviewed about poison ivy by Charlie Walsh of the Connecticut Post May 8
- Gave a presentation entitled “Poisonous plants” to members of the Naugatuck Valley Audubon Society at the Kellogg Environmental Center in Derby (47 attendees) *May 16*
- Was interviewed about the impact of wet weather on plants and foliar diseases by John Bracchitta of the Connecticut Post *June 12*
- Assisted the Connecticut Tree Protection Examining Board with oral exams for candidates for the arborist license *June 14*
- Was interviewed about Hosta X virus by Pamela Weil of the Connecticut Gardener *June 19*
- Was interviewed about mushrooms growing on walls in a house by Darren Duarte of Channel 8 *June 27*

EITZER, BRIAN

- Participated in a course on LC/MS methods conducted by the FDA in Cincinnati, OH on *August 9-11, 2005*
- Met with Loralee Jones, granddaughter of Donald F. Jones, and talked to her about work being done in Analytical Chemistry and gave her a tour of the laboratories *September 19*
- Presented a talk entitled "Uptake of chiral and achiral chlordane components by ecotypes of *Arabidopsis thaliana*" at the 26th annual Society of Environmental Toxicology and Chemistry meeting in Baltimore, MD *November 14-17*
- Was a judge at the 9th and 10th grade CT State Scholars Academy Science Fair in New Haven *January 31, 2006*
- Met with an official of the Kent Land trust to discuss analysis of soils bordering the Housatonic River for PCB content *February 2*
- Participated in a tour of the chemistry laboratories of the Connecticut Department of Public Health *February 9*
- Participated in a class on the operation of the thermo LTQ liquid chromatograph mass spectrometer in West Palm, Florida *February 20-23*

ELMER, WADE H.

- Participated in a Connecticut Greenhouse Growers planning meeting at Michael's Greenhouses in Cheshire *September 20, 2005*
- Presented the Connecticut Report at the Extension/Industry meeting, presided over the paper session "Forestry and Soilborne Pathogens", and presented the paper "Influence of earthworm activity on soilborne diseases" at the Annual Meeting of the Northeastern Division of The American Phytopathological Society in Geneva, NY *October 5-7*
- Presented the lecture "Fusarium: Taxonomy, Ecology, and Pathology" to Dr. von Bodman's Introductory Plant Pathology Class at UCONN in Storrs *October 12*
- Gave the presentation "Plant parts and their diseases" to the first grade classes at Mile Creek School in Old Lyme *October 19*
- Moderated the fall meeting of the Connecticut Greenhouse Growers Association and gave the presentation "Biofungicides in Connecticut" in Jones Auditorium *October 26*
- Spoke about *Fusarium* to a Botany Class from Quinnipiac University in Jones Auditorium *November 7*
- Spoke on "Management of *Fusarium* corm rot of Gladiolus" to the Connecticut Gladiolus Society in West Hartford *November 16*
- Moderated and presented a talk entitled "Update on biological fungicides in Connecticut" at the Bedding Plant Meeting in Jones Auditorium (35 attendees) *January 25, 2006*
- Co-organized the Bedding Plant Meeting with UCONN Cooperative Extension and presented a talk entitled "Update on biological fungicides in Connecticut" in Vernon (32 attendees) *February 8*
- Co-organized the Bedding Plant Meeting with UCONN Cooperative Extension and gave the talk "Update on biological fungicides in Connecticut" in Vernon (40 attendees) *February 28*
- Served as a judge for the State Science Fair held at Quinnipiac University in Hamden *March 15*
- Participated in a planning meeting for the Annual Meeting of the Northeastern Division of The American Phytopathological Society in Burlington, VT *April 14*
- Gave a talk entitled "Asparagus culture and vegetable diseases" to the Heritage Village Garden Club in Southbury (38 attendees) *April 19*
- Participated in the Dedication of the West Hartford Veteran's War Memorial where foreign soils from battlefield cemeteries were ceremoniously scattered over the lawn. Dr. Elmer was

instrumental in receiving and sterilizing the soils and the Station was thanked (1,000 attendees, including state and local representatives) *May 21*
- Presented the paper "Taxonomic notes on *Fusarium* species associated with *Spartina*" at the 2nd Sudden Wetland Dieback Workshop in Wellfleet, MA (35 attendees) May 24
- Gave a presentation entitled "Plant parts and their diseases" to four first-grade classes at Doolittle School in Cheshire (80 attendees) *May 26*
- Was interviewed about the association between *Fusarium* species and the sudden wetland dieback phenomenon observed in Long Island Sound and Cape Cod by Judy Benson of The Day (New London) *June 8*
- Was interviewed about the possible role of *Fusarium* species in wetland dieback on the Connecticut coast by Judy Benson of The Day (New London) *June 15*

FERRANDINO, FRANCIS J.
- Spoke on "Nectria canker on black birch" to a Botany class from Quinnipiac University in Jones Auditorium *November 7, 2005*
- Gave a talk entitled "Pesticide spray coverage in shade tobacco: Mistblower application" at the Annual Meeting of the Tobacco Growers Association in Suffield (160 attendees) *February 22, 2006*
- Gave a talk entitled "The coincident rise of deer, black birch, and Nectria canker in the northeastern hardwood forest" at the Forest Health Workshop held in Jones Auditorium (50 attendees) *March 9*

GENT, MARTIN
- Participated in the annual meeting of Multistate NE1017 "Developing and Integrating Components for Commercial Greenhouse Production Systems" regional research committee meeting in Wooster, OH *July 13-14, 2005*
- Talked on "Support of Horticultural Science by USDA Competitive Programs" at a Stakeholder Workshop sponsored by American Society for Horticultural Science *July 17*
- Presented a poster on "Effect of Shading on Yield and Composition of Fruit and Leaves of Greenhouse Tomato" at the American Society for Horticultural Science meeting in Las Vegas, NV *July 18-21*
- Gave a class on "Growing plants under lights" to the Federated Garden Clubs Garden Study School held in Jones Auditorium *September 28*
- Spoke to the Experiment Station Associates about greenhouse tomato production at Lyman Orchards in Middlefield *October 5*
- Spoke on "Plant species differ in movement of hydrophobic organic chemicals: Measurements and modeling" at the Society for Environmental Toxicology and Chemistry Meeting in Baltimore, MD *November 16-17*
- Spoke on "Vegetable production and nutrition in greenhouses" to the Albertus Magnus College Science Club in New Haven *November 18*
- Visited the Agriculture Class at the Sound School in New Haven and advised them on plants growing in hydroponics *November 30*
- Chaired and attended the New England Vegetable and Fruit Conference and moderated a session on greenhouse tomato and gave a talk on "Watering and Nutrition Throughout the Year" (100 attendees), and moderated a session on Winter Growing and gave a talk on "Fertilizer and Season Affect the Composition of Salad Greens Grown in High Tunnels" (100 attendees). The Conference was held in Manchester, NH *December 13-15*
- Participated in an evaluation meeting for the New England Vegetable and Fruit Conference in Manchester, NH *January 30, 2006*

- Presented the paper "Effect of Shade on Quality of Greenhouse Tomato" at the International Society for Horticultural Science Symposium on Advances in Soil and Soilless Culture Under Protected Environment" in Agadir, Morocco (300 attendees) *February 19-24*
- Spoke about germination and nutrition of hydroponic lettuce with a class at the Sound School in New Haven (10 student and 1 teacher attendees) *March 28*
- Spoke about watering and nutrition of hydroponics tomatoes at Regional School #7 in Winstead regarding their program in horticulture and general agriculture (1 student and 1 teacher attendees) *April 19*
- Organized and hosted a meeting and field trip for the NE-1017 regional research committee on "Developing and Integrating Components for Commercial Greenhouse Production Systems" at the Gordon Taylor Conference Room in Windsor. Fifteen scientists from twelve states attended the meeting *June 1-2*
- Participated in an Agriculture and Environment Career Panel at Lyman Hall High School in Wallingford (50 students) *June 5*

HANNAN, ROLLIN
- Along with Richard Cecarelli, dug up and packed up two 6-ft. chestnut trees for the University of New Hampshire. The trees were grown by Dr. Sandra Anagnostakis. A UNH staff member was on hand with a van to transport the trees, which will be planted in memory of Charles Warren, a staff member who was recently killed in an accident *October 17, 2005*

HISKES, ROSE
- Gave a talk on invasive plants to 6$^{th}$ year certificate science teachers at Southern Connecticut State University *July 6, 2005*
- Gave an update on the Discovery and Education Gardens at the Nursery and Landscape Research Tour at the Valley Lab in Windsor *July 19*
- Answered arborists questions at the Connecticut Tree Protective Association's summer meeting in Farmington *July 21*
- Participated in a Connecticut Nursery and Landscape Association's Education Committee meeting in Cromwell *July 27*
- Participated in a Connecticut Nursery and Landscape Association Education Committee Meeting n Kensington *August 11*
- Put on a Connecticut Tree Protection Association workshop "Organic Options in Tree Care" with Tim Abbey and Melissa LaVangie in Burlington *September 22*
- Hosted the Connecticut Nursery and Landscape Association Accredited Nursery Professional Students at a plant identification workshop in the CNLA Discovery and Education Gardens at the Valley Lab in Windsor *September 24*
- Gave a talk on invasive plants at Asnuntuck Community College in Enfield (20 attendees) *October 3*
- Gave a talk on invasive plants at St. Francis School in New Haven (22 attendees) *October 13*
- Gave a talk on houseplants at Incarnation Church in Wethersfield (60 attendees) *October 20*
- Gave a talk on Butterfly Gardening to the Oxford Garden Club in Oxford (50 attendees) *October 25*
- Taught pesticide applicator training to grape and Christmas tree growers in Windsor *October 27 and November 3*
- Proctored the private applicator pesticide exam in Windsor (6 attendees) *November 15*
- Participated in a CNLA Education Committee meeting in Kensington *August 11*
- Taught pesticide applicator training to grape and Christmas tree growers in Windsor (7 attended) *November 7*

- Proctored the private applicator pesticide exam in Windsor (6 attended) *November 15*
- Gave a talk on vertebrate garden pests and invasive plants to the Cheshire Garden Club (35 attendees) *February 6, 2006*
- Participated in a Connecticut Invasive Plant Working Group Symposium Planning Committee in Windsor *February 8*
- Served as a judge at the Suffield Vocational Agriculture Speech Competition in Suffield *February 9*
- Gave a talk on invasive plants at Asnuntuck Community College in Enfield (20 attendees) *February 22*
- Staffed the Connecticut Nursery and Landscape Association booth at the Connecticut Flower Show in Hartford *February 24*
- Staffed the Connecticut Invasive Plant Working Group booth at the Connecticut Flower Show in Hartford *February 25*
- Staffed the Station booth at the Connecticut Flower Show in Hartford *February 26*
- Gave a talk on "Care of Home Lawns" to the Green Bay Garden Club in Windsor (15 attendees) *March 7*
- Participated in a Connecticut Invasive Plant Working Group Symposium Planning Committee in Windsor *March 10*
- Staffed the Station booth at the Master Gardener Symposium in Manchester *March 18*
- Gave a talk on invasive plants at Nichols garden club in Trumbull (20 attendees) *March 14*
- Arranged a display of Station Research on Invasive Plants for an Arbor Day fair at Mitchell College in New London *March 21*
- Gave a talk with Tom Rathier, Jim LaMondia, DeWei Li and John Winiarski on "Educational and Display Gardens" to students from Springfield College in Windsor (90 attendees) *March 21*
- Taught an adult education class on "Trees and Shrubs for the Connecticut Landscape" in Windsor (6 attendees) *March 23 and 30*
- Participated in a Connecticut Tree Protective Association Education Committee Meeting in Wallingford *April 11*
- Assisted in staffing the Station display at the CPTV Family Science expo 2006 at the CT Expo Center (4,177 children, 1,665 adult attendees) *April 29*
- Participated in a Connecticut Invasive Plant Working Group Symposium Planning Committee in Windsor *May 15*
- Taught Integrated Pest Management to over 600 school children during Farm City Week at Lockwood Farm in Hamden *May 16-18*
- Led the Cheshire Red Hat Club on a tour of the Bird and Butterfly Garden at Lockwood Farm in Hamden (7 attendees) *May 23*
- Participated in a Connecticut Invasive Plant Working Group Symposium Planning Committee in Windsor *June 13*

INMAN, MARY

- Gave the talk "Gardening in Containers" at Partnerships Center for Adult Daycare in Hamden *July 20, 2005*
- Gave the talk "General care and common problems of houseplants" to the Branford Garden Club in Branford *October 6*

KACZENSKI, LISA

- Assisted in the setting up of the Station booth at the Connecticut Flower Show *February 22, 2006*

- Assisted in staffing the Station display at the CT Flower Show *February 23*
- Assisted in staffing the Station display at the CPTV Family Science Expo 2006 at the CT Expo Center (4,177 children, 1,665 adult attendees) *April 27-30*
- Demonstrated how pollution sources affect our water ways to Farm City students at Lockwood Farm *May 16*
- Continued to maintain the "Bluebird Trail" established in 2005 at Lockwood Farm. Added an additional Bluebird nest box donated by the Madison Garden Association to make a total of 14 nest boxes. The program produced 5 pairs of nesting Bluebirds with 21 successful fledglings *Spring-Summer 2006*

KETTLE, IRA
- Gave a report on bee inspection findings for 2005 at the CT Beekeepers' Association Meeting *February 4, 2006*
- Assisted at the Station's exhibit at the CT Flower and Garden Show in Hartford (7,072 attendees over 4 days) *February 25-28*
- Helped set up an exhibit and greeted visitors at the Annual Garden Expo at Ludlowe High School in Fairfield (1,419 attendees). *March 18-19*
- Assisted in staffing the Station display at the CPTV Family Science expo 2006 at the CT Expo Center (4,177 children, 1,665 adult attendees) *April 27-30*
- Gave a live presentation and talk on importance of honey bees to the Andover Senior Center (21 attendees) *May 3*
- Spoke on registering, Varroa medications, and inspection findings to the Eastern Beekeepers' Association at their Twilight Meeting (40 attendees) *May 11*
- Displayed honey bees and talked to students from many visiting school at Farm City Week on Lockwood Farm in Hamden *May 16-18*

KROL, WALTER
- Participated in numerous conference calls throughout the year as a member of the Interstate Chemical Terrorism Workgroup (ICTW) *July 2005-June 2006*
- Served as a judge in the CPEP New Haven Public Schools Science Fair at Woolsey Hall in New Haven *March 13-14*
- Participated in a course at the Army Aviation Support Facility (AASF) at Bradley International Airport entitled "Small Scale Production of Chemical/Biochemical Agents" *April 3-7*
- Presented the talk "Pesticides in food – keeping up with new products" at CAES Spring 2006 Open House in Jones Auditorium *April 20*

KWON, SEOKJOON
- Presented a paper entitled "Adsorptive Properties of Environmental Black Carbon: Pseudo Pore Blockage by Model Lipid Components of Natural Organic Matter" at the Northeast Regional Meeting of the American Chemical Society, held at Sacred Heart University in Bridgeport, CT *July 14, 2005*

LAMONDIA, JAMES A.
- Spoke about nematode diseases and diagnostics for tree fruit at the Connecticut Pomological Society Twilight meeting held at Lockwood Farm *July 6, 2005*
- Spoke about the effect of lesion nematode management by rotation or green manure crops on potato early dying during the Society of Nematologists meeting in Fort Lauderdale, FL *July 11*

- Was interviewed about tobacco blue mold and the state of the 2005 tobacco crop by Marla Goldberg of the Springfield MA Daily News *August 2*
- Gave the short talk "Rotation and green manure crops for nematode control" on Plant Science Day *August 3*
- Participated in a quarterly meeting of the Connecticut Tree Protection Examining Board in New Haven *September 7*
- Gave a tour of the Valley Laboratory to 3 officials visiting from the Peoples' Republic of China *October 3*
- Met with representatives of the crop insurance industry to review culture and disease aspects of both shade tobacco and broadleaf tobacco in the Connecticut Valley *October 6*
- Presented the paper "Systemic acquired resistance and fungicides for management of tobacco blue mold" at the Northeast Division meeting of the American Phytopathological Society in Geneva, NY *October 5-7*
- Spoke on research results at the Annual Meeting of the Northeast Regional Nematology Technical Committee (NE-1019) held in Geneva, NY *October 6-8*
- Spoke to the CAES Board of Control about strawberry black root rot research *October 19*
- Gave a guest lecture on "Genetics in plant pathology" to students at Asnuntuck Community College *October 24*
- Presented a Plant Pathology lecture on nematode identification at the University of Connecticut (17 attended) *November 16*
- Spoke on "Tobacco blue mold, a periodically introduced pathogen" to Trinity College students at the Valley Laboratory (30 attended) *November 17*
- Participated in the quarterly meeting of the Connecticut Tree Protection Examining Board in New Haven *December 14*
- Presented "Epidemiology and Management of Tobacco Blue Mold" at Lunch Club in New Haven *February 21, 2006*
- Spoke about research on management of tobacco pathogens including blue mold and tobacco mosaic virus and results of the breeding program for pathogen resistance at the CAES Tobacco Research Meeting held in Suffield (130 attendees) *February 22*
- Spoke about the Experiment Station and summer research assistant opportunities at a Career Day and Job Fair held at Central Connecticut State University (35 attendees) *February 27*
- Participated in the quarterly meeting of the Connecticut Tree Protection Examining Board in New Haven *March 16*
- Discussed Connecticut Valley tobacco culture and diseases with scientists from North Carolina State University *March 16*
- Participated in a tobacco growers informational meeting held by DeCran Ag Supplies in Northampton, MA *March 16*
- Spoke about the Station's overview and plant pathology research to students in the Sports Management Graduate Program from Springfield College at the Valley Lab in Windsor (100 student attendees) *March 21*
- Spoke about breeding for resistance to multiple pathogens in Connecticut wrapper tobacco at the CPS Tobacco Growers Meeting held in East Windsor (117 attendees) *April 5*
- Was interviewed about tobacco fungicide options by Dr. Richard Michell of the US EPA Office of Pesticide Programs *April 24*
- Was interviewed about the historical role of tobacco in the economy of colonial Connecticut by author Bruce Fairchild *May 10*
- Participated in a planning meeting for Arboriculture 101 in New Haven *May 31*
- Welcomed the Regional Research Group NE-1017 to the Valley Laboratory during their project meeting *June 1*

- Was interviewed by Paul Hughes of the Waterbury Republican American concerning cottonseed tree seed dispersal *June 6*
- Participated in the Connecticut Agricultural Information Council meeting in Tolland *June 7*
- Participated in the quarterly meeting of the Connecticut Tree Protection Examining Board in New Haven *June 14*
- Presented a paper entitled "Timing of broadleaf tobacco post-harvest tillage affects tobacco cyst nematode population development" at the annual meeting of the society of Nematologists *June 18-21*

LI, DE-WEI
- Presented the paper "Airborne basidiospores of boletes and their potential to infiltrate a residence in central Connecticut" at the Indoor Air 2005 meeting in Beijing, China *September 4-9, 2005*
- Gave an invited paper "Indoor fungi, their health effects, and research development" at Beijing Forestry University *September 8*.
- Visited the Shandong Forest Protection Institute, Shandong Academy of Forestry Research in Jinan and discussed research with plant pathologists Yuzhu Wu and Yanping Ji who visited CAES in 2004 *September 15*
- Hosted a group of 3 Chinese administrators on a visit arranged by the State Office of Policy and Management. The group visited the Valley Lab and the Departments of Plant Pathology and Ecology, Analytical Chemistry, Entomology, and Forestry and Horticulture in New Haven *October 3*
- Participated in a meeting of the Analytic Accreditation Board, American Industry Hygiene Association in Denver, CO *October 21-24*
- Presented the talk "Research on airborne and indoor fungi at the Connecticut Agricultural Experiment Station" to faculty and staff of the Environmental Health Center at UCONN Medical Center (11 attendees) *December 7*
- Participated in a meeting with researchers at Yale University School of Medicine to collaborate on planning the next three years of research *December 8*
- Participated in a board meeting of the Analytic Accreditation Board of American Industry Hygiene Association in Nashville, TN *February 2-5, 2006*
- Gave a presentation "Indoor fungi and building management" to Springfield College Students *March 21*
- Gave a lab tour to staff of the Occupational and Environmental Health Center of UCONN Health Center *April 13*
- Participated in a Board meeting of the Analytic Accreditation Board of the American Industry Hygiene Association in Chicago *May 13-14*
- Participated in the Currant Health Fair in Hartford *June 15*
- Hosted a group of 2 Chinese administrators. They visited the Valley Lab and the State Office of Policy and Management *June 21*

MAGNARELLI, LOUIS A.
- Spoke to the media at a press conference about mosquito/encephalitis virus research and the invasive aquatic plants project at the Station *July 7, 2005*
- Was interviewed about agriculture in Connecticut by Ken Simon of Simon Pure Productions *July 12*
- Was interviewed about ehrlichiosis by Gale Braccidiserro of the New York Times *July 22*
- Was interviewed about Plant Science Day by Ray Andrewsen of WQUN Radio in Hamden *August 2*

- Participated in an agricultural forum at the Hindinger Farm in Hamden and spoke about Station research farms *August 2*
- Was interviewed about Plant Science Day by Brian Smith of WICC Radio *August 2*
- Was interviewed about hybrid corn research done at the Station by Joyce Resinold, a freelance writer *August 25*
- Spoke to the Experiment Station Associates Board members about West Nile encephalitis, formula funds, a new potential human pathogen, Farm/City Week, and Plant Science Day *September 1*
- Participated in an Invasive Plants Council meeting in Hartford *September 6*
- Was interviewed about beekeeping in Connecticut by Linda Lambeck *September 15*
- Was interviewed about ticks by Leon Collins of Channel 3 TV, WFSB in Hartford *September 16*
- Greeted Federated Garden Club members in Jones Auditorium and gave an update on Station programs *September 27*
- Was interviewed about food safety by Nancy Cohen of Public Radio *October 4*
- Greeted the Greenhouse Growers in Jones Auditorium and gave a brief report on research advances at the Station *October 26*
- Participated in an Invasive Plant Council Meeting in Hartford *November 1*
- Met with Experiment Station Associates at Lockwood Farm and gave a report on Station research *December 1*
- Attended the fruit growers' annual meeting in Glastonbury *December 6*
- Attended an Invasive Plants Council Meeting in the State Capitol *December 13*
- Welcomed participants to the winter meeting on forestry research in Connecticut in Jones Auditorium (32 attendees) *January 10, 2006*
- Participated in an Invasive Plants Council Meeting in Hartford *January 11*
- Participated in a meeting of the Connecticut Tree Protective Association in Southington *January 19*
- Was interviewed by Marian Brown of the Connecticut Post about gypsy moths *February 2*
- Visited the Connecticut National Guard Headquarters in Hartford to view their mobile laboratories *February 9*
- Participated in an invasive plants meeting in Hartford *February 14*
- Hosted and attended a meeting of the Experiment Station Associates Board in Slate Laboratory *February 16*
- Welcomed the Experiment Station Associates to their annual meeting in Jones Auditorium and gave an update on research programs (32 attendees) *March 16*
- Welcomed Federated Garden Club members to Jones Auditorium and gave a report on Station research (45 attendees) *March 21*
- Gave a report to the Experiment Station Associates Board members on Station research (10 attendees) *April 5*
- Was interviewed about gypsy moths by Fran Schneido of WCBS News Radio *April 7*
- Was interviewed about ticks by Bob Miller of the Danbury News Times *April 11*
- Welcomed attendees to the CAES Spring 2006 Open House in Jones Auditorium (85 attendees *April 20*
- Was interviewed about invasive plants by Nancy Cohen of CT Public Radio *April 24*
- Participated as Vice-Chair of the Invasive Plants Council at their meeting in Hartford *May 11*
- Met with officials from the CT Department of Transportation to discuss a research project to help keep deer off of highways *May 23*
- Was interviewed about ticks and Lyme disease by Fran Schneido of WCBS Radio *May 26*

- Was interviewed for the Public Affairs TV Program "Local Edition" by Tim Washer in Newtown *May 30*
- Welcomed members of Multistate Research Project NE-1017 on greenhouse studies at the Valley Laboratory in Windsor *June 1*
- Was interviewed about mosquitoes and encephalitis viruses by Bob Miller of the Danbury News Times *June 2*
- Met with the Board of Directors of the Experiment Station Associates and gave a report on mosquito/encephalitis viruses, invasive aquatic plants, and integrated pest management research *June 13*
- Was interviewed about gypsy moths by Marian Brown of the Connecticut Post *June 19*

MAIER, CHRIS T.

- Spoke about "Alternate Hosts of Fruit Insects and Other Tidbits" at a Twilight Meeting of the Connecticut Pomological Society at Lockwood Farm *July 6, 2005*
- Displayed new entomological literature, a Connecticut walking stick, and an unusual collection of acrocerid flies (spider parasites) during a meeting of the Connectiuct Entomological Society at Yale University, New Haven *October 21*
- Gave the seminar "Invasive Insects In or Near Connecticut: Life Histories, Distributions, and Monitoring Techniques" at Trinity College, Hartford (30 attendees) *November 15*
- Summarized events at the recent Field Meeting of the North American Dipterists' Society in Oregon, displayed Oregon insects, and showed publications of two prominent societies for Diptera enthusiasts during the monthly meeting of the Connecticut Entomological Society at the University of Connecticut, Storrs. (30 attendees) *November 18*
- Displayed a poster on the winter moth at the Annual Meeting of the Connecticut Pomological Society in Glastonbury (ca. 50 people attended) *December 6*
- Presented a poster titled "Seasonal Activity Patterns and Hosts of Northeastern Cedar Longhorns (Coleoptera: Cerambycidae)" while attending the Annual Meeting of the Entomological Society of America in Ft. Lauderdale, Florida (ca. 1800 people attended the conference) *December 17*
- Spoke about the "Survey for the Emerald Ash Borer" and presented a poster on the winter moth at the Annual Meeting of the Connecticut Tree Protective Association in Plantsville, CT (675 attendees) *January 19, 2006*
- Exhibited European scientific literature on flower flies (Syrphidae) at a meeting of the Connecticut Entomological Society at the University of Connecticut in Storrs (30 attendees) *February 17*
- Spoke on the "Emerald Ash Borer and Other Exotic Insects", displayed exotic insects, and distributed fact sheets at the Forest Health Workshop in Jones Auditorium. (40 attendees) *March 9*
- Spoke about research projects involving the Diptera (flies) of Connecticut with directors of Aton Forest (10 attendees) *April 7*
- Spoke about the emerald ash borer and the brown marmorated stink bug at a meeting of the State Survey Committee of the Cooperative Agricultural Pest Survey of USDA, APHIS, at the Valley Laboratory (20 attendees) *April 11*
- Displayed a collection of showy tropical insects and distributed new information on exotic pests at the Annual Dinner Meeting of the Connecticut Entomological Society in Jones Auditorium (60 attendees) *April 21*
- Presented an exhibit on managing apple insects and answered questions at the 135$^{th}$ Anniversary Celebration of Bishop's Orchards, Guilford (200 attendees) *May 6*

- Spoke about the brown marmorated stink bug, the winter moth, and a coleopteran borer of peach roots at the Twilight Meeting of the Connecticut Pomological Society at Belltown Orchards, Glastonbury (70 attendees) *May 24*
- Displayed a poster on the winter moth and handed out fact sheets on the brown marmorated stink bug while attending the President's Summer Meeting of the Connecticut Pomological Society at Norton Brothers Orchards in Cheshire (80 attendees) *June 17*

MARRA, ROBERT E.
- Gave the talk "Ramorum Blight (aka Sudden Oak Death): Are Connecticut's Forests and Landscapes at Risk?" at the summer meeting of the Connecticut Tree Protective Association in Farmington *July 21, 2005*
- Spoke about Ramorum Blight to a Botany class from Quinnipiac University in Jones Auditorium *November 7*

MASTRONE, TIA
- Assisted in setting up and staffing the Station display at the CPTV Family Science expo 2006 at the CT Expo Center (4,177 children, 1,665 adult attendees) *April 27-30, 2006*
- Attended the USDA Forest Service Digital Aerial Sketch Mapping (D-ASM) training program in Holyoke, MA *May 16*
- Completed the Incident Command System (ICS) 100 Training online with the US Department of Agriculture *June 2*

MATTINA, MARYJANE INCORVIA
- Attends monthly meetings hosted by the Connecticut Department of Public Health for laboratories engaged in responding to chemical terrorist activities *July 2005-June 2006*
- Met with Loralee Jones, granddaughter of Donald F. Jones, and told her about projects underway in Analytical Chemistry. She also toured laboratories *September 19, 2005*
- Participated in a meeting hosted by the FDA Northeast Regional Laboratory for the Northeast FERN chemistry participants in Jamaica, NY *October 27*
- Spoke on work in progress in Analytical Chemistry to members of the Naugatuck Valley Chapter of the American Society for Quality (ca. 30 people attended) *November 9*
- Presented a report on research related to the analysis of chiral pollutants in the environment at the 26$^{th}$ national meeting of the Society of toxicology and chemistry in Baltimore, MD *November 14*
- Gave a presentation and a tour of the laboratories in Analytical Chemistry to the Science Club of Albertus Magnus College (15 students and 3 teachers attended) *November 18*
- Gave a tour of the Station and discussed work conducted in Analytical Chemistry to Russell Slayback, Chairman of Leggette, Brashears, and Graham *November 17*
- Gave a tour of laboratories in Analytical Chemistry to Lts. McCarroll and Chabot of the 14$^{th}$ Civil Support Team (Connecticut). After the tour they met with Analytical Chemistry staff *November 22*
- Participated in a meeting at the FDA Forensic Chemistry Center in Cincinnati for the eight Chemistry Cooperative Agreement laboratories *December 1-2*
- Along with the entire staff of Analytical Chemistry participated in two days of meetings related to the Cooperative Agreement that the Department has received from USFDA. Officials from the Forensic Chemistry Center in Cincinnati and the Division of Field Science at FDA attended the discussions to enhance cooperation between the two laboratories *January 24-25, 2006*
- Met with an official of the Kent Land Trust to discuss analysis of soils bordering the Housatonic River for PCB content *February 2*

- Toured the chemistry laboratories of the Connecticut Department of Public Health *February 9.*
- Presented a talk on Updates in Analytical Chemistry at the annual Experiment Station Associates meeting *March 16*
- Organized, hosted and presented a talk at the Station's Plant Science in the Spring Open House held at the Station *April 20*
- Participated in the annual meeting of CPEP, the sponsoring organization of the New Haven Public Schools Science Fair, held at Peabody Museum of Yale University *May 8*
- Was interviewed about issues related to atmospheric transport of persistent organic pollutants by Janet Pelly of Environmental Science and Technology *May 31*

MAYNARD, ABIGAIL

- Spoke on "Update of Japanese and Beach Plum Trials" at a meeting of the Connecticut Pomological Society held at Lockwood Farm *July 6, 2005*
- Reported on Station activities at the quarterly meeting of the Council on Soil and Water Conservation in Windsor *August 4*
- Judged fruits and vegetables at the North Haven Fair *September 8*
- Gave a tour of Lockwood Farm to a group of pre-kindergarten and kindergarten classes from Hamden Hall Country Day School *September 26*
- Spoke about the New Crop Program to the Experiment Station Associates at Lyman Orchards in Middlefield *October 5*
- Hosted the third grade from Hamden Hall Country Day School at Lockwood Farm and spoke about the New Crop Program *October 6*
- Spoke about the New Crop Program to visiting students from the Metropolitan Academy-New Haven *October 7*
- Reported on Station activities at a quarterly meeting of the Council on Soil and Water Conservation in Windsor *October 27*
- Participated in the annual meeting of the Connecticut Pomological Society in Glastonbury *December 6*
- Presented the talk "Sweet Potatoes for New England" at the New England Vegetable and Fruit Growers Conference in Manchester, New Hampshire (200 attendees) *December 13*
- Spoke on Station IPM research at a meeting of the State Technical Committee in Tolland (20 attendees) *December 14*
- Reported on Station activities at a quarterly meeting of the Council on Soil and Water Conservation in Windsor (18 attendees) *January 31, 2006*
- Advised Brownie Troop 360 on gardening at Hamden Hall Country Day School (11 children and 3 adult attendees) *March 6 and 27*
- Was interviewed about the New Crops Program by Marian Brown of the Connecticut Post *March 23*
- Reported on Station activities at a quarterly meeting of the Council on Soil and Water Conservation (15 attendees) in Windsor *April 26*
- Presented a talk "Unusual Garden Vegetables" to the Heritage Village Garden Club in Southbury (40 attendees) *May 17*
- Assisted Brownie Troop 360 in science experiments in Hamden (8 youths and 2 adults) *May 22*
- Toured gardens at Hamden Hall Country Day School and answered questions about gardening and the Station *June 5*
- Visited the farm at the Common Ground High School in New Haven and answered questions about gardening *June 8*

MCHALE, NEIL

- Presented lectures on Genetic Research in Plants to visiting students from Springfield College (Springfield, MA) as part of their Plant Physiology Class under Professor Charles Reddington *November 15, 2005*

MERVOSH, TODD

- Gave a talk about invasive plants and current management research to a group of ISIS Fellows (high school science teachers) at Southern Connecticut State University in New Haven *July 6, 2005*
- Gave talks on "Managing Horsetail (Equisetum) in Landscapes", Weed Management in Container-grown Plants", and "Managing Japanese Knotweed and Phragmites", and presented an informational display of weeds at the Nursery and Landscape Research Tour at the Valley Lab *July 19*
- Spoke about "Weed Management in Christmas Tree Plantations" and presented an informational weed display at a Christmas Tree Growers Twilight Meeting at the Valley Lab *July 19*
- Presented a poster with co-author David Gumbart of The Nature Conservancy on "Control of Oriental Bittersweet, Pale Swallowwort, and Phragmites at Bluff Point Coastal Reserve in Connecticut" at the New England Invasive Plant Summit in Framingham, MA *September 16-17*
- Delivered 1600 pounds of pumpkins harvested in an experiment at the Valley Lab to Northwest Park in Windsor for use at their annual Country Fair *September 24*
- Spoke about weed management in Christmas tree plantings at the fall meeting of the Connecticut Christmas Tree Growers' Association in Hamden (50 attendees) *October 1*
- Led an on-site workshop focused on identification and management of invasive plants for the East Granby Land Trust (6 attendees) *October 5*
- Participated in the IR-4 Project's Ornamental Horticulture Workshop (Weed Science Section) in Charleston, SC *October 11-12*
- Spoke on "Invasive plant management in right-of-way areas" as part of a DEP workshop in North Haven (70 attended) *November 16*
- Spoke to two classes from Trinity College about "Invasive Plants in Connecticut" at the Valley Laboratory (35 attended) *November 17*
- Hosted and participated in two meetings of the Connecticut Invasive Plant Working Group at the Valley Laboratory (30 attended) *November 29*
- Presented a guest lecture on "Weed management for ornamental plants" for an undergraduate weed science class at the University of Massachusetts in Amherst (50 students attended) *December 6*
- Participated in a meeting of golf course superintendents in Avon *December 7*
- Hosted a symposium planning meeting for the Connecticut Invasive Plant Working Group at the Valley Lab (10 people) *December 12*
- Spoke about research on "Quinoclamine for Control of Liverwort in the Propagation of Woody Ornamentals" and presented the poster "Management of Oriental Bittersweet Vines and Pale Swallowwort at the Connecticut Coastal Reserve" and was moderator for a symposium on "Recent Advances in Nursery Weed Management" at the annual meeting of the Northeastern Weed Science Society in Providence, RI (200 attended the conference) *January 4-6, 2006*
- Participated in a symposium planning meeting for the Connecticut Invasive Plant Working Group at the Valley Laboratory (10 attendees) *January 10*
- Participated in a symposium planning meeting for the Connecticut Invasive Plant Working Group at the Valley Laboratory (9 attendees) *February 8*

- Presented a research poster on "Management of Oriental Bittersweet (*Celastrus orbiculatus*) and Pale Swallowwort (*Cynanchum rossicum*)at a Connecticut Coastal Reserve" and was Chair of the Turf & Ornamentals Section of the Annual Meeting of the Weed Science Society of America in New York City (300 attended the conference) *February 13-16*
- Participated in a regional workshop on giant hogweed, a federal noxious weed, in Harrisburg, PA *March 7-8*
- Hosted a symposium planning meeting for the Connecticut Invasive Plant Working Group at the Valley Lab (11 attendees) *March 10*
- Spoke about plant/herbicide interactions at a training session for pesticide applicators organized by Vegetation Control Service, Inc. in Orange, MA (70 attendees) *March 23*
- Participated in a state survey committee meeting of the Cooperative Agricultural Pest Survey at the Valley Lab *April 11*
- Was interviewed about weed management options for container-grown nursery stock by Lauren Daniel of NM Pro magazine *May 9*
- Participated in a symposium planning meeting for the Connecticut Invasive Plant Working Group at the Valley Laboratory (10 attendees) *May 15*
- Was interviewed about poison ivy by Mindy Ramsey of NBC 30 Connecticut News *May 22*
- Spoke about weed control options for Christmas tree plantings at a meeting of the Connecticut Christmas Tree Growers' Association in Somers (60 attendees) *June 6*
- Participated in a symposium planning meeting for the Connecticut Invasive Plant Working Group at the Valley Laboratory (8 attendees) *June 13*
- Was interviewed about managing horsetail (*Equisetum*) in landscape beds by Pamela Weil of Connecticut Gardener *June 19*

MOLAEI, GOUDARZ

- Presented the poster "Host feeding patterns of *Culex* mosquitoes in relation to enzootic and epidemic transmission of West Nile virus in the Northeastern United States" at the 4th International Congress of Vector Ecology in Reno, NV *October 2-7, 2005*

MUSANTE, CRAIG

- Met with Loralee Jones, granddaughter of Donald F. Jones, and talked with her about work being done in Analytical Chemistry and gave her a tour of the laboratories September 19, 2005
- Participated in the Agilent 7500 ICP-MS System Training Course (H8974A) in Wilmington, DE *March 28-31, 2006*
- Participated in the US-FDA ICP-MS Methods Training Course held in Cincinnati, OH *April 27-28*

NAIL, WILLIAM

- During the year, many visits were made to private vineyards, farms, and residences helping with problems and advising on starting and maintaining vineyards 2005-2006
- and advice given to many state residents on growing grapes *July 2005-June 2006*
- Spoke on "Growing Grapes in Connecticut" at a meeting of the Connecticut Pomological Society held at Lockwood Farm *July 6*
- Met with officials at Harkness State park to discuss care of old, historic grapevines during greenhouse reconstruction *July 8*
- Participated in the annual meeting of the American Society of Enology and Viticulture – Eastern Section, in St. Louis, MO *July 13-16*

- Participated in a meeting of the New England Grape Growers in Little Compton, RI *August 15*
- Helped staff the Connecticut Farm Wine Council booth at The Big E in West Springfield, MA *September 21*
- Presented a description of the wine grape research program at the Station, which was published in the November-December issue of Wine East Magazine *October 11*
- Participated in a meeting of NE-1020 "Multi-State Evaluation of Wine Grape Varieties and Clones, in Winchester, VA *November 2-3*
- Participated in a meeting of the Connecticut Grape and Winery Association *November 14*
- Participated in a meeting of the Connecticut Grape and Winery Association *December 5*
- Participated in a meeting of the Connecticut Farm Wine Council at the Valley Laboratory *December 5*
- Presented the talk "Critical Issues in Early Vineyard Establishment" at the New England Vegetable and Fruit Conference 2005 in Manchester, New Hampshire (90 attendees) *December 14-15*
- Participated in meetings of the Connecticut Grape and Wine Association at the Valley Laboratory *January 9, 2006*
- Gave a presentation on "Vineyard Establishment" at the Connecticut Vegetable and Small Fruit Growers Conference in Vernon (130 attendees) *January 26*
- Presented the poster "Pruning and training system effects on yield and vegetative growth of Concord grapevines in Michigan" at the 6th International Cool Climate Symposium for Viticulture and Oenology in Christchurch, New Zealand (505 attendees) *February 7*
- Participated in a UMass Extension Meeting to discuss grape harvest rots in Westport, MA *March 15*
- Participated in a meeting of the Connecticut Farm Wine Council at Chamard Vineyards in Clinton *March 16*
- Participated in SARE Project LNE04-198 progress meeting in East Wareham, MA *March 20*
- Participated in the National Viticulture Extension Leadership Conference in San Antonio, TX *March 28-30*
- Assisted in the pruning and restoration of heritage greenhouse grapes at Harkness State Park *May 10*
- Participated in the Connecticut Grape and Winery Association Meeting at the Valley Laboratory (13 attendees) *June 5*
- Participated in a meeting of the Connecticut Farm Wine Council at the Valley Laboratory (4 attendees) *June 5*
- Participated in the annual meeting of the American Society for Enology and Viticulture in Sacramento, CA *June 28-30*

PETERSON, RICHARD

- Presented current research results and discussed collaborative experiments with Dr. Harry Frank at the Department of Chemistry at the University of Connecticut at Storrs *December 13, 2005*
- Attended the Twenty-third Annual Eastern Regional Photosynthesis Conference at Woods Hole, MA and presented two posters entitled "Progress Toward a High Throughput Structure-Function Analysis of the psbS Protein:Properties of psbS-Silenced *Nicotiana benthamiana*" and A Structure-Function Study of the psbS Protein of Photosystem II Based on Phylogeny and Site-Directed Mutagenesis *April 21-23, 2006*

PIGNATELLO, JOSEPH

- Gave the keynote presentation entitled "Some Fundamental Issues in Sorption Related to Physical and Biological Remediation of Soils" at a NATO-OTAN Advanced Research Workshop on Viable Methods of Soil and Water Pollution Monitoring, Protection and Remediation held in Krakow, Poland *June 25-July 2, 2005*
- Presented an invited lecture "Insights on molecular interactions of nonionic organic compounds with environmental black carbon (wood char) drawn from adsorption experiments, surface characterization, and studies of model systems" in an Environmental Chemistry Division Symposiuim on Characterization and Properties of Enviromentally Relevant Black Carbon Particles, American Chemical Society, held in Washington, D.C. *August 2*
- Presented the talk "Molecular interactions of nonionic organic compounds with environmental black carbon" at the 1st International Conference for Carbon for Energy Storage and Environmental Protection, Orleans, France *October 4*
- Presented an invited talk "Issues of biostimulation, bioaugmentation and bioavailability in the remediation of PAHs in a coal tar soil" at the 21st Annual International Conference on Soils, Sediments and Water, University Massachusetts, Amherst, MA *October 17*
- Presented the invited talk "Irreversible sorption of organic compounds to soil organic matter: Underlying causes and implications for the physical nature of SOM as a sorbent" at a Symposium on Humic Substances as Environmental Sorbents, at the Soil Science Society International Annual Meeting, Salt Lake City, Utah *November 6-10*
- Spoke about "Irreversible" sorption of organic compounds to soil particles at a CAES Lunch Club seminar *January 24, 2006*
- Presented an invited seminar "Advances in Our Understanding of the Sorption of Hydrophobic Organic Pollutants to Natural Organic Matter" to the Department of Chemistry, Louisiana State University, Baton Rouge, LA *February 10*
- Presented an invited seminar "Surface and Adsorptive Properties of Wood Char" at the IX Humic Science and Technology Meeting, Boston, MA *March 22*
- Presented a keynote address "Issues in Sorption Related to the Bioavailability of Chemicals in Soils" at the Pesticide Behaviour in Soils, Water and Air Conference, University of Warwick, Coventry, UK *March 27-29*

PRESTE, JAMES

- Met with a Forest Health Supervisor in the Massachusetts Department of Environmental Management at Southbridge, MA, to discuss cooperation in a winter study of predator survival on hemlock woolly adelgid *September 22, 2005*
- Discussed hemlock health and pests with an official of the DEP at Burr Pond State Park in Torrington, CT *August 16, 2006*

RATHIER, THOMAS

- Organized and led a tour of crops in the Connecticut River Valley, helped organize and lead a tour of a biotechnological facility and watershed study area in southeastern Connecticut, and presented a paper titled "Review of variables affecting the availability of mineralized N for shade tobacco fertilized with organic meals under plasticulture" for the annual meeting of the Northeast Branch of the American Agronomy Society/Soil Science Society of America in Storrs *July 11-13, 2005*
- Helped man the CAES booth and answered questions about tree problems at the summer meeting of the Connecticut Tree Protective Association in Farmington *July 21*
- Met with officials from the EPA and USDA-NRCS at the Jones Family Farm in Shelton *August 15*

- Organized and presented an educational tour for the summer field meeting of the Rhode Island Christmas Tree Growers Association in Rehoboth, MA *August 27*
- Spoke on Container Gardening to the North Stonington Garden Club (20 attendees) *September 27*
- Lectured on Tree-Soil Relationships to Arboriculture 101 students in Jones Auditorium (45 attendees) *September 28*
- Organized the education portion of the Connecticut Christmas Tree Growers Association Fall meeting and spoke on Cultural and Fertility Management in Hamden (65 attendees) *October 1*
- Spoke on Fall Planting of Woody Plants to the Connecticut Groundskeepers Association in Jones Auditorium (30 attendees) *October 3*
- Was interviewed about red pines in Connecticut by Mark Simpson of the Journal Inquirer *November 2*
- Instructed Arboriculture 101 students on insect identification and management in Jones Auditorium (45 attendees) *November 2*
- Taught pesticide applicator training to grape and Christmas tree growers in Windsor (7 attended) *November 7*
- Participated in a review session for Arboriculture 101 students in Jones Auditorium (45 attendees) *December 14*
- Spoke on Soils and Composting as a part of the Garden Lecture Series for the Friends of Elizabeth Park at the Park's Pond House in West Hartford (50 attendees) *January 18, 2006*
- Answered questions about tree health at the CAES booth at the annual Winter Meeting of the Connecticut Tree Protective Association in Southington *January 19*
- Gave a lecture on Tree Soil Relationships to Arboriculture 101 students in Jones Auditorium (45 attendees) *February 1*
- Was interviewed about the affect of unusually warm weather on woody plants by Christine McCluskey of the Journal Inquirer *February 6*
- Organized the educational program for the annual Winter Meeting of the Connecticut Christmas Tree Growers Association in Middletown *March 4*
- Lectured on Keys to Success with Woody Plants in the Landscape at the UConn Garden Conference (400 attendees) *March 9*
- Talked on insect identification and management for Arboriculture 101 in Jones Auditorium (45 attendees) *March 15*
- Spoke about diagnostic services of use to sport facilities managers to graduate sport management students from Springfield College at the Valley Laboratory (90 attendees) *March 21*
- Participated in a review session for Arboriculture 101 students in Jones Auditorium (45 attendees) *April 19*
- Answered questions about landscaping and gardening for hosts and callers to the WDRC Radio program House Calls in Bloomfield (8,000-10,000 listeners) *April 22*
- Spoke on Container Gardening at the Westport Senior Center (25 attendees) *May 15*
- Lectured on landscaping with woody plants at Revay's Garden Center (50 attendees) *May 18*
- Participated in an organizational meeting for the Hartford Botanical Garden *May 23*
- Answered questions about soil fertility at a twilight meeting for Christmas tree growers in Somers (25 attendees) *June 7*

RIDGE, GALE
- Was interviewed about the gypsy moth caterpillar outbreak by Channel 30 News *July 13, 2005*

- Was interviewed about the gypsy moth outbreak in Middlesex County by Mike McCune of the Hartford Courant *July 26*
- Worked with the disaster medical assistance team, homeland security and mobile field hospital in Louisiana, advising on protection of the staff from Fire ants and other biting and stinging arthropods *September 19*
- Was interviewed by a film crew on wildlife in New England about the rough neck root borer *September 22*
- Spoke on the history, epidemiology, and social impact of past major flu pandemics and the potential effects of H5N1 Avian flu today for the Amity Senior High School senior class in Woodbridge *December 2*
- Was interviewed about sod webworm ecology in the Canadian Eastern Provinces for the internet publication of Ecology Action Center in Halifax, Nova Scotia *December 7*
- Talked on Lyme Disease, West Nile Virus, the H5N1 flue, and effects on society from past flu pandemics at the Connecticut Groundskeepers Association in Hartford. (110 attendees) *February 15, 2006*
- Gave a Lunch Club lecture on the adult heteroptera thoracic endoskeleton in Jones Auditorium *February 28*
- Was interviewed on gypsy moths n Connecticut by Phoebe Hall of Shore Publications in New London *March 14*
- Gave a lecture on the "Adult heteropteran thoracic endoskeleton"at the graduate symposium at the University of Connecticut in Storrs *March 18*
- Was interviewed about Formosan termites in Louisiana mulch, and the internet urban legend surrounding shipments by Leon Collins of Channel 3 News *April 13*
- Was interviewed about gypsy moths, eastern tent caterpillars, boxwood leafminers, and other early springtime pests by Hao Neguyer of the Greenwich Times *May 5*
- Was interviewed about gypsy moth outbreaks and what will happen this spring especially with the rain by Steve Grant of the Hartford Courant *May 12*
- Was interviewed about the wet weather and gypsy moths by Kevin Hogan of Channel 3 News *May 12*
- Was interviewed bout gypsy moths, bed bugs, eastern subterranean termites, carpenter ants, carpenter bees and other insect pests around homes in springtime in Connecticut by Terresa Barger of the Hartford Courant *May 25*
- Was interviewed about eastern tent caterpillars and the Gypsy moth caterpillars and their damage to trees in Connecticut this year by Bridget Ruthman of the Republican American *June 9*
- Was interviewed about biological control on purple loosestrife using Galerucella calmariensis L. and Galerucella pusilla beetles by Abram Katz of the New Haven Register *June 9*
- Was interviewed about gypsy moths and springtime feeding damage and the effects on the population from the fungus by Fran Kefalas of the Norwich Bulletin *June 15*
- Was interviewed about a gypsy moth outbreak in New London County by Judy Benson of The New London Day *June 16*

ROBB, CHRISTINA
- Participated in an ELISA training course at the Forensic Chemistry Center in Cincinnati, Ohio *April 2-4, 2006*
- Participated in mass spectrometry training at the Forensic Chemistry Center in Cincinnati June 5-9

RUTLEDGE, CLAIRE

- Spoke to workers at Milane's Nursery in Cromwell about how to recognize Asian Longhorned Beetle, and Emerald Ash Borer. Management issues for Bronze Birch Borer and Gypsy Moth were also addressed. (40 attendees) *October 14, 2005*
- Taught a session of Arboriculture 101 titled "Insects that attack trees" 35 attendees) *October 26*
- Talked on the Emerald Ash Borer to officials of the Environmental Industry Council in Southington (200 attendees) *November 22*
- Gave a Lunch Club talk on the Chemical Ecology of *Callidiellum rufipenne*, the Small Japanese Cedar Longhorn Beetle (20 attendees) *December 7*
- Spoke on the biology of the Bronze Birch Borer and gave an update on Emerald Ash Borer and Asian Longhorn Beetle at a NOFA Organic Land Care Update Course in Tolland (50 attendees) *December 8*
- Gave a talk on the "Chemical Ecology of *Callidiellum rufipenne*, the Small Japanese Cedar Longhorn Beetle to the Entomological Society of America in Ft. Lauderdale, FL (30 attendees) *December 15*
- Gave a talk on the Emerald Ash Borer and Asian Longhorn Beetle to the Spring Glen Garden Club (20 attendees) *January 18, 2006*
- Taught the class "Insects and Mites that Attack Trees" for the Connecticut Tree Protection Association's Arboriculture 101 course. (35 attendees) February 22
- Gave the talk "Chemical Communication by Small Japanese Cedar Beetle" to the Forest Health Workshop (40attendees) *March 9*
- Gave the talk "Insects that attack trees" to the Arboriculture 101 course held in Jones Auditorium (35 attendees) *March 9*
- Participated in the "Tree Conditions Laboratory Night" of the Arboriculture 101 course given by the Connecticut Tree Protective Association *March 15*
- Gave the talk "Entomology" to students at the Middlebrook School at their Career Day in Wilton (35 attendees) *April 5*

SANDREY, STEPHEN
- Assisted at the Station exhibit at the CT Flower and Garden Show, Hartford *February 25, 2006*
- Assisted in staffing the Station display at the CPTV Family Science expo 2006 at the CT Expo Center (4,177 children, 1,665 adult attendees) *April 27-30*
- At the request of the City of Hartford, surveyed Elizabeth Park for gypsy moth egg masses *April 20*

SCHULTES, NEIL
- Presented a lecture on Plant Genetic Engineering and participated in a panel discussion as part of a college level course "Issues in Biotechnology" offered by Life.edu and University of Rhode Island at the University of Rhode Island *October 19 2005*
- Presented lectures on genetic research on plants to visiting students from Springfield College as part of a Plant Physiology class under Professor Charles Redding Springfield, MA *November 15*
- Presented current research results and discussed collaborative experiments with Dr. Harry Frank at the Department of Chemistry at the University of Connecticut at Storrs *December 13*
- Presented a series of lectures on "Application of Biotechnology to Modern Agriculture" to an undergraduate seminar Science 130 at Yale University *January 20, 27, and February 3, 2006*
- Presented a lecture on "Genetic Engineering in Agriculture" to an undergraduate class Political Science 309 "Leading Issues in Bioethics" at Yale University *February 16*

- Attended the Twenty-third annual Eastern Regional Photosynthesis conference at Woods Hole, MA, and presented two posters entitled "Progress Toward a High Throughput Structure-Function Analysis of the psbS Protein: Properties of psb-S-Silenced *Nicotiana benthamiana*" and A Structure-Function study of the psbS Protein of Photosystem II based on Phylogeny and Site-Directed Mutagenesis" *April 21-23*

SELSKY, ROSLYN
- Presented a poster on aquatic plant surveys at the New England Invasive Plant Summit in Framingham, MA *September 16*
- Hosted a Volunteer Invasive Aquatic Plant Monitoring Workshop in Jones Auditorium (25 attendees) *April 29*

SHEPARD, JOHN
- Conduct a workshop on mosquitoes and mosquito-borne diseases with a group of ten science teachers from three urban public school districts as part of a Science Education Partnership Award granted by the NIH to Yale's Peabody Museum *April 27*

SMITH, VICTORIA
- Gave a presentation on current season apple scab and disease conditions at a meeting of the Connecticut Pomological Society held at Lockwood Farm *July 6, 2005*
- Was interviewed about the gypsy moth outbreak by Gil Simmons of Channel 8 News *July 15*
- Gave a demonstration on nursery inspection for Ramorum blight and processing of samples for detection of Ramorum blight at a Nursery and Landscape Research Tour held at the Valley Lab *July 19*
- Participated in a steering committee meeting of the National Plant Pathogen Laboratory Accreditation Program held in Raleigh, NC *September 21-22*
- Gave a tour of the Entomology Department to a group of Chinese officials who were being sponsored at the Station by Dr. DeWei Li *October 3*
- Represented the Station at a joint meeting of the cooperators of the Durham Field Office and the Morgantown Field Office of the US Forest Service and gave a presentation on Forest Health Monitoring and Surveys held at West Point, NY *October 4-6*
- Presented a lecture on Tree Diseases to the Arboriculture 101 class in Jones Auditorium *October 19*
- Presented the talk "Ramorum Blight: A Potential Threat to CT Forests" to the CT Urban Forestry Conference held at Mountainside Resort in Wallingford *October 27*
- Presented the talk "Ramorum Blight – A Potential Threat to CT Forests" to the University of Connectiuct Department of Forestry and Natural Resources (35 attended) *November 2*
- Participated in a meeting of the Executive Committee of the Cooperative Agricultural Pest Survey, held in Nashville, TN as the Ad Hoc Representative of the Eastern Region (20 people participated) *December 9*
- Set up a table display and gave the talk titled "Update on *Phytophthora ramorum*" at the CT Nurserymen's Association Winter Meeting in Wallingford (500 attendees) *January 4-5, 2006*
- Participated in a meeting of the New England Wildflower Society CT Task Force meeting in Rockfall (24 attendees) *January 10*
- Presented the talk "Diseases of Landscape Plants", and organized and staffed a table at a meeting of the Connecticut Groundskeepers Association held at the CT Convention Center in Hartford (140 attendees for the talk; 1,000 attendees for the meeting) *February 15*
- Coordinated the annual Forest Health Workshop, in cooperation with DEP personnel and participated by giving the talk "Gypsy Moth Outbreak of 2005" in Jones Auditorium (40 attendees) *March 9*

- Participated in the Cooperative Agricultural Pest Survey – Early Detection and Rapid Response Workshop held in Portsmouth, New Hampshire (40 attendees) *March 15*
- Was interviewed about the Gypsy Moth outbreak of 2005 and prospects for 2006 by Joyce Conlon of the New London Day *March 31*
- Served on the Planning Committee, served as a moderator for a session titled "Partner Updates", presented the talk "A Pine Shoot Beetle Management Area – The Connecticut Experience", and moderated a second session titled "Partner Updates" and presented the talk "Case Studies – Effects of Invasive Plant Laws on the Nursery Business in Connecticut" at the annual meeting of the Eastern Plant Board held in Rehoboth Beach, Delaware (200 attendees) *April 3-6*
- Participated in a meeting of the Connecticut Cooperative Agricultural Pest Survey Committee held at the Valley Laboratory in Windsor (15 attendees) April 10
- At the request of the City of Hartford, surveyed Elizabeth Park for gypsy moth egg masses *April 20*
- Participated in training presented by the Durham Field Office of the US Forest Service to use a Digital Aerial Sketch Mapping System, held at Purgatory Chasm State Park in Massachusetts (10 attendees) *April 21*
- Participated (with Tia Mastrone and Peter Trenchard) in digital Aerial Sketch Mapping training, held by the Durham Field Office of the US Forest Service, at the Holyoke Heritage State Park Site, Holyoke, MA (16 attendees) *May 2006*
- Participated in a planning meeting for a full-scale emergency exercise, held by the USDA Professional Development Center, at the Wallingford Office of USDA-APHIS-PPQ (8 attendees) *May 18*
- Presented a brief Gypsy Moth Update at a meeting of the CT Pomological Society, held at Belltown Orchards in South Glastonbury (70 attendees) *May 24*
- Participated in planning for an Incident Command System exercise held at the USDA Office in Wallingford (6 attendees) *June 6*
- Participated in the planning of a program review for the US Forest Service at the Durham Field Office for August 2006 *June 16*
- Helped program the Digital Aerial Sketchmapping System for use in Gypsy Moth surveys at the US Forest Service Field Office in Durham *June 28*

STAFFORD, KIRBY C., III
- Participated in a meeting of the Northeastern Experiment Station Directors in Peabody, MA *July 11-12, 2005*
- Was interviewed about tick control recommendations from the Ridgefield Deer Committee by Susan Tuz of the Danbury News Times *July 13*
- Was interviewed about gypsy moth infestation in southeastern Connecticut by Ralph Hohman of the Record Journal *July 14*
- Was interviewed about the importance of bees in agriculture and threats to the bee industry by Helen Bennett Harvey of the New Haven Register *August 26*
- Was interviewed about methyl bromide use on solid wood packaging material by Garrott Condon of the Hartford Courant *September 15*
- Was interviewed about tick activity for the summer by Garrott Condon of the Hartford Courant *September 15*
- Was interviewed about the use of methyl bromide on solid wood packaging material by Abram Katz of the New Haven Register *September 15*

- Spoke on integrated management for the prevention of tick-associated disease in a symposium on the prevention of tick-borne disease at the International Congress of Vector Ecology held in Reno, NV *October 2-6*
- Spoke on ticks and Lyme disease to a class at Eastern Connecticut State University *October 21*
- Was interviewed about Lyme disease in Connecticut and impact of deer reduction on ticks and Lyme disease by Bridget Ruthman *October 24*
- Was interviewed about tick testing by Mary Conseur of the Naugatuck citizen news *November 7*
- Organized and introduced the speakers for the prevention of violence in the Workplace training sessions *November 28 and 30*
- Was interviewed about various tick reduction options by Jeff Yates of the Wilton Bulletin *January 3, 2006*
- Assisted with manning the Station's booth at the winter meeting of the Connecticut Nursery and Landscape Association *January 4*
- Participated in a meeting of the Peabody Museum Advisory Board *January 10*
- Spoke on the status of gypsy moth in Connecticut at the annual meeting of the Connecticut Tree Protective Association (200 attendees) *January 19*
- Was interviewed on the availability of entomopathogenic fungi for tick control by Diane Post of the Rachel Carson Center *January 25*
- Welcomed growers to their bedding plant meeting in Jones Auditorium (40 attendees) *January 25*
- Spoke on tick management at the NOFA Organic Land Care Course in Jones Auditorium *February 10*
- Was interviewed about gypsy moths by Marion Brown of the Connecticut Post *February 16*
- Was interviewed about the impact of winter weather on insect and tick activity by Fred Baumgarten of the Lakeville Journal *February 17*
- Spoke on ticks and Lyme disease for the Easton Garden Club in Easton (30 attendees) *March 8*
- Welcomed attendees and spoke on Station forest funding at the Forest Health Workshop in Jones Auditorium *March 9*
- Spoke on "Creating Tick Free Zones" at the NOFA Organic Connecticut Conference in Windsor (20 attendees) *March 11*
- Presented an update on tick control research at the annual meeting of the Experiment Station Associates (32 attendees) *March 16*
- Spoke on tick management and Lyme disease prevention and presented a tick workshop for 9 science teachers and staff at the Yale Peabody Museum for curriculum development modeled on biodiversity and vector-borne disease (12 attendees) *March 22*
- Participated in a meeting of the Northeast Regional Association of Experiment Station Directors in State College PA *March 28-29*
- Provided an update on CAES research and survey for gypsy moth at the annual meeting of the Connecticut Tree Warden Association (70 attendees) *March 30*
- Was interviewed about gypsy moth activity by Katy Zachry of Channel 3 TV *April 3*
- Spoke on tick management at the Department of Pathobiology of the University of Connecticut (45 attendees) *April 6*
- Spoke on tick identification and provided training for diagnostic laboratory staff in the Department of Pathobiology of the University of Connecticut (8 attendees) *April 6*
- Was interviewed about ticks by Robert Miller of the News Times Danbury *April 7*

- Spoke on the prevention of Lyme disease at a Lyme Disease Conference at Danbury Hospital (60 attendees) *April 8*
- Participated in a meeting of the CAPS Committee at Windsor to discuss surveys for exotic pests (20 attendees) *April 11*
- Was interviewed about the correlation between ticks and Lyme disease by Gary Santaniello of the Fairfield County Magazine *April 19*
- Spoke about the Experiment Station and product registrations for varroa mite at a meeting of the Connecticut Beekeepers Association in Jones Auditorium (40 attendees) *April 22*
- Was interviewed about ticks and Lyme disease prevention by Steve Savino of WQUN Radio *April 25*
- Spoke about the Experiment Station and product registrations for varroa mite at a meeting of the Backyard Beekeepers Association in Weston (120 attendees) *April 25*
- Participated in a combined meeting of the Yale Emerging Infections and Lyme Disease Prevention Programs in New Haven (13 attendees) *April 27*
- Spoke on tick management in Ridgefield (40 attendees) *April 29*
- Was interviewed about Lyme disease prevention and tick activity on tape for a program on WEZN and WPLR radio by John Voket, Associate Editor of the Newtown Bee *May 2*
- Spoke on tick management in a forum sponsored by the Newtown Health Department in Newtown (20 attendees) *May 2*
- Was interviewed about tick bite prevention and the upcoming tick season by Dan Lovallo of WDRC Radio *May 3*
- Spoke on tick management at a symposium on current trends in Lyme disease research at the University of New Haven (65 attendees) *May 12*
- Was interviewed about ticks by Jody Latina of Channel 8 News *May 12*
- Was interviewed about tick numbers and Lyme disease cases in 2005 by Michael Dinan of the Greenwich Times *May 16*
- Met with officials from the USDA APHIS PPQ and the Connecticut DEP to discuss an exercise of the Incident Command System for the Asian longhorned beetle *May 18*
- Was interviewed about tick numbers and Lyme disease cases in 2005 by Eric Parker of Channel 3 News *May 19*
- Participated in a teleconference call on the One Solution reporting system for USDA funded activities *May 24*
- Was interviewed about Lyme disease and tick control by Brian Lee, a student at Darien High School for a class Project *May 25*
- Was interviewed about the lone star tick in Connecticut and the increase in Lyme disease cases in 2005 by Robert Miller of the Danbury News Times *May 26*
- Was interviewed about ticks and Lyme disease by Meg Barone of the Connecticut Post *May 30*
- Was interviewed in the studios of Charter Communications in Newtown for a public affairs TV program 'Local Edition' on Lyme Disease Awareness by Tim Washer *May 30*
- Spoke to members of the Natural Resources Council of Connecticut about ticks at Lake Gaillard (150 attendees) *June 1*
- Participated in a pandemic influenza planning summit for state agencies in East Hartford *June 2*
- Was interviewed about tick control for a Moms Gone Mad Show on Lyme disease on Comcast Cable Television in Danbury *June 5*
- Participated in affirmative action training in Hartford *June 8*
- Was interviewed about the impact of weather on ticks by George Krinsky of the Republic American *June 8*

- Was interviewed about tick life cycle and control by Abram Katz of the New Haven Register *June 9*
- Provided an update on tick control research to Westport and Weston Health District staff and the chair of their Board of Directors in Westport (10 attendees) *June 14*
- Spoke on ticks and tick associated diseases to DuPont employees at locations throughout the U.S. via a conference link as part of their health, safety, and environment training (150 attendees) *June 15*
- Was interviewed about the survival of blacklegged ticks in washers and dryers by Pamela Weil of the Connecticut Gardener *June 22*
- Was interviewed about anaplasmosis by Marilyn Ross of the Orange Bulletin *June 29*
- Was interviewed about mosquito activity and surveillance by Bridget Ruthman of the Republic American *June 30*

STILWELL, DAVID
- Presented a talk "Copper, Chromium, and Arsenic in Soil and Plants Near Coated and Uncoated CCA Wood" at the 21st Annual International Conference on Soils, Sediments, and Water held in Amherst, MA *October 17, 2005*
- Was interviewed by Kris Christen of Environmental Science and Technology News on CCA pressure treated wood *December 8*
- Participated in the 4th Annual Community Gardening Conference held in Bridgeport *March 25, 2006*
- Participated in and completed the Agilent 7500 ICP-MS System Training Course in Wilmington, DE *March 28-31*
- Presented a talk "CCA Pressure Treated Wood in the House and Garden" at the CAES Spring Open House in New Haven *April 20*
- Participated in an ICP-MS training course at the Forensic Chemistry Center, FDA, Cincinnati, Ohio *April 26-28*

STONER, KIMBERLY
- Participated in a meeting of the Board of Directors of CT NOFA held in Durham *July 17, 2005*
- Presented a workshop on "Risk and the Precautionary Principle" at the NOFA Summer Conference at Hampshire College in Amherst, MA *August 13*
- Was a representative from Connecticut at a meeting of the Interstate Council of NOFA at Hampshire College, Amherst, MA *August 14*
- Gave the talk "Why Organic" at the NOFA Organic Lawn and Turf Course at Manchester Community College *August 16*
- Participated in the US Department of Agriculture forum on the 2007 Farm Bill by making a brief speech on the importance of funding programs for beginning farmers and research on organic agriculture at the Berlin Fair *October 1*
- Led a meeting of "It's Not Farmland Without Farmers," discussing the needs for information and resources for beginning farmers trying to get access to farmland owned by others (public or private) at the Valley Laboratory in Windsor *October 6*
- Participated in a meeting of the Board of Directors of CT NOFA in Berlin *October 16*
- Led a meeting of the NOFA Organic Land Care Committee at the Valley Laboratory in Windsor *October 18*
- Spoke about cabbage maggot life cycles and organic management at a meeting on Production of Brassica Crops at Appleton Farm, Ipswich, MA *October 19*

- Participated in a meeting of the Connecticut Agricultural Risk Management Advisory Group in Tolland *October 25*
- Participated in a training session on Plain Language for Agriculture, sponsored by the National Network for Immigrant Farming Programs, and funded by the Northeast Sustainable Agriculture Program, Glynwood Farm and Conference Center, Cold Spring, NY *October 26-28*
- Was interviewed about multicolored Asian ladybeetles by Bob Miller of the Danbury News-Times *October 31*
- Presented a progress report on the Organic Land Care Program to the annual meeting of CT NOFA in New Haven (60 people attended) *November 5*
- Organized and chaired a meeting of "It's Not Farmland Without Farmers" at the Valley Laboratory in Windsor (10 people attended) *November 8*
- Participated in a forum on open space, and made a brief presentation on the need for access to land for beginning farmers at the Litchfield Community Center *November 12*
- Chaired a meeting of the Organic Land Care Committee at the Valley Laboratory, Windsor *November 15*
- Participated in a meeting of the Board of Directors of CT NOFA in Tolland *November 20*
- Represented CT NOFA in a meeting of the Interstate Council, the body coordinating all the seven NOFA chapters in the Northeast in Old Chatham, NY *November 30-December 1*
- Participated in a retreat of the NOFA Interstate Council (representatives from 7 states) to plan activities for the coming year at Old Chatham, NY *December 1*
- Spoke at the NOFA Organic Land Care Update Course about new developments in the Organic Land Care Program in Tolland *December 8*
- Led a retreat of the CT NOFA Board of Directors to evaluate the previous year and plan the coming year, Hamden *December 10*
- Organized and ran a meeting of community farm groups (17 different organizations), non-profit groups in the process of setting up agricultural and educational programs on publicly owned or land trust land across the state at the Valley Laboratory in Windsor (40 attendees) *January 7, 2006*
- Presented the talk "Introduction to the Organic Land Care Course" at the Massachusetts NOFA Organic Land Care Course, at the Doyle Conservation Center in Leominster, MA (63 attendees) *January 10*
- Presented the talk "Overview of Pest Management" and "Management of Ticks and Lyme Disease" at the Massachusetts NOFA Organic Land Care Course at the Doyle Conservation Center in Leominster, MA (63 attendees) *January 12*
- Participated in a meeting of the Board of Directors of CT NOFA, New Haven (12 attendees) *January 22*
- Chaired a meeting of the Organic Land Care Committee at the Valley Laboratory (8 attendees) *January 24*
- Spoke at the Long Island Horticulture Conference on "Basics of An Organic Land Care Program" in Ronkonkoma, New York (100 attendees) *January 27*
- Presented "Introduction to Organic Land Care" at the Organic Land Care Course in New Haven (60 attendees) *February 8*
- Presented "Insect Pest Management in Organic Land Care" at the Organic Land Care Course in New Haven (60 attendees) *February 10*
- Participated in a meeting of the Board of Directors of CT NOFA in Hamden (12 attendees) *February 19*

- Presented "Cabbage Maggots: What Do We Know and What Can We Do?" at a meeting of the Northeast SARE Project On Improving Brassica Production, Grafton, MA (12 attendees) *February 28*
- Chaired a meeting of the Organic Land Care Committee, Windsor (8 attendees) *February 28*
- Presented two workshops, "Organic Management of Insects for Farmers and Gardeners" and "Improving Production of Brassicas" at the Cultivating an Organic Connecticut Conference (CT NOFA) at Windsor High School (50 attendees) *March 11*
- Interviewed about the Organic Land Care Program by Jim Battaglio for the Community Foundation for a Greater New Haven Newsletter *March 17*
- Participated in a meeting of the Board of Directors of CT NOFA in West Hartford *March 19*
- Chaired a meeting of the Organic Land Care Committee in Windsor *March 21*
- Presented a workshop on Insect Management at the Community Gardening Conference at the Beardsley Zoo in Bridgeport (25 attendees) *March 25*
- Presented the talk "Basics of Organic Vegetable Gardening" at the Cheshire Earth Day Celebration (22 attendees) *April 22*
- Participated in a meeting of the Board of Directors of CT NOFA, Manchester *April 23*
- Participated in a meeting of the State Advisory Council to the Vocational Agricultural School System, WAMOGO Vo-Ag School, Litchfield *April 25*
- Chaired a meeting of the NOFA Organic Land Care Committee, Windsor *April 25*
- Worked on setting up an integrated pest management program for Fort Hill Farm, an organic, community supported agriculture farm in New Milford *May 2*
- Presented a talk "All About Lady Beetles" at the Westport Center for Senior Activities (25 attendees) *May 8*
- Chaired a meeting of the NOFA Organic Land Care Committee at the Valley Laboratory in Windsor *May 30*
- Participated in a meeting of the State Advisory Council for Agricultural Education in Cheshire *June 12*
- Chaired a meeting of the NOFA Organic Land Care Committee at the Valley Laboratory in Windsor *June 27*
- Participated in a meeting organized by the CT Department of Agriculture to create a Farm Link program – a program to link landowners seeking to rent or sell farmland and farmers or prospective farmers seeking farmland at the CT Farm Bureau office in Windsor *June 28*

THOMAS, MICHAEL
- Conduct a workshop on mosquitoes and mosquito-borne diseases with a group of ten science teachers from three urban public school districts as part of a Science Education Partnership Award granted by the NIH to Yale's Peabody Museum *April 27, 2006*

TRENCHARD, PETER
- Assisted at the Station's exhibit at the Connecticut Flower and Garden Show, *Hartford February 23-25, 2006*
- At the request of the City of Hartford, surveyed Elizabeth Park for gypsy moth egg masses *April 20*

VOSSBRINCK, CHARLES
- Gave the talk "The World of Spiders", and displayed a large live *Nephalia claviceps* from Florida and numerous photographs and preserved specimens for a second grade class at Savin Rock Grammar School in West Haven. The talk was followed by a question and answer period *December 9, 2005*

WARD, JEFFREY

- Participated in the Connecticut Tree Protective Association annual meeting in Farmington *July 21, 2005*
- Hosted a visit by Tatsuhiro Ohkubo of Utsunomiya University, Japan, to discuss forest regeneration research and tour Station facilities *July 26*
- Presided at the Connecticut Tree Protective Association's Board of Directors meeting in New Haven *August 2*
- Was interviewed about the effect of summer heat on fall leaf color by Bridget Ruthman of the Waterbury Republican *August 10*
- Presided at the Connecticut Tree Protective Association, Board of Directors Meeting in New Haven *September 6*
- Spoke on "Tree Biology" for the Arboriculture 101 class sponsored by The Connecticut Tree Protective Association, Jones Auditorium *September 7*
- Spoke on "Homeowner tree care" for the Spring Glen Garden Club in Hamden *September 12*
- Was an invited guest on WTIC AM-1080 radio talk show "Garden Talk" to offer advice on tree management *September 17*
- Participated in the Connecticut Urban Forest Council Meeting in New London *September 20*
- Participated in the Organic Options in Tree Care Workshop in Burlington *September 22*
- Gave a class on "Outdoor Identification of Woody Plants" to the Federated Garden Clubs Garden Study School held n Jones Auditorium *September 28*
- Participated in Connecticut session of the Northeast Carbon Feasibility Project in Hartford *September 29*
- Met with Christy Haas and Doreen Larson-Oboyski of the City of New Haven and gave advice on using urban tree inventories *September 30*
- Presided at the Connecticut Tree Protective Association, Board of Directors meeting in New Haven *October 4*
- Was interviewed about fall foliage by Gil Simmons of WTNH TV-8 *October 6*
- Spoke on "Stand development insights from research in Connecticut" at the White Mountain National Forest Oak Regeneration Workshop at Laconia, NH *October 12*
- Spoke on "Homeowner tree care" for the West Haven Garden Club in West Haven *October 13*
- Taught "Introduction to forest ecology" for Coop High School, New Haven *October 17*
- Taught "Basic forest measurements" for Sound High School in New Haven *October 19*
- Along with Scott Williams, advised foresters of the Regional Water Authority and Metropolitan District Commission on reducing deer browse damage *October 21*
- Hosted a visit by Tatsuhiro Ohkubo of Utsunomiya University, Japan to discuss forest regeneration research and tour Station facilities *October 24*
- Spoke on "The Connecticut urban forest: composition and structure" at the 17$^{th}$ annual conference on urban and community forestry in Connecticut in Wallingford *October 27*
- Was interviewed about the effect of recent weather on fall foliage by Andy Hutchison of The Fairfield Minuteman *October 28*
- Spoke on "Old-Series plots (1927-1997): observations from long-term research" at the Yale forest Forum Seminar in New Haven *October 31*
- Spoke on "Guidelines to Minimize the Impacts of Hemlock Woolly Adelgid" to the Potapaug Audubon Society in Essex *November 3*
- Presided at the Connecticut Tree Protective Association, Board of Directors Meeting in New Haven *November 8*
- Presented the poster "Influence of Prescribed Fire on Stem Girdling and Mortality" at Fire in Eastern Oak Forests Conference in Columbus, OH *November 15*

- Was interviewed about the importance of ash in Connecticut by Bob Miller of the Danbury News-Times *November 29*
- Chaired research committee session at the Connecticut Forest Forum in West Hartford *November 30*
- Presided at the Connecticut Tree Protective Association, Board of Directors meeting in New Haven, *December 6*
- Talked to members of the Yale Urban Research Initiative to discuss urban tree inventories *December 16*
- Spoke on "Forest Research at the Connecticut Agricultural Experiment Station – 2006" for the Connecticut Chapter – Society of American Foresters in New Haven (35 attendees) *January 10, 2006*
- Spoke on "Tree Biology" for the Arboriculture 101 class sponsored by The Connecticut Tree Protective Association, in Jones Auditorium (45 attendees) *January 11*
- Participated in the Connecticut Urban Forest Council Meeting in Middlefield *January 18*
- Presided at the opening of the 84th Annual Meeting of the Connecticut Tree Protective Association in Plainville *January 19*
- Spoke on "Results From a Fuel Modeling Study" and "Effects of Fire on Oak and Residual Trees" at the Winter Meeting of the Northeastern Forest Fire Protection Commission in South Portland, Maine (91 attendees) *January 24*
- Participated in the Connecticut Tree Protective Association's Board of Directors Meeting in New Haven *February 6*
- Spoke on "Native trees and shrubs" for the Spring Glen Garden Club at Lockwood Farm (16 attendees) *February 9*
- Chaired a Connecticut Forest Council Research Committee Meeting in Middlefield *February 15*
- Was interviewed about species diversity in Connecticut by Carol Savage of the Reminder Newspaper *February 10*
- Spoke on "Homeowner's tree care" to the Hadlyme Garden Club in Hadlyme (24 attendees) *February 22*
- Participated in the annual meeting of the Yankee Society of American Foresters in Enfield *February 23*
- Presented the paper "Defoliation and Oak Mortality in Southern New England" at the 15th Central Hardwood Forest Conference in Knoxville, TN (45 attendees) *February 28*
- Participated in the Connecticut Tree Protective Association, Board of Directors Meeting in New Haven *March 7*
- Spoke on "Defoliation and Oak Mortality in Southern New England" at the 11th annual Forest Health Monitoring Workshop (33 attendees) *March 9*
- Spoke on "Homeowner's tree care" to The Shoreline Gardeners Club in Madison (20 attendees) *March 28*
- Participated in the Connecticut Tree Protective Association Board of Directors meeting in New Haven *April 4*
- Assisted with the "Tree Risk Assessment Workshop" in Burlington *April 6*
- Was interviewed about red maple flowering by Bob Miller of the Danbury News-Times *April 11*
- Spoke on "How trees grow and tree care" at the Manson Youth Institute in Cheshire (23 student and 5 teacher attendees) *April 12*
- Chaired the Connecticut Forest Council Research Committee Meeting in Middlefield *April 12*
- Spoke on "Legend of the unchanging forest" to the Guilford Conservation Commission (37 attendees) in Guilford *April 18*

- Served on the Goodwin Forestry Scholarship Committee in Middlefield *April 19*
- Spoke on "Fire and stand development" to the Experiment Station Associates (57 attendees) in Chaplin *April 26*
- Spoke on the importance of trees at the Arbor Day celebration at the state Capitol (30 student and 8 teacher attendees) *April 28*
- Participated in the Connecticut Tree Protective Association Board of Directors meeting in New Haven *May 2*
- Spoke on "Reducing browse damage" to the Killingworth Land Trust in Killingworth (64 attendees) *May 10*
- Participated in the Connecticut Urban Forest Council meeting in West Hartford *May 17*
- Spoke on "Precommercial thinning in upland oak stands" to CT-DEP foresters in Naugatuck (24 attendees) *May 16*
- Was interviewed about cottonwood seeds by Kent Pierce of Channel 8 News *May 30*
- Spoke on "White-tailed deer studies: effect and control" at the Natural Resources Council of Connecticut field tour at Lake Gaillard in North Branford (120 attendees) June 1
- Spoke on "The natural history of trees" for Strong and St Thomas schools 5th graders in Southington (50 students and 3 teachers) *June 2*
- Was an invited guest on WTIC AM-1080 radio talk show "Garden Talk" to offer advice on tree management (35,000 listeners) *June 3*
- Participated in a workshop "Developing an Urban Forest Management Plan" in Jones Auditorium *June 15*
- Participated in the Connecticut Tree Protective Association Board of Directors meeting in Farmington *June 20*
- Chaired a Connecticut Forest Council Research Committee meeting in Middlefield *June 21*

WHITE, JASON

- Participated in a press conference held by Representative Rosa DeLauro highlighting USDA funding that she sponsored for Station research programs *July 7, 2005*
- Discussed the Station's collaborative project on Invasive Aquatic Plants at the USDA ARS Invasive Plant Research Laboratory in Fort Lauderdale, Florida *August 18-19*
- Presented an invited seminar at the University of Texas El Paso entitled Bioavailability of weathered persistent organic pollutants in soil: Is phytoremediation possible *September 28*
- Was interviewed about phytoremediation on Texas Public Radio by Dr. Keith Pennel for a program entitled "Science Studio" *September 29*
- Chaired the Phytoremediation session at the 21st Annual International Conference on Soils, Sediments, and Water" at the University of Massachusetts, Amherst *October 20*
- Chaired a session on "Plant uptake of organic chemicals" and co-presented a poster entitled "Multi-species interactions impact the uptake of persistent organic pollutants" at the 26th Annual Meeting of the Society of Environmental Toxicology and Chemistry in Baltimore, MD *November 16-17*
- Spoke on "Bioavailability of weathered persistent organic pollutants in soil: Is phytoremediation possible?" at the University of Massachusetts (Amherst) weekly Department of Plant and Soil Science Seminar Series *December 6*
- Participated in an EPA sponsored conference call to explore the formation of an International Society of Phytotechnologists and also the planning of the next biennial International Phytotechnology Conference *January19, 2006*
- Hosted two graduate students from the Royal Military College in Kingston, Ontario who conducted experiments related to the phytoremediation of weathered persistent organic pollutants *February 13-March 10*

- Co-chaired the Phytoremediation Session and presented a lecture entitled "Mechanistic Investigation Into the Phytoremediation of Weathered Persistent Organic Pollutants by Curcurbits: Rhizotron Studies" at the 16th Annual West Coast Conference on Soils, Sediments, and Water in San Diego, CA *March 12-14*
- Hosted officials from the Invasive Plant Research Laboratory, Agricultural Research Service,USDA and to discuss the Invasive Aquatic Weed Project *May 9*
- As a member of the Executive Committee, participated in a US EPA sponsored conference call to begin organizing an International Phytotechnologies Society *May 9*
- Hosted officials from the Invasive Plant Research Laboratory, Agricultural Research Service, USDA regarding samples of aquatic invasive plant species and a program to isolate and identify microbial pathogens of interest *June 21-30*

WILLIAMS, SCOTT

- Met with officials at Highstead Arboretum in Redding, CT for deer damage inspection and deer management consultation *July 7, 2005*
- Presented a career talk and interpretive nature hike to high school students at Common Ground High School, New Haven *July 14*
- Spoke on deer management to the Fairfield County Municipal Deer Management Alliance, Weston, CT *August 30*
- Spoke about deer research and capture techniques to visiting students from the Metropolitan Academy-New Haven *October 7*
- With Dr. Jeffrey Ward , advised foresters of the Regional Water Authority and Metropolitan District Commission on reducing deer browse damage *October 21*
- Spoke on wildlife careers at a Yale University School of Forestry and Environmental Studies workshop *October 27*
- Guest lectured at the University of Connecticut's North American Wildlife class (NRME 217) about white-tailed deer research at the Agricultural Experiment Station, Storrs *November 8*
- Was interviewed about non-lethal deer control by Jeff Yates of the Wilton Bulletin *January 4, 2006*
- Spoke on "Wildlife Laws and Deer Damage Avoidance" at the Northeast Organic Farming Association Conference in Jones Auditorium (60 attendees) *February 14*
- Spoke on "Overabundant suburban white-tailed deer as seed dispersal agents" at 11th annual Forest Health Monitoring Workshop (33 attendees) *March 9*
- Gave a research talk entitled "Overabundant suburban deer as seed dispersal agents" at the 62nd Annual Northeast Fish and Wildlife Conference in Burlington, VT (42 attendees) *April 25*
- Presented 2 posters about Station research at the First Annual Connecticut Wildlife Conference, Storrs, CT *May 2*
- Gave a short talk on white-tailed deer research at the Station for the Natural Resources Council of Connecticut at Lake Gaillard, North Branford, CT (100+ attendees) *June 1*

# DEPARTMENT OF ANALYTICAL CHEMISTRY

The Department of Analytical Chemistry is headed by Dr. MaryJane Incorvia Mattina and the staff consists of Drs. Brian D. Eitzer, Walter J. Krol, David E. Stilwell; Terri Arsenault, William Berger, Craig Musante, Mamie Pyles. Dr. Christina Robb has joined our staff to support our FERN-related activities, to be described in more detail below.

The Department of Analytical Chemistry is involved in both service and research activities. The activities remain concentrated into two broad categories relevant to the mission of the institution and sustainable for the foreseeable future: food safety and environmental monitoring. Service functions include the analysis of samples submitted by State agencies, other Station departments, municipal agencies, and health departments throughout Connecticut. The research which we pursue is primarily service-driven, catalyzed, for the most part, by the required analyses of submitted samples. It consists of a variety of applied studies in Analytical Chemistry. Some of the applied studies have been developed by department scientists into fundamental research in Environmental Chemistry. One such peer-reviewed study, reported in MaryJane Incorvia Mattina, M. Isleyen, B. D. Eitzer, W. Iannucci-Berger, J.C. White "Uptake by Cucurbitaceae of Soil-Borne Contaminants Depends upon Plant Genotype and Pollutant Properties" ***Environ. Sci. & Technol.*** 40:1814-1821 (2006), was selected to receive the paper of the year award from the Quinnipiac chapter of the scientific society, Sigma Xi.

Beyond the service and research activities, all Analytical Chemists are involved in outreach activities by providing information to the citizens of Connecticut via telephone inquiries, tours of our laboratories, and assistance directly to Connecticut businesses. More and more often inquiries from citizens in other states and nations are directed to us for response via the Internet. Some examples of our outreach activities are provided here and elaborated in the following sections. Of special note, on 20 April 2006 the Department was designated by Director Magnarelli to host the Station's annual spring event. With the content of the day's program for this Open House focused on Analytical's involvement with public safety, we provided examples of how scientists pursue the Station's motto of "Putting Science to Work for Society." The day's talks were covered by the Connecticut Public Affairs Network, CT-N, for live viewing and subsequent streaming on the Internet. More detailed information is provided below. In addition, our staff participates in many activities directed primarily to the surrounding, greater New Haven community, for example, the New Haven Public Schools Science Fair and the New Haven community gardens. Drs. Eitzer and Stilwell continue to serve on the Advisory Committee for the Sound School in New Haven. Dr. Walter Krol has been elected secretary of the New Haven chapter of the American Chemical Society.

The most noteworthy development within the time period covered in this Record is the selection of the Department of Analytical Chemistry to receive multi-year funding under a competitive Cooperative Agreement Program with the U.S. Food and Drug Administration. One of only eight state laboratories throughout the country to be selected, Analytical Chemistry is greatly pleased by the recognition which the CAP

accords our staff and its work, and by the opportunity it provides to contribute significantly to protecting the nation's food supply. Our work within FERN, the Food Emergency Response Network., compliments nicely Dr. Mattina's long-term participation in the Laboratory Preparedness Advisory Committee chaired by the Connecticut Department of Public Health.

Summaries of the Department's service and research activities and other highlights for the past year are described in detail below.

## SERVICE ACTIVITIES

### ANALYSES FOR DEPARTMENT OF AGRICULTURE

The Connecticut Agricultural Experiment Station traces its origins to 1875. That year it was established as the nation's first experiment station for the analysis of feed and fertilizer products on behalf of the agricultural community, a function envisioned by Agricultural Chemist, Samuel W. Johnson. Johnson was a scientist of national prominence, serving as an expert witness in several high profile criminal cases in New Haven and one of the first presidents of the American Chemical Society. The Analytical Chemistry Department continues to conduct state-mandated feeds and fertilizer analyses in order to assure that such products sold in Connecticut are in compliance with the label guarantees printed on the products. These analyses are performed by Craig Musante and Mamie Pyles under the supervision of Dr. David Stilwell.

*Feeds:* Feed samples analyzed include products for both household pets and commercial agricultural operations. The samples are collected by the Department of Agriculture and submitted to the Analytical Chemistry Department for analysis. From 1 July 2005 to 30 June 2006, we analyzed 93 samples for parameters such as protein, fat, moisture, and fiber. We continue to analyze an increased number of feed samples for micronutrients such as calcium, copper, selenium, molybdenum, etc. Deficient samples, which totaled 44 (47.3%), are reported based on the analytical variations specified in the Official Publication of the Association of American Feed Control Officials.

*Fertilizers:* For the period 1 July 2005 to 30 June 2006, we analyzed 120 fertilizer samples collected by the Connecticut Department of Agriculture. This includes products intended for both commercial and residential applications. Analytical results for macronutrients, such as nitrogen, available phosphoric acid, and potash, and increasingly for micronutrients, such as boron, sulfur, cobalt, magnesium, and iron, are compared with label guarantees. Samples with deficiencies in macronutrients or in one or more micronutrients numbered 55 (45.8%). Deficiencies are determined according to the investigational allowances outlined in the Official Publication of the Association of American Plant Food Control Officials.

**IMPACT:** Product guarantees are a critical component assuring the robustness of the nation's agricultural operations. The staff in Analytical Chemistry has an established reputation for accurate and rapid surveillance of agricultural products. With the heightened potential for attacks on the nation's economy and the well-being of its

citizens, this capability is of renewed importance. These analyses provide a route for our chemists to contribute to assuring protection from those persons focused on contamination of animal feed products and the concomitant injury to the agricultural industry.

## ANALYSES FOR DEPARTMENT OF CONSUMER PROTECTION

### *FOOD and STANDARDS DIVISION*

*Pesticide residues in food:* During the period 1 July 2005 to 30 June 2006, inspectors from the Food and Standards Division submitted 142 samples of fresh and processed foods for pesticide residue analysis. The majority of samples represent Connecticut grown produce, although produce grown in other states, foreign grown produce, and organically labelled samples are also collected. Processed foods, such as juices, ciders, and baby food, are included in our survey as well. Dr. Walter Krol has responsibility for the market basket program. However, with the acquisition of additional instrumentation, some of which represents new technology in our laboratory, both Terri Arsenault and Dr. Brian Eitzer participate in conducting these analyses. The results of our pesticide residue program are published in an annual Station Bulletin, which is available online on the Station's web site. The most recent Bulletin presents data from the 2002 through 2004 surveys.

During the preceding twelve months we reported to the Connecticut Department of Consumer Protection that 10 of the 142 samples were violative. Some of the violations derived from analyses on our newly acquired instrumentation and were not previously accessible. These will be discussed in more detail below.

*Other samples:* In addition to the above food samples analyzed for pesticide residues, we received 151 samples from 1 July 2005 to 30 June 2006. Many of these samples originate from consumer complaints to the Department of Consumer Protection and involve potential product tampering or filth. For those samples containing foreign material such as plant or fungal substances, we rely frequently on the expertise of Dr. Sharon Douglas and Mary Inman of the Department of Plant Pathology and Ecology. Mr. Kenneth Welch and Gale Ridge of the Department of Entomology assist on a routine basis for identifications resulting from insect infestation.

An example of the determination of an insect pest of concern derived from four samples of dried soup mix in which a consumer alleged finding insects. Analytical Chemistry collaborated with Gale Ridge in the Department of Entomology who made a tentative identification of the Khapra beetle (Trogoderma, see photo at left). This imported insect pest was confirmed by entomologists from the USDA. Because of the level of interest in this finding, extensive follow-up investigations by USDA staff at the manufacturing operation have been conducted.

### *PRODUCT SAFETY DIVISION*

During the period 1 July 2005 to 30 June 2006, we analyzed 9 samples for the Product Safety Division. The samples were children's toys submitted for determination of lead content.

*LIQUOR CONTROL DIVISION*

During the period covered in this record, our department analyzed 2 samples to determine the authenticity of a rum product for potential mis-branding. The officers of this division have come to rely on our laboratory for information of this type.

**IMPACT:** The rapid and accurate response for the analysis of samples submitted to our laboratory is consistent with the level of training and experience of the staff in Analytical Chemistry. It is this quality which has been recognized by federal agencies and acknowledged through our receipt of the Cooperative Agreement. Response of the caliber, which our chemists provide, is critical in cases of intentional contamination or terrorist activities.

ANALYSES FOR DEPARTMENT OF ENVIRONMENTAL PROTECTION

*WASTE MANAGEMENT BUREAU*

*PCBs and pesticides:* The Connecticut Department of Environmental Protection is charged with compliance monitoring within the state in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). In support of these activities, for the period 1 July 2005 to 30 June 2006 our laboratory analyzed 132 samples on behalf of the Connecticut DEP, including foliage, water, fabric, and air samples. Of these samples, 38 consisted of wipes, soils, water, and transformer oils, and were submitted for polychlorinated biphenyls (PCBs) analysis. These analyses were performed by William Berger under the supervision of Dr. Brian Eitzer.

**IMPACT:** Rapid and accurate reporting of polychlorinated biphenyls in the environment can be critical to clean-up and health issues. Our scientists have been able to provide analytical results to the appropriate staff at Connecticut Department of Environmental Protection to assure the safety of sites accessible to the public.

ANALYSES FOR DEPARTMENT OF REVENUE SERVICES

*EXCISE & PUBLIC SERVICES TAXES SUBDIVISION*

*Beer, Wine and Liquor:* Distributors of alcoholic beverages must pay a tax on all sales of such beverages within the State of Connecticut. To assist Revenue Services with the levy of the tax, we determine the alcohol content of beers, wine coolers, ciders, distilled liquors, and other alcoholic beverages sold in the State. From 1 July 2005 to 30 June 2006, we analyzed a total of 170 samples for alcohol content. It should be noted that several samples were submitted by brew pubs, microbreweries, and importers operating within the State of Connecticut. We have made a special attempt to complete and submit determinations for these start-up Connecticut businesses as rapidly as possible. Such accommodation has been duly noted by a number of such businesses, as

well as out-of-state facilities which have made requests to our laboratory for particularly rapid determinations.

## ANALYSES FOR MUNICIPAL AGENCIES

In the period covered by this report, we were requested by the Ohio Department of Agriculture to analyze 39 samples of maple syrup for lead content.

During this same time period, we served as a referee laboratory for determination of dieldrin in a feed sample sent to us by the Hawaii State Department of Agriculture.

We were asked to analyze a sample that originated at the Emergency Room of Hartford Hospital. The sample consisted of a jug of fruit punch for possible contamination with ethylene glycol which had been allegedly consumed by a patient. Brian Eitzer quickly developed a SPME method for determination of ethylene glycol in the liquid and we were able to report back that the liquid was approximately half ethylene glycol.

In May 2006, a sample of white powder was brought to our laboratories for identification. Since 9/11 such samples require a heightened level of response. We coordinated the response with local police and fire departments, incident response centers and the Connecticut Department of Public Health. Within five hours of the sample arriving at our facility, it was determined that it did not represent a threat to public health.

For several years our laboratory has assisted non-profit organizations throughout Connecticut with the establishment of community gardens. Located primarily in urban areas, it is important to determine that the soil at these sites is not contaminated with toxic heavy metals which could present a health hazard to persons working on the project. Again in the period covered by this report David Stilwell and Craig Musante provided analyses of soils in New London and New Haven. We are attempting to design and coordinate with Valley Laboratory and University of Connecticut Extension a large project for collecting and analyzing soils from community gardens across the state.

## ANALYSES FOR OTHER STATION DEPARTMENTS

We actively support work done principally in other Station Departments. In the twelve month period 1 July 2005 to 30 June 2006, we analyzed 56 samples submitted by other departments. Samples were submitted primarily by the Valley Laboratory in Windsor. Several of these samples were soils from planned community gardens in urban locations with potential contamination from heavy metals such as lead.

## ANALYSES OF CHECK SAMPLES

The value of the data generated by the staff of the Analytical Chemistry Department depends on its accuracy and precision. While each scientist makes sure that the analyses for specific analyses as described in our in-house Standard Operating Procedures (SOPs) contain adequate quality control such as spiked and blank samples, we also participate in a variety of formal check and performance evaluation sample programs. Primary among these are performance evaluation samples reported back to our certifying agency, Connecticut Department of Public Health. We also participate in

the Southern States Check Sample program to monitor the reliability of our analyses related to the market basket survey.

In addition to the long-standing check samples mentioned above, during the past year we have participated in several proficiency tests related to our FERN work. More specific information is provided below.

## FOOD SAFETY ACTIVITIES

By far the largest impact on activities in the Department of Analytical Chemistry in the past several years has been our involvement with the Food Emergency Response Network (FERN), in general, and our selection as Cooperative Agreement Program (CAP) laboratory, in particular. While commitments to FERN and CAP are numerous, it is essential to maintain all of our previous service work on behalf of Connecticut state agencies, as well as our research projects. The challenge is one of assuring that these commitments compliment each other as much as possible rather than being distinct and isolated pathways. We provide examples of how the Department's Analytical Chemists are assuring this complementarity.

One newly acquired technology in our Department is liquid chromatography (LC)/mass spectrometry (MS). By interfacing an LC functioning in our department since 2001, with an MS purchased in part through funds received from the Connecticut Department of Public Health, we have established instrumentation required by our CAP participation. Brian Eitzer has dedicated most of his work to mastering this equipment and using it for our CAP assignments, our market basket food samples, and several environmental samples. Accordingly, we have increased substantially the number of agrochemicals which we report out to several state agencies. This, in turn, has impacted detection of violative samples. Walter Krol has taken on the responsibility of incorporating new active ingredients into our GC/MS and LC/MS methods. Terri Arsenault is investigating replacing our long-standing method for preparing market basket samples with an alternative method to save resources and to permit both GC/MS and LC/MS analyses with the same extract.

Walter Krol, Brian Eitzer, and Terri Arsenault (L. to R.) examine data acquired on our LC/MS system.

As a result of our CAP funding, we have acquired instrumentation to conduct enzyme linked immunosorbent assay (ELISA). Dr. Christina Robb (at left) uses this method for the detection of FERN-specified toxins in food matrices.

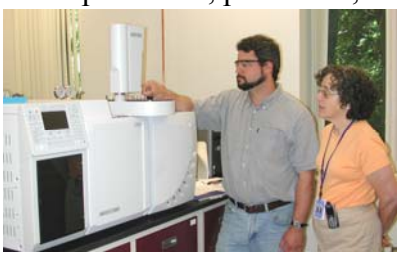
Also, as a result of CAP funding, we have installed in our laboratory inductively coupled plasma interfaced with a mass spectrometry detector. This will permit us to increase the number of elements which we can identify and considerably lower detection levels. In the photo as left David Stilwell and Craig Musante (L. to R.) work on the ICP/MS while Mamie Pyles conducts feeds and fertilizer analyses in the background.

## RESEARCH ACTIVITIES

*Studies of Persistent Organic Pollutants and Terrestrial Plants—Mechanisms of Uptake.* In 1990, we were intrigued by our observation of persistent organochlorine pesticide (POP) residues in certain crops. POPs such as DDT, chlordane, and heptachlor have not been permitted for use on food crops in the United States for more than 20 years. Nevertheless, trace residues of these compounds have been found by us and others in produce, including some produce grown on farms which have not used any pesticides for more than a decade. The sources of the produce contaminated with POPs comprise not only Connecticut-grown crops, but crops from other states, as well as imported crops. Our market basket data anecdotally suggested that specific crops selectively uptake POPs from soil, while other crops do not contain POPs in their edible tissues. In 1997, we initiated experiments to investigate issues suggested by the anecdotal observations. Several components of our investigation have been completed and several new lines of research are in progress.

We are actively studying the mechanisms of uptake of soil-bound persistent organic pollutants by the Cucurbitaceae plant family, using the optical handle that some of these compounds possess, via analyses based on chiral gas chromatography with ion trap mass spectrometry detection. The most recent publication from our research group, MaryJane Incorvia Mattina, M. Isleyen, B. D. Eitzer, W. Iannucci-Berger, J.C. White "Uptake by Cucurbitaceae of Soil-Borne Contaminants Depends upon Plant Genotype and Pollutant Properties" *Environ. Sci. & Technol.* 40:1814-1821 (2006) has received the paper of the year award from the Quinnipiac chapter of Sigma Xi.

This work is directly related to phytoremediation. Phytoremediation remains a long-term goal for the treatment of soil contaminated with organic pollutants as it has the potential to be a less expensive *in-situ* treatment process. By studying the uptake of POPs from soil by Cucurbitacea in greenhouse rhizotrons, we can examine the rhizosphere soil, porewater, and xylem sap on a very detailed basis using solid phase microextraction (SPME). Once released to the soil porewater, different species of Cucurbitacea have vastly different capabilities regarding the uptake and translocation of contaminants. Our recent acquisition of automated SPME (see photo at left) will considerably enhance our research efforts.



Bill Berger and MaryJane Incorvia Mattina set up samples for automated SPME on a new GC/ITD.

We have recently found that *Arabadopsis thalinia* can translocate POPs from soil to aerial tissue. This species is very well characterized genetically. It is, therefore, hoped that by studying the uptake of pollutants by different ecotypes of this species, we can learn which genes are important in the uptake of pollutant chemicals. This in turn could lead to enhancements in the ability of plants to uptake and translocate pollutants, which could subsequently make phytoremediation a truly viable alternative for the treatment of contaminated soil.

*Food Safety:* In the arena of food safety most of our work over the past several months relates to our Cooperative Agreement participation. Walter Krol has determined the current list of active ingredients registered for use by the U.S. EPA. He has followed this up by obtaining all chemical standards not in our inventory. Using this list, he has updated our GC/MS method to included detection of these agrochemicals.

Following on this initiative, Terri Arsenault and Brian Eitzer have been working to include this expanded list of A.I. into our GC/MS and LC/MS methods for FERN. To date Brian Eitzer has examined over 100 different compounds on our newly acquired LC/MS. Along with newly developed methods he can now detect almost 20 different herbicides in soil and water matrices. As well as greatly expanding the number of agrochemicals we can now detect using LC/MS, we are exploring a revised method for extraction of food samples which will reduce consumption of solvents and make analysis by GC/MS and LC/MS possible from a single extract.

*Environmental Studies on the Use of Pressure Treated Wood*: This project focuses on the environmental effects of the use of wood, which has been pressure treated with chromated copper arsenate (CCA) preservative. The pressure treatment causes the preservative to penetrate deeply into the wood, typically, in concentrations of between of between 0.1-0.2 percent. As of January 2004, this formulation was phased out for residential uses. However, massive amounts of CCA wood are expected to remain in-service for many years, raising concerns that dispersal of these additives could impact the environment.

Arsenic uptake by plants grown near CCA wood structures is an area of potential concern. In gardens, CCA treated wood is used for borders, raised beds, posts and stakes. Typically, plants are also grown around the perimeter of decks, patios and porches, all of which may contain CCA wood. During this twelve-month period, we finished trials on the effect of coatings on leaching and subsequent arsenic uptake by plants. Planting boxes constructed using CCA wood were coated with various finishes, filled with soil, weathered for two years, and then planted with leafy vegetables. Opaque, film-forming finishes were found to form an effective barrier to arsenic leaching and subsequent plant uptake. The reduction in plant As ranged from 50-84% in plants grown next to the opaque finished wood, and by growing plants 6 cm away from the wood the reduction in arsenic ranged from 55-84% compared to plants grown next to the wood.

This ongoing work on the many aspects of the impact of the use of CCA-treated wood has been widely recognized. Dr. Stilwell served on the EPA scientific advisory

panel (SAP) on the risk assessment of CCA wood, by invitation during 2001, 2003, and 2005, and presented a paper on this work (by invitation) at a symposium on the environmental effects of wood preservatives.

Dr. Stilwell is assisted in this project by Craig Musante.

*Heavy Metals in Community Garden Soils:* We re conducting an ongoing program on the environmental impacts of lead and other heavy metals in community garden soils and plants. Previously, we found that the bioavailability of lead in these soils decreased with increasing phosphorus content. Extraction experiments using various forms of phosphorus are underway in an effort optimize the use of phosphorus to immobilize lead. Plant tissue analysis for trace amounts of lead is now possible with the acquisition of a new instrument- the ICP-MS (Inductively Coupled Plasma- Mass Spectroscopy). This new method allows us to determine lead and other heavy metals at sub part-per-billion (ppb) levels, about an order of magnitude lower than we were previously able to achieve. Method development using this ICP-MS for plant and soil analysis of heavy metals is underway. Dr. Stilwell is assisted in this project by Craig Musante.

## PUBLIC OUTREACH

*Telephone/internet inquiries*: We receive frequent calls from the public requesting information on issues such as pesticides in food and in the environment, lead in paint, food, soils, and consumer products. In some instances we refer the caller to a more appropriate Station Department or State agency. We typically handle over 1000 such inquiries each year. As more persons gain access to the Internet, inquiries are coming from beyond Connecticut.

*Station Bulletins*: Station Bulletins are typically published annually by our Department. These bulletins are available in printed form and on the Station's web site. They are also available at libraries throughout Connecticut.

*Fact Sheets*: Listed on the Station's web site under "Publications" are several articles written for the general public regarding topics of timely and widespread interest. These are also available in printed format. Department members also cooperate with the Connecticut Department of Public Health in producing fact sheets published by them.

*New Haven Sound School*: Two members of our Department, Drs. David Stilwell and Brian Eitzer, serve on the advisory council of New Haven Public School's Sound School.

*New Haven Public School Science Fair*: This past year both Walter Krol and David Stilwell served as judges for this well established science fair.

*20 April Open House:* The Station hosts two major events annually, Plant Science Day in the Spring in April and Plant Science Day in August at Lockwood Farm. This year Dr. Magnarelli chose "public safety" as the theme of the April event and requested that Analytical Chemistry host the day, preparing talks and tours. Because of the public

safety orientation and the nature of invited participants from outside of the Station, we decided to call the April event an Open House.

The afternoon began with three talks by scientists from Analytical Chemistry: "CCA Pressure Treated Wood in the House and Garden" focused on research by Dr. David Stilwell and Craig Musante; "Pesticide Residues in Food—Keeping Current with New Products:" described work by Dr. Walter Krol and Terri Arsenault; and in the talk "Safeguarding the Nation's Food Supply—and More" Dr. Mary Jane Incorvia Mattina described the recent work in the food safety arena in which all Analytical staff is participating. Following the talks most of the audience participated in tours of the Department of Analytical Chemistry, Biosafety Level 3 Laboratory, Molecular Plant Diagnostics Laboratory. We were especially pleased that also available for tours were the mobile laboratory from the 14th Connecticut National Guard Civil Support Team and the mobile laboratory from the Connecticut Department of Environmental Protection. The event was broadcast by CT-N and made available on video for purchase.

## DEPARTMENT OF BIOCHEMISTRY AND GENETICS

**Leaf development**

Dr. Neil A. McHale in collaboration with Dr. Ross E. Koning (Eastern CT State University) continued work on the molecular biology of leaf development, with technical assistance provided by Regan Huntley. The current emphasis is on a recently discovered group of small, mobile RNA molecules which regulate the expression of developmentally important genes at the post-transcriptional level. These microRNAs induce gene silencing in plants by guiding a ribonuclease complex to specific target mRNA molecules, resulting in their cleavage and subsequent degradation. The expanding list of target mRNAs indicates that miRNAs regulate virtually all aspects of plant growth and development. The basic steps in biogenesis of miRNA molecules have been defined through analysis of mutant plants of Arabidopsis, but the mechanisms controlling the spatial and temporal patterns of miRNA activity in plants remain unknown. We focused our work on the miRNA targeting HD-ZIPIII mRNAs (miR165/166), because they are critical regulators of leaf development in all higher plants. Our approach involves construction of GUSPLUS reporter transgenes artificially placed under miR165/166 regulation by insertion of the miRNA recognition site. Though this is normally expressed everywhere in the plant, the miR165/166 recognition site eliminates GUSPLUS mRNA in tissue where this miRNA is present and active. The data show that this miRNA is active throughout the spongy mesophyll of leaf blades, but not in the overlying vasculature or in upper palisade layer. Our earlier studies on a MYB transcription factor (NsPHAN) indicated that this gene was also essential for palisade formation, raising the possibility that it performs this function through regulation of miR165/166 activity. To test this, we introduced our GUSPLUS reporter into mutant plants lacking NsPHAN function, and confirmed that loss of NsPHAN leads directly to an aberrant expansion of miR165/166 activity into vascular tissue of the leaf midrib and into the palisade layer of the blade. This result points directly to miRNA as the molecular mechanism that allows leaf blades to develop into a living solar panel.

Our most recent work suggests that NsPHAN is actually regulating the location of miRNA activity through the plant hormones gibberellin (GA) and auxin. Under normal circumstances, NsPHAN is promoting formation of small interfering RNA (siRNA) molecules that block auxin responses in the upper layers of the leaf blade. In the absence of NsPHAN, auxin responses are triggered throughout the blade, leading to aberrant activity of miR165/166. We show that introduction of a constitutive transgene for GA oxidase substitutes completely for loss of NsPHAN, blocking auxin response in the vasculature and palisade, and eliminating the aberrant activity of miR165/166. Plant physiologists have known for decades that GA and auxin act as antagonistic regulators of plant development. It now appears that this is accomplished through their opposing influence on the activity of small regulatory RNAs.

**Photosynthetic Genes**

Richard Peterson and Neil Schultes with technical assistance from Carol Clark and Ada Vail continued research on mechanisms that protect the photosynthetic light harvesting in plant leaves. The 22-kiloDalton product of the nuclear *psbS* gene is essential for thermal dissipation of excess absorbed quanta, often referred to as nonphotochemical quenching of chlorophyll fluorescence yield (NPQ). Amino acid sequence data for 62 psbS proteins from 44 species were compiled using cDNA and expressed sequence tag nucleotide sequences in internet databanks. A phylogenetic analysis of the protein sequences revealed topologies resembling those seen in phylogenetic trees constructed based on conventional taxonomic criteria. This indicates that amino acid substitutions (whether neutral or adaptive) occurred over the course of biological evolution in parallel with appearance of new taxa. Alignment analysis indicates, however, that numerous regions of psbS are highly conserved consistent with their involvement in intrinsic aspects of the NPQ mechanism. Two such regions resemble a known chlorophyll-binding motif in the photosystem II light-harvesting proteins LHCII and CP29. Site-directed mutagenesis was employed to block possible ion-bonding to two chlorophyll molecules by replacing putative glutamate and arginine ligands with non-binding valine and leucine in psbS from *Arabidopsis thaliana*. The capacity to form NPQ was severely restricted in leaves from Arabidopsis lacking psbS due to deletion of the gene and in transformants of this deletion line that produced either of the mutant forms of psbS described. The results are consistent with, but do not prove, that chlorophylls bound to psbS participate in the NPQ mechanism.

Despite success in use of transgenic Arabidopsis lines to test functional hypotheses regarding the mechanism of NPQ, creating such lines is laborious and time-consuming. The implication is that a suitable pace of future progress in discovering psbS functional domains will entail a more empirical approach involving analysis of large numbers of structural variants; a strategy incompatible with use of Arabidopsis transgenics. To address this challenge, we have developed a novel high throughput system for analysis of psbS structural variants in *Nicotiana benthamiana*. Three important attributes of the *N. benthamiana* system have already been established. First, virus-induced gene silencing efficiently suppressed expression of endogenous *N. benthamiana psbS* to create a *de facto* deletion phenocopy. Secondly, Agrobacterium-mediated transient expression of native (eg. *N. benthamiana*) or orthologous Arabidopsis

*psbS* resulted in accumulation of psbS and complementation of NPQ-deficiency in pre-silenced *N. benthamiana* leaves. Thirdly, effects of structural dissimilarities on the capacity to generate NPQ are isolated (eg. free of psbS and zeaxanthin concentration effects) based on a simple mathematical model. Ongoing efforts will exploit existing structural diversity by comparing NPQ capacities for distinct psbS proteins (orthologs) from species selected from a database of 65 verified sequences. The second phase will involve testing of domain-swap chimeras of *N. benthamiana/Zea mays psbS* to test the functional significance of psbS regions showing adaptive evolution identified by *in silico* analysis.

**Plant Metabolism**

Dr. Neil Schultes with technical assistance from Regan Huntley and in collaboration with Dr. George Mourad at the Department of Biology at the University of Indiana/Purdue at Fort Wayne Indiana, continued research on mechanisms regulating transport of purines and pyrimidines in plants. Plant metabolites are in a constant state of flux, moving from cell to cell and between subcellular compartments. Membrane bound transporters act as metabolite-specific gatekeepers that regulate their movement. These transporters are often key control points in plant biochemistry. Therefore, understanding how plant transporters function is an important goal for eventual enhancement of crop productivity. At least six different families of transporters (containing some forty-two members) are involved in the movement of nucleobases. Our research investigates transporters in the nucleobase-ascorbate transporter (NAT) family and recently identified genes in the adenine/guanine-like transporter (*AtAzgA*) and purine related transporter (PRT)families. In addition, we investigate the *FOR1* locus in Arabidopsis that is involved in post-transcriptional regulation of uracil transport.

NAT proteins transport purines, pyrimidines or vitamin C and are present in most living organisms. A large number of processes utilize nucleobases or ascorbate in plants including house-keeping functions, secondary metabolite synthesis, plant/pathogen interactions, oxygen radical biochemistry and carbon or nitrogen storage and transport. In particular, purine metabolism and transport is central for ureide production. Ureides are the major nitrogen transport molecule in tropical N2-fixing legumes such as soybeans. The Arabidopsis genome contains twelve NAT loci. We hypothesize that NAT proteins have distinct but overlapping solute transport specificities and that NAT loci have unique expression patterns. Such function/expression combinations often address sink-source relationships throughout the plant as has been shown for multi-gene sugar and amino acid transporter family members. Our long-term research goals aim at determining the expression pattern and function of plant NAT genes and proteins. We routinely use four independent methods to monitor gene expression to ensure accurate spatial and temporal expression patterns. Superior spatial resolution is achieved through analysis of transgenic Arabidopsis harboring NAT promoter-β-glucuronidase (GUS) fusions. Northern blot and RT/PCR were used to monitor endogenous NAT gene expression in different tissues and stages of plant development. In addition *in situ* hybridization analysis was employed to monitor tissue-specific expression of NAT genes and verify the spatial expression patterns observed with transgenic reporter plants. We have gene expression data for ten of the 12 NAT loci. Our results confirm that each NAT

locus has a unique expression pattern. These patterns support the hypothesis that NAT proteins move nitrogenous compounds throughout the plant to serve the needs of developing "sink" tissues such as pollen, eggs and seed. The expression profiles display a preference for vascular localization and expression in 'sink' tissues (e.g. flowers). We have initiated experiments to use real-time PCR methods to quantitate the expression of NAT genes using the Cepheid Smart cycler system with Dr. Charles Vossbrink in the Dept. of Soils and Water.

We identified two Arabidopsis loci (At3g10960 and At5g50300) that encode for proteins very similar to the adenine-guanine transporter in *Aspergillus nidulans AzgA.* In Aspergillus, mutants in *AzgA* locus can grow on 8-azaguanine (8-azg) containing media. We are employing both reverse and forward genetic approaches in our investigations to determine if Arabidopsis has similar guanine transporters – designated as *AtAzgA*. In collaboration with Dr. Mourad we are investigating two EMS-induced Arabidopsis mutants (*azr1* and *azr2*) that show enhanced resistance to growth on 8-azg. During the past year we amplified and sequenced genomic sequences from these mutant lines that correspond to the transporter loci (At3g10960 and At5g50300) and loci encoding for key guanine biosynthetic enzymes hypoxanthine-guanine phosphotransferase (At1g71750) or GMP kinase (At3g06200). All of these loci contained wild type sequence, indicating that *azr1 & 2* correspond to other loci . Further mapping studies are underway to link the molecular genotype with the genetic phenotype. In a reverse genetic approach, we have obtained independent T-DNA insertion mutant Arabidopsis lines in loci At3g10960 and At5g50300. We have generated homozygous lines and are verifying the molecular genotypes. These lines will be used to test for enhanced resistance to growth on 8-azg containing media. In addition, we have placed the full-length cDNAs from both At3g10960 and At5g50300 into yeast expression vectors and will test their ability in yeast heterologous systems for resistance to 8-azg.

Amino acid alignment of the protein encoded by Arabidopsis locus At5g03555 reveals substantial homology to prokaryotic and eukaryotic proteins in the Nucleobase Cation symporter 1 family and to the purine transport related transporter family (PRT) in *Saccharomyces cerevisiae*. Transporters in these families are responsible for the movement of uracil, uridine, allantoin, thiamine or cytosine. Our experiments investigate if the At5g03555 protein fulfills any of these roles. We will test the function of the locus through growth of insertion mutant lines on toxin analogs 5-fluoroorotic acid, 5-bromo-deoxyunidine, pyrithiamine. In addition, we will test the ability of the A5g503555 gene to restore sensitivity to these toxic analogues once expressed in yeast deficient for the *fur4*, *fui1, thi7 and fcy2* loci. In preparation for these experiments, we have obtained two insertion mutant lines in this locus – ET8162 from the Cold Spring Harbor Mutant collection and WiscDsLox419C03 from the Wisconson T-DNA insertion collection. Our molecular analysis reveals that the ET8162 line has lost the insertion into At5g03555 and can no longer be used in mutant analysis. Homozygous WiscDsLox419C03 insertion lines have been propagated for the growth studies. In addition, we have cloned the coding region of the at5g03555 locus into two yeast transcription vectors to producing plasmid pNS399 and pRH124 for heterologous complementation studies.

We have an active collaboration with Dr. George Mourad in the Biology Dept. at the University of Indiana/Purdue at Fort Wayne Indiana. He has isolated and characterized a mutant arabidopsis line - called *for1*- that is resistant to higher concentrations of 5-fluoroorotic acid (5FOA). 5FOA is a toxic analogue of uracil. *for1/for1* plants take up of uracil at approximately only 25% the rate or wild type arabidopsis. This locus may represent a NAT gene or a gene that regulates uracil transporter genes. Our collaboration aims to find the locus responsible for the *for1* phenotype. During the past year our collaboration resulted in the submission and acceptance of a manuscript entitled " A fluoroorotic acid-resistant mutant of Arabidopsis defective in the uptake of uracil" in the Journal of Experimental Botany.

**Genetic Engineering of Paenibacillus Organisms**

To provide insight into ways to improve the use of *Paenibacillus popilliae* as a biological control agent against harmful insects, Dr. Douglas W. Dingman, assisted part-time by Cindy Musante, has performed molecular biological investigations on this insect pathogen. Various molecular techniques and molecular properties of this bacterium were explored to obtain a better understanding of the overall characteristics of *P. popilliae*. Restriction fragment length polymorphism (RFLP) DNA fingerprinting has been performed on 54 strains of P. popilliae and *Paenibacillus lentimorbus* obtained from different insect hosts and geographical locations. RFLP was performed using complete bacterial genomes extracted from the various isolates and pulsed field gel electrophoresis to separate restriction fragments for production of DNA fingerprints. Using computer software to compare fingerprints, a phylogenic tree of the two organisms was constructed. *P. popilliae* and *P. lentimorbus* isolates were clearly separated into two groupings. This work did not support or negate these organisms as being different species. Within the *P. popilliae* grouping, 2 phylogenic clusters were identified. Within the *P. lentimorbus* grouping, 3 phylogenic clusters were identified. This work was supported by other experiments to determine the 16S rRNA sequence for comparisons between different isolates. Geographic distribution of isolates by phylogeny was observed. All isolates obtained in Connecticut belonged to either one *P. popilliae* or one *P. lentimorbus* cluster. All isolates obtained from commercial insecticides were grouped into the second *P. popilliae* cluster. This phylogenic grouping of milky disease bacteria demonstrates a geographic distribution of these bacteria and suggests modifications to be made for use of these bacteria as commercial insecticides.

DNA sequence analysis of the *P. popilliae* plasmid pBP68 has been completed. The complete DNA sequence of this plasmid has been aligned to another *P. popilliae* plasmid, pBP614, and shown to have extensive nucleotide identity. pBP68 appears to encode three proteins (i.e., rep, zot-like, and an unidentified protein) and does not appear to contribute to the overall physiology of the bacterium. The rep protein is involved in plasmid replication and matches rep protein identified in plasmid pBP614. An 83% amino acid identity was observed between rep proteins. The zot-like protein was representative of only the amino-terminal portion (possibly involved in phage assembly) of Zot (zonula occludens toxin). Zot is a protein having dual function of phage assembly and intestinal permeating action. This information suggests that these plasmids are members in a family of rolling circle plasmids possibly originating from a bacteriophage.

Interestingly, these two plasmids (i.e., pBP68 and pBP614) were obtained from bacterial strains isolated from locations geographically disperse (New Zealand and North America). This sequence information will help scientific investigations on plasmid DNA evolution. Attempts at using the sequence information to develop pBP68 into a shuttle vehicle for genetic exchange experiments have not been successful. Collaboration with Dr. Neil P. Schultes to develop genetic exchange and insertional mutagenesis procedures has not been successful. Several attempts at electroporation of a pBP68-Tn5 erythromycin fusion plasmid into *P. popilliae* failed to produce transformants. Also, conjugative transfer of a vector construct, containing Tn916 ends and the origin of transfer, was unsuccessful. Evaluation of these negative results and redesign of vector constructs are continuing. Development of tools and protocols for genetic exchange and insertional mutagenesis in *P. popilliae* are essential before many of the more powerful molecular techniques can be available for molecular investigations on this bacterium.

## 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 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, and wood-boring insects. Staff members also work closely with organic farmers and landscapers in Connecticut.

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. According to the latest census by the National Agricultural Statistics Survey, the Connecticut Green Industry (i.e., nursery, greenhouse, floriculture, sod, Christmas trees) is the largest agricultural business in Connecticut with a market value of $246 million in 2002. An economic survey by the New England Nursery Association indicated that sales by the Connecticut Green Industry surpassed $1.1 billion in 2005. In conjunction with regulatory activities, Department staff conducts a surveillance program in Connecticut for a variety of established pests like the gypsy moth 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 through the Cooperative Agricultural Pest Survey (CAPS) program and the U.S. Forest Service. One example is the surveillance for Ramorum blight, a fungus-like pathogen that can affect many plants, but that can be particularly devastating to oaks. The regulatory and plant survey staff in Entomology collects samples, which are tested by culture and molecular techniques in a new

laboratory set up for DNA analysis in the Department of Plant Pathology and Ecology with funding support from the Governor and Connecticut General Assembly.

The staff of the Department of Entomology also takes the 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 including agricultural fairs like the Eastern States Exposition (Big E), the Connecticut Public Television Family Science Expo, and the Connecticut Flower and Garden Show.

With a display hive, Ira Kettle answers questions about honey bees at the CPTV Science Expo (photo by Rose Bonito).

Honey bees continue to be a popular exhibit at these events. Department staff members also produce fact sheets and other various publications for the citizens of Connecticut. Three pesticide guides toward integrated pest management were produced for Connecticut arborists, nurseries, and Christmas tree growers. The guide for Christmas tree growers was individually mailed to 290 members of the Christmas Tree Growers Association. In the past two years, nearly 10,000 copies of the Tick Management Handbook have been distributed through northeastern states, most of which went to Connecticut residents as well as Connecticut municipal and regional health departments, physicians and hospitals, and Connecticut Cooperative Extension.

Service, research, regulatory, and pest surveillance activities are detailed in the following sections.

## SERVICE ACTIVITIES

*Insect Inquiry Office*: Kenneth Welch, Gale Ridge, and Rose Bonito assisted by Alyson Florek and Michelle Guidone answered questions from the public. The insect inquiry office, in its more or less current form, has provided services for around 40 years. However, our insect identification services date to the early years of this institution and its mission. Starting with the first Annual Report of the Connecticut Agricultural Experiment Station for 1877, the Station announced, among other things, that it was prepared to "identify useful or injurious insects… and to give useful information on the various subjects of Agricultural Science for the use and advantage of the citizens of Connecticut".

The insect inquiry office served 4,109 people through the year and 693 different insect and spider species were identified. Ants, termites, bees, wasps, hemlock woolly adelgids, and pantry pests continue to be the leading pests of concern. The office has also seen an increase in inquiries about human bedbugs. Ticks, primarily the blacklegged tick *Ixodes scapularis*, would rank up among the highest number of specimens submitted for identification (6,123 in 2005). While ticks are processed in a different laboratory at the Experiment Station, many specimens are submitted through the insect inquiry office.

The office served private citizens, the pest control and real estate industries, nurseries, arborists, health departments and other medical professionals, museums, municipalities, libraries, state government, and the news media. Inquiries were made through 2,342 telephone calls (57%), 1,233 visitors (30%), 534 mail submissions (13%), and other miscellaneous submissions. The office also supported the plant regulatory activities of the Office of the State Entomologist and agricultural and forest pest surveys with assistance on identification of collected insects.

*Impact*: Stakeholder concerns about a variety of insects, spiders and other arthropods were addressed. Identifications were made to determine which of the various arthropods presented were considered pests. Proper identification provided residents with a guideline as to which arthropods required control and reduced stakeholder concerns about the "pest". Information was given on chemical and non-chemical control measures. In some cases, applications of pesticides could be reduced or eliminated. Correct identification also provided an opportunity for intercepting potential new pests.

*Bird and Butterfly Garden*: Rose Bonito, Jeffrey Fengler, Vicki Bomba-Lewandoski, and Kirby Stafford updated the informational flyer for the Experiment Station's Bird and Butterfly Garden at Lockwood Farm. Rose Bonito and Jeffrey Fengler displayed information about the species present and provided identification tours on Plant Science Day. The garden is a collaborative project of the Federated Garden Club of Connecticut, the Spring Glen Garden Club of Hamden, and the Connecticut Agricultural Experiment Station. Maintenance and improvements to the garden are done by farm manager Richard Cecarelli, his staff, and other Station staff members with monthly care provided by members of the Spring Glen Garden Club. The garden is open to the public during regular business hours. Photographs by Jeffrey Fengler and Vickie Bomba-Lewandoski.

Rose Bonito, Jeffrey Fengler, and Michael Thomas observed 19 species of butterflies, 2 species of moth, 16 species of birds, and 14 species of dragonflies in the garden on Plant Science Day August 3, 2005.

| Butterflies & Moths | Birds | Dragonflies |
|---|---|---|
| American Lady | American Crow | Autumn Meadowhawk |
| Black Swallowtail | American Goldfinch | Black Saddlebags |
| Bumblebee Clearwing (Moth) | American Robin | Blue Dasher |
| Cabbage White | Barn Swallow | Calico Pennant |

| | | |
|---|---|---|
| Clouded Sulpher | Common Grackle | Carolina Saddlebags |
| Comment Ringlet | European Starling | Cherry-faced Meadowhawk |
| Common Sootywing (including larva) | Gray Catbird | Common Pondhawk |
| Dun Skipper | House Sparrow | Dot-tailed Whiteface |
| Eastern Tiger Swallowtail | Mourning Dove | Eastern Amberwing |
| Hobomok Skipper | Northern Mockingbird | Four-spotted Skimmer |
| Horace's Duskywing | Red-tailed Hawk | Slaty Skimmer |
| Hummingbird Clearwing (Moth) | Red-winged Blackbird | Spangled Skimmer |
| Monarch | Rock Dove | Wandering Glider (in field) |
| Northern Broken Dash | Ruby-throated Hummingbird | Widow Skimmer |
| Orange Sulphur | Song Sparrow | |
| Pearl Crescent | Turkey Vulture | |
| Peck's Skipper | | |
| Silver-spotted Skipper | | |
| Spicebush Swallowtail | | |
| Summer Azure | | |
| Tawny Edge Skipper | | |

*Tick Testing*: In 2005, Bonnie Hamid, assisted by Elizabeth Alves and Michelle Guidone, identified 6,123 nymphs and adults of the blacklegged tick, *Ixodes scapularis*, submitted by local and regional health districts for Connecticut residents. A total of 5,897 were tested for the presence of the causal agent of Lyme disease, *Borrelia burgdorferi*, by polymerase chain reaction (PCR) techniques, of which 1,613 (27.35%) were positive.

## RESEARCH ACTIVITIES

*Community Program for the Prevention of Lyme Disease*: The majority of Lyme disease cases (75%) are acquired in the residential landscape, primarily through the nymphal stage of the blacklegged tick, *Ixodes scapularis*. The blacklegged tick *Ixodes scapularis* (commonly known as the deer tick) is the vector for the Lyme disease spirochete (*Borrelia burgdorferi*), the protozoan that causes human babesiosis (*Babesia microti*), and the agent of human granulocytic anaplasmosis (*Anaplasma phagocytophilum*). Funded by the Centers for Disease Control and Prevention for 4 years, a community-base program is being conducted for the prevention of Lyme disease in the Torrington Area Health District (TAHD) and the Ledge Light Health District (LLHD). Research elements continue in the Westport Weston Health District (WWHD), the location of the first national Lyme disease community project, which formally ended in September 2004. These local intervention projects are a cooperative effort of the Connecticut Department of Public Health (DPH), Dr. Kirby Stafford of the Connecticut Agricultural Experiment Station, and the local health districts. Dr. Stafford provides technical advice, site visits, and lectures on tick management for the projects and supervises the tick management research elements of the program. In the TAHD, research efforts are focused in the towns of Canaan, Cornwall, and Salisbury. In the LLHD, tick control studies have been focused in the community of Mumford Cove in Groton. In 2005, the research was conducted with the assistance of Heidi Stuber and J.P. Barsky, and summer research assistants Christina Stoehr, Tricia Borgstrom, Gregory Dunford and Lindsley Colligan and included collecting data on tick abundance, determining the prevalence of infection in both the vector and reservoir hosts, and evaluating

interventions in the communities. The long-term evaluation of the mouse-targeted fipronil-based bait box in residential communities is an important aspect of the ongoing research in the targeted communities.

*Rodent-Targeted Tick Control:* White-footed mice (*Peromyscus leucopus*) are important hosts for larval and nymphal *I. scapularis* and are the principal reservoir for the three tick-borne pathogens. The Eastern chipmunk is also an important host reservoir for the tick, the Lyme spirochete and *B. microti*. A fipronil-based rodent bait box system for treating white-footed mice and chipmunks to control ticks, initially tested by scientists from the CDC in cooperation with the Connecticut Agricultural Experiment Station on Mason's Island, Stonington, CT, is available commercially. Fipronil is the active ingredient in some flea and tick control products for dogs and cats (Frontline®). The commercial version of the bait box (Maxforce® Tick Management System, Bayer Environmental Science, Montvale, NJ) continued to be evaluated in conjunction with the Lyme disease community intervention projects in the WWHD and TAHD. Working closely with the local health districts, Dr. Stafford established trials of the fipronil bait box in 2001 in inland residential neighborhoods in Westport and Weston, and with J.P. Barsky's assistance in 2002, in Litchfield County in Salisbury, Canaan, and Cornwall. The commercial Maxforce TMS box was used at the same sites or neighborhoods from 2002-2006.

In Westport and Weston in 2005, 72 homes in two neighborhoods received 1,732 boxes (34 in Weston and 38 in Westport). The number of treated homes was down slightly from 2004. The boxes were installed in two installations (one in May (n = 866) and one in July (n = 866) to target nymphs and larvae on the rodents, respectively. The same residences in the two untreated neighborhoods, one each in Weston and Westport, continue to serve as the control. Virtually all examined boxes were fully empty of bait so rodent usage of the boxes continues to be high. Unlike 2004, there was little difference in the prevalence of infestation with larvae between the control and bait box sites, but the mean number of nymphal and larval ticks on the rodents was lower in the bait box treated sites than the control. In the WWHD, there was a decrease in the number of host-seeking *I. scapularis* nymphs in the bait box treated sites in 2005 compared with the control, especially at the Westport site. In Westport, there was a decrease of 61.9% compared to the control and in the preliminary analysis, this was statistically significant (P = 0.021).

In three towns of the Torrington Area Health District (TAHD), the mean number of nymphal and larval ticks on the rodents continues to be lower in the bait box treated sites than the control. Placement of the Maxforce TMS was begun mid-season in July 2002 and has continued through 2006. In 2005, 63 homes received a total of 1,636 boxes, again in two installations (May, n = 824; July, n = 812). There were 382 boxes placed at 15 homes in Canaan, 822 boxes placed at 30 homes in Cornwall, and 432 boxes placed at 18 homes in Salisbury. With the exception of 2005, there has been a steady decline in the prevalence of infestation by larval ticks on rodents in the bait box sites (77.8% in 2002, 61.3% in 2003, 34.4% in 2004, and 56.0% in 2005), while infestation levels in the control, again 2005 was higher, have been more consistent (45.5, 58.1, 51.4%, and 75.0% for 2002-2005, respectively). Unlike 2004, there was no statistical difference in the larval numbers on the rodents between the control and bait box sites in 2005, although numbers in the control were higher. In addition, there appeared to be no significant difference in

questing tick abundance between the control and treated sites in any of the three towns. In 2005, host feeding and host seeking tick abundance were higher than the previous couple of years. This reflected an observed increase in tick activity at a number of sample locations in Connecticut.

There was a major change in the bait box installations in 2006 with the requirement by the U.S. Environmental Protection Agency (EPA) that a metal shroud or cover be used for each bait box to prevent damage and access to the bait by squirrels. Due to the unanticipated increased costs of the shrouds and some project budget cuts, the number of treated homes was reduced, focusing on the homes where tick and rodent sampling had been conducted through the earlier course of this study.

*Entomopathogenic Fungi for Tick Control:* Postdoctoral scientist Dr. Anuja Bharadwaj began studies on the survival and efficacy against *I. scapularis* of the fungus *Metarhizium anisopliae* Strain 52 with Dr. Stafford in 2004 and experimental trials continued through 2005 and 2006. The fungus is now being developed commercially in both an oil-based emulsifiable concentrate (EC) and eventually a granular formulation for the control of a variety of pests, including the blacklegged tick under the label Tick-Ex® (Earth BioSciences, Inc., New Haven, CT). The purpose of these studies is to determine optimum dosage and length of viability under different conditions in the field. Previously, we had shown that spores survived for more than 1.5 months in fall and for more than 3 months in the summer. However, high mortality in mealworm bioassays was observed only in woodlands for this length of time. Bioassay tests and germination tests began in June 2005 to determine fungal viability in the field under summer conditions when nymphal ticks are active.

Laboratory experiments were conducted with both the oil-based emulsifiable concentrate (EC) and granular formulations against adult and nymphal ticks to provide initial guidelines on efficacy of the material and on the rate to be tried for field applications. Three types of treatment methods were conducted with the EC against *I. scapularis* – Dip test, Crawl test and Spray-Crawl Test with four different concentrations of *M. anisopliae* in replicated sets. In dip test, ticks were dipped into the different concentrations levels for 30 seconds. The crawl and spray crawl test represented increasing exposure to the fungus. Crawl and spray-crawl methods were used as representative of field exposures to residuals or a direct spray of the fungal spores. For crawl test, the ticks were allowed to crawl on filter paper treated with different concentrations for 3, 30 or 300 minutes. In spray-crawl test, ticks sprayed with different concentrations and then allowed to crawl for 3, 30 and 300 minutes. In case of granular formulation, ticks were allowed to crawl for 3, 30 and 300 minutes for each rate of application. After treatment, ticks were transferred into screened centrifuge vials and held for four weeks in a humidity chamber at 90% RH and 25˚C. Ticks were examined weekly and mortality was recorded.

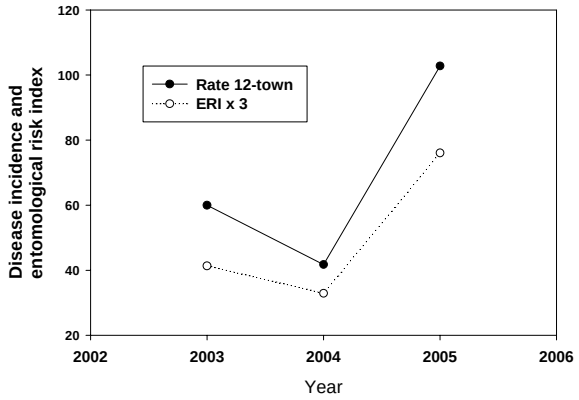
Female *Ixodes scapularis* killed by the fungus *Metarhizium anisopliae* in the laboratory.

With the highest concentration level of EC tested in crawl test with adults, 100% mortality was obtained within a

week after only 3 minutes of exposure to the fungus. The lowest concentration ($2.6x10^5$ $cfu/cm^2$) that was used for the adult ticks when tested against nymphal ticks brought 72.3% percent mortality within a week with only 3 minute time exposure. When the same concentration was sprayed and the adults were allowed to crawl for 3 minutes, 100% mortality was observed after only two weeks. The result of the experiments with granular formulation showed that it needs more development and refinement to be effective for the same rates of application. These laboratory trials suggest that high mortality can be obtained with this strain of *M. anisopliae* at rates suitable for commercial formulation and application. With the receipt of *M. anisopliae* spores from Earth Bioscience in late April 2006, field applications with two concentrations of the spores were made to woodland plots in May 2006. Other plots serve as controls. These and upcoming studies will provide information needed for the application guidelines for commercialization of *M. anisopliae* as a tick biopesticide. A commercial product with *M. anisopliae* will provide the first practical biological alternative to broadcast insecticides for residential control of the blacklegged tick.

*Tick Abundance and Lyme Disease Incidence:* In 2005, Dr. Stafford's staff (Heidi Stuber, Christina Stoehr, and Tricia Borgstrom) continued to monitor populations of *I. scapularis* nymphs on the lawns and adjacent woods at several residences in Lyme, Old Lyme, and East Haddam, Connecticut, by dragging the vegetation with a square meter cloth 'tick drag'. Ticks have been collected at these residences since 1989. Tick activity was up substantially for June and July in 2005 in these three communities (436.3 nymphs per hectare) compared with 97.1 nymphs per hectare in 2004, 66.2 nymphs per hectare in 2003 and 132.5 nymphs per hectare in 2002. Even though only 6.5% (of 261 tested) were infected with *B. burgdorferi*, the risk index based on the abundance of infected ticks was 25.4 vs. values less than 20 for the past 5 years in this region. The incidence of Lyme disease continues to be related to tick activity.

Twenty-seven cases of Lyme disease were reported in East Haddam, Lyme and Old Lyme in 2005, compared to 10 and 7 for 2004 and 2003, respectively. Statewide, the number of reported cases increased to 1,810 compared to only 1,348 cases in 2004 and 1,403 in 2003. Comparisons of long-term trends in tick activity and prevalence of infection with reported incidence of Lyme disease will permit a better understanding of the relationship between tick abundance and disease incidence.




Comparison of the entomological risk index (ERI) x 3 (abundance of infected ticks) for the towns of East Haddam, Lyme and Old Lyme with the reported incidence of Lyme disease per 100,000 population for a 12 town area around the Connecticut River, which includes the three sampled towns, 2003-2005.

*Tick-Borne Infections:* Dr. Louis A. Magnarelli, assisted by Tia Mastrone, collaborated with Dr. Kirby C. Stafford, III, Dr. Jacob W. IJdo (University of Iowa) and Dr. Erol Fikrig (Yale University) on measuring serum antibodies to whole-cell or recombinant antigens of the agents that cause Lyme disease (*Borrelia burgdorferi*), granulocytic anaplasmosis (*Anaplasma phagocytophilum*), and babesiosis (*Babesia microti*). Emphasis was placed on white-footed mice, rodent reservoirs for these pathogens in nature, and the development of new tests called enzyme-linked immunosorbent assays. Of the 414 mouse sera analyzed, 310 (75%) had antibodies to whole-cell *B. burgdorferi*, whereas 157 (38%) were positive to a specific outer surface protein (VlsE) of this bacterium. Antibodies were also present to the other two disease organisms. Positive mice in extreme northern Connecticut indicate further geographic expansion of these infections in the state.

New research was conducted on the bacterial agent of tularemia (*Francisella tularensis*) in cats. Assisted by Tia Mastrone, Dr. Louis A. Magnarelli, Dr. Steve Levy (Durham Veterinary Hospital), and Dr. Ray Koski of $L^2$ Diagnostics (New Haven) used a microagglutination (MA) test and indirect fluorescent antibody (IFA) staining methods to detect serum antibodies to *F. tularensis*. Blood samples were obtained from privately owned cats that had outdoor exposure in Connecticut and New York State. Of the 91 sera tested by MA, 11 (12%) contained antibodies to *F. tularensis*. IFA staining methods revealed 22 (24%) positives. There was good concordance in laboratory results of both tests. Cats were exposed to *F. tularensis* or a closely related organism. With exposure to ticks, other biting arthropods, mice, and rabbits, cats are at risk for acquiring *F. tularensis* infections and can be an important source of information on the presence of this agent in nature.

*Spruce Needleminer:* Caterpillars of the spruce needleminer, *Batrachedra pinicolella* (Lepidoptera: Batrachedridae), eat the needles of spruces, causing mainly cosmetic injury that could affect their value as Christmas trees. In 1997, Dr. Maier discovered this Eurasian moth in Connecticut—the first North American record. In spring 2005, he sent pheromone traps to cooperators in Canada and the United States to determine the distribution of the exotic moth. Based on adult captures in the traps, this invasive moth has a broad range in northeastern North America. Pheromone traps captured adults in Quebec, all New England states, New York, New Jersey, Delaware, Pennsylvania, West Virginia, Ohio, and Michigan; no moths were caught in western or southern states. In 2006, pheromone-trapping will continue in northeastern North America.

In Orange, Connecticut, the adult males of *B. pinicolella* were captured in pheromone traps between mid-June and late July 2005. This flight period was similar to the one detected in 2004. Knowledge of the distribution and flight times should assist foresters, landscapers, and Christmas tree growers in developing strategies to cope with this potential pest of spruces.

*Surveys for Exotic Insects*: In a 2005, Dr. Maier and his assistants, Mathew Wohlstrom and Shalyn Zappulla, conducted a CAPS (Cooperative Agricultural Survey, USDA) survey to find infestations of the highly destructive emerald ash borer, *Agrilus planipennis*, in Connecticut. In the midwestern states of Indiana, Michigan, Ohio, and Illinois, this eastern Asian beetle has killed about 10 million ash trees. The survey team

visually inspected 2,004 ash trees at 492 sites in the 169 towns of Connecticut. Inspectors also examined sticky bands on girdled ash trees in seven counties to detect adults. Fortunately, the results in 2005 were the same as in 2004: no ash trees had emerald ash borers.

In a second CAPS survey, the same inspectors searched for the brown marmorated stink bug, *Halyomorpha halys*, in Fairfield and Litchfield Counties by jarring the branches of apple and crabapple trees. This eastern Asian stink bug has a very broad host range, and, thus, could become a pest of several major crops in Connecticut. In 2005, the stink bug was not detected at any of the 23 sites sampled. The brown marmorated stink bug, however, is established in nearby states, such as Pennsylvania and New Jersey. In late summer 2006, another survey will be conducted in the southern counties of Connecticut.

In 2005, Dr. Maier also confirmed the presence of an exotic leaf-cutter bee, *Anthidium oblongatum*, and a foreign checkered beetle, *Thanasimus formicarius*, in Connecticut. The latter, mainly a predator of bark beetles, might assist in controlling several pestiferous wood-boring beetles were it to become established.

*Classical Biocontrol of Leafminers in Apple Orchards:* Dr. Maier, and his assistants, Tracy Zarillo and Morgan Lowry, detected the Palearctic encyrtid wasp, *Holcothorax testaceipes*, in a commercial orchard for the first time in 2005. In seven plantings of apple trees in Guilford orchard, the parasite, first released nearby in 1988, killed between 1-19% of the exotic tentiform leafminers of the first generation. By the second leafminer generation, the parasitism rate had fallen to only 1% in the low-spray plantings. The next phase of this research will concentrate on how to use *H. testaceipes* effectively to bolster biocontrol in other low-spray orchards.

*Impact*: Governmental agencies urge the use of alternative (non-chemical) methods to reduce human exposure to pesticides. Integrated pest management, particularly through biological control, contributes significantly toward accomplishing this objective. The long-term benefits of using effective parasitic wasps, such as the exotic encyrtid released in Connecticut, to suppress pestiferous fruit pests are reduced pesticide contamination of the environment, decreased health risk to humans, and possibly financial gains for growers.

*Seasonal Abundance of Wood-boring Beetles*: In a long-term study, Dr. Maier, Tracy Zarrillo, and Morgan Lowry, are investigating the pattern of seasonal activity of wood-associated insects by capturing them on sticky bands on girdled forest trees and in Lindgren funnel-traps baited with ethyl alcohol and alpha-pinene. In 2005, they caught more than 100 species of beetles, wood-boring wasps, and their natural enemies on bands on girdled white ash, white pine, and Norway spruce trees or in funnel-traps hung in conifer plantations. At the principal research sites in Barkhamsted and Orange, they trapped enough adult beetles to determine the activity of at least 30 species, including 10 species of longhorned beetles (Cerambycidae) and 5 species of checkered beetles (Cleridae). Understanding the activity period of adult checkered beetles may be useful in timing tree harvests to conserve these natural enemies of wood-boring beetles.

*Community Farming:* In their efforts to preserve farmland and other open space, many towns and local land trusts have bought farmland in the last ten years in order to keep it from being developed. But, towns and land trusts often don't have the capacity to run farms themselves, and often the land is abandoned, and its usefulness as farmland is allowed to deteriorate, as fields are taken over by invasive species and other brush, and barns and other infrastructure are not maintained. Dr. Kimberly Stoner organized a meeting of local community groups across the state, concerned about the farmland owned by their own towns or land trusts. The organizing meeting in January 2006 drew 40 people from 17 organizations.

Five of the organizations will work together on a project, funded by a grant from the Northeast Sustainable Agriculture Community Program to Dr. Kimberly Stoner. These community organizations will learn the principles of Holistic Management and apply Holistic Management to planning, making decisions, and testing the results in managing their local farms. This training will begin in August of 2006.

*Swede Midge Survey:* The swede midge, *Contarina nasturtii* (Kieffer), a pest of plants in the cabbage family in Europe and Southwest Asia, was discovered in Ontario, Canada in 2001. Subsequent research found that this exotic insect was already established in many areas of Ontario and Quebec, and surveys in the cabbage growing regions of western New York State found in 2004 and 2005 that the swede midge was present in 6 counties. In 2006, Dr. Stoner, assisted by Adam Scheinkman, began surveying for the swede midge using pheromone traps and visual surveys on eight farms in central and western Connecticut as part of the CAPS programs.

*Cedar Beetles:* Dr. Claire Rutledge continued her investigation of two aspects of *C. rufipenne*'s chemical ecology in collaboration with Dr. Lawrence Hanks of the University of Illinois, Urbana-Champaign and Dr. Jocelyn Millar of the University of California, Riverside and their students. *Callidiellum rufipenne* is native to eastern Asia and was discovered in live arborvitae in Connecticut in 1998 by Gale Ridge, Carol Lemmon and Dr. Chris Maier. The borer has since established in the southern half of Connecticut. *C. rufipenne* is found most frequently on plants in the families Cupressaceae and Taxodiaceae. We confirmed that the beetles follow the typical mating strategy of Cerambycidae; males recognize females by means of a contact pheromone in the female's epicuticle. The contact pheromone appears to be a blend of straight-chain hydrocarbons and branched hydrocarbons. We also discovered that male *C. rufipenne* produce a volatile compound. This compound is consistent in chemical structure with recently discovered aggregation pheromones produced by males of two other cerambycid beetles; the red-headed ash borer (*Neoclytus acuminatus acuminatus*(Fabricus)) and the red-oak borer (*Enaphalodes rufulus* (Haldeman)). In addition, the pores, which release the volatile pheromone, and the glands which produce it were identified, and were consistent in location and structure with those of the other two cerambycids. Based on field and laboratory studies, adult beetles are attracted by the male beetles while they are emitting the volatile pheromone, and by their host plants. Preliminary data suggest that female beetles respond more strongly to the male-produced volatiles and that the volatiles are active over a fairly short range. The exact function of this volatile pheromone for *C. rufipenne* is still under investigation, but could potentially be exploited as a monitoring tool.

*Bronze Birch Borer*: Dr. Rutledge examined the strategies by which the Bronze Birch Borer, *Agrilus anxious* Glory, a native insect, locates its hosts. The beetles require stressed living trees to develop, and thus frequently attack birches in landscape and nursery settings. The beetles cause considerable aesthetic and financial damage to homeowner and nursery properties in Connecticut. Following results from summer 2004, which suggested that borers can discriminate between stressed and healthy trees, Dr. Rutledge has begun to sample and analyze the air surrounding healthy and stressed birches in cooperation with Dr. L. Hanks of the University of Illinois to attempt to isolate the attractive compounds.

*Soybean Aphid in Connecticut*: The soybean aphid, *Aphis glycines* Matsumara, was first found in the United States in Wisconsin in the summer of 2000. Since that time, it has spread to 21 states, primarily in the upper Midwest, and 3 Canadian provinces. The predicted range of soybean aphid includes all of New England, but it had not yet been reported from Connecticut and Massachusetts. Dr. Rutledge surveyed two sites in each state during the summer of 2005: two sites were sampled throughout the growing season, Lockwood Farm, and an organic farm in Cromwell, CT. Aphid population dynamics were substantially different than those found in the Midwest during summer 2005, implying that soybean aphid populations are not linked to those in the Midwest.

*Mordellidae Attraction to Methyl Salicylate*: In the summer of 2004, attempts to attract Bronze Birch Borer with methyl salicylate were unsuccessful. However, the traps were highly attractive to one species of tumbling flower beetle (Coleoptera: Mordellidae). Almost 300 individuals were collected over a 2-week period. The experiment was repeated in 2005, about half the number of individuals were collected. In both years, the peak captures were made at roughly 1500 Degree Days (July 14, 2004 and July 25 2006). The beetle was identified by Dr. J. Jackman of Texas A&M as *Falsomordellistena bihamata* (Melsheimer). Little is known about the ecology of the Mordellidae, and this is the first known report of mass trapping of mordellids.

## REGULATORY ACTIVITIES
## NURSERY INSPECTION AND CERTIFICATION

Three-hundred and twenty-nine nurseries were certified to conduct intra- and interstate business. There were 846 nursery inspections during the growing season. Eight-thousand, seven-hundred and thirty-three acres of nursery stock were examined as well as plants growing under 32,586,875-sq. ft. of greenhouse space. The majority of plants were grown in hoop houses (28,264,900 sq. ft.), followed by plastic greenhouses (2,801,143 sq. ft.) and glass greenhouses (1,519,000 sq. ft.).

## JAPANESE BEETLE CERTIFICATION

We observed treatments of 425,015 plants at one nursery and issued phytosanitary certificates to comply with states that quarantine nursery stock from Connecticut because of the Japanese beetle, *Popillia japonica*.

One nursery, which met the containerized nursery stock accreditation program requirements of the United States Japanese Beetle Harmonization Plan, shipped 5,090 plants to other states in 2005.

Five nurseries met other requirements of the United States Japanese Beetle Harmonization Plan and shipped 2,935 plants to states that quarantine plants from Connecticut.

## JAPANESE BEETLE CERTIFICATION TO CANADA

Seven Connecticut nurseries, which met the inspection requirements of the US/Canada Japanese Beetle Harmonization Plan, shipped 40,655 plants out of state in 2005.

## NURSERY DEALER PERMITS

Nursery dealer permits were issued to 173 firms. One-hundred and fifty of these companies operate individual outlets. The remaining businesses have more than one outlet each. In total, there were 465 outlets.

## PHYTOSANTIARY CERTIFICATES

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

| Plants | Number |
|---|---|
| Apples (Cartons) | 13,268 |
| Bulbs & Tubers (Dahlia, Lilium, Gladiolas) | 10,369 |
| Chestnut (Seeds) | 80 |
| Chinese tree peonies (plants) | 26 |
| Greenhouse plants | 1,140 |
| Nursery stock (containers & plants) | 33,189 |
| Orchids (plants & flasks) | 4,126 |
| Perennials (plants in tissue culture) | 65 |
| (bare root plants) | 8,350 |
| (plants) | 10,925 |
| (flats) | 157 |
| Seeds (cartons) | 4 |
| Tobacco (bales, boxes, bundles & cartons) | 151,482 |

SPECIAL INSPECTIONS

1. Twenty-eight inspections were made for 592 individual plants and bulbs to assist homeowners moving out of state.

2. One-hundred and sixty-four inspections were made to assist nurseries moving the following plants interstate:

| Plants | | Number |
|---|---|---|
| Nursery stock | (containers) | 24,960 |
| | (bare root plants) | 1,566 |
| | (B & B) | 1,127 |
| | (unrooted cuttings) | 58 |
| Perennials | (plants) | 425,015 |
| | (unrooted cuttings | 100 |
| | (bare root plants) | 10 |
| Allium (bulbs) (pounds) | | 617 |
| Chinese tree peonies (plants) | | 1 |
| Christmas trees | | 1 |
| Corn seed (pounds) | | 771 |
| Geraniums | | 1,381 |
| Greenhouse plants | | 440 |
| Hemlock Lumber (Board Feet) | | 66,000 |

3. Two tobacco growers had 151 acres inspected for the aerial application of pesticides.

4. Fifteen post-entry inspections were carried out on 14,650 plants at 2 locations. At two sites, 2,584 plants were released from quarantine.

APIARY CERTIFICATION

Three-hundred beekeepers registered 1,974 colonies in 2005. Our bee inspector opened and inspected 676 colonies in areas known to have foulbrood disease. American foulbrood was found in 27 colonies. These colonies were destroyed.

| County | Colonies Opened & Inspected | Varroa Mite Positive | American Foulbrood Positive | Nosema | Formica Ants | Wax Moth |
|---|---|---|---|---|---|---|
| Windham | 213 | 35 | 4 | 1 | 3 | |
| New London | 94 | 5 | 2 | | | |
| New Haven | 116 | 10 | 2 | | | |
| Hartford | 122 | 96 | 7 | | | |
| Middlesex | 21 | 5 | 6 | | | 4 |
| Litchfield | 53 | 25 | 5 | | | |
| Fairfield | 33 | 5 | 1 | | | |
| Tolland | 24 | 3 | | | | |
| Totals | 676 | 184 | 27 | 1 | 3 | 4 |

*Varroa mite totals represent infestations that were not controlled. These colonies were in the final stages of their existence. Varroa mites are present in all colonies, treated or untreated.

During 2005, 500 honey bees from 3 apiaries in the towns of Chester, Weston and Fairfield were examined in the laboratory for the tracheal mite, *Acarapis woodi*. There were no positives for tracheal mites.

## FOREST HEALTH SURVEY

During the summer of 2005, 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. In general, our forests remain healthy.

## INSECT AND PLANT DISEASE SURVEYS

### NURSERY INSECTS

The most abundant pests found in nurseries were mites on various trees and shrubs, lacebug on *Pieris* and *Rhododendron*, aphids on various trees and shrubs, black vine weevil *(Otiorhynchus sulcatus*) on *Taxus* and Rhododendron leafminer on *Rhododendron.*

SURVEYS FOR INSECT PESTS

Surveys were conducted regionally and statewide for native, established and exotic insect pests. No emerald ash borers, Asian Longhorned beetles, or pine shoot beetles were found in 2005.

*Gypsy Moth:* There was an outbreak of gypsy moth activity in parts of eastern Connecticut in 2005, with defoliation of white oaks and other trees, including some evergreens over an area of 64,273 acres (see table). Our annual aerial survey for gypsy moth defoliation, conducted starting in early July 2005 by Deputy State Entomologist, Dr. Victoria Smith, and State Plant Inspector, Peter Trenchard, covered 1.8 million acres of urban/suburban forest in all eight Connecticut counties. Gypsy moth caterpillars were abundant from Guilford to Waterford and appeared centered in the East Haddam area. Tree defoliation was most extensive in Middlesex County (32,985 acres), followed by New London County (19,062 acres). An estimated 10,896 acres or 17% of the total acreage with some defoliation was considered heavy (76-100% defoliation).

Forest defoliation in acres by county from the gypsy moth in 2005 based on aerial survey.

| | % Defoliation | | | | |
|---|---|---|---|---|---|
| County | 10-25 | 26-50 | 51-75 | 76-100 | Total acres |
| Hartford | 1,532 | | | | 1,532 |
| Litchfield | 972 | | | | 972 |
| Middlesex | 18,481 | 3,501 | 4,459 | 6,544 | 32,985 |
| New Haven | 3,326 | 1,700 | 941 | 3,325 | 9,548 |
| New London | 13,326 | 1,277 | 3,432 | 1,027 | 19,062 |
| Windham | 37 | | 137 | | 174 |
| Total | 37,930 | 6,478 | 8,969 | 10,896 | 64,273 |

In November and December, a gypsy moth egg mass survey was conducted in 80-95% favorable host sites on a 7 -mile grid (102 sites) throughout Connecticut. At sixteen sites, egg masses were found in low numbers that may indicate a build up in population. At seven sites, egg masses were found in numbers large enough to be considered a problem for the spring and summer of 2006.

*Asian Longhorned Beetle:* The Asian longhorned beetle, *Anoplophora glabripennis*, first discovered attacking trees in August of 1996 in New York, has spread in Queens, New York to within 25 miles of Greenwich in southwestern Connecticut.

There is risk for beetle entry in ports because of the transportation of solid wood packing material on ships coming from areas of the world where this beetle is found.

We, therefore, concentrated additional survey efforts in Connecticut in the areas of Bridgeport, Groton, New Haven and New London as well as their surrounding parks that contain a high percentage of maple, a favorite food source of the Asian longhorned beetle. All surveys and identifications, thus far, were negative.

Asian Longhorned Beetle Survey, 2005.

| County | # Inspections | # Trees Inspected | # Infested Trees |
|---|---|---|---|
| Fairfield | 9 | 1,301 | 0 |
| New Haven | 13 | 850 | 0 |
| New London | 5 | 975 | 0 |
| | | | |
| Totals | 27 | 3,126 | 0 |

*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. Occasionally, local infestations occur when oaks have been stressed by other factors such as drought or gypsy moths. Serious defoliation can occur when this happens. The moths lay up to 500 eggs on the undersides of oak leaves in early summer and are attracted to artificial light. The caterpillars feed on the foliage, and then they burrow into the soil and build an earthen cell, where it pupates and passes the winter. On September 27 & 28, 2005, a statewide aerial survey was conducted for orange-stripped oakworm defoliation. Defoliation was found in five towns (3,631 acres) in Windham County and in two towns in New London County (131 acres). Total acres defoliated were 3,762.

*Pine Shoot Beetle:* One-hundred and twenty-three Christmas tree farms in 56 Connecticut towns were inspected for pine shoot beetles, *Tomicus piniperda*, during 2005. The inspections encompassed 1,399 acres of trees and the individual examinations of 76,781 Christmas trees. The trees were examined by walking along the rows looking for damage. Pine shoot beetles were not found in Connecticut.

In late November and December, we examined 38,654 Christmas trees owned by 114 dealers in 58 towns. The trees were inspected for over-wintering pine shoot beetle adults in the base of tree trunks or beetle damage. We were especially concerned about Christmas trees that were shipped into Connecticut from states with *Tomicus piniperda* infestations. Pine shoot beetles were not found in Connecticut.

During March, 2005, Lindgren Funnel traps were set up for Pine shoot beetle. Five traps were set up in each county and were monitored at two week intervals through mid-May. No adult pine shoot beetles were found.

*Smaller Japanese Cedar Longhorn Beetle:* Based on surveying with trap-logs and on rearing insects from dead wood, the exotic small Japanese cedar longhorned beetle, *Callidiellum rufipenne*, is established in 58 Connecticut towns distributed in Fairfield,

Hartford, Middlesex, New Haven, and New London Counties. The beetle successfully developed on 9 species of ornamental and wild plants in the family Cupressaceae. In the wild, the principal host was dead eastern red cedar, but *Callidiellum rufipenne* also infested dead common juniper and Atlantic white cedar. In garden centers, the main hosts were stressed balled and burlaped arborvitae and other cupressaceous landscape plants.

During 2005, we inspected 21,187 plants for *Callidiellum rufipenne* at 51 nurseries in 52 Connecticut towns. Nine infested plants were found.

*Warehouse Survey for Wood-Boring Insects:* In early 2005, we conducted a trapping survey of 15 Connecticut warehouses in 5 counties to detect the possible presence of exotic wood-boring insects. Lindgren funnel traps, with a chemical lure, were placed in the warehouses and checked bi-weekly for insect activity. No exotic insects were found.

*Winter Moth:* In November, 2005 wing traps were set up for Winter moth, *Operophtera brumata*, at 36 locations in eastern and central Connecticut. The traps were checked once in mid-December and removed at the end of December. Winter moth was found at 2 locations in Stonington, Connecticut.

*Hemlock Woolly Adelgid:* The hemlock woolly adelgid, *Adelges tsugae*, remains an important pest of hemlock in Connecticut, spreading northward since its coastal detection in 1985 and infesting trees in all 169 towns in the state. During 2005, we required all hemlock nursery stock that was being shipped out of Connecticut to be treated for Hemlock woolly adelgid. Two nurseries shipped hemlock trees out of state. Our inspectors observed treatments and issued phytosanitary certificates to cover 1,135 plants in these shipments.

SURVEYS FOR PLANT DISEASES

*Daylily Rust:* A rust fungus (*Puccinia hemerocallidis)* was found on daylilies in a southeastern U.S. nursery for the first time in the summer of 2000. It was found in Connecticut in 2001 and 2002 on daylilies owned by private citizens. It is now confirmed to occur in three counties. During 2005, we surveyed daylilies in nurseries and garden centers for signs of this rust. One-hundred and eight inspections were carried out on 128,256 plants. No signs of *Puccinia hemerocallidis* were found.

*Ramorum Blight:* Ramorum Leaf Blight (Sudden Oak Death) is a serious plant disease that attacks many types of plants and trees common to Connecticut. It is currently known to occur in the Pacific Northwest on oaks, azaleas, big leaf maples, huckleberry, California bay laurel, camellia, myrtles, honeysuckle, Pacific madrone, Douglas fir, rhododendrons, and viburnum. It does not affect humans and is not a food safety concern.

Sudden Oak Death is caused by a pathogen called *Phytophthora ramorum*. The pathogen is not a fungus or a bacterium, but a member of a unique group of organisms

called Oomycetes. Oomycetes share some characteristics of fungi but are biologically different.

Plant inspector Peter Trenchard (left) and Tia Mastrone, with plant inspector Stephen Sandrey (right) conduct surveys for Ramorum blight.

As part of the National Nursery Survey, we examined plants for symptoms of Ramorum Leaf Blight. We inspected plants in nurseries and garden centers and plants being shipped to other states and Canadian destinations. A total of 80 inspections were carried out on 89,333 *Rhododendron*, 36,143 *Pieris*, 25,446 *Kalmia*, 19,187 *Viburnum*, 16,392 *Syringa*, and 10,381 *Vaccinium*. An additional 15,859 plants on the host list were examined. No signs of Sudden Oak Death were found.

A nursery/forest environmental survey was done in conjunction with the US Forest Service. The perimeter survey was done on three large wholesale nurseries, the three nurseries that had positives during the nursery trace forwards in 2004 and one woodland plot. Four one hundred meter transects were measured using GPS along nursery perimeter. The starting and ending trees marked with GPS readings and tape. The woodland plot transects measured from one starting point tree. All host species along transects were examined for possible symptoms of *Phytophthora ramorum.* No infected leaves or tree cankers were found.

*Chrysanthemum White Rust:* During 2005, we continued to survey for *Chrysanthemum* white rust disease, caused by the fungus, *Puccinia horiana*. We inspected 1,147,018 chrysanthemums raised by 364 growers and dealers for the presence of chrysanthemum white rust. No chrysanthemum white rust was found.

## 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, and the effect of the growing deer population on natural and managed landscapes. Connecticut has a strong link to the forest. Approximately 60% of Connecticut's land area is classified as forest. In addition to valuable non-commodity amenities (watershed protection, wildlife habitat, passive recreation), the forests are a valuable part of the local economy. Connecticut has a $500 million wood product industry of 350 firms that provide employment to 3,600

loggers, millworkers, and others. Both gypsy moths (*Lymantria dispar*) and white-tailed deer (*Odocoileus virginianus*) have lowered the productivity of our forests. Gypsy moth defoliations can reduce growth and survival of trees, while deer alter the composition and density of forest regeneration.

*Gypsy moth defoliation and oak mortality*: Gypsy moths have spread to at least seventeen eastern states since its accidental introduction outside of Boston in the late 1800's and is well established on the eastern and northern portions of the central hardwood region. Although gypsy moth has a wide host range, increased mortality and reduced growth of oak (*Quercus*) species have accounted for most of the economic and ecological damage caused by this alien pest. The Old-Series plots, established in 1926-27, provided a unique opportunity to document the effect of multi-year defoliations on oak mortality and diameter growth, analyze how mortality was influenced by crown and vigor classes, and examine the longer term impacts (20+ years) of multi-year defoliations on mortality and growth of upland oaks.

**Dr. Jeffrey S. Ward** remeasured these plots in 1997. Crown class and diameter of 4,088 upland oaks have been monitored at 10-yr intervals on these plots. During the thirty-years before defoliation, mortality rates for upper canopy trees (dominant and codominant crown classes) were lower than mortality rates for lower canopy trees (intermediate and suppressed). Mortality rates for upper canopy trees did not differ between the white and red oak groups. Among upper canopy trees, diameter growth of red oaks (0.17 inches/year) was significantly greater than for white oaks (0.12 inches/year).

Plots had three episodes of moderate to heavy defoliation: 1961-1964, 1971-1972, and 1981. Primary defoliators were gypsy moth, canker worm (*Paleacrita vernata*), and elm spanworm (*Ennomos subsignarius*). The three consecutive years of moderate to heavy defoliation, 1961-1963, were the first known defoliation episodes on these plots. Mortality rates increased significantly during this period for both the red oak and white oak groups, and for all crown classes. Mortality of upper canopy white oaks was significantly higher than for upper canopy red oaks. Mortality of upper canopy red oaks remained higher than pre-defoliation levels during 1967-77 when there were two consecutive years of defoliation. Mortality of upper canopy white oaks decreased to values similar to, and not significantly different from, pre-defoliation values.

Diameter growth of upper canopy red oaks, but not white oaks, decreased during the initial period of defoliation. Surprisingly, multi-year defoliations did not have a significant impact on diameter growth of lower canopy trees. This may be because mortality was higher for the slowest growing trees. For red oaks, but not white oaks, tree vigor was a good predictor of upper canopy tree mortality between 1957-1967. Red oaks with annual diameter growth of at least 0.1 inches had lower mortality rates during the period of multi-year defoliations than slower growing trees. For example, mortality was 16 percent for codominant red oaks that had annual diameter growth of 0.15 inches compared with 60 percent for codominant red oaks that had annual diameter growth of less than 0.05.

Since the end of the multi-year defoliations in 1972, mortality rates for both species groups and all crown classes have fallen to pre-defoliation levels. Diameter growth

quickly recovered following the end of multi-year defoliations. Diameter growth of codominant red and white oaks during 1987-1997 were similar to, or higher than, growth before 1957-1967. The longer term impacts of multi-year defoliations have been to nearly eliminate lower canopy oaks (both red and white oaks) and to reduce the proportion of white oaks relative to red oaks. Because mortality of upper canopy red oaks was less than that of white oaks, and because the diameter growth of surviving red oaks increased once defoliations ceased, total oak basal area is now higher than before the period of multi-year defoliations.

*Reducing browse damage in forest plantations*: Maintenance or enhancement of a conifer component is an integral part of maintaining habitat diversity, especially in areas dominated by deciduous species. Loss of eastern hemlock (*Tsuga canadensis*) following infestation of hemlock woolly adelgid (*Adelges tsugae*) has reduced the conifer component from New England through the southern Appalachians. Other conifer species in the northeastern United States are potentially threatened by introduced pests including a siricid woodwasp (*Sirex noctilio*) and European Pine Shoot Moth, (*Rhyacionia buoliana*).

Replacement of conifers lost to introduced pests, or maintenance of extant conifer populations, can be problematic in areas with large deer herds. Severe browse damage by deer has been reported in eastern and western United States, Europe, and Asia. In many areas, especially natural areas and parks where hunting in prohibited, the presence of large deer herds precludes successful regeneration unless seedlings are protected.

In response to the loss of red pine (*Pinus resinosa*) initiated by red pine scale (*Matsucoccus matsumuraein*) and red pine adelgid (*Pineus borneri*) in Connecticut , **Drs. Jeffrey S. Ward and George R. Stephens** began a series of experiments in 1989 to develop a practical system of growing white pine in areas with large deer herds. Growth and survival was monitored on these plots through 2005. The first study, in collaboration with **Dr. Martin P.N. Gent**, found tree shelters did not increase height growth of eastern white pine, but did increase survival. However, tree shelters were both expensive to install and maintain.

In 1991, a study site was established in Natchaug State Forest to examine the potential of bud caps. The study was further expanded in 1994-95 with plots in Voluntown, Chaplin, Middletown, and Ashford to determine if the system of rigid mesh tube and buds caps developed in the western United States could be successfully used to increase survival and height growth of eastern white pine in southern New England. These studies found that the combination of rigid mesh tubes and bud caps could reduce terminal bud damage, and quite unexpectedly, the incidence of white pine weevil (*Pissodes strobi*) damage.

A site visit at Natchaug study site during mid-June the summer after bud caps were installed found distorted top growth on some seedlings. This distortion was caused by terminal buds snagging on the bud caps. A closer inspection revealed that terminal buds that were at least 0.5 cm higher than the bud cap were not distorted. Thereafter, all bud caps were adjusted to be slightly below the height of the terminal bud. No subsequent terminal bud distortions were observed.

We observed one problem with the rigid mesh tubes that was not reported in earlier studies. The taller (91 cm) tubes frequently folded over following a heavy wet snowfall that is typical of southern New England. This required the tube to be straightened before bud expansion to avoid distorted growth of the terminal. Later experiments used a shorter (60 cm tall) tube and this problem was eliminated.

Although shelterwood prescriptions have been suggested as one method of naturally regenerating eastern white pine, underplanted seedlings generally grow slower than those planted in open clearcuts. After nine years, underplanted seedlings were the same height as open-grown seedlings after three years, and were still short enough to be vulnerable to browse damage. These results suggest that underplanting could be a successful strategy to establish pine seedlings in hardwood stands, but complete overstory removal will be necessary after several years if the pines are to grow and form part of a future upper canopy.

In 1997, **Drs. Jeffrey S. Ward and Todd L. Mervosh (Valley Lab)** began a study to examine the interaction of browse control and competition control on eastern white pine survival and growth. Protecting seedlings from deer browse may not ensure a successful planting on sites with vigorous weeds and brush. The vegetation control component used a combination of herbicide application and mowing.

Plantings were established in four locations: Gaillard, Pachaug, Woodstock, and Norfolk. Each study site had two replications. Each replication had 20 seedlings for each of the following treatments: vegetation control/browse protection, vegetation control/no browse protection, no vegetation control/browse protection, no vegetation control/no browse protection.

The final experiment indicates that the decision to use vegetation control will depend on the anticipated degree of browse damage. Browse damage was higher and survival lower on the vegetation control plots at Gaillard where deer densities were much higher than the other study areas. The seedlings at Gaillard were much smaller than the surrounding vegetation (primarily grasses and *Solidago*). Thus, in areas with large deer herds, the benefits of reducing competition from surrounding vegetation may be more than offset by the increased probability of repeated severe browse damage to seedlings not hidden by taller plants.

Where significant browse damage can be expected, browse protection can increase survival and height growth. Only two of eighty seedlings survived seven years without browse protection at Gaillard; and these seedlings were only 35 cm tall. This study found a weak correlation between browse protection and height growth at Gaillard.

Vegetation control may be appropriate for areas with lower deer densities. Both survival and height growth were increased by vegetation control where deer densities were lower. Competing vegetation can limit photosynthetically active radiation available to smaller seedlings, thus influencing both survival and growth.

*Deer Browse Exclosure Study*: Each year, more and more Nutmeggers have the opportunity to watch deer in their own backyard and gardens. Unfortunately, this increasingly common sight has a cost. Many a gardener knows the frustration of waking

up to find prized roses, perennial plant beds, or vegetable gardens damaged by deer browse. In 2001, it was estimated that deer nationwide were the cause of $407 million in losses to field crops, vegetables, fruits, and nuts. Deer damage is not limited to plants. Deer are a host species for the ticks that transmit Lyme disease. Connecticut also reports approximately 3,300 vehicle collisions with deer annually, but the Department of Environmental Protection estimates the total number to be closer to 10,000 due to unreported collisions. Nationwide, an estimated 1.5 million vehicle collisions with deer occur annually and result in approximately $1.1 billion in damages, 29,000 human injuries, and 200 human fatalities.

Severe browsing by large deer herds has seriously impaired natural regeneration on some Connecticut forests. Forest understories have become dominated by browse resistant species such as hophornbeam, blue beech, and striped maple along with exotic invasives such as Japanese barberry, ailanthus, oriental bittersweet, and winged euonymus. Unfortunately, these browse resistant species often have lower economic, aesthetic, and wildlife values than the species they displace. The damage caused by browsing is not limited to trees. At least 98 threatened or endangered plants are browsed by white-tailed deer. Many spring wildflowers (lilies, trilliums, orchids, lobelias, and buttercups) and flowering shrubs (dogwoods, viburnums, roses, and rhododendrons) are favored by deer. Change in forest structure caused by deer browse can have a negative impact on bird species that nest in the understory.

One method to study the impact of deer on natural ecosystems is to compare growth rates and species diversity of vegetation protected from deer browse to unprotected plots. **Scott C. Williams** and **Dr. Jeffrey S. Ward** collected vegetation data within and outside sixteen deer exclosures throughout the state. Deer exclosures prevent deer from accessing vegetation within. Growth rates and species diversity of enclosed vegetation were compared with that of an adjacent control plot, where deer have access to vegetation. The project is a collaborative effort with The Nature Conservancy to maintain and sample twelve deer exclosures, four each at Burnham Brook Preserve in East Haddam, the Bingham Easement also in East Haddam, and Devil's Den Preserve in Weston. We are also including four of our own exclosures on South Central Connecticut Regional Water Authority property in North Branford. Preliminary data analysis from the fall 2005 sampling period indicates that seedling density within the exclosures is greater than control plots. Vegetation was taller within exclosures. Herbaceous vegetation sampling will be completed by the end of summer in 2006. All locations will be resampled for both woody and herbaceous vegetation in the fall. Results from this study will reveal plant species composition and growth rates in the absence of deer. Land managers can use this information to strategize an appropriate deer management plan.

*White-tailed Deer as Seed Dispersers in Connecticut*: **Scott C. Williams** and **Dr. Jeffrey S. Ward** are completing the fourth and final year worth of data collection looking at white-tailed deer as seed dispersers. A total of 514 deer pellet groups have been collected over four years (2002-2005) in the towns of Guilford, North Branford, Cheshire, and Norfolk. Entire pellet groups were collected and placed in individual sampling bags and vernalized at 5°C for 60 days. After 60 days, pellet groups were removed and placed on and lightly covered with a growing medium. Planted samples were kept in a temperature

controlled greenhouse at 24ºC. Samples were watered as needed, fertilized to encourage flowering for identification purposes, and remained in the greenhouse for approximately 6 months. Germinants were allowed to grow until they could be identified, at which time, they were removed from the tray and discarded.

Thus far, a total of 11,044 seedlings of 77 positively identified species have germinated. The majority of species (60%) and seedlings (approx. 85%) are not of native origin to the state of Connecticut. Such species include purslane (*Portulaca oleracea*), Carolina horsenettle (*Solanum carolinense*), lamb's quarters (*Chenopodium album*), wine raspberry (*Rubus phoenicolasius*), common plantain (*Plantago major*), multiflora rose (*Rosa multiflora*), autumn olive (*Elaeagnus umbellata*), honeysuckle (*Lonicera* sp.), as well as others. We determined deer on site had the potential to disperse approximately 2,000 exotic seeds per mile$^2$ per day throughout summer and autumn. It has been estimated that exotic plants are taking over 1.73 million acres of forest and wildlife habitat annually and white-tailed deer are contributing to this invasion. As white-tailed deer numbers in Connecticut continue to grow, so will the number of exotic seeds dispersed into woodland settings, choking out native species and further altering forested ecosystems. Exotic plants are usually of little economic value and have a competitive advantage over valuable native species. Exotic plants are a serious economic threat to our renewable natural resources such as timber, game species, and non-game wildlife. Before steps can be taken to slow the spread of exotic species, all potential dispersal agents need to be identified.

*Analysis of Deer/Vehicle Collisions*: There are approximately 3,000 reported deer/vehicle collisions annually in Connecticut. However, the Connecticut Department of Environmental Protection estimates that approximately 18,000 occur annually. Human injuries and death do occur each year from deer/vehicle collisions in Connecticut. It has been estimated that damage to each vehicle involved in a deer collision costs about $2,500, or an estimated $45,000,000 annually in vehicle repairs alone. **Scott C. Williams** is continuing a project to analysis spatial patterns deer/vehicle collision. Currently, the 2003 Deer Kill Incident Report data are being entered into a database. This information will be added to statewide data for 2000, 2001, and 2002 which was entered in previous years. Location of accidents is described on reports. Latitude and longitude coordinates are then obtained using DeLorme Street Atlas USA. Analysis of data thus far indicates similar findings to other studies. Collisions are most likely to happen in October, November, and December. Collisions often occur during morning and evening hours, corresponding to peak traffic and animal activity. We are in the process of establishing a partnership with the Connecticut Department of Transportation to research the behaviors of white-tailed deer around Connecticut highways. By better understanding how roadways affect deer usage of the surrounding habitat, we may be able to better predict areas with high collision potential. If such spots are identified, the public can be alerted to these areas during peak hours and numerous collisions could be avoided, decreasing risk to Connecticut residents and saving millions of dollars in vehicle repairs.

*Survey of deer damage in Connecticut*: Damage caused by white-tailed deer is not limited to forest regeneration and deer-vehicle collisions. Anecdotal reports of extensive deer damage to agricultural crops in Connecticut are common, but not well documented. In 2003-2004, surveys were distributed to members of the Connecticut Farm Bureau, Connecticut Nursery and Landscape Association, and the Connecticut Pomological Society. Growers were requested to report on actual crop damage from different wildlife species (including deer), percent of that crop lost, percent of that crop damaged by each species of animal, monetary loss due to each damaged crop, and measures taken to avert animal damage.

A total of 137 surveys were returned from growers in 83 towns. On average, respondents had owned or managed their land for 31 years. These farms, orchards, and nurseries included over 6,000 acres of the nearly 100,000 acres of working landscape in Connecticut. The surveys indicated wildlife damage on nearly 40% of the acreage. A wide variety of crops was reported to be damaged by deer including Christmas and fruit trees, pumpkins, berries, nursery plants, vegetables, grapes, and hay fields.

As a part of the survey, growers reported the monetary losses related to wildlife damage. Respondents indicated a total of $70,000 in wildlife damage to Christmas tree crops, $42,000 in damages to fruit trees, $15,000 to vegetable crops, and $8,000 in other crops. These totals would undoubtedly be larger if all farms in Connecticut were surveyed. Economic losses were not limited to direct damage of crops, but also to indirect damages from profitable crops that could not be grown. Forty growers had stopped using at least one field, or had stopped growing a crop, because of damage. Christmas trees and pumpkins were the crops most commonly discontinued.

Thirty-four percent of growers reported increased wildlife damage in the past five years. Growers with increased damage spent an average of $710 to reduce damage during 2002. Growers have employed a variety of methods to reduce browse damage . Crop damage permits and fencing were the only methods that were reported to be generally effective at least half of the time. Repellents were reported to be the least effective method.

*Deer Repellent Study*: **Dr. Jeffrey S. Ward** and **Scott C. Williams** began a deer repellent trial at two different sites within Connecticut in spring 2006. Deer repellents are most often strong and/or foul-smelling agents that are applied directly to plants in an attempt to prevent deer from browsing and ultimately damaging them. Repellents work in different ways: some make the animal sick, others taste very hot or bitter, while others are supposed to invoke fear. Ten different repellent formulations are being tested: Chew Nott®, Deer Away®, Big Game Repellent®, Plantskydd®, Bobbex®, Liquid Fence®, Deer Solution®, Hinder®, Repellex® systemic tablets, and coyote urine. Other repellent trials have been completed, but none as extensive with such a varied array of repellent types. At both sites, Windsor and Woodbridge, 144 yews (*Taxus*) and 144 hostas (*Hosta*) were planted. Twelve hostas and twelve yews at each site receive one of twelve treatments (the ten different repellents, a fence, and untreated control). Manufacture's instructions for repellent application are being followed. Results from this study will inform Connecticut residents about the most effective repellent for use on these two browse susceptible species.

*Effect of shade quality of greenhouse tomato*: Farmers produce tomatoes in greenhouses to capitalize on the demand by consumers for fresh and native vegetables with improved taste and nutritive qualities. Typically plants are started in spring, but much of the production occurs during the hottest months of summer. **Dr. Martin P.N. Gent** concluded three years of experiments in 2005 to compare the yield and quality of various cultivars of tomatoes grown in greenhouses that were cooled by covering with reflective aluminized shade cloth. Houses were compared that either had no shade, or a shade cloth that reduced light transmission into the greenhouse by 15%, 30% or 50%, compared to greenhouses only covered with the usual double-layer of clear polyethylene film. These treatments are referred to as 0, 15%, 30% or 50% shade, respectively. The shade was applied in early June, corresponding to the start of fruit production, and the start of the first warm weather. The houses remained shaded for the rest of the summer, and fruit was picked into August. The tomato plants were grown from seeds germinated in January, and the seedlings were transplanted into the greenhouses in March.

Within each of the years 2003 to 2005, yields were compared among greenhouses with different degrees of shade. Shade reduced total yield significantly in each year. Total yield with 50% shade was 16.4, 17.5 and 18.5 lbs/plant, compared to 21.8, 20.4 and 20.7 lbs/plant with no shade, in 2003, 2004 and 2005, respectively. Thus, total yield with 50% shade was 24, 14 and 11% less than that with no shade in these years. However, shade did not decrease marketable yield significantly in any year. The marketable yield with 50% shade was 11.5, 9.5, and 9.7 lbs/plant, compared to 11.5, 9.5, and 10.1 lbs/plant with no shade, in 2003, 2004 and 2005, respectively. Thus, marketable yield with 50% shade was only 10% less than that with no shade in 2003, the same as that with no shade in 2004, and only 4% less than that with no shade in 2005. Compared to the number of fruit produced with 50% shade, 16, 14 and 14% more of the fruit was unmarketable when produced with no shade, in 2003, 2004 and 2005, respectively.

The effect of shade on fruit size and the fraction of fruit with various defects varied among the three years of the experiment. In part, this was because two of the cultivars grown in 2003 differed from those grown in 2004 and 2005. In 2003, Rapsodie had the largest fruit, 7.8 to 8.6 oz, while ‘Buffalo’ had the smallest, 6.2 to 6.7 oz. ‘Buffalo’ had the highest fraction of marketable fruit overall, 57 to 69%, but the marketable fraction was least with 50% shade. ‘Match’ had the lowest fraction of marketable fruit, 41 to 51%, and this fraction increased with shade. ‘Buffalo’ had the fewest fruit with cracked skin, 21 to 29%, while ‘Rapsodie’ had the most, 28 to 42%. For all cultivars except ‘Buffalo’, plants grown with 50% shade produced the fewest fruit with cracks. The incidence of blossom end rot was lower in 2003 than in other years, because ‘JetStar’ was not included.

Averaged over all cultivars, shade treatment reduced fruit size significantly only in 2003. Fruit size was 6.9 oz with 50% shade, compared to 7.4 oz with no shade. In 2004, fruit size differed by only 0.2 oz among all shading treatments. In 2005, the largest fruit was picked from greenhouse covered with 15 or 30% shade, 9.0 and 8.6 oz, respectively, compared to 8.4 oz from greenhouses with none or 50% shade.

The treatments had little effect on fruit quality in 2004, except shade decreased total yield in proportion to the degree of shade. In 2005, a 15% shade resulted in the highest yield. The largest fruits were also produced with 15 or 30% shade. The decrease in the number

of fruit with cracks was proportional to the degree of shade. The number of irregular fruit also varied with shade. All of these characteristics differed between cultivars, and the effect of shade on fruit size, and fruit with cracked skin or irregular shape differed between cultivars.

The cultivars differed in most yield characteristics in 2004 and 2005. In these two years, 'Cabernet' had the highest total yield, but it also had the lowest marketable yield and the greatest fraction of non-marketable fruit. Only 22 to 37% of 'Cabernet' fruit was marketable, compared to 58 to 77% for 'Buffalo'. In 2005, the fraction of marketable fruit increased with shade for all cultivars except 'Buffalo'. The poor market quality of 'Cabernet' was due to cracks in the skin; 47 to 67% of the fruit had cracked skin. The incidence for other cultivars was 24 to 36% for 'JetStar', 14 to 16% for 'Buffalo', and 23 to 25% for 'Quest'. The effect of shade was more marked in those cultivars that were prone to cracks in the skin. 'Quest' had the most fruit with rough skin, 8 to 11 % in 2004, and 4% in 2005. 'Cabernet' had the most fruit which ripened unevenly or had green shoulder, 21 to 47%. 'JetStar' had the most blossom end rot, and the highest incidence was observed with no shade. 'JetStar' also had the most irregularly shaped fruit, 8 to 18%, and more fruits had an irregular shape when grown with 30 and 50% shade. For the other cultivars, only had 1 to 5% of the fruit ripened unevenly or had an irregular shape. The cultivars differed only slightly in fruit size in 2004. In 2005, 'Buffalo' had the smallest fruit, 7.0 to 7.6 oz. Fruit size of the other cultivars ranged from 7.9 to 9.6 oz, and the largest fruit were picked from plants grown with 15% shade.

Shade appeared to be a useful means to reduce the number of fruit with cracked skin without also reducing fruit size. Although shade did not affect marketable yield, the fraction of fruit that was marketable was least without shade and greatest with 50% shade. There would be an economic benefit to shade, in that less labor would be used to pick non-marketable fruit. The labor cost per unit of marketable fruit would be lower with some degree of shade than without shade.

There are about 50 growers in Connecticut who use greenhouses to extend the production season of tomatoes. Whereas they can sell unblemished tomatoes at retail for up to $3/lb, those fruit with cracked skin or other defects have to be discarded or sold at a low price. The effort to pick the crop increases with the total yield, regardless of how marketable it is. Labor for picking is the most significant single cost of production for greenhouse tomatoes in the summer. Shading will decrease this labor cost to the extent that it decreases the amount of fruit that is picked but unmarketable. Thus, shading will reduce the labor cost of picking and culling a crop of tomatoes, in proportion to the decrease in the fraction of unmarketable fruit. In my experience this fraction was reduced by about 15% by shading a greenhouse to reduce light transmission by 50%. Thus, shade could reduce by 15% the cost of labor for picking greenhouse tomatoes.

*Heirloom Tomato Trials:* Interest and sales of heirloom tomatoes have increased dramatically in the past 10 years. More and more consumers are willing to forego appearance for that real old-fashioned tomato taste. Knowledge of high yielding cultivars and cultural details would benefit growers, especially those who serve inner city consumers who purchase these fruits at local farmers markets throughout the Northeast.

But growing heirloom tomatoes can be a challenge. Heirlooms tend to have poor disease resistance and have lower yields when to compared to hybrid tomatoes. They are also more susceptible to cracking due to their tender skin.

In 2005, **Dr. Abigail A. Maynard** evaluated ten cultivars of ethnic heirloom tomatoes for yield and quality at Windsor and Mt. Carmel. At Windsor, yield of Anna Russian and Pineapple were greatest (24.0 lb/plant) with Giant Ponderosa and Kellogg's Breakfast averaging 22.0 lb/plant. Pineapple produced the largest fruit (11 oz/fruit) with Giant Belgian and Giant Ponderosa both averaging 8 oz/fruit. Results at Mt. Carmel were similar. These trials will continue in 2006.

*Personal-sized Watermelons Trials:* The newest melons on the marketplace are seedless miniature "personal" watermelons, weighing 3-7 pounds each. Personal-sized watermelons offer an attractive alternative for small families or for consumers that have limited refrigerator space. Beside the smaller size, they also have a thinner rind, which reduces waste. In addition, researchers have found that lycopene and beta-carotene contents are abundant in personal-sized watermelons. Lycopene, an antioxidant, has been linked to the possible prevention of cancer and heart disease.

In 2005, **Dr. Abigail A. Maynard** evaluated five cultivars of personal sized seedless watermelon for yield and quality at Windsor (sandy terrace soil) and Mt. Carmel. At Windsor, average yield of plants mulched with black plastic was 38 T/A compared to 32 T/A from the unmulched plots. Mulched plots averaged 4.4 melons/plant compared to 3.9 melons/plant from the unmulched plots. Extazy and experimental cultivar S133 had the greatest yields (43 T/A) followed by experimental cultivar S130 (33 T/A) and Vanessa (30 T/A). Bobbie (5.1 lb/fruit), Vanessa (5.1 lb/fruit), and Extazy (4.9 lb/fruit) produced the largest fruit at Windsor. At Mt. Carmel, mulched plots averaged 29 T/A compared to 22 T/A from the unmulched plots. Mulched plots averaged 3.1 melons/plant compared to 2.9 melons/plant from the unmulched plots. Experimental cultivar S133 (28 T/A) and Extazy (26 T/A) averaged the greatest yields. Extazy (5.7 lb/fruit) produced the largest fruit (Bobbie was not grown at Mt. Carmel due to poor germination). Bobbie averaged the greatest sugar content with an average Brix of 13 compared to Extazy (11.5). All other cultivars at both sites had Brix readings under 11. Extazy was very high in lycopene (95-99 ug/g) (as determined by Dr. Penelope Perkins) with the other cultivars averaging (54-85 ug/g). It appears from these preliminary trials that black plastic mulch increases yields and that Extazy is the cultivar of choice. Research will continue with evaluations of additional varieties and various cultural methods.

*Garlic Trials:* Garlic, a bulbous plant closely related to the onion, has a wide number of market niches and is used in great quantities for cooking. Consumption of garlic in the U.S. has risen from 0.5 pound per person in 1985 to 3.1 pounds per person in 1999. To meet that demand, acreage devoted to the production of garlic rose from 16,000 acres to 41,000 acres, or about a 156% increase. No other vegetable, including popular vegetables like onions, broccoli, and carrots, has exhibited such strong sustained growth. One factor contributing to this strong surge in use is the rising popularity of ethnic foods and proliferation of ethnic restaurants. In addition, there have been numerous news releases

describing the health benefits of garlic. In 2005, **Dr. Abigail A. Maynard** initiated garlic variety trials by planting 6 cultivars in October. These bulbs will be harvested in July and evaluated for yield, quality, and storage durability. Future experiments will determine the effect of different mulches on yield, quality, and storage durability of garlic.

*Cauliflower Trials:* Recent developments in the fast-food industry, to provide low-carbohydrate foods to diet-conscious consumers, prompted a replacement of mashed potatoes with mashed cauliflower. In 1986,1987,1988,and 1994, we tested 47 cultivars of cauliflower for yield and quality. Most of the cultivars tested are no longer available from seed companies. To evaluate yield and quality of cauliflower cultivars, released since 1988, **Dr. Abigail A. Maynard** evaluated 12 cultivars for spring harvest at Windsor and Mt. Carmel. In spring, average yield of 12 cultivars at Windsor was 8.5T/A. Yield of Freedom was greatest (10.9 T/A) with Absolute, Attribute, Cumberland, Minuteman, and Wentworth exceeding 9.5 T/A. There was a crop failure at Mt. Carmel due to severe browsing from woodchucks. These trials will continue in 2006.

*Jilo – Moisture Conservation Trials:* Jilo (*Solanum gilo*) is a solanaceous plant akin to eggplant. This tropical vegetable is grown principally in Nigeria. Its culture was transported to central and southern Brazil where is became a minor crop. Its principal use is in vegetable stew (ratatouille) and sweet and sour mixes with chicken and pork. In 1998, a Bethel grower obtained seeds from a member of the Brazilian community in the Waterbury-Danbury area (estimated population 4500). The Connecticut Department of Agriculture obtained some of the seeds and sent them to the Experiment Station for further testing. We found that jilo grows well in Connecticut's climate and can produce up to 11 lb/plant when mulched with black plastic to warm the soil. We also found that jilo flowers abort when subjected to moisture stress. In this experiment, use of plastic mulch or drip irrigation to improve the moisture content of the soil throughout the growing season to prevent fruit abortion was compared to untreated controls. At Mt. Carmel (loamy upland soil), average yield of fruit from Comprido Verde Claro was 3.7 lb/plant in plants grown with black plastic mulch and 6.6 lb/plant with drip irrigation compared to 2.6 lb/plant in control plots. It appears that the supplemental drip irrigation was especially important in the hot and dry summer of 2005. These trials will continue in 2006.

*Calabaza – Selection for Early Maturity:* Calabaza squash, also known as tropical pumpkin, is mostly grown in tropical and semi tropical climates. Calabaza is highly prized by consumers of Hispanic origin. It was identified by the Connecticut Department of Agriculture as one of the most sought-after vegetables at Connecticut's 65 farmers' markets. In 2003, one plant of La Estrella produced mature fruit in only 90 days on 12-foot vines. Early maturing fruit are generally found on the vine within 2 feet of the planting site. Fruit that mature in 90 days is appealing to northern growers because the majority of fruit can mature before frost. With a traditional maturity of 120 days, some fruit that form late on the vine do not reach maturity. We saved the seeds from the fruit planted them at Mt. Carmel and Windsor in 2005. At Windsor, 17% of the plants

produced early-maturing fruit (90 days) within 2 feet of the planting site while only 4% produced early fruit at Mt. Carmel. The greater success at Windsor may be due to an adjacent cover crop of buckwheat, a known bee attractant, which helped to pollinate early forming female flowers. At. Mt. Carmel, the adjacent cover crop of soybeans did not attract bees. These trials will continue in 2006.

*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. Abigail A. 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 1994-2004 and incorporated into the soil by rototilling. Yields of lettuce, rutabaga, and edible soybeans were compared to yields from the control plots where no leaves were added. All plots received the same amount of 10-10-10 fertilizer applied at the recommended rate for vegetable production (1300 lbs/A). In 2005, lettuce yields were virtually the same for all the treatments with plots amended with maple leaves and the control plots averaging 1.2 lbs/head. Plots amended with undecomposed oak leaves averaged 1.3 lbs/head. Plots amended with oak leaves averaged the greatest soybean yields (2.7 lbs/plot) compared to plots amended with maple leaves (2.2 lbs/plot) and the control plots (2.0 lbs/plot) (all dry weights). The greatest rutabaga yields were from plots amended with maple leaves (2.8 lbs/plant) compared to plots amended with oak leaves and the control plots (1.8 lbs/plant). It appears that applications of oak or maple leaves are not deleterious to vegetable production but the experiment will be continued to determine the effect of repeated applications of oak or maple leaves.

*Specialty Fruit Variety Trials*: As wholesale marketing of major tree fruits becomes unprofitable, many Connecticut growers are turning to retail sales of their fruit. For a retail operation to be successful, there must be a diversity of products. Thus, many growers are interested in adding minor specialty fruits to their operations. In response to this grower interest, **Dr. A. Abigail Maynard** in 2001 expanded the New Crops Program at the Station to include fruits. This trial, also repeated at the Valley Laboratory in Windsor, includes 12 cultivar/rootstock combinations of Japanese plum and 4 cultivars of pawpaws. At Windsor, the greatest yields in 2005 were from Shiro (129 lbs/tree) and Friar (122 lbs/tree). Beauty and Obilnaja averaged 64 lbs/tree. Fortune and Methley produced the largest plums averaging 2.5 ounces and 2.3 ounces, respectively. Production at Mt. Carmel has been delayed due to heavy deer browse. In addition, in Spring 2003,

210 beach plum seedlings were planted at Lockwood Farm and 96 at the Valley Lab. These seedlings were raised at Cornell University from seeds collected from 35 sites from Maine to Delaware. The trees will be evaluated annually and select elite individuals will be propagated as possible cultivars in the future. In their third growing season, seedlings from Cape Henlopen State Park, Delaware, averaged the greatest growth (21.2 inches) at Lockwood Farm while seedlings from Delaware Seashore State Park averaged 20.3 inches. There was no production due to severe deer browse. At Windsor, 44% of the New Hampshire cultivar plants and 15% of the cultivar Ocean Side produced over 6 pounds/plant.

Wine grape growers and Farm Wineries face several 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 resulted in significant plant loss on less cold hardy varieties, and have driven up prices for purchasing Connecticut and out-of-state fruit. Little information is available to growers regarding cultural information for growing more cold hardy and disease resistant hybrid varieties in the state. 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 variety selection in newly planted vineyards.

*Wine Grapes*. **Dr. William R. Nail** initiated studies in 2004-2006 to help determine cultural practices for growing high quality wine grapes profitably in Connecticut. The wine grape industry in Connecticut is rapidly expanding- the first Farm Winery in the state opened in 1979, and there are currently 22 wineries with a Farm or Commercial Winery license, with 2 or 3 more scheduled to open in the foreseeable future. The existence of these wineries adds substantially to local economies, as local restaurants, hotels, bed and breakfasts, etc. 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. William R. Nail** established a planting of 288 Pinot Gris vines at Lockwood Farm in summer 2004. Two different rootstocks were used: 3309C, the most commonly planted rootstock, and 101-14, which may tend to ripen fruit earlier and have better tolerance to severe winter freezes. The first (small) crop of grapes from this plot is anticipated in 2006, and various cultural experiments will be initiated to determine better strategies for optimum yield and fruit quality.

*Reducing cluster compactness*. Harvest rots are a major problem if climactic conditions are favorable for disease development between veraison and harvest. Based on published results the increased susceptibility of tight-clustered cultivars and clones is a result cluster of compactness rather than being genetic in nature. Reducing photosynthesis by leaf removal at bloom has been shown to reduce fruit set, resulting in looser clusters. However, since the leaves are permanently removed, this reduction in photosynthesis has

negative consequences for bud fruitfulness in the subsequent growing season. Studies with the herbicide Terbacil have shown that by temporarily reducing photosynthesis, fruit set can be reduced with no long-term negative consequences. Terbacil is not labeled for such a use, and it is extremely unlikely that a grower would confidently apply an herbicide to his or her crop if it were. JMS Stylet oil is labeled for use on grapes as a fungicide and insecticide, and is used by many growers, especially organic ones. It has been shown to slightly reduce photosynthesis, and can result in lower fruit soluble solids if over applied.

JMS Stylet oil was applied during bloom of 2006 to selected Pinot Gris vines. Single leaf photosynthesis measurements were made before and after application. Flower primordia on clusters opposite measured leaves were counted. Fruit set, cluster compactness, and harvest rot incidence and severity will be determined. The experiment will be continued for at least two more years to ensure that there are no negative effects of this practice.

*Effects of graft union height*. Freeze damage to grafted grapevines frequently occurs at the graft union, which is typically very close to the ground. 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, and the vines will be transplanted in spring 2007 at Lockwood Farm. Vines will be evaluated for vine performance, winter survival, and crown gall incidence and severity in subsequent years. Funding for this project was obtained from the Viticulture Consortium East.

*Spacing and training in hybrid varieties*. **Dr. William R. Nail** established a new planting of the hybrid varieties St. Croix, Cayuga White, and Traminette in May, 2005 at a private grower's vineyard. St. Croix and Cayuga White are among the most widely planted red and white varieties, respectively, in the state, and Traminette is a relatively new release from the Cornell breeding program which shows much promise. Hybrid varieties have different growth habits and management issues than *V. vinifera*, which may involve fundamental issues both before and after planting. Plants of all three varieties were planted at 6 and 8 foot spacings, and will be grown on different training systems: low wire, Vertically Shoot Positioned (VSP), Hudson River Umbrella (HRU), Geneva Double Curtain (GDC), and another divided canopy system such as Scott Henry. Those on 6 foot spacing will also be pruned to both cane and cordon systems. Pruning and training systems will be established beginning in spring, 2007.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.

A planting of Seyval Blanc, Chambourcin, Villard Blanc, and Villard Noir at Lockwood Farm was rejuvenated in 2004, and vines were either cordon or cane pruned in 2005 and 2006 to compare the relative efficiencies of these pruning methods. Yield and fruit quality parameters were determined beginning in the 2005 harvest season. Initial data suggest that cordon pruning is a viable alternative to the cane pruning used in most Connecticut vineyards.

*Cultivar and clonal evaluation*. Previously established experimental plots at two private grower's vineyards and the Valley Laboratory were evaluated by **Dr. William R. Nail** beginning in 2004. One vineyard was established to compare Cabernet Franc, Merlot, and Cabernet Sauvignon. Cabernet Sauvignon has displayed high vine mortality and poor fruit quality due to lack of ripeness. Cabernet Franc and Merlot both produced good quality fruit, although yields in Merlot were slightly lower. There may be differences in performance of different clones and/or rootstocks for these two varieties, but data will have to be collected through the 2006 growing season before any conclusions can be drawn. At another vineyard several *V. vinifera* and hybrid varieties were compared. Hybrids outyield most *vinifera* varieties. Data from this vineyard will also be collected through the 2006 growing season. In 2004 and 2005, Riesling fruit was considerably less mature at harvest than any other white variety, indicating the need to harvest it later than other varieties or, if all varieties are treated the same, to consider not planting it.

**Dr. William R. Nail** plans to establish a new study at Lockwood Farm to compare cultivars of *V. vinifera* and hybrids. This study will be coordinated with researchers from other states throughout the country as NE-1020: Multi-State Evaluation of Winegrape Cultivars and Clones. This project should help answer the questions "What are the criteria for selecting a particular variety?" and "What cultivar(s) is(are) most suited to my situation?"

## DEPARTMENT OF PLANT PATHOLOGY & ECOLOGY

### Biological control employing earthworms

Earthworm activity is associated with healthy soils. It is generally believed that they accomplish this by processing organic matter and by facilitating water infiltration and breaking up hardpans through their burrowing. More importantly, we have learned that earthworm castings are rich in microbes that can reduce root disease. **Dr. Wade Elmer** established greenhouse experiments to determine whether or not earthworm activity could affect disease of asparagus in replanted soil infested with Fusarium pathogens. In repeated studies with asparagus, plants associated with earthworms were twice as large, had 50% fewer root lesions, and had 5 to 10 times as many beneficial microorganisms in the rhizosphere as in the control plots. Fluorescent pseudomonads and filamentous actinomycetes were the major groups affected.

Earthworm emerging from the root zone of a young asparagus plant. Earthworms directly improve root health and can offer a means for delivering biological control agents to the roots of established plantings.

Field plots were established in 2005 and 2006 using eggplants, tomatoes, and asparagus as model systems for studying if earthworms could

reduce disease and increase yield. Plots where earthworms were introduced had larger plants, more yield, and less disease.

Although it is known that earthworms increase the numbers of naturally occurring beneficial microbes in their castings, Dr. Elmer has demonstrated that they can also distribute introduced biocontrol agents (BCA) throughout the soil around plant roots. Studies done with two beneficial nonpathogenic *F. oxysporum* isolates (CWB 318 and CS-20) showed that earthworm activity increased colonization of asparagus and tomato roots by these two BCA.

*Impact*. Understanding how earthworm activity affects root health may lead to more improved means of enhancing soil health in problem fields and may offer a unique method of delivering biocontrol agents to the roots of established plantings.

**Fusarium ecology** (*Corn stubble survey*)

Fusarium head blight of wheat is caused by *Fusarium graminearum*, a fungus that produces carcinogenic mycotoxins in grain. The fungus can infect other hosts, most notably corn. Since wheat is not grown in Connecticut, Drs. Elmer and Ferrandino questioned whether *F. graminearum* would persist at levels reported for regions where wheat and corn are cropped in close proximity. Six corn farms were sampled in 2004 and 2005 and over 1600 isolates of *Fusarium* were identified to species. The two most prevalent species found were *F. graminearum* (30%) and *F. subglutinans* (18%). Statistical analyses suggested that there was an inverse relationship between the prevalence of these two species, indicating that one species might be able to colonize corn stubble more effectively than the other. Laboratory assays to study the competitive ability of the two species to colonize corn stubble showed that *F. graminearum* was far more competitive than *F. subglutinans* and may explain its high prevalence in Connecticut cornfields.

**Ornamental Disease Research.**

China asters were evaluated by **Dr. Wade Elmer** for resistance to *Fusarium oxysporum* f. sp. *callistephi*. Most plants were susceptible to some degree, but eight cultivars were not significantly different from the control plants grown in noninfested soil. Following initial tests in the greenhouse, these eight cultivars were evaluated along with susceptible cultivars in field plots at Lockwood Farm and the Valley Lab in Windsor for their resistance to Fusarium wilt. Of the eight cultivars previously found to be resistant in greenhouse trials, only three cultivars had good field resistance to Fusarium wilt. They were Aster combination 7892, Astoria Mix Aster 2087, and Stokes Aster Sandy Mix. Six other cultivars produced flowers that did not differ statistically in number from the noninfested controls, but these cultivars did show more signs of disease.

Fusarium corm rot of gladiolus is caused by *Fusarium oxysporum* and is the most destructive root disease of gladiolus. To determine if disease could be suppressed by combining a product that activates defense mechanisms, viz., acibenzolar-*S*-methyl (Actigard 50 WP) (ASM), Dr. Elmer soaked corms for 30 minutes in Actigard (ASM) combined either with or without biological or chemical fungicides in 2003-2005. The

object was to determine if any of these treatment combinations could provide season-long suppression of Fusarium corm rot. Susceptible corms treated with ASM did not show a significant decrease in disease progress, but did show a 48% increase in the number of marketable flowers. None of the biological fungicides were effective in reducing disease progress or in increasing flower spike number, however, the chemical fungicides, fludioxinil (Medallion 50 WP) and triflumizole (Terraguard 50 WP) reduced disease progress and increased flower spike number. No interactions were noted between the ASM and the fungicides except for when ASM was combined with azoxystrobin (Heritage 50 WP). ASM and azoxystrobin used separately were not effective in reducing disease progress, but when they were combined they provided season-long suppression of corm rot. Continued research on ASM for ornamentals may offer an additional strategy for reducing corm rot.

*Impact*. Fusarium diseases are extremely difficult to control with chemicals. When host resistance is present, it provides the most economically efficient management available. We found alternative strategies that employ combinations of new chemistries provide some suppression for growers.

**Sudden dieback of wetland vegetation**

In the summer and fall of 2002, large areas of emergent vegetation at several sites along Long Island Sound began to disappear. The loss was mostly restricted to *Spartina alterniflora* and *S. patens*. In 1999, Louisiana suffered a similar phenomenon where *Fusarium* pathogens were associated with dieback areas, but these pathogens were not the single cause of the decline. Since then, almost every coastal state from Maine to Louisiana has reported sudden wetland dieback.

Loss of wetland flora like *Spartina* has drastic implications for coastal ecology and marine life.

In 2005, **Dr. Elmer** sampled three sites in Hammonasset State Park, Madison, CT, and recovered several species of *Fusarium* sp. Pathogenicity tests are underway. Molecular analyses of the *Fusarium* isolates by Dr. Kerry O'Donnell of ARS USDA in Peoria, IL, have shown that the isolates are new species. Continued sampling and monitoring are ongoing in 2006.

*Impact*: Loss of wetland flora like *Spartina* has drastic implications for coastal ecology and marine life.

## Aerial dispersal of corn pollen

The extensive adoption of genetically modified crops has led to a need to better understand the dispersal of pollen in the atmosphere because of the potential for unwanted movement of genetic traits via pollen flow in the environment.

The ability to model maize pollen transport in the atmospheric surface layer is important both for predicting gene flow between neighboring fields on the same or nearby farms and for establishing a realistic boundary condition for a convective boundary layer (CBL) model that can be used to predict longer distance transport. **Drs. Donald Aylor and Matthew Boehm** and Elson Shields (Cornell University) studied the aerial dispersal of maize pollen by comparing the results of a Lagrangian stochastic (LS) model with pollen concentration measurements made over 26-ha cornfields using a combination of tower-based Rotorod samplers and airborne radio-controlled, remote-piloted vehicles (RPVs) outfitted with remotely operated pollen samplers.


Remote-piloted vehicle (RPV) flying above a cornfield to sample corn pollen. The irregular red lines represent the model generated trajectories of corn pollen grains released from the tassels.

A modeled value for the concentration corresponding to each RPV measured value was calculated by simulating the RPV flight path through the LS model pollen plume corresponding to the atmospheric conditions, field geometry, wind direction, and source strength. The geometric mean and geometric standard deviation of the ratio of modeled to measured concentrations, $C_{model}/C_{measure}$, over all the downwind sampling periods were 1.42 and 4.53, respectively, and the lognormal distribution corresponding to these values was found to closely fit the probability density function (PDF) of the ratio. Model output was sensitive to the turbulence parameters, with a factor of 100 difference in the average value of $C_{model}$ over the range of values encountered during the experiment. Compared to this large potential variability, we conclude that the average factor of 1.4 between $C_{model}$ and $C_{measure}$ found here indicates that the LS model is capable of accurately predicting, on average, concentrations over a range of atmospheric conditions. The model tended to better predict concentrations when winds were at least moderate ($u_* > 0.25$ m $s^{-1}$) than

during lighter wind conditions, when all meteorological parameters, including wind direction, were less well defined. This emphasizes the need to incorporate convective boundary layer properties into the model. This work is currently in progress.

*Impact:* The model of aerial dispersal of corn pollen being developed here will allow for objective evaluations of the risks of off-site pollen movement, and will provide a framework for improving strategies for regulating off-site gene flow, estimating the potential off-target effects of GM pollen, and determining the impact of off-site movement of GM pollen on the potential marketability of non-GM corn. Applications of the model include establishment of isolation guidelines for field testing new genetic traits incorporated into open-pollinated plants and evaluation of regional cropping plans where conflicts might arise between conventional and organic farm communities.

**Pollen deposition on corn silks**

Key determinants of seed purity and yield in maize are the deposition efficiency of pollen on silks and the competition between pollen grains from different sources to fertilize the ovules. This requires an accurate assessment of the amount of pollen released in a cornfield that reaches the female flowers (silks) as well as a physical description of deposition of pollen grains on individual silks within a growing silk brush.

**Dr. Donald Aylor** devised a method using a combination of measurements and modeling for quantifying pollen flux at silk

Silks emerging from the tip of a corn ear. Each silk is attached to an ovule and must be fertilized by a pollen grain in order to produce a seed. The amount of pollen reaching silk height depends on leaf area density, pollen retention, and turbulence.

height. Model estimates for the average release rate of pollen grains per area of crop, $Q$ (grains $m^{-2}$ $s^{-1}$), were deduced by comparing measured and modeled values of $C$. Using these determinations of $Q$, the model predicted well ($r^2 = 0.73$) the measured pollen fluxes in the canopy. On average, about 20% of the pollen released by the tassels reached the height of the silks in the canopy.

Measured fluxes of pollen at silk height were highly variable; this variability was mainly due to the faster wind speeds and higher levels of turbulence in the upper canopy, which led to greater amounts of rebound and re-entrainment of pollen grains from leaves. The results of this study underscore the importance of rebound and re-entrainment

processes in the amount of maize pollen reaching the silks. The strengths of this approach are that it can be used to examine a wide array of conditions and planting schemes and that the model results are conveniently expressed in terms of the potential pollen production of the "male" parent in the field, allowing ready comparison across inbred and hybrid varieties. This flexibility should be of particular value to seed producers interested in improving the efficiency and purity of seed production in their fields.

*Impact:* The model of aerial dispersal of corn pollen being developed here will allow for objective evaluations of the risks of off-site pollen movement, and will provide a framework for improving strategies for regulating off-site gene flow, estimating the potential off-target effects of GM pollen, and the impact of off-site movement of GM pollen on the potential marketability of non-GM corn. Applications of this model include establishment of isolation guidelines for both field testing new genetic traits and hybrid seed production, evaluation of regional cropping plans involving neighboring conventional and organic farms, and prediction of the impact on international marketability of non-GM corn.

**Nectria canker on black birch**

**Dr. Francis Ferrandino** has been studying the ecology of Nectria Canker on black birch trees in the forests of Connecticut. Black birch is becoming an increasingly important component of the northeastern forests due to its prolific production of seeds and its resistance to deer browsing and gypsy moth defoliation. High canker incidence is common within birch-dominated forest stands.

Culling of infected trees seems like a logical control measure. However, the results of a recent five-year study made on Water Company property near Lake Saltonstall indicated that when infected trees were cut down, cankers on the logs produced spores at 5-9 times the rate of cankers on uncut infected trees. This enhanced spore production lasted for a period of two years until the felled logs succumbed to rotting

Black birch canker disfigures the trees and renders their worth nothing more than firewood.

organisms. Similarly, cankers on girdled trees sporulated at 3-5 times the rate of cankers on ungirdled trees for a period of 3 to 4 years. Since young trees (<20 years old) are most susceptible to this

disease, the early release of such high levels of inoculum would likely increase the spread of Nectria Canker.

**Aerial application of pesticides**

In July of 2001, The Connecticut Agricultural Experiment Station was charged with conducting a study of aerial pesticide application to shade tobacco to investigate off-target drift (General Assembly Bill 7507 Sec. 71). Station scientists, **Drs. LaMondia, Ferrandino, and Mattina**, studied the amount of spray drift at distances up to 1000 feet from a helicopter-sprayed shade tobacco tent in Enfield, CT. Over 2,000 samples were collected during ten spray dates over a two-year period. These samples were chemically analyzed to detect the quantity of the applied fungicide (Acrobat MZ) blown off-target. The results of this study have resulted in a

Helicopter applies chemical spray to an agricultural field.

Station Bulletin (B1003). In way of summary, 85% of the samples beyond 25 feet from the edge of the sprayed shade tent had no detectable chemical. The samples on which the fungicide could be detected were all at trace levels and below the quantifiable limit of 0.016 µg AI/$cm^2$. In fact, if tomatoes were grown as close as 25 feet from the shade tent, the levels of fungicide on the fruit would not have exceeded the established EPA Market Basket Food Tolerances. Water-sensitive papers placed out during application indicated that the off-target drift was carried in small droplets (< 0.004 in. in diameter). This result points out the importance of using coarse spray nozzles, which are kept clean and well adjusted, in order to minimize the number of tiny spray droplets.

**Milk-based sprays to control mildew**

For the past five growing seasons, Dr. Ferrandino has studied the effects of using milk-based foliar sprays to reduce the economic impact of powdery mildew epidemics on pumpkins and muskmelon.

Treatments based on milk were, on average, about 50% to 70% as effective in reducing a foliar symptoms and postharvest fruit rot as the chemical control.

Pumpkin field showing adjacent areas of diseased (white) and sprayed (green) plants. Healthy plants were protected from powdery mildew by applying milk in a water-based spray.

Overall, milk-sprayed plots were 40% to 50% as effective in increasing marketable yield as chemical fungicides. This result is important where the use of chemical controls is not desirable for example: strict "organic" farms, or backyard and community gardens.

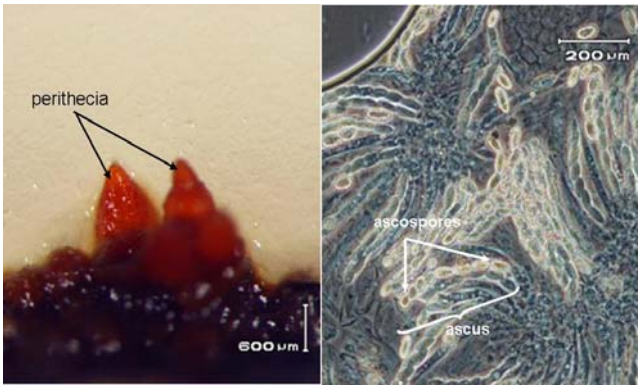
**Biology of the Target Canker pathogen**

The species delimitation, natural history, and population structure of the ascomycete fungus causing target canker on birch (Neonectria canker; also previously known as Nectria canker) are poorly understood. The fungus causing the disease is *Neonectria ditissima* (prev. *N. galligena*). Birch, especially black birch (*Betula lenta*), is valued for its use in producing veneers, although cankers caused by *N. ditissima* can render the tree and its wood virtually useless in this regard. Black birch has become the dominant hardwood in eastern forests, including those in Connecticut, and concurrent with the tree's increasing frequency is the increasing frequency of Neonectria canker.

**Dr. Robert Marra's** research on Neonectria canker focuses on the ecology and genetics of this fungal pathogen, 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, and using this knowledge to develop effective biocontrol strategies. The groundwork for this research involves developing a system of genetic markers that will permit fine-scale analysis of mating patterns, spore dispersal, and population structure.

Developing informative genetic markers requires a set of isolates from as wide a distribution as possible, under the assumption that they represent maximum genetic diversity. Dr. Marra collected the majority of his *Neonectria* isolates in 2004 from a variety of locations within the state, principally from *B. lenta*, with a small number from *B. alleghaniensis* (yellow birch), and one sample from sassafras (*Sassafras albidum*). To supplement this collection, Dr. Marra has obtained, from colleagues, cultures from Canada, Europe, and other parts of the U.S. With an efficient and economical DNA extraction procedure now in place, initial genetic analyses are underway. The first set of markers being explored is called Amplified Fragment Length Polymorphisms (AFLP). This procedure exploits the Polymerase Chain Reaction (PCR) in scanning the entire genome for polymorphic restriction sites; i.e., those that may be present in some isolates but absent in others. Using this technique, markers have been identified and will be used to analyze populations of the pathogen.

A thorough understanding of *Neonectria's* population biology also requires an understanding of its mating system. Successful matings have been achieved in laboratory crosses allowing us to study ascospore progeny using the aforementioned markers.




(Left panel). Perithecia emerging from the edge of a sterilized wounded birch stem embedded in agar in a Petri dish. The conical tips of the perithecia dehisce when mature, releasing the ascospores contained within. (Right panel). Ascospores isolated from a perithecium from a laboratory mating.

The study of ascospore progeny is important to field studies. Using the aforementioned markers, we can determine (1) if they are the result of outcrossing or self-fertilization, and (2) if outcrossed, the extent to which they are inbred or outbred. Understanding this aspect of the mating system sheds light on the fungus' dispersal patterns, and will be critical to development of a biocontrol program.

*Impact:* Over the past sixty or so years, black birch has become an increasingly important component of Connecticut forests, both in terms of the number of trees and the amount of wood. By either metric, it appears that black birch is taking the lead over oaks, maples, beeches, and other species. Cankers caused by *Neonectria* cause major disfigurement, even though trees can persist for decades with several to many such cankers along their stems. These heavily cankered mature trees, which compete for resources (water, light, nutrients), have a significantly negative economic and aesthetic impact. The genetics and epidemiology of the fungus and its role in the forest are poorly understood. Knowledge gained from studies of Neonectria canker will suggest appropriate hypotheses on biocontrol strategies.

**Ramorum Blight**

Ramorum Blight, a disease of over 70 plant species that is currently ravaging the coastal oak forests of central California and Oregon, is caused by the Oomycete *Phytophthora ramorum*. The pathogen, which is transported on host nursery stock from west coast production nurseries, poses a serious threat to Connecticut's landscapes and forests, which include numerous proven hosts.

**Drs. Marra and Douglas** are interested in determining the overwintering potential of the pathogen, and have successfully applied for a USDA-APHIS-PPQ permit allowing them to use *P. ramorum* cultures for research purposes, including performing leaf inoculations. Using Rhododendron, Kalmia, and Syringa plants donated by area nurseries, Dr. Marra is performing detached leaf inoculations to study the effects of desiccation and low temperature on pathogen survival in infected leaves.

Dr. Marra and Dr. Douglas have been supervising the implementation of USDA-mandated assays for detection of *P. ramorum* on nursery material shipped from California, Oregon, or Washington. Beginning this year (2006), these assays are being carried out by technician Jason Corwin. The process begins with a serological test called ELISA (enzyme-linked immunosorbent assay), which detects all *Phytophthora* species. If a sample tests positive by ELISA, attempts are made to isolate the pathogen from the infected plant material, and DNA is extracted for molecular analyses.

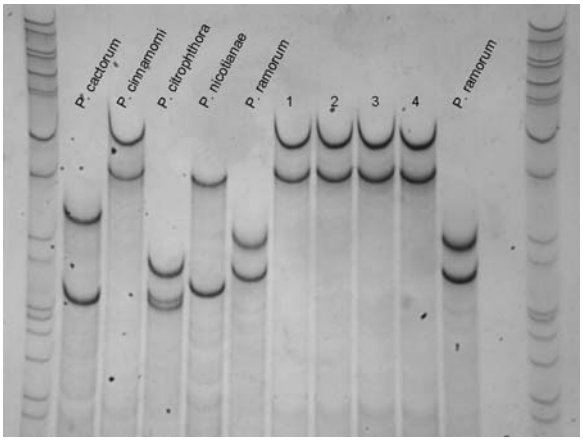
**Molecular Plant Diagnostics Laboratory**

Efforts to achieve APHIS certification in Ramorum Blight diagnostics have been successful, due in large part to the creation of a new laboratory, the MPDL, designed by Dr. Marra and adjacent to his current laboratory. The MPDL is now being used for conventional and real-time Polymerase Chain Reaction (PCR), as well as other molecular techniques. This facility incorporates state-of-the-art equipment, and has the capability to quickly and accurately identify new and emerging pathogens. The certification process involved the inspection by APHIS staff of the MPDL as well as the laboratories of Dr. Marra and Dr. Douglas. Also involved in the certification process was the development of a Standard Operating Procedure (SOP), conforming to guidelines outlined by PPQ in order to guarantee the veracity of results and minimize the potential for accidental escape of the pathogen.

The department's new Molecular Plant Diagnostics Laboratory (MPDL). Jason Corwin, technician, is preparing samples for real-time PCR analysis.

Among the MPDL's new capabilities is a technique called SSCP (Single Strand Conformational Polymorphisms), which has been demonstrated to be useful in distinguishing among *Phytophthora* species. Identifying species within the *Phytophthora* genus has been difficult and very time-consuming in the past, due to difficulties in culturing and in obtaining the spore stages necessary for species determination. The *Phytophthora* SSCP procedure requires only a very small amount of DNA, which can be obtained from an initial culture or directly from infected plant material. The procedure exploits minor differences among species in the sequence of a conserved region of DNA called the ITS region. Figure Q shows the SSCP patterns for a number of different *Phytophthora* species, including four samples from Viburnum that were brought into the

Plant Disease Information Office, and that were proving difficult to identify. The SSCP procedure confirms the identity of these samples as *P. cinnamomi*.




SSCP profiles of several *Phytophthora* species. Four unidentified samples from the CAES Plant Disease Information Office were all shown by SSCP analysis to be *P. cinnamomi*. Lanes on the left and right of the gel contain "ladder" DNA for reference purposes only.

*Impact: P. ramorum* is a pathogen of growing concern in Connecticut because of the many species of plants and trees common in Connecticut that are known or suspected hosts. Much of this concern centers on Connecticut's significant nursery industry, which at over $1 billion in annual production ranks Connecticut among the ten largest in the country. Nurseries found to have plants infected with *P. ramorum* are effectively quarantined until rigorously demonstrated to be clear of the pathogen, a process that can take several months. Therefore, Ramorum Blight, independent of its impact on our forests and landscapes, can have a significant impact on the state's economy. Many of the most susceptible hosts—eastern red oak, rhododendron, lilac, mountain laurel, and viburnum, to name a few—are significant parts of the nursery industry as well as Connecticut forests and landscapes. Given that the eastern United States, including Connecticut, is considered at high risk for *P. ramorum*, based on host distribution and climate, concern over the possible release of the pathogen into the environment is warranted. Through the new Molecular Plant Diagnostics Laboratory, Dr. Marra's goal is to accelerate and refine our ability to identify *P. ramorum* in infected plants from the nursery, garden center, forest, and landscape, greatly increasing our chances of averting a Ramorum Blight epidemic. Additionally, the molecular diagnostic techniques being used and under development in the MPDL will continue to enhance the disease diagnostics services provided to Connecticut's stakeholders.

## Chestnut Breeding for Orchard and Timber Trees

Planting chestnut hybrids (which are resistant to chestnut blight disease) in forest clear-cuts, and keeping the native American chestnuts in the area alive by treatments with hypovirulent strains of the chestnut blight pathogen, will allow crossing to occur between the trees and the establishment of a population of timber chestnut trees resistant to blight and adapted to the local niche. The Experiment Station's breeding program to produce chestnuts for orchards and for timber (under the direction of **Dr. Sandra Anagnostakis**) yielded 1,252 seeds this year. Of these, 190 are being grown in Vermont by a cooperator to test them for winter hardiness. There are 40 being grown by a middle school in Port Chester, New York, to test their growth in the soil type there, and as an educational project for the students. The remaining seeds are being raised for us by a nursery in

Georgia, and one-year-old seedlings will be sent back to us for test plantings in Connecticut forests in 2007.

Dr. Sandra Anagnostakis on a ladder at The Chestnut Plantation at Sleeping Giant. White paper bags protect female flowers until the flowers are ready to receive pollen about a week later. The bags are then replaced and remain until harvest in the fall.

Forty seedlings from last year's crosses were planted in a clear-cut in the Farmington Town Forest this May to see whether they can survive in the heavy soil found in this area. This year, many new crosses are being made for both timber plantings and for more detailed information on the genetics of chestnuts. In addition, crosses of some of our better nut-producing trees will yield seed to test for improved orchard productivity.

**Butternut Trees in Connecticut**

Butternut populations are declining throughout the native range, due to an exotic fungus that caused lethal cankers. Healthy trees, and infected trees that apparently have resistance and survived the disease, have been found in severely affected forest stands in 19 states. Our cooperators in Tennessee are propagating trees exhibiting resistance and using them in their breeding program for restoration efforts. Last year we planted, in

Pamela Sletten standing among the butternut trees and hay-scented ferns in the Mattatuck State Forest.

the Mattatuck State Forest, seedlings from five families of butternut from western North Carolina. We examined the trees for survival this spring. The trees are in two groups with slightly different conditions. One group is surrounded by grass, and the other by hay-scented ferns, and survival was better among the ferns (57%) than in the grass (25%). Twigs with symptoms of butternut canker disease were taken to the laboratory for testing.

**Noteworthy Plant Health Problems**

Unusual outbreaks of Sclerotium crown rot occurred during the hot, humid conditions of summer 2005. These occurred on a number of container and field-grown herbaceous perennials including hosta, pachysandra, ajuga, stachys, physostegia, and many others. Sclerotium crown rot, caused by the fungus *Sclerotium rolfsii,* is generally more common in more southerly regions of the US. Other names for this disease that reflect its normal geographical occurrence are Southern Blight and Southern Wilt. Initial aboveground symptoms include discoloration of lower leaves, wilting, and plant collapse. These can be followed by quick plant death, or "meltdown," as described by many growers. Symptoms are easily confused with other basal stem rots such as those caused by *Rhizoctonia* or other fungi. However, fluffy, fan-like, white, stringy mycelium (often with a distinct "mushroomy" odor) near the plant root/crown area on the potting mix or soil can be used to distinguish Sclerotium crown rot from other diseases. This fungus forms sclerotia, a distinguishing characteristic of this disease.

Diagnostic sclerotia or resting structures of the Sclerotium crown rot fungus.

Sclerotia are compact masses of fungal hyphae that can survive unfavorable environmental conditions. They are first white, and then darken to tan as they mature. These structures resemble "tiny mustard seeds" that are about .04-.08 inch in diameter. As these sclerotia germinate, the fungal mycelium or mass of fungal threads grow across the media surface during warm, humid weather. The fungus secretes enzymes that break down the plant tissue, especially at the crown, so that large leaves, such as hosta, wilt and collapse. On many different groundcovers, wilting may not occur and one needs to look closely for the presence of the fungus. *Sclerotium* does not produce airborne spores, but it can readily spread by the sclerotia in the container mix or soil, or on plants, tools and other equipment, and shoes. *S. rolfsii* has a wide host range including many different ornamentals, fruits, and vegetables in over 200 different plant genera.

Powdery mildews continued to be unusually heavy on many hosts. Of particular note were outbreaks on peony.

Powdery mildew symptoms on peony.

This was observed in 2005 and again in spring 2006. Symptoms developed very early in the season and resulted in stunting, poor flower production, and early senescence for many heavily infected plants. Other hosts with notable powdery mildew infections were dogwood, oak, maple, forsythia, rhododendron, azalea, lilac, and many herbaceous hosts such as phlox, monarda, coleus, and verbena. Roses had very early and very heavy infections of both powdery mildew and black spot and many cultivars were defoliated by mid-June.

The extended drought conditions of 2005 lifted in October, when over 15 inches of rain fell throughout Connecticut in a period of several weeks. As a result of this volume of rainfall, extended periods of waterlogged soils occurred in many sites. These conditions resulted in a number of problems. Some woody trees and shrubs came out of their heat- and drought-induced dormancy and initiated new and untimely spurts of growth. This reversal of dormancy resulted in tender growth that was highly susceptible to the cold temperatures of early winter. Other waterlogged plants developed symptoms associated with impaired root function and were also predisposed to Phytophthora root rot infections.

The winter of 2005-2006 was warmer than usual and had dramatic temperature fluctuations, freeze-thaw cycles, and unusually warm midwinter temperatures. These conditions were exacerbated by the fall weather previously described. The record warm temperatures in January caused many trees and shrubs to begin to break dormancy and resulted in sub-lethal damage to the cambium, “frost heaving,” and bud death when seasonal temperatures returned. All of these factors were implicated in problems that showed up on woody ornamentals and perennials as growth was initiated this spring. Among the species of particular concern were flowering cherry, dogwood, Japanese maple, buddleia, and rhododendron. Many trees that flowered and “leafed-out” looking apparently normal suddenly collapsed several months into the season. Among those affected were weeping cherry, beech, and redbud. Significant dieback and death were reported on roses. In addition to problems in landscape plants, commercial growers of

container woody ornamentals also dealt with substantial winter damage to container-grown lilac, euonymus, holly, spirea, and quince as a result of the unusual winter weather pattern.

The cool, wet conditions of spring 2006 resulted in many bacterial diseases of herbaceous and woody ornamentals. Dr. Douglas identified bacterial leaf spot and blight (*Pseudomonas syringae* pv. *syringae*) on many woody hosts in commercial production and in landscape plantings. Hosts included euonymus, oak-leaf hydrangea, honeysuckle, viburnum, forsythia, pear, and lilac. Among herbaceous hosts with bacterial diseases were rudbeckia, delphinium, anemone, and chrysanthemum.

**Disease Survey**

Dr. Douglas and Ms. Inman diagnosed a wide range of plant health problems for homeowners, commercial growers, plant care professionals, and government, state, and cooperative extension personnel during the past year. Fungal and bacterial diseases were the more prevalent although several viral diseases were also identified on many hosts.

As a consequence of predisposition by drought, an unusually high number of fungal tip blights (Diplodia tip blight of pine, Phomopsis and Kabatina tip blights of junipers) and numerous cankers and diebacks associated with the fungi *Botryosphaeria*, *Phomopsis*, and *Cytospora* were observed. Also prevalent were increased incidences of root problems associated with *Armillaria* and *Phytophthora* on many woody hosts. Many drought-stressed plants also showed increased sensitivity to air pollutants and pesticides to which they were exposed.

The trend for unusually high incidences of vascular wilt diseases evident in previous years continued during ’05-‘06 and symptoms were observed on several key ornamental tree species throughout Connecticut. Of particular concern was Dutch elm disease caused by the fungi *Ophiostoma ulmi* and *O. novo-ulmi*. This historically important disease infects elm and was diagnosed on old, established specimens as well as on recently planted trees. Verticillium wilt caused by *Verticillium* spp. was also diagnosed by Dr. Douglas on numerous tree species including maple, smokebush, tuliptree, tree lilac, and redbud. While many species of maple were affected, Japanese maples appeared to be particularly susceptible and often collapsed shortly after the disease was diagnosed. While both of these vascular wilt diseases usually result in a slow, general decline and flagging of limbs, this year many trees exhibited atypical symptoms. These included complete failure to “leaf out” in spring and sudden, midseason death. Both wilt diseases appeared to have been enhanced by root damage from several years of drought and other environmental stresses.

Decline of ash, especially white ash, continued to be a problem throughout the state and prompted many questions from homeowners and arborists. This syndrome appeared to be exacerbated by the prolonged drought and, in some cases, was associated with the phytoplasma causing ash yellows.

Dr. Douglas and Ms. Inman continued to respond to many inquiries about Ramorum Blight from concerned and interested residents in the state. Although this disease has not been found in Connecticut, public awareness and concern are still evident.

Bleeding canker of European beech was diagnosed with increasing frequency during the 2005 and 2006 season. Cankers were identified on mature, specimen trees with no previous history of problems. In addition to the typical bleeding cankers characteristic of this disease, atypical non-bleeding cankers were found. Several species of *Phytophthora* were isolated from these cankers and Dr. Douglas is working with Dr. Marra and Mr. Corwin to characterize the most prevalent species associated with bleeding cankers in Connecticut.

Daylily streak, caused by *Aureobasidium microstictum,* continued to be a problem on daylilies, and rust on hollyhock was particularly early and heavy throughout the season. Numerous instances of Verticillium wilt of impatiens were diagnosed by Dr. Douglas and Ms. Inman. In most cases, impatiens had been planted in the same locations for many years and this resulted in the buildup of the soilborne fungus in these sites.

Viral diseases were detected on many herbaceous hosts. Cucumber Mosaic Virus (CMV), Tobacco Mosaic Virus (TMV), and thrips-transmitted TOSPO viruses, impatiens necrotic spot virus (INSV) and tomato spotted wilt virus (TSWV), continued to threaten many types of greenhouse, landscape ornamentals, vegetable, and herb crops in Connecticut. Unusually high populations of thrips contributed to the high prevalence of these diseases, which were confirmed on a diverse range of hosts including cineraria, impatiens, New Guinea impatiens, coleus, hosta, geranium, basil, and pepper. An unusual virus, tobacco rattle virus, was detected on hostas that had recently been imported by a large grower from Europe.

Slime flux and wetwood of elm and several species of oak also occurred with greater-than-usual frequency this season. Dr. Douglas speculated these problems were associated with the unusual weather patterns and associated stresses.

Tree and small fruit had a number of disease problems. These included black knot of plum and cherry, brown rot, powdery mildew, rusty spot, and perennial canker of peach, black rot, powdery mildew, and downy mildew of grape, and Phomopsis canker and mummy berry of blueberry. Bacterial spot was unusually widespread and severe in 2005 and 2006 on many stone fruits, including peach, nectarine, apricot, and plum. These infections resulted in significant crop loss for several orchardists. X-disease was also observed on peaches and nectarines in numerous locations throughout the state and appeared to be increasing in severity and prevalence in some orchards.

Vegetables had their share of disease problems as well. Noteworthy outbreaks of Septoria leaf spot on tomato and Verticillium wilt of eggplant were reported. Downy mildew, angular leaf spot, and powdery mildew were also diagnosed on many types of cucurbits. Bacterial diseases were prevalent throughout the state in commercial and backyard gardens. Identified by Dr. Douglas were bacterial spot and speck on tomatoes and bacterial spot on pepper.

Volutella blight of pachysandra was diagnosed with great frequency and caused significant problems and extensive dieback in established plantings throughout the state. Symptoms developed in late summer and were prevalent again this spring. Plants weakened by drought stress or those growing in marginal sites (e.g., full sun) appeared to be most susceptible to this fungus. Although diagnostic, concentric lesions were present on leaves, stem cankers posed the most important problem since they resulted in sudden collapse of plants in large patches.

Dr. Douglas worked with Drs. Victoria Smith and Robert Marra, CAES nursery inspectors, Jason Corwin (technician), and USDA-APHIS-PPQ personnel to assess the presence of the Ramorum Blight (Sudden Oak Death) pathogen, *Phytophthora ramorum*, in Connecticut. Dr. Douglas and Ms. Inman are continuing to enhance the collection of cultures of *Phytophthora* species isolated from samples submitted to the Plant Disease Information Office for diagnosis. This collection will assist in work aimed at refining techniques used for detecting various species of *Phytophthora*, including *P. ramorum*.

Dr. Douglas' laboratory, Room 110, Jenkins Laboratory, was updated to fulfill the requirements to obtain USDA-APHIS-PPQ approval for "Provisional Status for Ramorum Blight testing." Room 110 is part of a "suite" of laboratories that includes Rooms 11 and 12 in Jenkins Laboratory. Room 110 now has stereo and compound microscopes with digital cameras. In addition, it has a Class II Type A biological safety cabinet for handling samples and cultures.

Dr. Douglas using the new compound microscope with attached digital camera in her recently upgraded laboratory, Room 110, Jenkins Laboratory.

As woodchip mulches become increasingly common components of the landscape, inquiries about two curious fungal problems have increased. *Sphaerobolus stellatus*, the artillery fungus, was once again diagnosed as the source of persistent brown to black spots on cars, house-siding, plants, and other surfaces during the 2005-2006 season. Slime molds, predominantly *Fuligo septica*, were also identified on many mulches. These types of fungi can dramatically appear overnight as large (up to 12-16 inches in diameter), brightly-colored masses. Although both problems are eye-catching, they are not plant pathogens.

The unusually hot, humid, dry summer of 2005 caused significant drought stress and dieback of many lawns throughout the state. Damage began in June and continued into early September as cool season turfgrasses went beyond their normal summer dormancy to completely dead. As a consequence of these stressful conditions of prolonged heat and high humidity, many weed and disease problems plagued lawns and golf greens. The key disease problems diagnosed by Dr. Douglas and Ms. Inman were the patch diseases summer patch, Rhizoctonia brown patch, and necrotic ring spot, and anthracnose, especially the more atypical basal or crown rot stage of this disease. Nutsedge and crabgrass gained predominance in many lawns by late summer, having taken advantage of the stressed cool season turfgrass species. Bentgrass was frequently identified as a common "grassy" weed in many home lawns. In spring 2006, the most prevalent disease was red thread because of the cool, wet conditions and the predominant weeds were annual bluegrass, ground ivy, henbit, and speedwell.

Identification and control of Japanese bamboo continued to be a significant problem for many homeowners. Poison ivy remains a key plant of great public concern since it is widespread throughout the state.

*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.

**Seed Testing**

During 2006, the Bureau of Regulation and Inspection of the Connecticut Department of Agriculture submitted to Dr. Douglas 350 vegetable seed samples for germination analysis and 15 lawn grass seed samples for purity and germination analyses. Eleven vegetable seed samples did not meet germination claims. Eight samples were retested and failed the second test. Three samples were not retested because of insufficient numbers of seeds. Of the 15 lawn seed samples tested, one met label claims for both purity and germination. Two samples failed label claims for both purity and germination. Nine samples passed label claims for germination but did not meet claims for purity. Three passed label claims for purity but did not meet claims for germination. Vegetable and lawn seed samples were also examined for prohibited noxious weed seeds and none of these samples contained weed contaminants.

*Impact:* Germination and purity analyses are performed every year on official samples of vegetable, lawn, and crop seeds by The Connecticut Agricultural Experiment Station, the official seed testing laboratory for the state. The results of these tests provide Connecticut residents with information on the compliance of seeds sold within the state with the Connecticut Seed Law Regulation and the Federal Seed Act.

*Samples for Analytical Chemistry and the Connecticut Department of Consumer Protection:* During this year, Dr. Douglas and Ms. Inman examined 36 samples from the

Connecticut Department of Consumer Protection at the request of the Department of Analytical Chemistry of the Experiment Station.

*Meetings sponsored:*

January 24, 2006. Wade Elmer was the CAES sponsor for the Bedding Plant meeting in Jones Auditorium. Approximately 30 growers were present.

February 8, 2006. Wade Elmer was the CAES sponsor for a UCONN Extension outreach meeting for bedding plant growers in Vernon, CT. Approximately 35 growers were present.

February 28, 2006. Wade Elmer was the CAES sponsor for a UCONN Extension outreach meeting for bedding plant growers in Torrington, CT. Approximately 30 growers were present.

Wade Elmer organized and hosted 12 Lunch Club seminars by Station staff and outside speakers.

Dr. Elmer participated in the West Hartford Memorial Veteran Monument Ceremony by receiving and autoclaving foreign soils from battlefields around the world where American soldiers have died. Over 160 samples were processed and sprinkled onto the ground to consecrate the site.

*Citizen inquiries:* Dr. Douglas, assisted by Ms. Inman, answered 6,855 inquiries about plant health from Connecticut citizens: 12% dealt with food crops, 67% with ornamentals and trees, 6% with turf grasses, and 15% were miscellaneous questions. Twenty-four percent of the inquiries were from commercial growers and plant care professionals, 70% were from homeowners, and 6% were from cooperative extension, health, news, and agricultural personnel. A further breakdown of inquiries showed that 51% of the samples came in by phone, 11% came in by mail, 2% came as email (Connecticut only), and 36% were brought in person. Dr. Douglas and Ms. Inman also sent over 900 letters and sent numerous email messages with attached files of fact sheets. 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.

Dr. Anagnostakis responded to over 800 inquiries about chestnut blight, chestnut trees, and other nut trees.

Dr. Elmer answered 13 inquiries dealing with plant problems on asparagus, basil, cyclamen, and pumpkins, and made 21 site visits to growers.

In the past year, Dr. Marra processed 227 nursery samples for the 2006 National Survey and 4 nursery samples for the 2006 Trace Forward survey.

# DEPARTMENT OF SOIL AND WATER

*Mosquito Trapping and Testing Program.* Mosquito surveillance for West Nile virus (WNV) and Eastern Equine Encephalitis (EEE) virus 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) baseline data that are used to assess the threat of WNV 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 Drs. Theodore Andreadis and Philip Armstrong (assisted by John Shepard, Michael Thomas, and Shannon Finan). Mosquito trapping is conducted at 91 permanent trapping stations that are located in 72 municipalities throughout the state. One-third of the sites are located in southern Fairfield and New Haven Counties where the highest rates of dead crow sightings have been consistently observed and where the highest levels of WNV activity in mosquitoes and humans have been detected in previous years.

In 2005, mosquito trapping was conducted from June 6 to October 20. 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). Elevated CO2-baited CDC Light Traps, placed approximately 7 m in the tree canopy, were additionally used at 12 sites in southern Fairfield and New Haven counties. 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 WNV and other mosquito-borne arboviruses of public health importance. Virus isolates from mosquito pools were tested for WNV, EEE, Jamestown Canyon (JC), Cache Valley (CV), Trivittatus (TVT), Highlands J (HJ), and LaCrosse (LAC), and Potosi (POTV) viruses. Isolated viruses were identified by Real Time (TaqMan) PCR or standard RT-PCR using virus-specific primers, or by plaque reduction neutralization (PRNT). 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.

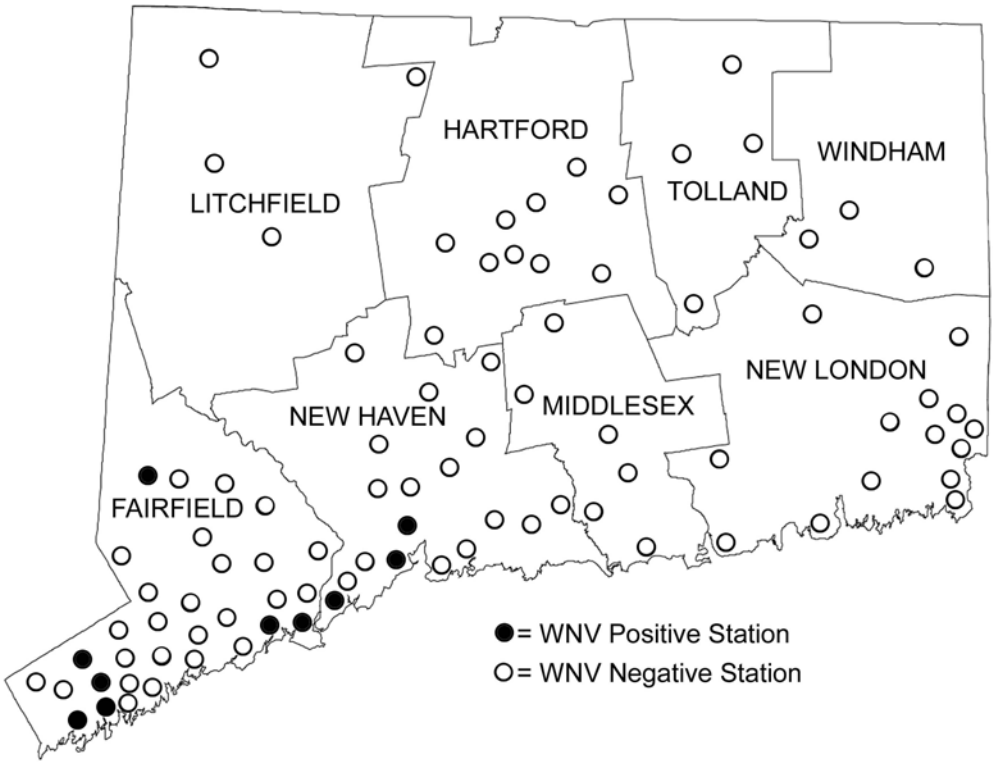
During 2005, a total of 111,731 mosquitoes (9,840 pools) representing 33 species were trapped and tested. A total of 34 isolations of WNV were made from 5 species (*Culex pipiens* = 29, *Culex salinarius* = 2, *Culex restuans* = 1, *Culiseta melanura* = 1, and *Ochlerotatus triseriatus* = 1), collected in 8 towns in 2 counties where WNV activity has been greatest in previous years: Fairfield County (Bridgeport, Danbury, Greenwich, Stamford, Stratford) and New Haven County (Milford, New Haven, West Haven). The first positive pool of mosquitoes was collected on July 11, and the last on October 5. Six human cases of WNV, of which five were locally acquired, were recorded in the State of Connecticut in 2005.

## *Mosquito species trapped and tested for arboviruses in Connecticut, 2005*

| *Mosquito Species* | # Mosquitoes | # Pools | Virus | | | | |
|---|---|---|---|---|---|---|---|
| | | | WN | JC | TVT | LAC | CV |
| *Aedes cinereus* | 7,285 | 631 | | 3 | | | |
| ***Ae. vexans*** | 9,818 | 839 | | | | | |
| *Anopheles barberi* | 9 | 9 | | | | | |
| *An. punctipennis* | 2,071 | 557 | | 1 | | | |
| *An. quadrimaculatus* | 613 | 207 | | | | | |
| *An. walkeri* | 546 | 100 | | | | | |
| *Coquillettidia perturbans* | 25,517 | 1044 | | 2 | | | |
| *Culex pipiens* | 9,016 | 990 | 29 | | | | |
| *Cx. restuans* | 4,344 | 524 | 1 | | | | |
| *Cx. salinarius* | 4,262 | 456 | 2 | | | | |
| *Cx. territans* | 59 | 35 | | | | | |
| *Culiseta melanura* | 4,624 | 534 | 1 | | | | |
| *Cs. minnesotae* | 59 | 17 | | | | | |
| *Cs. morsitans* | 36 | 23 | | | | | |
| *Ochlerotatus abserratus* | 1,742 | 100 | | | | | |
| *Oc. aurifer* | 2,310 | 132 | | | | | |
| *Oc. canadensis* | 12,016 | 657 | | 3 | | | |
| *Oc. cantator* | 4,200 | 280 | | 8 | | | |
| *Oc. communis* | 62 | 6 | | | | | |
| *Oc. diantaeus* | 4 | 1 | | | | | |
| *Oc. excrucians* | 528 | 91 | | 1 | | | |
| *Oc. japonicus* | 1,526 | 594 | | | | | |
| *Oc. provocans* | 86 | 6 | | | | | |
| *Oc. sollicitans* | 2,793 | 112 | | 3 | | | |
| *Oc. sticticus* | 1,200 | 73 | | | | | |
| *Oc. stimulans* | 1,708 | 201 | | | | | |
| *Oc. taeniorhynchus* | 5,079 | 157 | | 1 | | | |
| *Oc. thibaulti* | 2,195 | 148 | | | 1 | | |
| *Oc. triseriatus* | 1,520 | 504 | 1 | | | 1 | |
| *Oc. trivittatus* | 2,303 | 238 | | | 3 | | 1 |
| *Orthopodomyia signifera* | 3 | 3 | | | | | |
| *Psorophora ferox* | 1,296 | 171 | | | | | |
| *Uranotaenia sapphirina* | 2,905 | 403 | | | | | |
| **TOTAL** | **111,735** | **9,843** | **34** | **22** | **4** | **1** | **1** |

**CV** = Cache Valley, **LAC** = LaCrosse, **JC** = Jamestown Canyon, **TVT** = Trivittatus, **WN** = West Nile Virus

***Mosquito trapping stations showing West Nile virus positive sites in Connecticut, 2005***




*Mosquito Investigations.* To evaluate the host-feeding patterns of the mosquitoes *Aedes vexans* and *Culiseta melanura* as secondary vectors of West Nile virus (WNV) in northeastern United States, Drs. Theodore Andreadis and Goudarz Molaei identified the source of vertebrate blood-meals by sequencing portions of the cytochrome b gene of mitochondrial DNA. Analysis of PCR products from a total of 119 *Ae. vexans*, revealed that 92.4% of individuals acquired blood solely from mammalian and 2.5% from avian hosts. Mixed-blood meals from both avian and mammalian hosts were detected in 5% of individuals of this species. *Aedes vexans* obtained vertebrate blood meals most frequently from white-tailed deer (80%) followed by domestic horse, American Robin, eastern cottontail, and domestic cat. In contrast, *Cs. melanura* fed predominantly on avian species (89.6%), but exhibited some inclination for mammalian blood (4.2%). Individual mosquitoes containing mixed-blood meals were also identified in 6% of *Cs. melanura*. American Robin was the most common source of vertebrate blood for *Cs. melanura* (23%), followed by Wood Thrush and Gray Catbird. American Crow represented only 2% of the blood meals identified in *Cs. melanura*, as was similarly found with other recognized *Culex* vectors of WNV in the northeast. These findings support the view that *Ae. vexans,* is likely to be a relatively important "bridge vector" to large mammals including deer and horse, while *Cs. melanura* likely plays a secondary role in enzootic transmission of WNV among free-ranging birds in more rural environs.

The risk of transmission of West Nile virus (WNV) to humans is associated with the density of infected vector mosquitoes in a given area. Current technology for estimating vector distribution and abundance is primarily based on CDC light trap collections, which provide only point data. In order to estimate mosquito abundance in areas not sampled by traps, Dr. Andreadis and colleagues from Yale University (Dr. M. A. Diuk-Wasser, H. Brown and Dr. D. Fish) developed logistic regression models for five mosquito species implicated as the most likely vectors of WNV in Connecticut. Using data from 32 traps in Fairfield County from 2001 to 2003, the models were developed to predict high and low abundance for every 30x30m pixel in the County. They were then tested with an independent dataset from 16 traps in adjacent New Haven County. Environmental predictors of abundance were extracted from remotely sensed data. The best predictive models included non-forested areas for *Cx. pipiens*, surface water and distance to estuaries for *Cx. salinarius*, surface water and grasslands/agriculture for *Ae. vexans* and palustrine habitats for *Cs. melanura*. No significant predictors were found for *Cx. restuans*. In Fairfield County, the final models predicting high and low abundance correctly classified 75% of the traps for *Cx. pipiens*, 84.4% for *Cx. salinarius*, 84.4% for *Ae. vexans* and 93.8% for *Cs. melanura*. In New Haven County, the models correctly classified 81.3% of the traps for *Cx. pipiens*, 75% for *Cx. salinarius*, 62.5% for *Ae. vexans* and 81.3% for *Cs. melanura*. County-wide continuous surface maps of habitat suitability were generated for each species, which could contribute to future surveillance and intervention activities.

Eastern equine encephalitis (EEE) virus perpetuates in an enzootic cycle involving ornithophilic mosquito vectors, principally *Cs. melanura*, and avian amplification hosts. To better understand the role of *Cs. melanura* and *Cs. morsitans* (Theobald) in the epizootiology of EEE virus, Drs. Andreadis, Molaei Armstrong along with colleagues from Cornell University and the NY State Department of Public Health (Drs. J. Oliver and J. Howard) collected blood-fed mosquitoes from two sites associated with an EEE virus focus in central NY and identified the source of vertebrate blood by nucleotide sequencing of PCR products of the cytochrome b gene. Analysis of 484 *Cs. melanura* and 122 *Cs. morsitans* revealed that 94.2% and 86.9%, respectively, acquired blood solely from avian hosts. Blood meals derived exclusively from mammals were detected in 0.8% of *Cs. melanura* and 1.6% of *Cs. morsitans*. Individual mosquitoes containing mixed-blood meals from both avian and mammalian hosts were also detected in 5.0% of *Cs. melanura* and 11.5% of *Cs. morsitans*. Wood Thrush constituted the most common vertebrate host for *Cs. melanura* (23.6%) and *Cs. morsitans* (30.9%) followed by American Robin, Song Sparrow, Ovenbird, Red-eyed Vireo, and Common Yellowthroat. Mammalian-derived blood meals were identified as white-tailed deer, horse, domestic cat, and eastern pipistrelle bat. There were three isolations of EEE virus from *Cs. melanura* and one from *Cs. morsitans* demonstrating active virus transmission when mosquitoes were sampled. These results suggest that Wood Thrush and a few other passerine birds may play key roles in supporting EEE virus transmission in the northeast and possibly throughout the geographic range of EEE in North America. The frequency of mammalian feedings also suggests that *Cs. melanura* and *Cs. morsitans* may play a role in the transmission of EEE virus to equines, in addition to maintaining enzootic transmission among avian hosts.

Laboratory bioassays designed to evaluate the infectivity and pathogenicity of the baculovirus, OscoNPV (originally isolated from the mosquito, *Oc. sollicitans* in FL) were continued against larval mosquitoes by Dr. Theodore Andreadis (assisted by J. Shepard and M. Thomas). Five or ten larval equivalents (LE) with 5 mM $Mg^{2+}$ added were used as a dosage rate in exposures with second and third instars at 20-24 $^0$C. Infection rates were as follows: *Oc. japonicus* (18.0% @ 5 LE and 48% @ 10 LE), *Oc. atropalpus* (66.0% @ 10 LE), and *Cs. melanura* (66.0% @ 10 LE). No infections were obtained in *Cx. pipiens* nor were infections found in any species in the absence of $Mg^{2+}$. Development of the virus was observed in the nuclei of the midgut epitheial cells in the gastric caeca and posterior region of the stomach. Extensive infections and high mortality were observed in *Oc. japonicus* and *Oc. atropalpus,* while comparatively light infections occurred in *Cs. melanura.* The host range of OscoNPV has now been extended to 10 species of *Ochlerotatus,* and 1 species each of *Aedes* and *Culiseta*.

*Arbovirus studies.* Drs. Armstrong and Andreadis reported the first isolation of La Crosse virus (LACV) from New England. In 2005, a bunyavirus that was isolated from a pool of eastern tree-hole mosquitoes, *Ochlerotatus triseriatus* collected from Fairfield, Connecticut (CT). Nucleotide and encoded amino acid sequences from portions of the S, M and L segments were more similar to the prototype strain of LACV than that of closely related snowshoe hare virus. Phylogenetic analysis of sequences from the M segment indicated that the CT isolate represents a distinct lineage of LACV, diverging earliest from other strains found in southeastern, central, and northeastern United States. Despite low sequence homology with other viral strains, the CT isolate was antigenically similar to the prototype strain of LACV by plaque-reduction neutralization tests with poly- and monoclonal antibodies. This represents the first isolation of LACV in New England to our knowledge and suggests long-term independent evolution of the CT isolate.

The phylogenetic relationships of eastern equine encephalomyelitis virus (EEE) strains are currently being evaluated by Drs. Armstrong, Andreadis, Anderson, and Vossbrinck. Virus isolates obtained from the statewide mosquito trapping program during 1998-2004 were sequenced and analyzed to discern patterns of evolutionary change and lineage turnover from year-to-year. Preliminary results indicate the following: 1) Diverse EEEV lineages may co-circulate in a given transmission season. For example, in 2003, 6 well-supported clades were detected representing 11 distinct sequence variants. Two distinct lineages co-circulated in 2000 and 2001 versus one identical strain in 1998. 2) There appears to be limited viral traffic between foci in the western and eastern parts of the state. Using the CT River Valley as a dividing line, different strains tend to circulate along an east-west axis. 3) The same strains do not reappear in successive years except for one from 2000-2001 and another from 2003-2004. This suggests that local over-wintering occurs in CT but on a limited basis. Most EEE strains are unique and probably arose from importation events. Long term persistence of the same viral strain for more than two transmission seasons was not supported by the data.

Drs. Vossbrinck, Andreadis, Armstrong and Anderson (assisted by John Shepard) have completed sequencing of more than 396 WNV isolates from Connecticut. Results show a correlation between location and evolutionary relatedness. Isolates obtained from

mosquitoes are being recaptured in following years. Some are identical with isolates obtained in previous years while others show nucleotide mutations and changes to their protein structure. The recapture of isolates from previous years provides good evidence that the virus is over wintering in Connecticut. Analysis in the current year will look for convergent changes in the viral protein that is the same mutation in an unrelated isolate, to see if the virus is possibly adapting to the new bird hosts or mosquito vectors found in North America.

*Controlling Exotic Invasive Weeds in Connecticut Lakes* (Dr. Jason White, Gregory Bugbee, Dr. Robert Capers, assisted by Roslyn Selsky)

*Surveillance and Monitoring Program.* A second full season of monitoring and surveillance for invasive aquatic weeds in CT lakes was completed. A total of 104 lakes have been mapped for aquatic vegetation; 62 in this last year. GPS-based bathymetric vegetation maps were created and digitized, along with text-based narratives. All information is currently being incorporated into the Invasive Aquatic Plant Program website as part of the CAES web page. As anticipated, more than two thirds of the surveyed water bodies have been invaded by non-native plants; in fact, most lakes contained multiple invasive species. The most commonly found invasive plants were curly leaf pondweed *(Potamogeton crispus),* Eurasian water milfoil (*Myriophyllum spicatum*), variable water milfoil *Myriophyllum heterophyllum*), fanwort *(Cabomba caroliniana*), and minor naiad (*Najas minor*). Less commonly found were mudmat *(Glossistigma cleistanthum)*, water hyacinth *(Eichornia crassipes)* and water shamrock *(Marsilea quadroflia).* Samples of all species from all surveyed lakes are being archived in herbaria collections at CAES and the University of Connecticut. The monitoring and surveillance program has scientifically confirmed anecdotal and historical data; clearly invasive aquatic plant species are both present and problematic in a large number of CT water bodies.

*Control efforts.* A central goal of this program has been to experiment with novel methods of control so as to restore native plant communities to aquatic ecosystems as they existed prior to invasion by non-native species. We have several long-term research projects that are summarized below:

*Bashan Lake, East Haddam, CT.* Water milfoil is an invasive aquatic plant that can restrict the recreational use of lakes and eliminate desirable native aquatic plants. Since 1994, the Station has been monitoring the milfoil problem in Bashan Lake, East Haddam. The Connecticut Department of Environmental Protection (CTDEP), the town of East Haddam and the Bashan Lake Association have supplied the Station grants to study the use of the herbicide 2,4-D for controlling the milfoil. Greg Bugbee and Jason White have met with lake association, CTDEP and town officials to educate the public on the project and obtain the necessary permits. In 2000 - 2005 areas of Bashan Lake were treated with 2,4-D (2,4-D ester). Although control was generally very good re-growth occurred in some areas and new areas of milfoil were found particularly in water from 10 – 20 feet deep. Tests in 2001- 2004 have discovered that a late summer application of 2,4-D is likely more effective than the traditional spring treatments and the rate can be reduced from 200 lbs/acre to 75 – 100 lbs/acre with equally good control. Areas treated

with 2,4-D usually stay nearly milfoil free for at least two years. Reinfestation is thought to occur either by uncontrolled remnants of previous plants or rooting of plant fragments from untreated portions of the lake. New underwater video equipment has allowed CAES to accurately assess where milfoil is occurring document large areas of milfoil that were previously unkown. This milfoil could be the source of plant fragments. In September 2005, 2,4-D was applied to 45 acres of milfoil between the outlet dam launch and the Sunset Acres dock. Other areas, totaling five acres, including portions of the boat launch cove, Brooks Cove, and Laurel Cove were also treated. Late fall and spring surveys indicated excellent control. Nearby groundwater wells are tested and no 2,4-D has been found. It is hoped that herbicide applications can gradually be reduced. Effective development of late season herbicide application approaches are highly desirable because of the low lake usage by stakeholders during the early fall.

*Lake Quonnipaug, Guilford CT*.

Lake Quonnipaug, Guilford CT, has become infested with the non-native aquatic weeds cabomba and Eurasian water milfoil. In 2001, the herbicide Sonar SRP (fluridone, slow release pellets) was applied to two acres of cabomba in the cove near the boat launch with excellent control. This was the first known successful control cabomba with a granular herbicide applied as a spot treatment. In 2002, this area was monitored for regrowth and a total of 122 plants were found and removed by hand pulling. Many of these plants had likely come from fragments floating in from other parts of the lake and taking root. Regrowth of cabomba in the north cove continued through 2005, and cabomba has become a problem again. Retreatment scheduled for 2005 was delayed by CTDEP until the proximity of an endangered plant called water marigold could be detailed. Aquatic vegetation was mapped. Georeferenced locations of water marigold supplied to CTDEP by CAES have allowed treatment of the north cove in 2006. In the southern cove, a 2000 X 50 ft. area of lily pads and other nuisance vegetation was treated with glyphosate in September 2002. Three weeks later, the area was then hydroraked and the collected vegetation was removed. In April 2004, the hydroraking was performed again to remove floating islands of muck and dead aquatic vegetation. A spring survey found large areas of cabomba in the treated area. Two treatments of fluridone Q (quick release) were applied in June 2004. Aquatic plant surveys were performed along GPS referenced transects in 2004 and 2005 to monitor conditions before and after treatment. These surveys found the quick release Sonar provided too little residual activity and regrowth occurred by late summer 2004 and proceeded further in 2005. Water samples were routinely tested for temperature, dissolved oxygen, pH, alkalinity, conductivity, phosphorus, and fluridone.

*Grannis Lake, East Haven, CT*. The effectiveness of the aquatic herbicides fluridone and Diquat in controlling Eurasian milfoil, sago pondweed, curly leaf pondweed and coontail are being tested in Grannis Lake. Grannis Lake was surveyed for aquatic vegetation prior to the initial treatment and again each spring thereafter. North/South transects were made at 100 feet intervals using GPS. Vegetation samples were obtained at 50 ft. intervals, identified, judged for abundance and then brought back to the lab to obtain dry weight. Diquat was applied in May 2005 and fluridone was applied in split applications throughout the summer 2005 to maintain concentrations of 10 –20 ppb. Water was tested each week to determine fluridone concentrations. By late May the diquat had eliminated all Eurasian milfoil, coontail, Sago pondweed, and curly

leaf pondweed. The fluridone application prevented any regrowth of these plants for the remainder of 2005. In spring 2006, transects were again surveyed and only curly leaf pondweed and a small amount of Sago pondweed was found. The Diquat /fluridone treatments were determined ineffective for curly leaf pondweed control probably because the plant set reproductive structures called turions prior to the application of the Diquat. Water samples are periodically tested for temperature, dissolved oxygen, pH, alkalinity, conductivity, phosphorus and fluridone.

*Molecular studies*. After a preliminary study in the 2004, a full line of investigation was opened on the identification of aquatic plants through molecular (DNA/RNA) techniques. The motivation for this research is the difficulty in identifying many plants of interest, including both invasive and threatened species. Dr. Charles Vossbrinck (assisted by Kirsten Deeds) has joined the project and has developed procedures for isolation of DNA from aquatic plants. Using the isolated DNA, three genes (small ribosomal subunit, internal transcribed spacer ribosomal DNA, intergenic spacer) from each plant have been amplified and sequenced. Sequences of 24 plants have been determined and a database for molecular analysis between genera and species is being constructed. The successful implementation of a molecular-based identification system will significantly increase the accuracy of vegetation surveys in CT Lakes.

*Outreach efforts.* Given the magnitude of invasion by non-native aquatic plants, we are making significant efforts to engage citizens, lake associations, and other stakeholders as part of this project. CAES scientists organized three workshops on the identification of invasive aquatic plants this year. Our web site gives details on the CAES Invasive Aquatic Plant Program, including a full description of the research goals and a complete presentation of the project results (http://www.caes.state.ct.us/AquaticPlants/index.htm.). Included are all publications in downloadable PDF formats, as well as the digitized maps of all surveyed lakes. Successfully educating and engaging stakeholders is critical to the success of CAES efforts at managing invasive aquatic plants in CT waters.

*Phytoremediation of persistent organic pollutants:* Studies were conducted by Dr. Jason White in an ongoing investigation of the potential of certain vegetation to remove moderately low levels of persistent organic pollutants from soil. Previous data had indicated that *Cucurbita pepo* cultivars seemed to have remarkable abilities to phytoextract the weathered residues but that significant crop variability may exist down to the species or even subspecies level. Studies were conducted under several different lines of investigation in the past year:

(1.) In a greenhouse rhizotron study, three cucurbits (zucchini, non-zucchini summer squash, and a cucumber) were grown in a soil contaminated with weathered residues of several persistent organic pollutants (POPs)(chlordane, DDE/DDD/DDT, PAHs). Movement of contaminants was studied by comparing concentrations in the bulk soil, rhizosphere pore water, xylem sap, and aerial tissues. This enabled calculation of BCFs or bioconcentration factors from the soil pore water to the xylem sap. BCFs for chlordane varied somewhat among the different cucurbits; 36, 40, and 23 for zucchini, squash, and cucumber respectively. Interestingly, for the DDE/DDD/DDTs, the BCFs

were 19, 4, and 8 for the zucchini, squash, and cucumber. For PAHs, bioaccumulation was highly variable but related to the number of rings. These data show, for the first time, that the accumulation of weathered POPs is not only highly dependent on the phylogeny of the plant but also on the physicochemical properties of the contaminants.

(2.) Field experiments were conducted to assess the impact of inoculation with mycorrhizal fungi on the accumulation of weathered *p,p'*-DDE from soil by three cultivars of zucchini (*Cucurbita pepo* spp *pepo*). Three commercially available mycorrhizal products (BioVam, Myco-Vam$^{TM}$, INVAM) were inoculated into the root system of the zucchini seedlings at planting. Plants not inoculated with fungi accumulated large but variable amounts of contaminant, with root BCFs ranging from 10-48 and stem BCFs ranging from 5.5-11. The total amount of contaminant phytoextracted ranged from 0.72-2.9%. The effect of fungal inoculation on contaminant uptake appeared to vary at the cultivar level. For Goldrush, fungal inoculation generally decreased tissue BCFs but because of slightly larger biomass, did not significantly impact the percent contaminant phytoextracted. Alternatively, for Costata, BioVam and Myco-Vam$^{TM}$ generally enhanced *p,p'*-DDE accumulation from soil, and increased the amount of contaminant phytoextracted by up to 34%. For Raven, BioVam reduced contaminant uptake whereas Myco-Vam$^{TM}$ and INVAM increased contaminant phytoextraction by 53 and 60%, respectively. The data show that fungal inoculation may significantly increase the remedial potential of *C. pepo* ssp *pepo*, although the apparent cultivar specific response to mycorrhizal inoculation is unexpected and problematic.

(3.) Field experiments were conducted to assess the impact of surfactant amendment on the accumulation of weathered *p,p'*-DDE from soil by three cultivars of zucchini (*Cucurbita pepo* spp *pepo*). Four different surfactants were added at one of three concentrations (100 mg/L, 500 mg/L, 1000 mg/L) prior to zucchini seedling planting in the field. Two synthetic/industrial surfactants (Triton X-100, Tween-80) and two biosurfactants (rhamnolipids, cyclodextrin) were used. Abiotic desorption studies showed that for all amendments except cyclodextrin, surfactants significantly increased the release of weathered DDE. However, the effect of surfactant amendment on zucchini's ability to accumulate DDE was cultivar specific. For one cultivar, all surfactants at all concentrations significantly decreased contaminant uptake. Alternatively, Triton X-100 increased the DDE phytoextraction of another cultivar by 450% and yielded nearly 5% contaminant removal from soil. In addition, several of the surfactants at higher concentrations clearly reduced plant biomass. The data show that under the appropriate conditions, surfactant amendment may dramatically increase contaminant uptake but the conditions of successful treatment remain unknown.

(4.) In ongoing collaborative investigations with Dr. Jason Kelsey of Muhlenburg College, small pot studies were designed to compare the uptake of weathered DDE from both contaminated soil and compost. When two cucurbit species were grown in soil and compost containing weathered DDE residues at approximately the same concentration, dramatically different pollutant levels were found in the plants. On average, DDE appears to be 7-8 times more available in soil than in compost. However, if one expresses the amount of contaminant in the soil and compost on an organic carbon normalized basis, the differences disappear; this is due to the fact that the compost organic carbon content is 8-10 times greater than that of the soil. The bioavailability of

weathered persistent organic pollutants to plants in compost is significantly less than that of a similarly contaminated soil.

*Bioavailability of persistent organic pollutants to earthworms:* In further collaborative investigations with Dr. Jason Kelsey of Muhlenburg College, the influence of four separate surfactants (each at three concentrations; 100, 500, and 1000 mg/L) on DDE accumulation by two earthworm species (*Eisenia foetida, Lumbricus terrestris*) was determined. Two synthetic/industrial surfactants (Triton X-100, Tween-80) and two biosurfactants (rhamnolipids, cyclodextrin) were used. For both worm species, all surfactants at all concentrations significantly increased DDE levels in the tissues. On average, the increases in contaminant burden were 2 to 6-fold, although Tween-80 at all concentrations increased the contaminant level in *L. terrestris* by more than 70-fold. Eathworm species appear to be much more sensitive receptors than are plants relative to the surfactant-enhanced bioavailability of weathered persistent organic pollutants. The bioavailability of weathered DDE in both soil and compost was also assessed for two separate species of earthworm (*Eisenia foetida, Lumbricus terrestris*). Similar to the plant-based studies described above, the bioavailability of DDE in soil is significantly greater to both species than when the contaminant is present in compost; 7.7-fold for *E. foetida* and 3.4-fold for *L. terrestris*. However, if one expresses the soil concentration on an organic carbon basis, the availability of DDE is actually greater when in compost. The bioavailability of weathered persistent organic pollutants to earthworms in compost is significantly less than that of a similarly contaminated soil.

*An Isotope Exchange Technique to Verify True Sorption Hysteresis and Assess Mechanism.* (Drs. Joseph Pignatello and Michael Sander). The sorption of organic compounds to natural sorbents often shows hysteresis, or non-coincidence of the sorption and desorption branches of the isotherm. The objective of this study was to develop an experimental technique based on the use of $^{14}C$ isotopes to distinguish hysteresis due to experimental artifacts from true hysteresis due to thermodynamically irreversible processes. The study was also designed to investigate causation of true hysteresis (irreversible sorption). The technique determines the rates and the degree of isotope exchange (IE) on equilibrated sorption and desorption points at different constant bulk chemical concentrations. The technique was applied to the sorption of naphthalene (NAPH) on Beulah-Zap lignite, a low rank reference coal composed mainly of kerogen. Sorption of bulk was found to be reversible below $10^{-5}$ g $L^{-1}$, but hysteretic above $10^{-4}$ g $L^{-1}$. Complete isotope exchange on sorption and desorption points that defined an irreversible cycle demonstrated that hysteresis was true. A comparison of normalized uptake and release kinetics of label and bulk NAPH at different concentrations revealed slow structural deformation processes of the sorbent during bulk sorption and desorption. This is taken as corroborating evidence for the pore deformation hypothesis of hysteresis in which incoming sorbate molecules induce quasi-reversible changes in the organic matter that lead to different pathways for sorption and desorption. Although unable to rule it out completely, the data demonstrates that physical entrapment of sorbate molecules plays a minor, if any, role to the observed hysteresis in this system. The study validates true hysteresis in natural organic matter and shows that it results from irreversible deformation of the solid during a sorption desorption cycle. This finding is

likely to alter the paradigm of sorption, which will have important impacts on transport models of chemicals in soil and sediments.

*Conditioning –Annealing Studies of Natural Organic Matter Solids Linking Irreversible Sorption to Irreversible Structural Expansion.* (Drs. Joseph Pignatello, Michael Sander, Yuefeng Lu). The assumption of reversibility underpins the sorption term in current models dealing with the fate and impact of organic compounds in the environment, yet experimentally sorption of organic compounds in soils and sediments often shows 'irreversible' behaviors such as hysteresis and the conditioning effect (enhanced repeat sorption). The objective of this study was to test whether a glassy polymer irreversibility model applies to natural organic matter (NOM) solids. Irreversible sorption in polymers is believed to be caused by irreversible expansion and creation of internal micropores by penetrating molecules, leading to increased affinity for the adsorbate during desorption or subsequent re-sorption. Using chlorobenzene as a conditioning agent and polychlorinated benzenes as test compounds in a second sorption step, we observed conditioning effects for a peat soil, a soil humic acid, and a model glassy polymer, poly(vinylchloride), but not for a model rubbery polymer, poly(ethylene). The conditioning effect for the two natural solids, probed by the enhancement in the sorption distribution coefficient of 1,2,4-trichlorobenzene, relaxed upon sample annealing between 45 $^{o}$C and 91 $^{o}$C in a manner similar to the relaxation of free volume and enthalpy of glassy polymers. Relaxation of the conditioning effect in the NOM solids depended on annealing temperature and, at a given temperature, followed a double additive exponential rate law with a non-zero constant term descriptive of the final state that depends inversely on temperature. At environmentally relevant temperatures, the conditioning effect may "never" completely relax. The results provide compelling evidence for the glassy, non-equilibrium nature of natural organic matter solids and for irreversible structural expansion as a cause of irreversible sorption.

*Effect of Natural Organic Substances on the Surface and Adsorptive Properties of Environmental Black Carbon.* (Drs. Soukjoon Kwon and Joseph Pignatello). Black carbon (BC; char and soot) particles emitted to the environment typically are formed with high microporosity and surface area—properties that are responsible for their presumed important role in adsorption of anthropogenic organic chemicals in soils and sediments. An issue that has received little direct attention is the possibility that naturally-occurring organic matter attenuates the surface activity of BC. We found that simulated "aging" of prepared wood char particles in a soil-water suspension leads to a strong decline in char total surface area (TSA) determined by the customary method of $N_2$ adsorption at 77 K using the B.E.T. equation, and a more modest decline in the affinity of char for dissolved benzene. To help determine underlying cause, we measured the effects of adsorbed natural lipids or lipid fractions of humic substances, modeled by triglycerides of a commercial vegetable oil. With increasing lipid loading (up to 40% by char weight) from aqueous mixtures, $N_2$-TSA was strongly suppressed (up to 100-fold), while $CO_2$ cumulative surface area (CSA, 0-1.4 nm) at 273K and benzene adsorption at 293K were hardly affected. In addition, the rate of $CO_2$ adsorption was retarded. We propose that externally adsorbed lipid molecules occupy pore throats with access to interior pore networks. At 77 K, as opposed to the higher temperatures, lipid chains are too inflexible

to allow passage of adsorbate. It is concluded that benzene adsorption to char predominates at interior pore sites and does not correlate with $N_2$-probed micropore properties when the char accrues pore-blocking substances from the surroundings. The findings indicate that $N_2$ may not be suitable for probing hydrophobic microporosity in BC materials present in soils and sediments.

*Concentration-Dependent Multi-Term Linear Free Energy Relationship for Sorption of Organic Compounds to Soils.* (Drs. Dongqiang Zhu and Joseph Pignatello). A LFER of the type in the title is applied to sorption of numerous compounds to polyethylene and three soils for which sorption to natural organic matter (NOM) is presumed dominant. It provides fractional contributions to the Gibbs free energy of sorption corresponding to hydrophobic effects, dipolar/polarizability (D/P) effects in excess of the reference state, and the sum of possible specific forces such as H-bonding and π-π electron donor-acceptor (π-π EDA) interactions in excess of the reference state. Minimal inputs are the isotherm, the *n*-hexadecane-water partition coefficient and the Abraham $\pi_i$ parameter representing D/P effects. Sorption of all compounds to polyethylene can be described by considering only hydrophobic effects. Sorption of a calibration set of apolar compounds (aromatic and aliphatic hydrocarbons and chlorinated hydrocarbons) to the natural sorbents is well-described by a combination of hydrophobic and D/P effects. For the apolar set, D/P contributes ~15-40% of sorption free energy (2-8% for cyclohexane). D/P effects increase with the degree of chlorination for aliphatic compounds. For aromatic compounds D/P effects increase with fused ring size but do not vary with degree of chlorination and chlorine substitution pattern. H-bonding contributes substantially to sorption of alcohols, and similarly for 2-nonanol and 2,4-dichlorophenol (33%-44%). π-π EDA forces contribute to phenanthrene sorption in one case. The effects of concentration, sorbent aromaticity (literature NMR), and sorbent polarity [(O+N)/C] on hydrophobic and D/P contributions for all compounds indicate that: a) molecules fill sites of progressively greater hydrophilic character; b) the energy penalty for cavity formation in the solid decreases with concentration due to plasticization and greater intermolecular contact; c) sorbent aromatic content more than sorbent polarity controls D/P interactions. Basing free energy on an inert electrostatic chemical environment afforded by *n*-hexadecane permits evaluation of direct electrostatic forces in NOM that contribute to sorption. The LFER gives valuable information on the driving forces affecting sorption with respect to chemical structure, concentration of chemical in solution, and soil organic matter properties.

*Nonlinear and Competitive Sorption of Apolar Compounds in Black Carbon-Free Natural Organic Materials.* (Drs. Joseph J. Pignatello, Yuefeng Lu, Eugene J. LeBoeuf, Weilin Huang, J Song and Baoshan Xing- University of Massachusetts). Many studies have reported a spectrum of sorption phenomena in soils, sediments, and organic matter isolates of those materials that are inconsistent with a partition model proposed in the late 1970s and early 1980s, a model based on the hypothesis that sorption is linear and non-competitive. To explain these nonideal phenomena prior studies have proposed a hard/soft (glassy/rubbery) model for soil/sediment organic matter (SOM), while others have recently attributed them singularly to black carbon (soot and charcoal) particles present in topsoils and sediments. In this study, we demonstrated nonideal sorption

behavior (isotherm nonlinearity, competitive effects) for a group of apolar compounds in a large set of natural and model organic materials, including a commercial lignin and humic acids from different sources. Complete oxidation of samples by an acid dichromate method was taken to signify the absence of black carbon. (However, polymethylene units are stable even if functionalized on both ends, making the technique unreliable for quantifying black carbon.) Other samples were inferred free of black carbon by their source and method of preparation. Characterization by thermalanalytical methods indicated the glassy character of the organic materials. The origin of the nonideal behaviors appears to be the glassy character of these materials. Sorption nonlinearity increased or decreased by changing the temperature, co-solvent content, and by cross-linking with metal ions as predicted for organic solids in a glassy state. We conclude that macromolecular humic substances in the environment may exhibit nonideal sorption behavior in soils and sediments, quite apart from any such behaviors attributable to black carbon.

*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, Mr. Bugbee tested 5,807 samples and answered 1,996 inquiries.

# VALLEY LABORATORY

## RESEARCH ACTIVITIES

*Activities on the farm:* There were a total of 42 experimental plots during the past year at the Windsor farm. Five Windsor-based scientists had 27 of these plots; six New Haven-based scientists were using the remaining 15 plots. Valley Laboratory scientists also conducted experiments in many plots off site, such as in growers' fields and State forests. Richard Horvath kept the farm and his equipment ready and in excellent shape. With the help of Nick Sikorski and Matthew Deltendre, Richard expertly maintained the many field plots and addressed the specific needs of each scientist. He and his summer assistants did an outstanding job maintaining the extensive ornamental garden in cooperation with Rose Hiskes and the Connecticut Nursery and Landscape Association. Mr. Horvath 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.

*Exotic insect pests of hemlock*

Hemlock woolly adelgid (HWA), *Adelges tsugae*, is an introduced insect pest from Asia, which continues to threaten the health and distribution of native eastern hemlock, *Tsuga canadensis* and Carolina hemlock, *Tsuga caroliniana* on both the forest and urban landscapes in 16 eastern states from Georgia to Maine. Recent winters have been less severe, and the potential for major resurgence of HWA in Connecticut and the rest of New England has been widely anticipated. Biological control, in a national program supported by the USDA Forest Service, remains a major tool for forest

management of HWA infestations. Connecticut, via the Connecticut Agricultural Experiment Station, was the first state in the US to release and study biological control of HWA using a tiny Japanese ladybeetle, *Sasajiscymnus* (formerly *Pseudoscymnus*) *tsugae*. This program, now funded almost entirely by the USDA Forest Service, is now in its 12th year of research, predator releases and evaluations but its continued viability is threatened by recent federal funding cuts. Dr. Cheah continues to direct a 3-part project, funded by the USDA Forest Service, to improve the implementation and assessment of biological control of HWA by imported coccinellid predators.

The first project involves enhancing biological control of hemlock woolly adelgid through the development of artificial diets for mass rearing of ladybeetle predators. Several introduced predator species from Japan, China and the Pacific North-West are currently being reared in the south by several state-supported, or private insectaries for deployment in the HWA-infested states as a part of the national biological control program supported by the USDA Forest Service. The mass rearing of *S. tsugae* and other imported predators is completely dependent on extensive collections of healthy, heavily infested hemlock foliage, primarily collected and shipped from the infested areas of North Carolina. The availability of infested foliage is seasonal and can be unpredictable. This dependence on natural prey collections and the necessity for labor-intensive techniques has placed numerical limitations on the large-scale production of specialist predators for adelgid control. Dr. Cheah, in collaboration with Dr. Allen Cohen, Insect Diet and Rearing Institute, Tucson, Arizona, continued with artificial diet investigations at the Valley Laboratory, for maintaining and/or mass rearing *Sasajiscymnus tsugae*, an introduced predator for biological control of hemlock woolly adelgid. After the testing of 60 formulations in feeding and survival bioassays, a freeze dried formulation of Dr. Cohen's, derived from chicken egg extracts has proved to be palatable to both adults and larvae but requires frequent changes (every 2-3 d) to attract feeding. In long-term trials in 2005 and 2006, adult survival at room temperatures of 20-22 ºC was 79% for females and 41.2% for males supported on diet alone for 9 weeks. The rapid development of mold on the exposed diet was a major contributor to increased levels of adult mortality. However, some adults were still alive after 13 weeks of feeding on diet alone. Surviving adults were vigorous and able to mate and oviposit within a few days of being placed on adelgid-infested hemlock as an oviposition stimulus. Fecundity has been high, weekly oviposition patterns have been normal, and longevity enhanced. This indicates that the diet formulation is nutritionally complete and able to support full reproductive capacity of adult *S. tsugae* deprived of its natural prey for over 3 months. The current challenges are directed towards improving the shelf-life of the diet by decreasing mold, desiccation and modification of the diet packaging to enable feeding by larvae. The development of a suitable artificial diet for adelgid predators and a complementary labor-saving delivery system would enable the amplification of mass rearing of predators with significant implications on the economics and efficacy of the national program. Of equal importance would be the development of an artificial diet for maintaining colonies of predators in the event of a shortage of HWA.

The second project involves the development of improved assessments of hemlock health, monitoring for *S. tsugae* impact, establishment, dispersal and survival.

Biological control with *S. tsugae* began in Connecticut and the majority of *S. tsugae* release sites were implemented in the mid-late 1990s when HWA had reached a

zenith and all towns in Connecticut reported infestations and tree decline. *S. tsugae* available for release against HWA are reared in state at the Valley Laboratory in Windsor. Around 174,000 *S. tsugae* have been released at 25 forest and urban sites in Connecticut from 1995-2006. In 2006, over 3,700 *S. tsugae* were reared for release at the Valley Laboratory with the assistance of James Preste, with over 2,700 released at 3 new sites in central, northeastern and southern Connecticut. The 2006 winter was much less severe, and assessments of HWA winter mortality at 15 sites recorded great variation in HWA mortality in central and northern regions while HWA mortality was least in the coastal sections. Overall HWA winter mortality in 2006 in Connecticut was 61%, ranging from 44.2% at southern coastal sections to 70% in northern and central stands. As new infestations continue to reappear with current warming climatic trends, there is an urgent need in Connecticut for the continuation of predator releases, but this is challenged concurrently by inadequate funding for the program.

At 5-11 years since release, the majority of the Connecticut sites represent the oldest *S. tsugae* sites in the U.S, in addition to constituting a unique large scale field experiment involving a single predator species release. Dr. Cheah, with the assistance of James Preste, continued summer assessments of hemlock health in 16 *S. tsugae* release sites. In 2005, *S. tsugae* release sites continued to show recovery across all types of woodland suitability sites with high levels of new shoot production and reduced HWA crown levels. Hemlock recovery was still evident even in the poorest of hemlock habitats composed of rocky outcrops with very thin droughty soils. The recovery of hemlocks occurred statewide in both release and non-release stands and was correlated with optimal cool moist growing seasons and concurrent heavy winter mortality of adelgids in 2003 and 2004. No increased hemlock mortality in release sites was recorded. During the fall and winter of 2005, Dr. Cheah and James Preste located topographically matching non-release sites within a few miles of *S. tsugae* release sites and assessed the health of hemlocks for comparisons to established release sites. All non-release matching sites had been or were currently infested with HWA. In addition, baseline sites, which comprised northern natural hemlock stands which were not infested with either HWA or elongate hemlock scale, were also located and rated to provide a standard for hemlock health under the influence of normal abiotic stressors such as drought etc. The results were indisputable: hemlocks in release sites, which had previously suffered heavy dieback and decline, had now developed significantly healthier crowns than in non-release sites. The hemlock crowns in release sites were not significantly different from hemlock crowns in baseline sites, indicating an enhanced level of recovery.

Predator recoveries through current sampling of the lower canopy remain inefficient. However, an adult *S. tsugae* was recovered through foliage inspection in a northern site with very low levels of HWA, 6 years after release, showing the persistence of the species. Overwintering studies in 2006 of *S. tsugae* adults in large field cages in northern and southern sites provided insight into the impact of Connecticut winters on the predator. The winter of 2006 was considered above normal in mean winter temperature although a cold snap occurred early in mid-December 2005. Survival and recovery of *S. tsugae* was minimal in Norfolk, in northwestern Connecticut, where HWA mortality was around 91% and *S. tsugae* survival on large caged branches was only 7.1% where the minimum winter temperature in Norfolk dropped to –4.4 ºF in mid-December 2005. In Windsor, the survival of *S. tsugae* was much improved at 73.5 % where the minimum

winter temperature dropped to 1.97 ºF. Recovery of survivors from other large tent cages in other sites enclosing hemlock trunk sections and foliage was poor.

Releases of *S. tsugae* into previously heavily infested stands in Connecticut, in conjunction with weather events such as the impact of recent severe winters and wet, cool growing seasons, have resulted in the greater recovery of hemlocks previously in decline. This continued recovery of previously declining hemlock stands in Connecticut is the first to be documented in eastern states that have been under HWA siege since the early 1990s. The efficacy of the biological control program using *S. tsugae* in Connecticut continues to be justified. Recent data suggest that reintroductions of the predator should become a key component of the biological control program due to variable winter mortality of the predator.

The third project has a goal of enhancing biological control of hemlock woolly adelgid through the development of effective mass rearing procedures for exotic predators. Dr. Cheah, with the assistance of USDA Forest Service technicians Paul Moore, Gregg Bradford and Cuyler Remick, has re-established the original stressed US laboratory colonies and improved mass rearing techniques for 2 other introduced coccinellid species from high mountainous regions in southwestern China, *Scymnus sinuanodulus* and *Scymnus ningshanensis*. Successful small-scale mass-rearing methods for *Scymnus* species were developed by Dr. Cheah and her team at the Insect Rearing Facility of the Northeastern Research Station in Hamden, CT, based on the species' preferences for cooler temperatures for oviposition. Production of *S. sinuanodulus* in 2005 and 2006 was greatly improved by oviposition at 12°C, which prolonged the oviposition period, and subsequent transfer of the eggs to accelerate and complete larval development to adult at 20°C. This method has proved successful for both species and this rearing technology, together with another 500 adults of *S. sinuanodulus*, were transferred to the primary HWA predator mass rearing facility, the Philip Alampi Beneficial Insect Laboratory, New Jersey Department of Agriculture, to facilitate mass rearing for releases in other states. Studies from 2004-2006 have also shown that *S. ningshanensis* does not exhibit peak reproductive ability until the second year after emergence, in spite of the provision of optimal densities of healthy adelgids, photoperiod and temperature. In 2006, around 3,000 *S. ningshanensis* were successfully reared in Hamden, re-establishing a healthy colony. *S. sinuanodulus* are reproductive in the year following their emergence and 1,080 adults were released in an adjoining area of the Centennial Watershed State Forest in Weston, to augment a 2005 release. Another 1,057 *S. sinuanodulus* were also sent for release in southern Pennsylvania, in cooperation with the Pennsylvania Department of Conservation and Natural Resources. In addition, Dr. Cheah has also directed the quarantine investigations and evaluations of new species of coccinellids collected from expanded foreign exploration in China, which were initiated in April 2005 under the biological control initiative. In 2005, 2 new coccinellid species were collected and imported into the USDA FS quarantine laboratory in Ansonia, *Scymnus geminus* and *Scymnus (Pullus) huashanshong* but neither showed a strong oviposition response to HWA at different temperatures and survival was limited on HWA. These species do not appear to be viable candidates for HWA biological control. Shipments from explorations in Japan and China in 2006 have also not yielded any numbers of promising new candidates. Progress was also made toward identifying temperature treatments aimed at reducing the extended duration of egg diapause in a third

species, *Scymnus camptodromus*. Improving the viability and productivity of imported *Scymnus* predator colonies resulting in transfers to other mass rearing insectaries has fulfilled an important objective of the national HWA biological control strategy of the USDA Forest Service. Investigations of new species of coccinellids from Asia for potential biological control of HWA under quarantine laboratory conditions are also integral to research aimed towards establishing a complex of introduced HWA predators.

Major accomplishments of the HWA research program include:

- First to document the recovery of eastern hemlocks statewide, especially in previously heavily damaged, adelgid-infested stands where biological control has been implemented
- In collaboration with Dr. Allen Cohen, have identified an artificial diet which has the potential to stabilize adult colonies of *S. tsugae* in the absence of HWA
- Revived *Scymnus* predator colonies for biological control implementation and improved collaboration and ties with the USDA Forest Service Northeastern Research Station in Hamden, CT

## *Nursery Integrated Pest Management*

Tim Abbey continues to work with commercial nursery growers, and other ornamental plant industries, to promote the adoption of integrated pest management (IPM) practices. During the 2005 field season, three nurseries received intensive on-site assistance with establishment of IPM programs. Pesticide usage records from the cooperative year, in this case 2005, are compared to the year designated as pre-IPM adoption. Overall, insecticide/miticide usage decreased by 4.4 pounds of product. Total active ingredient applied decreased by 6.2 pounds. This translated into a decrease of $57 for insecticide products. (Product and active ingredient results calculated from two grower participants, cost information was from one.) Along with the detailed analysis of the pesticide spray records, participants were asked to complete a post-season questionnaire that allows them to review their collaboration with Mr. Abbey. The Nursery IPM program was rated as "Excellent" (2) and "Good" (1). All of the participants stated that they would recommend the program to other Connecticut nurseries.

The life history study of the rhododendron leafminer (*Lyonetia latistrigella*) by Tim Abbey was extended into 2005 at a model container nursery. Forty-one hoop houses were selected in the nursery. Areas (approximately 250 sq.ft.) were marked with flagging tape at both ends and the middle of each house. The *Rhododendron* sp. in these areas were monitored on a weekly basis from late April through September. Infested leaves were counted and removed each week. The routine monitoring documented the date and location that this pest first appeared in the nursery, along with the corresponding growing degree days. Insecticide applications were applied to target specific insect life stages and areas of rhododendrons rather than cover sprays to entire blocks of plants. The hypothesis that early detection and targeted insecticide treatments will stop a major rhododendron leafminer infestation, and thus, decrease overall insecticide applications, appears to be accurate. There was minimal damage at the end of the 2005 growing

season, but more than at the end of 2004. To finalize the project, a more focused monitoring of select areas, along with observations of infested plants in an enclosed cage; will continue in 2006. At this time in 2006, no damaging leafminer population has been detected.

*Strawberry breeding:* Dr. Richard Cowles continues to make selections for strawberries bred for tolerance to black vine weevil and black root rot. Plants that have passed rigorous selection for these traits are being propagated to assess overall fruit quality and yield characteristics. The best hybrids may be tested in growers' fields in 2007 and 2008.

*Christmas tree insect pest management:* Field research trials continue to fine-tune chemical control of pales weevils, elongate hemlock scale, conifer root aphid, and balsam twig aphid in Christmas tree plantations. The 2005 experiments conducted by Dr. Cowles determined that very early spray timing is essential for minimizing the reproduction of pales weevils in Christmas tree stumps. This year's experiment is designed to optimize the combination of bifenthrin and carbaryl insecticide combination to achieve resistance management and rapid knock down of adults at the lowest cost. Effective chemical options for elongate hemlock scale control were identified in 2005. However, each of the options has drawbacks with respect to cost, difficulty in application, or harm to beneficial predators or parasites. This year's trials are investigating use of products that should have minimal impact on these beneficials. A new option for managing conifer root aphid and balsam twig aphid has been discovered in a large-scale multi-year field experiment. Imidacloprid applied as a broadcast spray to the soil and incorporated with rainfall provides benefit for controlling these aphids and white grubs. The single application of insecticide to the soil prevents the need for foliar sprays of insecticides in the subsequent year to control balsam twig aphids. Avoiding foliar sprays is anticipated to have additional benefits for conserving predators and parasites of spruce spider mites, cryptomeria scale, and elongate hemlock scale.

In collaborative work for managing white pine weevil in Christmas trees, Dr. Cowles provided technical support by identifying weevil samples submitted by extension personnel in NJ. He also chose and obtained the materials, and provided the experimental design and protocol for testing these insecticides against white pine weevil in NJ.

*Annual bluegrass weevil management:* Dr. Cowles is working together with extension personnel in CT, MA, NJ, RI, and NY to develop a research program and survey to improve annual bluegrass weevil management on golf courses. This golf course pest caused extensive injury in CT to greens, collar areas, and fairways in 2005. Populations of weevils from an affected golf course were tested by Dr. Cowles and determined to not be susceptible to field-labeled concentrations of γ-cyhalothrin insecticide. This year's experiments focus on finding non-pyrethroid tools for managing this pest, with an emphasis on biorational products more compatible with the conservation of beneficial predatory arthropods in turf.

*Hemlock woolly adelgid:* Two experiments in Pennsylvania state forests are fine-tuning the use of imidacloprid in soil applications to manage hemlock woolly adelgids.

The greatest environmental risk may be movement in the soil of this systemic insecticide to ground water. Three avenues are available to mitigate this risk: dosage reduction, reformulation of the active ingredient in a manner that will reduce the leaching potential, and improved application methods. The dose-response experiment has demonstrated that the optimal dosage of imidacloprid is not proportional to the trunk diameter (the current label instructions). However, the logarithm of the dosage is proportional to the trunk diameter. Small trees could be effectively treated at lower dosages than on the current label instructions, but trees with trunk diameters greater than 30 inches cannot be adequately dosed in one year. Based largely on Dr. Cowles' trials in Connecticut, soil application of imidacloprid has become the treatment method of choice for controlling hemlock woolly adelgid. Arborists from New Hampshire to Georgia have adopted soil-based application, including staff from the Greater Smoky Mountains National Park. Dr. Cowles developed best management practices guidelines with USDA Forest Service, university, and Bayer scientists for the soil application of imidacloprid for suppression of hemlock woolly adelgid in forests. This document is in conjunction with a new Section 24c use of imidacloprid to save critical hemlock forests from destruction by adelgids in the southern Appalachian Mountains.

*Indoor Fungi Studies*: Dr. DeWei Li conducted research on indoor molds of human health concern, fungal succession on building materials, and infiltration of mushroom spores outdoors into residences.

*Airborne fungi*: Dr. Li is collecting both indoor and outdoor air samples in Avon on a weekly basis. This is a long-term study started from fall 2004 to measure the airborne fungal concentration and compositions (types of fungi) in Connecticut, to establish the baseline of exposure of residents/occupants to airborne fungi in CT, and to determine seasonal and diurnal patterns of airborne fungi, and at the same time to determine the relationship of airborne indoor fungi with outdoor ones. The samples are under analysis and sampling continues. Currently, thresholds of fungal exposure levels are not available in Connecticut and in the United States at present due to a lack of long term research and the presence of huge of geographic, seasonal, and diurnal variations of airborne fungi. This study is imperative to determine the human exposure level of airborne fungi in Connecticut and the predominant airborne fungi in the area. Such data are useful to determine the effects of airborne fungi on public health.

*Fungal succession on building materials*: Two batches of samples were taken and analyzed for type of fungus the extent of colonization. The data indicate that the severity of water damage had effects on the fungal composition on the wall units. More diverse fungal populations developed on the wall units with increasing water damage. Some studies showed that the fungal species of *Penicillium* and *Aspergillus* will be the predominant species at early stage of water damage. However, species of *Penicillium* and *Aspergillus* were not the predominant species at early stages of water damage in the present study. These results are not in agreement with current indoor air quality professionals. These data are crucial to the IAQ industry and public health professionals for rating water damage.

A pilot aeromycological study in greenhouses is being conducted to determine the relationships of airborne fungi (potential exposure levels) with foliar fungi, crops and production practice in two greenhouses in CT. Sampling is being carried out on a monthly basis starting in January, 2006. Results obtained will help the greenhouse industry to understand airborne fungal populations and compositions and their significance to occupational health and crop health, for example, *Trichoderma harzianum* and *Botrytis cinerea*.

*Tobacco pathology*: The breeding program to develop resistance to tobacco pathogens in Connecticut, including *Fusarium oxysporum* (the fungal pathogen causing Fusarium wilt of broadleaf tobacco); *Globodera tabacum tabacum* (the tobacco cyst nematode); tobacco mosaic virus, and the blue mold pathogen (*Peronospora tabacina*) is continuing for both shade and broadleaf tobacco types under the direction of Dr. James LaMondia. The development and deployment of resistant plants is the most effective, economical and environmentally safe means of managing disease. Approximately 25 lines each of shade and broadleaf tobacco were grown and evaluated under field conditions in 2005. After a tobacco free period to eliminate blue mold, an additional generation of 20 shade and 20 broadleaf lines was grown in the greenhouse during the winter of 2005-2006 to reduce the number of years required to release resistant lines to growers.

Fusarium wilt increased in severity during the 1980's and early 1990's, causing up to 20% crop losses on broadleaf tobacco. The development and release of wilt-resistant broadleaf cultivars has avoided at least $5 million per year in losses due to this disease each year since 1992. Production of CAES wilt-resistant cultivars has reduced spread of the pathogen and kept infested fields in production without soil fumigation. All advanced shade and broadleaf lines under development in the breeding program continue to be screened in the field for high levels of resistance to wilt.

The tobacco cyst nematode decreases shade tobacco growth and leaf yield directly (losses of up to 15%) and indirectly affects broadleaf tobacco as a component of the Fusarium wilt complex. Dr. LaMondia transferred single gene resistance to *G. t. tabacum* to shade and broadleaf tobaccos using both a pedigree breeding program with repeated backcrossing to Connecticut types as well as a bulk system of modified single seed descent. Approximately 900 progeny of BC9 to BC12 or F1 hybrid crosses were evaluated for nematode resistance and/or horticultural characters in the field and in greenhouse tray evaluations. Leaf quality evaluations were conducted on advanced lines in cooperation with growers in 2004 and limited quantities of seed were made available to growers for cooperative field evaluation under commercial conditions. Tobacco cyst nematode shade tobacco lines are being crossed with blue mold-resistant parents to select for resistance to both pathogens. In field evaluations, these resistant lines reduced tobacco cyst nematode populations by 60 to 80%, similar to the effects of soil fumigation with a broad spectrum nematicide. The deployment of TCN-resistant cultivars would reduce human health risks, reduce environmental exposure to large amounts of fumigant nematicides and be more effective than soil fumigation while eliminating costs of approximately $500 per acre.

Single dominant gene resistance to tobacco mosaic virus is present in many of these lines. Evaluation and selection for TMV resistance is conducted on all field-grown progeny. In 2002 to 2005, TMV infection resulted in significant commercial losses ($3 million to $5 million) due to green spot symptom development on susceptible shade and broadleaf tobacco leaves. Our research demonstrated the association of green spot with TMV infection, and determined that plant resistance was the single most important factor for reducing green spot disease. Grower lines were evaluated for resistance to TMV and large amounts of seed of homozygous TMV-resistant shade and broadleaf tobacco produced at the Valley Lab were distributed to growers to reduce losses from virus infection. This seed will avoid large economic losses due to TMV.

Blue mold, caused by *Peronospora tabacina,* has been a recurring problem on tobacco in the Connecticut River Valley from 1997 through 2004, causing losses up to the tens of millions of dollars annually. The development and use of better spray technology, timing of applications, and grower education has greatly reduced blue mold severity in recent years. Tobacco lines with resistance to blue mold were collected from different sources and evaluated for blue mold resistance under field conditions in Windsor. Two shade tobacco lines developed by the USDA in the 1960's, line numbers 509 and 292-393, were promising sources of adapted resistance and have been used as parents in crosses to Connecticut shade tobacco types. A Cuban dark tobacco accession, H2000, was found to be virtually immune to blue mold infection and is also being used as a resistant parent in crosses to Connecticut broadleaf tobacco. Blue mold resistance breeding in shade and broadleaf is being attempted through the selection of resistant inbred lines and the development of male-sterile Connecticut types to allow the production of F1 hybrids between resistant and susceptible shade tobacco and resistant and susceptible broadleaf tobacco. Male sterile lines are being developed to allow production of F1 hybrid blue mold resistant seed. Blue mold incidence was compared between susceptible commercial varieties and resistant lines. Over 5 pickings in 2004, susceptible 8212 tobacco had a total of 360 blue mold lesions per plant while several promising advanced breeding lines had 0 to 11 lesions per plant.

Six advanced F1 male-sterile hybrid broadleaf lines and five advanced F1 male-sterile hybrid shade tobacco lines were distributed to growers for commercial evaluation during the 2006 season. If lines appear to have potential for commercial production, seed will be increased and tested again on a larger scale in 2007. The use of plant resistance would have a large impact on disease management, the environment, and human health.

Fungicide applications were evaluated for efficacy of blue mold control in shade tobacco in Windsor, CT. Acrobat MZ, Actigard, and Quadris fungicides were applied at 14-day intervals to shade and broadleaf tobacco plants in small plots. Actigard resulted in fewer blue mold lesions per leaf than Acrobat MZ (1.0 to 2.5 lb./acre) or Quadris (0.24 or 0.48 pt/acre) and was active at rates as low as 0.03 oz/acre Actigard when applied in combination with Acrobat MZ or Quadris. All fungicide applications resulted in significantly less disease than untreated controls. Actigard, a systemic acquired resistance elicitor, appears to act synergistically with fungicides to increase fungicide efficacy at very low rates. This synergy may greatly increase fungicide efficacy while reducing the amount of total fungicide applied.

The tobacco cyst nematode (TCN), *Globodera tabacum tabacum*, is a damaging pathogen of broadleaf cigar wrapper tobacco. Broadleaf is a stalk-cut tobacco type

typically harvested 55 to 65 days after transplanting. Growers commonly stagger planting over a period of several weeks and harvest over a similar, staggered time frame. A common practice has been to leave cut stalks in the field until an entire field or farm is harvested. The fields are then tilled and planted to a winter cover crop. We performed experiments over several years to determine cyst nematode populations after immediate tillage to break up roots compared to leaving cut stalks and roots in the field from 2 to 6 wks after harvest before tillage and planting to a cover crop. Plots tilled immediately after harvest had consistently lower final TCN populations ($P \leq 0.02$ to 0.0003) and Pf/Pi ratios when compared to plots with delayed tillage 2 to 6 wk after harvest. Final TCN densities in soil after immediate tillage ranged from 64% to 18.5% of densities after tillage 2 wk or 6 wk after harvest, respectively. A factorial experiment with Nemacur or no Nemacur and early (immediately after harvest) or late tillage (5 wk later) demonstrated that both nematicide and tillage timing affected TCN final populations in soil. There were no significant interactions. When tillage of stalks and roots is delayed until harvest is complete on an entire field or farm, it allows late first generation or early second generation females to develop. Timely destruction of roots slows the increase of *G. t. tabacum* to damaging levels in soil (Pf/Pi ratios ranged from 0.65 to 2.21 after immediate tillage compared to 1.0 to 6.78 for later tillage) and reduces the need for chemical management to avoid yield loss. This may save growers the expense of soil fumigation and protect the environment by reducing the application of broad-spectrum fumigants to soils.

Tobacco mosaic virus is a common and important pathogen of cigar wrapper tobacco. The disease has recently been successfully managed by the incorporation of genetic resistance derived from *Nicotiana glutinosa* into the most widely grown shade and broadleaf tobacco cultivars. This resistance is conferred by a single dominant gene (*N* locus) that results in a hypersensitive local lesion reaction. However, recent genetic drift and selection for size has resulted in the loss of TMV resistance in most grower selections. Recent TMV epidemics in flue-cured and other tobacco types have resulted in increased incidence of inoculum present in many tobacco products. The combination of widespread TMV inoculum and an inadvertent loss of TMV-resistance in two of the most widely-grown wrapper-tobacco cultivars in the Connecticut River Valley resulted in severe losses due to TMV symptoms on tobacco in the field and green spot on cured leaves in 2004 and 2005. TMV resistance is temperature dependent and has been reported to fail at temperatures above 28C. The effects of TMV infection on TMV infection of resistant plants under hot summer weather conditions (at temperatures greater than 28C) in shade tents had not been determined. We conducted experiments to determine i) whether TMV was associated with green spot on cured leaves of non-symptomatic wrapper tobacco, ii) the effects of plant resistance on green spot incidence and severity, and iii) the effects of temperature and inoculation on the development of TMV on resistant or susceptible tobacco plants in the field and green spot on cured leaves. Fresh tobacco leaf tissue was tested for TMV using a commercially available double antibody sandwich enzyme- linked immunosorbent assay (DAS alkaline phosphatase ELISA) kit for the common strain of TMV.

The proportion of TMV-inoculated near-isogenic tobacco lines resistant or susceptible to TMV with green spot symptoms (1 or more green spots per leaf) on cured leaves was greater for TMV-susceptible plants than for TMV-resistant plants. The

differences between TMV-susceptible and resistant plants were even greater when the proportion of cured leaves with severe green spot (>25 spots per leaf) were compared. Susceptible plants had nearly 10 times the leaves with severe symptoms. When tissue was tested for virus titer, resistant plants were not found to contain the virus except for the parts of the leaves which were inoculated. In contrast, TMV spread quickly through susceptible plants. In experiments where plants were held at constant temperatures above 82 F, resistance was no longer expressed in resistant plants. However, in field experiments under hot daytime conditions but cooler night temperatures, resistance continued to be expressed and virus particles did not spread throughout the plant. Plant resistance remains the single most important means of managing TMV in commercial wrapper tobacco crops.

*Weed research:* Dr. Todd Mervosh conducts research on weed management in a variety of crop systems and at non-agricultural sites. In the past year, his projects included weed control experiments in ornamental plants grown in containers, Christmas trees, and pumpkins. These experiments were conducted at the CAES Valley Laboratory in Windsor and/or in growers' fields or nurseries. Dr. John Ahrens is a research partner in some experiments involving ornamentals and Christmas trees. In addition, Dr. Mervosh is conducting experiments to find effective and environmentally sound methods to control the following invasive plants: common reed (*Phragmites australis*) in marshes, Oriental bittersweet (*Celastrus orbiculatus*) vines in a woodland, pale swallowwort (*Cynanchum rossicum*) in a coastal ecosystem, and shrub honeysuckle (*Lonicera* sp.) in a shoreline community. Krystle Olszewski and Dorothy Reiss assisted with projects during the summers of 2005 and 2006.

*Nursery ornamental weed control:* Liverworts (*Marchantia* sp.) are troublesome weeds in container-grown nursery stock, especially in propagation houses and greenhouses. They form dense mats on potting media surfaces and are very difficult to remove. Liverworts are bryophytes and unaffected by most herbicides used to prevent weed seedling emergence in containers. The federal IR-4 Ornamental Crops program has placed a high priority on evaluating plant tolerances to quinoclamine, a compound known to provide control of liverworts, mosses and algae. Quinoclamine (Mogeton WP) has been used for many years in some European countries and Japan, but is still under evaluation by the U.S. EPA. In addition to Mogeton sprays, we also evaluated a granular product (TerraCyte) containing sodium carbonate peroxyhydrate as active ingredient. TerraCyte is already registered for use as an algaecide/fungicide that also has activity on liverworts and mosses. The experiment was conducted in the spring and summer of 2005 in a propagation house at a large Connecticut nursery. TerraCyte and Mogeton treatments were effective in controlling liverwort. TerraCyte injured the foliage of some plants, whereas Mogeton caused no visible injury at the proposed application dosage, and in most cases, no injury at four times the normal dosage. If approved by EPA, Mogeton demonstrates excellent potential as a liverwort control agent for nurseries and greenhouse growers.

At the IR-4 Ornamental Horticulture Workshop in 2003, high priority was placed on obtaining data needed to expand labels for preemergence herbicides to include additional

herbaceous perennials. We conducted experiments in 2004 and 2005 to evaluate several ornamental perennials for their tolerances to herbicides not currently registered for use on these plants. The following herbicides were included: *s*-metolachlor sprays (Pennant Magnum 7.62L), pendimethalin granules (Pendulum 2G), and isoxaben plus trifluralin granules (Snapshot 2.5TG). Herbicide treatments were applied over the top of plants at up to four times the labeled dosage, and all treatments were applied again 8 weeks later. In this way, plant tolerances are tested under a worst-case scenario. Some plants were highly tolerant of one or more of the herbicides evaluated. The IR-4 program will submit this information to the EPA and to the manufacturers of these herbicides, who will then consider changes to the herbicide labels. The eventual result is that nurseries will have additional weed control options for the wide variety of plants they grow.

The granular herbicide BroadStar 0.25G was registered for use in 2003. It is being used by several nurseries in CT to prevent grassy and broadleaf weeds in containers and field plantings. BroadStar controls weeds at much lower dosages than other herbicides used by nurseries, but it has a more limited label in terms of the list of tolerant ornamental species. Only specified woody plants are tolerant of BroadStar. In most cases, nurseries apply preemergence herbicides as soon as possible after plants are potted, prior to emergence of any weed seedlings. Plants tend to be more susceptible to herbicide injury right after they are transplanted. The objective of this experiment was to determine if delayed application of BroadStar (by 1 or 2 weeks after planting) would reduce the injury to plants sensitive to this herbicide and also efficacy against weeds. Dwarf burning bush (*Euonymus alatus* 'Compactus') was tolerant of all BroadStar treatments and application timings. However, spirea (*Spiraea x bumalda* 'Goldflame') was injured by BroadStar when applied right after transplanting, but the injury was much less severe when the application was delayed by 1 or 2 weeks. Weed control was not significantly affected by treatment application timing.

*Weed Management in Pumpkins:* Herbicide options for pumpkins were evaluated in 2005 in experiments conducted at the CAES Valley Laboratory in Windsor. Pumpkin seeds were planted by hand on June 30 in freshly tilled sandy loam soil containing about 2% organic matter. The experiment included two pumpkin varieties ('Howden' and 'Spooktacular') that were planted in alternating plots. Treatments included an untreated check and a hand-weeded check. The following preemergence (PRE) treatments were applied: ethalfluralin [Curbit 3EC] (1.125 lb/A ai), clomazone [Command 3ME] (0.5 lb/A ai), ethalfluralin + clomazone [Strategy] (0.4 + 0.125, 0.8 + 0.25, or 1.2 + 0.375 lb/A ai)], and ethalfluralin (1.125 lb/A ai) + halosulfuron [Sandea 75DF] (0.25 or 0.5 oz/A ai). Halosulfuron was also applied as postemergence (POST) treatments. In these plots, ethalfluralin (1.125 lb/A ai) had been applied preemergence to prevent annual grasses. Postemergence halosulfuron treatments (0.25 and 0.5 oz/A ai with 0.25% non-ionic surfactant) were applied at "early POST" or "late POST" timings. Also applied on July 16 was a treatment containing the herbicides halosulfuron (0.5 oz/A ai) + sethoxydim [Poast] (0.19 lb/A ai) to control emerged weeds in plots that did not receive any preemergence treatment.

The primary weeds in the field were large crabgrass (*Digitaria sanguinalis*), redroot pigweed (*Amaranthus retroflexus*), purslane (*Portulaca oleracea*), common lambsquarters (*Chenopodium album*), carpetweed (*Mollugo verticillata*) and yellow

nutsedge (*Cyperus esculentus*). The best overall weed control was provided by Strategy at the highest dosage and the Curbit + Sandea PRE treatments. Yellow nutsedge was only controlled in plots in which Sandea was applied. Sandea was effective on yellow nutsedge at all application timings and doses.

Halosulfuron was the only herbicide to cause significant injury to pumpkins. Slight stunting and chlorosis occurred when halosulfuron was applied PRE, more injury resulted from early POST treatments, and the most severe injury occurred on pumpkins sprayed with late POST halosulfuron treatments. Injury was directly related to halosulfuron application rate, but was most dependent on application timing. Most injured plants recovered well, except for the pumpkins receiving the late POST halosulfuron treatments. As expected, the lowest pumpkin yield was harvested from the untreated (weedy) check plots. The highest pumpkin yields were obtained from plots treated with Strategy at the medium and high dosage.

*Invasive Plant Management:*

Phragmites (common reed; *Phragmites australis*) is a very tall member of the grass family (Gramineae). It is a perennial that spreads aggressively via rhizomes to form large monotypic colonies, primarily in wet soils. Phragmites is a widespread problem in wetlands and marshes because it is highly invasive and displaces many native plants in these habitats. Very few plants can compete with a dense stand of phragmites that can reach heights of 14 feet. Phragmites is very difficult to control. Mowing or cutting a stand of phragmites provides only temporary suppression of this invasive plant. Three herbicides that are approved by EPA for weed control in wetlands and aquatic sites have demonstrated potential for control of phragmites.

Dr. Mervosh, in cooperation with David Roach of All Habitat Services LLC (Madison, CT), is conducting phragmites control research at two sites in CT: Laurel Marsh in Manchester (a freshwater marsh) and Ayer's Point Marsh in Old Saybrook (a brackish marsh - primarily freshwater with some salt water influx with the tides).

Dr. Mervosh began this study in 2004. Herbicide treatments consisted of various dosages and combinations of Rodeo (glyphosate) and/or Habitat (imazapyr), and were applied in June, August and October. Plots were evaluated throughout 2004, and final ratings of phragmites vigor, stem density and height were taken in the summer of 2005.

In general, the August 2004 application timing was the most effective in that all the treatments reduced phragmites by more than 90% at 1 year after treatment. Treatments applied in June suppressed phragmites growth for the remainder of 2004, but significant re-growth occurred in most plots in 2005. June treatments that contained Habitat at dosages of at least 1 qt/acre were most effective at reducing phragmites in 2005. Because a significant frost had occurred in early October, the October treatments were applied later than the optimal fall timing for phragmites. Thus, these treatments were not as effective as expected.

Dr. Mervosh is working in cooperation with David Gumbart of The Nature Conservancy on a project partially funded by the Long Island Sound License Plate Program, administered by the Connecticut Department of Environmental Protection, Office of Long Island Sound Programs. The project began in 2003. The primary focus is to conduct research on control of the non-native invasive plants Oriental bittersweet

(*Celastrus orbiculatus*) and pale swallowwort (*Cynanchum rossicum*) at Bluff Point State Park and Coastal Reserve in Groton, CT, and to remediate specific areas impacted by these invasives. These plants threaten the health of ecosystems at this coastal location and in many other areas throughout North America. By obtaining data on the efficacy of various treatments, the scientists hope to improve conditions for native vegetation at Bluff Point and provide information for other projects intended to manage these invasive plants.

Oriental bittersweet is a woody vine that wraps around and climbs trees and grows over other vegetation. Bittersweet vines are widespread in parts of the forested section at Bluff Point and are adversely affecting trees and shrubs. Pale swallowwort is an herbaceous perennial in the milkweed family. Swallowwort, a relatively recent invader at Bluff Point, is outcompeting two rare native plants [yellow thistle (*Cirsium horridulum*) and Scotch lovage (*Ligusticum scoticum*] along the shoreline, particularly the cobble beach habitat just above the high tide line. Research was conducted over a 3-year period. Experimental treatments were applied in 2003 and 2004, and data were collected through 2005.

For Oriental bittersweet, vines were tagged in two size classes: diameters of 15 to 25 mm ("small") and diameters of 26 to 40 mm ("large"). Vines were measured and treatments were applied to vines between 15 and 30 cm above ground. Each treatment was applied randomly to ten vines (five small and five large) at each of three timings (May, August, November) in 2003, and similarly to a different set of vines at the same timings in 2004. Herbicides were applied undiluted with a paint brush. Basal-bark (BB) treatments consisted of 1.5 ml of herbicide applied uniformly to the lower bark of uncut vines. Cut-stump (CS) treatments consisted of 0.75 ml of herbicide applied to the stump surface of freshly cut vines. Eight treatments were applied: BB untreated (uncut check), BB triclopyr ester (61.6% ai), BB triclopyr ester (13.6% ai), CS untreated (cut check), CS triclopyr amine (44.4% ai), CS triclopyr amine (8% ai), CS glyphosate (41% ai), CS glyphosate (25% ai). Vines were evaluated in the summer of the following growing season. CS herbicide treatments were generally more effective than BB treatments, especially when applied in November 2004. All CS treatments with either triclopyr or glyphosate were effective in reducing vine survival (77 to 93% mortality) and number of sprouts from stumps or roots (91 to 99% reduction).

For pale swallowwort, 1.83 x 3.05 m plots were established in areas of high infestation along the cobble beach. Treatments (RCB design with three replicates) applied to plots in July 2003 and again in August 2004 included hand pulling, cutting, application of glyphosate (20.5% ai) or triclopyr amine (22.2% ai) to cut stems, and foliar sprays of glyphosate (0.82% ai) or triclopyr amine (0.89% ai). Plots were evaluated for percent area covered by swallowwort, swallowwort vigor, and presence of other vegetation. By July 2005, glyphosate foliar sprays and cut-stem treatments with glyphosate or triclopyr caused the greatest reduction in the amount of swallowwort, and the glyphosate spray treatment was most effective in reducing swallowwort vigor. Triclopyr foliar sprays caused temporary injury but swallowwort recovered, and long-term control was no better than that provided by hand pulling or cutting once per year.

There are a number of non-native, invasive honeysuckle (*Lonicera*) species in Connecticut. Honeysuckle shrubs have spread widely in a parcel of wooded land owned

by The Nature Conservancy (TNC) near Black Point Beach in East Lyme. This project was conducted by Dr. Mervosh in cooperation with David Gumbart of TNC. Honeysuckle shrubs were tagged and then cut and/or stump-treated with various herbicides on August 17, 2005. For each shrub, a saw was used to cut off each stem 6 to 12 inches above ground level. Herbicide treatments (diluted in water) were applied to cut surfaces with a paint brush within a few minutes after cutting. Treatments included Roundup Pro (glyphosate) 10% or 50% solution, Garlon 3A (triclopyr amine) 10% or 50% solution, and Garlon 4 (triclopyr ester) 10% or 50% solution.

On May 18, 2006, the honeysuckle shrubs were evaluated for new growth. Shrubs that had not been cut at all averaged 7 ft tall and 8 ft wide. Stumps that had been cut the previous August, without herbicide treatment, produced 25 to 80 new sprouts that were an average of 16 inches long. No sprouts were found on any of the stumps treated with Roundup Pro; these stumps appeared to be dead. Stumps treated with a 10% solution of Garlon 3A or Garlon 4 had at least 2 new sprouts per stump, but these sprouts were generally stunted and exhibited triclopyr injury symptoms. Most stumps treated with a 50% solution of Garlon 3A or Garlon 4 had no new sprouts, but there were a few that did have some stunted and distorted sprouts. Garlon 3A treatments were somewhat more effective than Garlon 4 treatments in preventing new sprout formation. But glyphosate (Roundup Pro) treatments were completely effective in preventing new growth the following spring.

*Christmas Trees*. In 2000, Mr. Rathier began a long-term experiment to determine how much nutrition Christmas trees get from the soil they are planted in compared to how much they get from applied fertilizers. Several plantations in Connecticut successfully grow trees with no annual applications of fertilizer though it may take them longer to grow. Forestry research suggests that uptake of fertilizer applied nutrients is slight compared to what trees get from native soil. But the slight extra nutrition that trees obtain from fertilizer nutrients may be enough to maintain quality color and reach salable size a year or more sooner. Therefore, plots have been established at the Valley Laboratory for a ten-year experiment. Uniformly high quality, 4-year-old Fraser fir transplants were planted at ten foot spacing, which will allow for annual root pruning between plots to limit root growth into adjacent plots. One treatment will receive no fertilizer for ten years. Others will receive the following annual treatments that began in 2002: phosphorus and potassium only; nitrogen, phosphorus and potassium (NPK) applied in the spring; NPK applied in the fall; and NPK applied in the spring along with a second application of N only in the fall. Every 2 years, 4 trees from each treatment will be cut, chopped and analyzed for nutrients. During the summer of 2003, visual color differences were observed between trees receiving N (darker green) and those that have not received N (lighter green). The first set of trees to be harvested for analyzes were cut in December 2003 and the second set in December 2005. Fresh and dry weight data did not differ between treatments. Additional harvests are planned every 2 years until the trees reach maturity. Results of this experiment could impact the industry by helping growers realize the fertility values of their soils, possible avoiding over fertilization.

In 2000, Mr. Rathier established a Christmas tree transplant survival experiment at the Valley Laboratory. With droughty springs and/or summers occurring in three out of the last five years many Christmas tree growers have experienced substantial transplant losses that may be reflected in a shortage of mature trees in seven or eight years. Since most tree plantations cannot be easily irrigated, bare root transplants are greatly susceptible to drought problems and growers are looking for strategies or products that may assist in survival. Products such as biostimulants, mycorrhizal fungi and planting gels are currently being used to improve transplant survival in the landscape and arborist industries. The volume of roots may also play a role in survival, so the Fraser fir transplants in this experiment were graded into 2 categories – good and poor. Each root grade group was planted with one of the following transplant survival products: biostimulant; mycorrhizal fungi; planting gel; a combination of all three products; and no treatment. In July 2002, one tree was removed from each plot and evaluated for root quantity and quality. The only effect noticed was that the trees with greater root volumes at planting were the most vigorous and continued to have the greatest root volumes. No effects were observed due to any of the supplemental treatments. Similar results were observed with the second harvest in 2003. The 2004 harvest revealed similar results. Two trees will remain in each plot to grow to salable size. Enough room was left in this experiment to make a second planting in spring, 2002 in cooperation with Dr. Cowles. Instead of grading by root volumes, however, the trees were graded based on whether or not they had their root systems injured by white grub feeding. The same evaluation criteria will apply to these trees.

The Impact of transplant survival experiments should be to help growers optimize survival and avoid costly replanting and losing time in production areas.

*Tobacco.* One shade tobacco grower in the valley is growing the crop under plasticulture (e.g. plastic film mulch for weed control and leaching management and drip irrigation for water and nutrient management). This method is appropriate for Connecticut tobacco but is complicated by the fact that the quality of our crops is linked to the traditional use of natural sources of nitrogen such as cottonseed meal or castor pomace. Conventional culture allows for the application of these meal types of fertilizers prior to planting and in side-dressings throughout the first 30 days after transplant in the field. Formation of raised beds and installation of the drip irrigation and plastic mulch limit the use of meals to the preplant period only. Determining how much meal to add in advance and its rate of mineralization under the plastic is a significant challenge. Additionally, amounts and timing of supplemental nitrogen applied through the drip irrigation needs to be determined.

Since 1997, Mr. Rathier has been conducting studies at shade tobacco farms in Suffield and West Suffield, CT. The findings thus far are 1. The plastic mulch speeds up the N mineralization rate by 2-3 weeks, depending on the weather. In years with unusually high rainfall amounts and cool soil conditions, the plastic mulch actually slows down N mineralization. 2. The timing of supplement N applications should mirror the N needs of the plants but be advanced by about 2 weeks; 3. Applying twice as much meal fertilizer than normal does not improve N availability or yield or leaf quality. 4. Applying no meal fertilizer in advance reduces N availability, yield and leaf quality; 5. Eliminating supplement soluble N addition reduces yield and leaf quality but not N

availability. 6. No difference was observed among different N treatments when soil texture was variable. 7. The actual amounts of supplement soluble N needed at any one time are far less under plastic. This study will continue for a few more years to work out all the possible variations of preplant and supplemental nitrogen and their affects on yield and quality. The major impact of this experiment will be to help growers reduce losses of nitrate nitrogen and other solutes to ground water, reduce fertilizer costs and improve the ability to grow a uniform crop.

## SERVICE ACTIVITIES

*Requests for information:* A total of 8,517 inquiries were answered at the Valley Laboratory during the past year. The majority of these queries (62%) were answered by Mr. Thomas Rathier (5,296), assisted by Mr. John Winiarski (853) and Ms. Rose Hiskes (388) in the inquiry office, and by Drs. LaMondia (10%), Cowles (5%), and Mervosh (5%). About 60% of the requests for information were from the public sector; the remainder was from commercial growers and pest control operators. Inquiries by subject category were as follows: arthropod pests (21%); plant diseases (10%); general horticultural information (26%); soil fertility and water issues (26%); pesticide use (10%); weed control (4%); mammals, birds and reptiles (2%); and others (1%).

Continuing concern among tobacco growers over the blue mold epidemic in the Connecticut River Valley spawned a large number of inquiries to Dr. James LaMondia and Thomas Rathier. Dr. LaMondia initiated and maintained the Connecticut River Valley Blue Mold Web Site to keep tobacco growers current with the progress of the disease in North America, and the potential exposure and management options in the Valley. He also obtained Section 18 registrations for Quadris and Acrobat MZ fungicides for control of blue mold in shade tobacco.

*Inquiry office perspective: Commercial agriculture:*

Mr. Rathier made 52 field visits to commercial and municipal fields, nurseries, greenhouses, Christmas tree farms, forests and private landscapes to diagnose complex problems firsthand. Some problems were solved during the visits but many required taking plant and soil samples for laboratory analyses and subsequent reports to the growers. Most of the inquiries from commercial agriculture came during grower visits to the diagnostic lab or during phone calls.

Many diagnoses were centered on plant responses to weather conditions. The 2005 growing season was a year of oddities and extremes. There were nearly 30 days during the summer during which the temperatures exceeded 90F and nearly 20 inches of rain fell during 10 days in October. The hot summer was accompanied by significant drought conditions that further stressed crops. Annual crop yields were reduced and woody crops were similarly threatened. Many large trees in parks, golf courses and commercial landscapes required substantial pruning or even removal in 2006 due to the drought. Many weakened trees have succumbed to vascular wilts such as Verticillium and Dutch elm disease and various borers.

Newly planted and mature Christmas trees were significantly stressed during the droughty 2005 growing season. Fall 2005 saw some recovery and the 2006 spring planting season was generally favorable although excessive rainfalls in each season may have adverse affects where soil conditions don't favor good drainage. White pine weevil, Pales weevil, spruce spider mites and elongate hemlock scale were the insect pests most often reported. Needle diseases (Rhabdocline and Rhizosphaera needlecasts and spruce needle rust were the most reported problems.

Comparatively little winter injury was observed on overwintering woody plants in production settings although some desiccation injuries occurred on broadleaf evergreens and conifers. Growers of woody and herbaceous plants in containers outdoors were faced with irrigation water shortages that limited leaching capabilities resulting in elevated soluble salt levels in potting media. Most plants over wintering in white plastic covered hoophouses or other structures made it through the winter with very few injuries. Freeze and frost injuries and subsequent bacterial or fungal blights and leaf spots resulted in significant losses, especially in lilacs and rhododendrons. Continued cool and wet conditions in Spring 2006 hampered nutrient release from slow release fertilizers resulting in some off color new growth.

Greenhouse growers experienced a bright though difficult to heat late winter season but cool, dark conditions during the spring resulted in root diseases such as Pythium and foliar diseases, especially Botrytis blight. The marketing season for bedding plants was marred by several rainy, cold weekends which limited sales.

Golf courses and turf farms saw drought related problems during Summer 2005 and foliar and root diseases throughout the cool, moist fall. Forage crops grew slowly during the drought and most growers were hampered by rains with the hay harvest on time in June 2006. Silage crop harvests were reduced in 2005 as wet conditions made storage of harvests difficult. Spring planting in 2006 was hampered by continuous rains.

Small fruit harvests were below average during the 2005 season, with droughty conditions causing significant yield reduction. Spring 2006 saw very little frost damage to strawberries but difficult conditions for harvesting and yields were average.

Vegetable growers near continuous irrigation and had only modest harvests in 2005. Bacterial spot and wilt diseases continued to plague peppers and tomatoes. Growers using plasticulture or row covers saw fewer problems despite a colder than normal start. The planting season in 2006 was plagued by prolonged by cold, wet soil conditions. Many growers had to replant fields.

Tobacco acreages did well in 2005 thanks to prolonged warmth and dry conditions. Blue mold appeared very late in the season with nearly no affect on yields thanks to greater attention to fungicide spray coverage and the widespread use of the fungicide Acrobat. Most broadleaf tobacco growers experienced significant curing losses as wet conditions in late summer kept harvested tobacco from drying properly in sheds. Ordinary insect problems, such as budworms and aphids were present in many fields.

The transplant production season in spring 2006, as was the case in the three previous seasons, was hampered by significant periods of cool, dark conditions, which limited rapid growth in the greenhouse. Also present in spring 2005 was black root rot (*Thielaviopsis basicola*) and root rots caused by *Pythium* and *Rhioctonia* resulting substantial losses of transplants. Presently, no fungicide is registered for management of this disease but growers can successfully use cultural methods to manage the disease.

## Commercial and Home Landscapes

As with commercial agriculture, weather conditions throughout the bulk of 2005 were hot and droughty and nearly all landscape plants were severely stressed. Conditions in Spring 2006 were somewhat favorable but desiccation problems, especially to conifers like arborvitae were numerous and like to persist. Plants installed in landscapes in Spring 2006 have seen reduced stress so far.

Vascular wilts, most commonly caused by Verticillium were diagnosed in many different woody plants but most commonly in maples. More than likely the infections were made worse by the droughty conditions of previous seasons. Despite the moist conditions, many trees will continue to fail well into 2005.

Home landscapers reported significant difficulties transplanted trees and shrubs, due mostly to the lack of rainfall throughout the 2005 growing season. Transplant shock or failure remains the single most important cause of losses in landscapes. In some cases, field dug shrubs and trees did not have enough roots to support the transplant and soil conditions did not allow timely growth of new roots. Container grown plants may have had too many roots that didn't allow the plant to grow new roots until too late. The highly porous conditions of container growing media create conditions were root growth dominates the space within the container and the plants do well while under daily irrigation. But once that root ball is placed in a typical landscape soil, its needs are no longer met. The plant lives on the carbohydrate reserves in the roots and stems and often do not grow new roots. Landscapers and homeowners need to take better care to prevent or limit this condition.

Home landscapers with frequent irrigation habits reported many cases of slime molds growing on mulches, especially wood chips or locally produced bark mulch that contained large amounts of wood. The presence of wood in the mulch allows the mold fungi to grow more rapidly and the moist conditions of regular irrigation created the ideal environment for growth. Artillery fungus that "shoots" spore cases towards light colors such as structures and vehicles, also grow well in these conditions and was widely reported.

Also a result of previous dark, moist growing seasons, algae and lichens were reported on a variety of surfaces including trees, paved areas, bare soil, roofs and siding. Frost and freeze related problems were observed on an assortment of plants in June 2005.

Hemlock woolly adelgid has begun to rebound somewhat after three difficult winters in a row. Cool moist conditions in the 2004 growing season and a moderate winter of 2004-2005 allowed many hemlocks to recover and grow more vigorously. Also plaguing hemlocks and other conifers were elongate hemlock scale and spruce spider mites.

Gypsy moths were quite prevalent in several areas around the state, the result of dry conditions in June 2005. Sprays were typically not needed but homeowners and landscapers are being cautioned to scout for egg masses in the coming winter and to be prepared to spray next year. Spring 2006 conditions favored the return of natural controls. Also observed in Spring 2006 were forest tent caterpillars.

Other arthropods of note during the throughout 2003 were white pine weevil and Pales weevil. Hard pines were once again infested with European sawflies, tip moths and pine shoot moths. Leafhoppers, lace bugs, arborvitae leaf miners were more plentiful and significant defoliation by assorted caterpillars and sawflies was observed on deciduous and evergreen plants.

Also noticed were azalea bark scale, cottony camellia scale, assorted lecanium scales and white prunicola scale. Hibiscus sawfly and lily leaf beetle, both newcomers to Connecticut continued to establish populations in Connecticut. Viburnum aphids and assorted eriophyid mites were more numerous in spring 2006.

Diseases were more plentiful in 2005-2006, especially foliar disorders such as leaf spots, blights and anthracnose. Anthracnoses have been widespread and especially problematic to sycamores, oaks, maples and birches. Cedar apple rust and other gymnosporangium rusts were quite common on many crabapples, hawthorn and shadbush. Stress related cankers were reported on many trees, especially ornamental cherries, maples and beeches.

Powdery mildew was a problem on many different broadleaf trees and shrubs as well as herbaceous plants. Conifers were plagued by needlecasts, needle rusts, and tip blights.

Home lawns experienced drought conditions throughout summer 2005 that resulted in substantial losses. Disease pressure was much higher on high maintenance lawns, especially summer patch, dollar spot, leaf spots, Pythium and red thread. Large numbers of scarab beetles adults were reported in spring 2006, so caution may be appropriate for the coming season. White grub injury was very obvious because conditions were stressful. Chinch bugs were a problem also. Bluegrass billbug outbreaks have been observed on a few occasions and only on sodded areas.

Ground ivy, violets, corn speedwell and yellow nutsedge were the most important weeds in lawns. Poor crabgrass management was a common observation in 2005 due mostly to home landscapers applying pre-emergent controls too early in the season followed by heavy rains and cool conditions. Crabgrass germinated late in most lawns

and management compounds were below the seed by then. Moss colonization of poor turf areas received plenty of attention from homeowners, as well.

Management strategies offered for all pests include cultural and sanitary approaches as the primary effort with low impact pesticides as a second effort, and lastly, stronger pesticides when other approaches do not succeed.

*Wildlife and Structural Pests*

Animal problems were numerous throughout the year with most inquiries concerning squirrels, chipmunks, moles, voles, rabbits, woodchucks, skunks and snakes.

Insects that bother humans were of concern to many homeowners.. Mosquito problems were more intense in spring 2006 due to excessive rainfall. Many ticks were submitted for identification. All black legged ticks were forwarded to the lab in New Haven for spirochete analysis. Wasps, especially German yellow jackets and solitary ground bees were bothersome to many. Numerous populations of ground bees were reported in Spring 2005.

Among arthropods found inside structures, carpenter ants, termites, black and varied carpet beetles, ground beetles, grass carrier wasps, cigarette beetles, larder beetles, acorn weevils, foreign grain beetle, confused flour beetles and spiders received the most attention. Also noted were multicolored Asian lady beetles, squash bugs, western conifer seed bugs, boxelder bugs, clover mites, assorted food infesting beetles, ground beetles, rove beetles, Indian meal moths and centipedes and millipedes. On a somewhat disturbing note, Bed bugs were submitted in greater numbers in the past year.

Where management strategies for indoor and other structural pests were necessary, most homeowners chose baiting and/or sanitation rather than pesticide use.

*Field visits by scientific staff*: Valley Laboratory scientists visited 468 commercial fields, greenhouses, golf courses, Christmas tree farms, residential properties, parks and forests during the past year to conduct research and diagnose the more complex problems firsthand. The majority of these visits were made by Timothy Abbey (178) who visited production nurseries, Christmas tree growers, and golf courses. Dr. Carole Cheah visited 139 forest sites, Thomas Rathier made 50 visits to commercial and municipal fields, nurseries, greenhouses, Christmas tree farms, forests and private landscapes, Dr. Richard Cowles made 20 field visits to evaluate soil-inhabiting insect pests and mites in nurseries and strawberry fields, Dr. James LaMondia visited 24 farms, Dr. DeWei Li made 13 visits to investigate molds, and Drs. Todd Mervosh and John Ahrens made 27 and 17 visits, respectively, to investigate weed control problems. Most problems were solved during these visits, but many required taking plant and soil samples for laboratory analysis with subsequent reports to growers by letter or phone call.

*Special diagnostic tests:* Valley Laboratory scientists conducted 1014 special diagnostic tests at the request of citizens during the past year. Of these, 526 were in-depth investigations of unusual pest problems by Thomas Rathier and Rose Hiskes, 241

involved identification and enumeration of plant parasitic nematodes in soil samples by Dr. James LaMondia, 40 were evaluations of mites and soil-inhabiting insects by Dr. Richard Cowles, 52 were tobacco seed germination trials and 84 were soil texture or organic matter determinations conducted by Mr. John Winiarski, 52 were made by Tim Abbey from nursery visits, and 8 were identifications and control evaluations of weeds by Drs. Todd Mervosh and John Ahrens.

*Soil testing:* A total of 4,499 soil tests were expertly performed by Mr. John Winiarski during the past year. About 64% were performed for commercial growers, 31% for homeowners, 1.5% for municipalities, and the remainder for Station research. Of the 2,862 commercial samples submitted, 50% were for landscapers; 24% for tobacco growers; 8% for nursery growers; 7.5% for vegetable growers; 3.3% for golf course superintendents; 2% for fruit growers; 1.5% for Christmas tree growers; 1% for greenhouse growers, and the remainder for others.

*Gordon S. Taylor Conference Room:* Many agricultural organizations used the conference room at the Valley Laboratory regularly for their meetings. During the past year, 38 different groups used the room on 123 occasions. Our most frequent users were the Connecticut Farmland Trust, Connecticut Rhododendron Society, Connecticut Chapter of the National Organic Farmers Association, Farm Wine Council, the CT Wine Association, Connecticut Department of Environmental Protection, Connecticut Farm Fresh, Connecticut Greenhouse Grower's Association, Connecticut Nursery and Landscape Association, and Connecticut Invasive Plants Workgroup. Jane Morrison, Thomas Rathier and John Winiarski scheduled the appointments and Richard Horvath arranged the furniture for scheduled meetings and ensured that the room was available after hours.

## *BULLETINS OF THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION PUBLISHED DURING 2005-2006*

997 A Guide to Invasive Aquatic Plants in Connecticut. 24 pages. Robert S. Capers, Gregory J. Bugbee, Roslyn Selsky and Jason C. White. (2005)

998 Control of Cabomba and Eurasian Milfoil in Lake Quonnipaug with Fluridone and 2,4-D 2001. 12 pages. Gregory J. Bugbee and Jason C. White. (2005)

999 A Diagnostic Feasibility Study of Moodus Reservoir, East Haddam, CT: Water chemistry, aquatic vegetation survey and management options 2002. 24 pages. Gregory J. Bugbee and Jason C. White. (2005)

1000 Pesticide Residues in Produce Sold in Connecticut 2002-2004. 20 pages. Walter J. Krol, Terri Arsenault, and MaryJane Incorvia Mattina. (2006)

1001 Seed Germination and Purity Analysis – 2005. 15 pages. Sharon M. Douglas and Mary K. Inman. (2005)

1002 Control of Cabomba, Eurasian Milfoil and Water Lily in Lake Quonnipaug with Herbicides and Hydroraking 2002. 16 pages. Gregory J. Bugbee and Jason C. White. (2005)

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