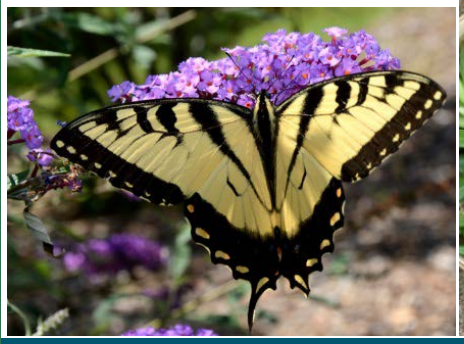
The Connecticut Agricultural Experiment Station
107th Plant Science Day

Lockwood Farm, Hamden, CT
Wednesday, August 2, 2017

Health



Food Safety

Agriculture

Environment

CAES
The Connecticut Agricultural Experiment Station

The Connecticut Agricultural Experiment Station's **Plant Science Day** is held at Lockwood Farm on the first Wednesday of August every year, beginning in 1910. This one-day event features reports on research, field plots, barn exhibits, tours, and other opportunities for Connecticut residents and attendees to discuss many topics of plant science on an informal basis and interact with CAES scientists and staff. While the event only lasts one day, planning for Plant Science Day is a year-round activity spearheaded by the *Plant Science Day Planning Committee*. This committee, chaired by Ms. Vickie M. Bomba-Lewandoski, is comprised of CAES staff members who strive to make this event as meaningful and organized as possible. We acknowledge their hard work and thank them for allowing this historic event to happen each year.

Plant Science Day 2017 Planning Committee

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Dr. Theodore Andreadis
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Dr. Kirby Stafford
Dr. Blaire Steven
Mr. Peter Thiel
Mr. Michael Thomas
Dr. Jeffrey Ward
Dr. Jason White
Dr. Quan Zeng

Program booklet created, compiled, and edited by Ms. Vickie Bomba-Lewandoski, and assisted by Ms. Brandi Marks.

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HISTORY OF LOCKWOOD FARM, HAMDEN

Lockwood Farm is a research facility of The Connecticut Agricultural Experiment Station. The farm was purchased in 1910 with monies provided by the Lockwood Trust Fund, a private endowment. The original farm was 19.6 acres with a barn and a house. Since then, several adjacent tracts of land have been purchased, enlarging the property to 75.0 acres.

The farm is located in the extreme southern portion of the Central Lowland Physiographic Province. This lowland region is underlain by red stratified sandstone and shale of Triassic age from which resistant lava flows project as sharp ridges. One prominent ridge, observed from the farm, is Mount Carmel (the “Sleeping Giant”), which lies to the north. The mountain is composed of diabase, a dense igneous rock which has a fine crystalline texture, having been pushed up as magma close to the surface where it cooled quickly. The "trap rock" of this region is either diabase, or its compositional equivalent basalt which was extruded onto the surface in lava flows that form topographic "trappa" or "trappe" (steps or stairs) and it is commonly used as a building material and ballast for railroad tracks.

The topography of the farm is gently rolling to hilly and was sculpted by the Wisconsin glacier that overrode the area some 10,000 years ago and came to rest in the vicinity of Long Island. A prominent feature of the farm is a large diabase boulder that was moved by flowing ice from its place of origin, and is therefore also known as a Glacial Erratic. The boulder probably fell onto the top of the glacier oozing its way down past the Sleeping Giant's head during the waning stage of the last continental glaciation. It was deposited here, near the toe of the waning glacier, onto "till," an unsorted mass of sandy or silty material mixed with rounded pebbles and boulders that had been pushed in front of, or under, the glacier, and deposited as the ice melted. Most of the boulders around the area, such as those in the nearby stone walls, are rounded and their surfaces have been ground smooth by abrasion beneath the glacier. The boulder came to rest on the crest of a hillock to the south of the upper barns. From this hillock, Sleeping Giant State Park comes into full view and is a favorite spot for photographers and other artists.

The soils of the farm developed on glacial drift are composed primarily of the underlying reddish-brown sedimentary rocks. The soils, characterized by reddish-brown profiles, are the well-drained Cheshire fine sandy loam (67%), the moderately well-drained Watchaug loam (10%) and the shallow-to-bedrock Sunderland fine sandy loam (16%). Along the western edge of the farm, adjacent to the Farmington Canal Greenway, lies a level terrace of stratified glacial drift. There, the well-drained Branford loam and the moderately well-drained Ellington loam (7%) dominate. Elevations on the farm range from 140 to 220 feet above mean sea level.

The farm lies in the Coastal Plain Climatological District. The local climate is influenced by its proximity to Long Island Sound, which lies 9 miles to the south. The average frost-free season is 190 days, compared to 180 days at the inland Valley Laboratory in Windsor.

In 1936, a fully instrumented weather station was established on the farm. The weather data are reported to and published by the U.S. Weather Service in their cooperative observer program. The mean annual temperature for the farm is 49.0 F. A record high temperature, 104.0 F, was observed on July 4, 1949. A record low temperature, -24.0 F was recorded on February 16, 1943. The mean annual precipitation for the farm is 52.6 inches. The greatest total precipitation, 74.36 inches, was recorded in 2011. The least precipitation, 30.4 inches, was recorded in 1965. The mean annual snowfall for the farm is 32.3 inches. The greatest total snowfall, 78.5 inches, was recorded during the winter of 1995-1996. The least total snowfall, 10.0 inches, was recorded in 2011-2012.

The farm provides a field laboratory for Experiment Station scientists who learn how to control the pathogens and insects that attack trees, fruit, and vegetables. In some experiments, scientists learn how crops grow and develop strategies for efficient crop production**.** All field research can be observed at Plant Science Day, held each year on the first Wednesday in August.

Revised: August 2014

CENTURY FARM AWARD

The Century Farm Award is given to a farm that has been in family operation for more than 100 years. The recipient is selected by the Connecticut Agricultural Information Council.

Kasheta Farms
South Windsor, CT

Proclamation from Governor Dannel P. Malloy:

Kasheta Farms had its beginnings in 1905, when Peter and Mary Kasheta purchased a long, narrow parcel of land that extended from the Connecticut River to the Town Center in South Windsor. The primary crop grown at that time was broadleaf tobacco, but it was also a complete family farm selling milk, cheese, butter, eggs, and fresh grown fruits and vegetables.

Operation of the farm was subsequently taken over by Walter Kasheta along with his son, Edward W. Kasheta, Sr. In 1955, the tobacco industry in the Connecticut River Valley was dealt a severe blow due to the invention of a process to produce sheet tobacco for use as binders and wrappers for cigars. The federal government provided assistance to farmers through funding of the Connecticut-Massachusetts Tobacco Co-Op and purchased all the unsold tobacco produced in the Valley so farmers could survive. Kasheta Farms consequently started growing 150 acres of potatoes until that market fell into decline in the 1960s. Kasheta Farms further diversified by growing market vegetables, including tomatoes, sweet corn, peppers, and squash all while still producing tobacco.

Ed Kasheta, Jr. then added grain corn marketed as a high moisture corn crop and sold it for chicken feed to K & L Feed Co. in North Franklin, CT until that mill closed. Along the way, pumpkins, gourds, and giant pumpkins were added to the list of products that were sold to local farm stands and retailers.

Through the years, Ed Sr.'s other sons joined the family business. Donald T. Kasheta has been growing and delivering sod turf and currently oversees a commercial landscape maintenance service. David A. Kasheta runs the power equipment store sales, service, and parts. All three brothers and Dad work together to keep the farm running smoothly.

Kasheta Farms, Inc. is currently producing approximately 400 acres of grain corn, 100 acres of sod, 20 acres of broadleaf tobacco, and 20 acres of pumpkins and gourds.

THE SAMUEL W. JOHNSON MEMORIAL LECTURE (Pavilion)

The Experiment Station Board of Control established the lectureship to further discuss issues of concern to Connecticut residents and the Station. Professor Johnson was director of the Experiment Station from 1877 to 1900 and a leader in the establishment of American agricultural experiment stations.

ANSWERS TO YOUR QUESTIONS (Plot 20)

Staff members in the "question and answer" tent are prepared to give information on identification of insects, plant disorders, soils and their management, and other problems of growers and gardeners.

KIDS' KORNER (Plot 25)

Come to the Kids' Korner to pick up your child's passport and a gift. The passport is a special activity for young children to help them enjoy and explore Plant Science Day. There are six different stations located throughout Lockwood Farm that they can visit, where they can ask questions, learn about the topic featured at the station, and then receive a special stamp for their passport. Once the passport is complete, they can go to the Self-Guided Activity Plot (plot 26) to collect a CAES patch.

SELF-GUIDED ACTIVITY FOR ALL CHILDREN, INCLUDING GIRL SCOUTS (Plot 26)

Girl Scouts and older children should be directed to this plot. A self-guided worksheet is available for all children, and it is better suited for older children than the passport. The activity will guide them to interact with some of the many people here today helping to put science to work for society. In addition, Girl Scouts may use the activity to complete steps towards their Naturalist Legacy badge. Once the activity is completed, all children can return to this plot to collect either a Girl Scout or CAES patch. Children with completed passports should return here to collect their badges as well.

CONNECTICUT PESTICIDE CREDITS (Registration, R)

Connecticut pesticide credits will be offered for attending Plant Science Day. If you are interested in obtaining pesticide credits, you must sign in at the registration desk (R) at the start of the day, between 9:30 a.m.-10:00 a.m., collect signatures for the talks, demonstration, and tours you attended, and sign out to pick up your pesticide credit form at 3:20 p.m. at the registration desk (R).

Connecticut Pesticide Credits Offered: **ALL SUPERVISOR CATEGORIES and PRIVATE APPLICATOR (PA) CATEGORY / 4.50 TOTAL CREDIT HOURS.**

SOCIAL MEDIA LINKS

Keep current with The Connecticut Agricultural Experiment Station by using our SOCIAL MEDIA and E-ALERT resources.

CAES is encouraging our constituents to share their photos about CAES and PLANT SCIENCE DAY on social media using the hashtag **#CAES**. Selected photos may be used in future publications.

Facebook (www.facebook.com/CT.CAES)

Twitter (www.twitter.com/CT_CAES)

YouTube (www.youtube.com/user/CTAGEXPSTATION)

Instagram (www.instagram.com/ct.caes/)

(http://en.wikipedia.org/wiki/Connecticut_Agricultural_Experiment_Station)

To visit our webpage, go to www.ct.gov/CAES,
or just scan our QR code below with your smartphone.

E-ALERTS

The Connecticut Agricultural Experiment Station (CAES) E-ALERT service.
We are inviting you to subscribe to our free E-ALERT e-mail service to receive CAES news updates by e-mail.
Go to our website, scroll to the bottom left hand corner of our page,
and click Receive Updates by e-mail e-ALERTS to get started.
Once you have created your CT.gov profile you can now subscribe to our e-alerts.

NO PETS, PLEASE. SERVICE ANIMALS ONLY.

JUST A REMINDER THAT LOCKWOOD FARM IS A WORKING FARM WITH ACTIVE RESEARCH BEING CONDUCTED, SO PLEASE RESPECT THE SCIENTISTS' WORK.

After the lecture, visitors may remain in the pavilion to eat lunch. Coffee and cold drinks are free.

CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

107th PLANT SCIENCE DAY

Gates open at 9:30 a.m.
Program begins at 10:00 a.m.
Event 10:00 a.m. – 4:00 p.m.

AGENDA

Moderator – Ms. Vickie M. Bomba-Lewandoski, Information Officer

10:00 a.m. – 10:15 a.m. **PAVILION**
MORNING GREETING AND OPENING REMARKS
Dr. Theodore G. Andreadis, Director
The Connecticut Agricultural Experiment Station

10:15 a.m. - 10:45 a.m. **PAVILION**
Dr. Kirby C. Stafford III, State Entomologist, Department of Entomology
Gypsy Moth Outbreaks in Connecticut: Past, Present, and Future
The gypsy moth, *Lymantria dispar*, was introduced into the US (Medford, MA) around 1869 and had spread to all 169 towns in Connecticut by 1952. In 1981, 1.5 million acres in the state were defoliated by the gypsy moth. During an outbreak in 1989, CAES scientists discovered that the entomopathogenic fungus *Entomophaga maimaiga* was killing the caterpillars. Since then, the fungus has been the most important agent suppressing gypsy moth activity. However, in 2015, 2016, and going into the summer of 2017, Connecticut, Rhode Island, and Massachusetts had a major gypsy moth outbreak and in Connecticut, defoliation was particularly widespread and severe through many parts of Middlesex, New London, and Windham counties. Limited fungus activity and the large gypsy moth population in the eastern half of the state was largely due to the drought in 2015 and 2016. In the places where CAES counts of the egg masses predicted heavy gypsy moth numbers in 2017, the number of caterpillars was great and tree defoliation ranged from moderate to severe in those areas. However, timely spring and early summer rains in 2017 initiated *E. maimaiga* infections in the gypsy moth caterpillars in June and allowed propagation of the spores. In this presentation, Dr. Stafford will review the current multi-year outbreak, the impact of rain in 2017 on the control of gypsy moth caterpillars by *E. maimaiga*, and the prospects for further activity by this pest in 2018.

10:15 a.m. – 10:35 a.m. **TECHNICAL DEMONSTRATION TENT**
(20-minute demonstration, repeated twice during the day, 10:15 a.m. & 2:30 p.m.)
Ms. Lindsay A. Patrick, Technician, Department of Plant Pathology and Ecology
Pruning Basics
When homeowners identify an overgrown shrub or small tree on their property, they often feel apprehensive about attempting to prune it themselves. With the right tools and an understanding of the proper techniques, pruning can lead to a more aesthetically pleasing landscape and healthier plants. This discussion will focus on reasons why we prune, what tools are needed, correct timing, and basic techniques to help homeowners make proper cuts on woody plants.

10:40 a.m. – 11:00 a.m. **TECHNICAL DEMONSTRATION TENT**
(20-minute demonstration, repeated twice during the day, 10:40 a.m. & 3:00 p.m.)
Dr. Gale E. Ridge, Entomologist, Department of Entomology
Household Pest Control
A house is a manmade habitat, which is a refuge for numerous other creatures. Some pass through, while others settle in and stay. The talk is a brief introduction to the creatures and critters we unknowingly host in our homes followed by advice about what to do.

10:45 a.m. - 11:05 a.m. **PAVILION**
CENTURY FARM AWARD
Kasheta Farms, South Windsor, CT

11:05 a.m. – 11:10 a.m. **PAVILION**
EXPERIMENT STATION ASSOCIATES
Ms. Barbara Yaeger*, President, Experiment Station Associates*

11:10 a.m. – 12:00 noon **PAVILION**
THE SAMUEL W. JOHNSON MEMORIAL LECTURE
Mr. Rob Klee, Commissioner
Connecticut Department of Energy & Environmental Protection
Building a Sustainable Future in an Age of Uncertainty

1:15 p.m.-1:45 p.m. **PAVILION**
Dr. Richard S. Cowles, Agricultural Scientist, Valley Laboratory, Windsor
Bees and the Neonicotinoid Controversy
Acute public concern was aroused over the use of neonicotinoid insecticides on June 17, 2013, when an arborist made an illegal application of a dinotefuran-containing insecticide to linden trees in full bloom, resulting in the death of over 50,000 bumble bees. Under normal agricultural and turf uses, these insecticides are transported to nectar and pollen at concentrations that are expected to be of little concern to honey bees, and because these products are systemic (transported throughout the plant in sap), their use often replaces multiple foliar sprays of more bee-toxic alternative classes of insecticides. Researchers at the CAES have been quantifying these systemic insecticides in nectar and pollen of ornamental plants that have been treated at the high levels commonly used in landscapes and nurseries, in order to determine if these application rates could be harmful to pollinators. Compared to honey bees, native bees could be more sensitive to these insecticides; therefore, great caution is warranted when using any systemic insecticides on plants attractive to pollinators. Among the several major factors that have been proposed to be at the heart of poor bee health—diseases, loss of quality bee forage, and neonicotinoid exposure are most commonly considered—only diseases sufficiently fit geographic and temporal patterns of bee losses, yet their importance has not been emphasized to the public. Varroa mite parasitism is a central problem, as these mites vector viruses among honey bees, which in turn disperse these viruses to native pollinators via shared floral resources. The varroa/virus problem needs to be resolved before we can expect to see improvement in both honey bee and native bee health. Greater survival of bees through efforts to genetically improve honey bees should indirectly demonstrate that neonicotinoids are an insignificant factor in poor bee health, and should also have the side benefit of improving the health of native bees.

1:45 p.m.-2:15 p.m. **PAVILION**
Dr. Francis J. Ferrandino, Biophysicist, Department of Plant Pathology and Ecology
Growing Grapes in Connecticut's Ever-Changing Climate
Francis J. Ferrandino, Department of Plant Pathology & Ecology
The climate of Connecticut is much more variable than in other grape-producing regions throughout the world. We experience hotter and wetter summers and colder winters with inconsistent snow cover. This disparity leads to a number of difficulties including variable ripening, increased disease pressure and high mortality. Since 1978, when the Farm Wineries Bill was first enacted, The Connecticut Agricultural Experiment Station has monitored test winegrape and table grape plots to determine the suitability of various cultivars grown under local conditions. At present, we have 32 cultivars planted at the three CAES experimental farms (Windsor, CT; Hamden, CT; and Griswold, CT). Weather is continuously monitored at these sites and growth, disease levels, phenology and yield data are taken each season. This study is part of an ongoing process to inform growers of the performance levels they can expect and the problems that may arise.

2:15 p.m. **PAVILION**
Adjourn Main Talks

2:30 p.m. – 2:50 p.m. **TECHNICAL DEMONSTRATION TENT**

(20-minute demonstration, repeated twice during the day, 10:15 a.m. & 2:30 p.m.)

Ms. Lindsay A. Patrick, Technician, Department of Plant Pathology and Ecology

Pruning Basics

When homeowners identify an overgrown shrub or small tree on their property, they often feel apprehensive about attempting to prune it themselves. With the right tools and an understanding of the proper techniques, pruning can lead to a more aesthetically pleasing landscape and healthier plants. This discussion will focus on reasons why we prune, what tools are needed, correct timing, and basic techniques to help homeowners make proper cuts on woody plants.

3:00 p.m.-3:20 p.m. **TECHNICAL DEMONSTRATION TENT**

(20-minute demonstration, repeated twice during the day, 10:40 a.m. & 3:00 p.m.)

Dr. Gale E. Ridge, Entomologist, Department of Entomology

Household Pest Control

A house is a manmade habitat, which is a refuge for numerous other creatures. Some pass through, while others settle in and stay. The talk is a brief introduction to the creatures and critters we unknowingly host in our homes followed by advice about what to do.

3:20 p.m. **TECHNICAL DEMONSTRATION TENT**

Adjourn Technical Demonstrations

3:20 p.m. SIGN-OUT **(for those requesting pesticide credits) (R)**

Attendees pick up Pesticide Credit forms at the registration table (R).

BUS TOUR (B)
EVERY HALF HOUR, 10:15 a.m. to 3:30 p.m.

EVERY HALF HOUR
10:15 a.m. – 3:30 p.m.

This is a great way to see the farm. Join us on an air-conditioned bus ride around the farm for approximately 30 minutes. You can be dropped off at any plot, and picked up the next time the bus comes around. Dr. Neil Schultes and Mr. Michael Cavadini will narrate the ride.
The bus will be suspended during the guest lecture from 11:10 a.m. – 12:00 noon.

BARN EXHIBITS (BARN B)

Invasive Shrubs and Deer Browse
Department: Forestry and Horticulture
Investigators: Dr. Jeffrey S. Ward and Dr. Scott C. Williams
Assisted by: Ms. Megan A. Linske, Mr. Michael R. Short, and Mr. Joseph P. Barsky
Abstract: Both chronic white-tailed deer over browsing and invasive shrubs are locally important drivers of plant community dynamics that have been linked to tree regeneration failure. Plant communities remained relatively unchanged where invasive shrubs were not treated, regardless if deer browsing was excluded or not. With increasing intensity of invasive shrub control, tree seedlings, native shrubs, and forbs became more dominant where deer browsing was excluded, and native grasses and ferns more dominant where browsing remained severe. Restoring native plant communities and forest regeneration requires integrated management that eliminates invasive shrubs and reduces deer browsing intensity.

Mosquito Blood-Feeding Behavior and the Risk of Human Infection
Department: Environmental Sciences and Center for Vector Biology & Zoonotic Diseases
Investigators: Dr. Goudarz Molaei, Dr. John S. Soghigian, and Dr. Theodore G. Andreadis
Assisted by: Mr. Michael C. Thomas and Mr. John J. Shepard
Abstract: Eastern Equine Encephalitis virus causes severe disease in humans and horses in eastern North America and is maintained in a cycle involving the bird-biting mosquito, *Culiseta melanura*, and wild perching birds in fresh-water swamp habitats. However, crucial details of the involvement of this mosquito species in transmission to humans and equines are not well understood. In recent years, we have witnessed changes in the frequency of virus activity and expansion into new regions, as well as increased human biting by *Cs. melanura*. By using next generation sequencing, we are identifying genetic variations in populations of this mosquito species, and evaluating if differences among populations could be responsible for the risk of human infection.

Detecting Pesticides in Plant Pollen
Department: Departments of Entomology, Analytical Chemistry, and Valley Laboratory
Investigators: Dr. Kimberly A. Stoner, Dr. Brian D. Eitzer, Dr. Richard S. Cowles, Mr. Mark H. Creighton, and Dr. Alejandro Chiriboga (University of Connecticut)
Assisted by: Ms. Andrea Nurse (University of Maine), Ms. Tracy A. Zarrillo, and Ms. Morgan F. Lowry
Abstract: Pesticide use on ornamental plants may pose a hazard to honey bees because:

1. Ornamental plant growers are legally allowed to use higher rates of many pesticides than are allowed on food crops,
2. Many of the insecticides used travel throughout the plant and thus could travel into nectar and pollen, and
3. Many flowering plants are attractive to bees.

We put colonies of honey bees in three commercial ornamental plant nurseries, collected pollen from the workers returning to the hive, tested the pollen for pesticides, and then identified the sources of pollen most closely associated with pesticide residues.

Analysis of Aflatoxins in Animal Feed
Department: Analytical Chemistry
Investigators: Dr. Brian D. Eitzer and Dr. Nubia Zuverza-Mena
Abstract: Aflatoxins are toxic carcinogenic compounds that can be produced by fungi that are found on animal feeds such as corn. If animals eat contaminated feed, the carcinogens can be transported into the human food supply. The FDA has therefore established action level guidelines for these compounds. The CAES in cooperation with the Department of Agriculture has begun a new program to monitor these compounds. This poster will provide background information on aflatoxins and details on how they are analyzed.

Hops, a New Specialty Crop in Connecticut
Department: Valley Laboratory
Investigators: Dr. James A. LaMondia and Dr. Katja Maurer
Abstract: Hops were successfully demonstrated as a new crop for Connecticut. A number of varieties are being evaluated for disease resistance, yield and quality on high and low trellis systems. The CT Hop Growers Association has been formed and commercial production is underway.

Using Tomography to Assess Internal Decay in American Elms

Department: Plant Pathology and Ecology
Investigators: Dr. Robert E. Marra and Dr. Nicholas J. Brazee (University of Massachusetts)
Assisted by: Ms. Genevieve Higgins and Ms. Kelly Allen (University of Massachusetts, Amherst).

Abstract: The stately and iconic American elm, *Ulmus americana*, has been devastated by Dutch elm disease, caused by the non-native fungal pathogen, *Ophiostoma novo-ulmi*, and a non-native elm-bark beetle, which vectors the fungus. For mature and noteworthy elms, the most effective method of control of the disease is through trunk injections of fungicide administered through small holes drilled through the bark around the perimeter near the tree's base, repeated every two to three years. Because the injection holes have the potential to serve as entry points for wood-decay bacteria and fungi, we are using sonic and electrical-resistance tomography to nondestructively assess whether internal decay is more prevalent in trees undergoing injection than those that do not receive injections.

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

The experiments exhibited here depict only a portion of the work performed by Experiment Station scientists. In addition to Lockwood Farm, Griswold Research Center, and laboratories in New Haven and Windsor, Station scientists use state forests, private orchards, lakes, and farms for their experiments. Experiments and surveys are conducted in many widely separated towns of the state.

THE EXPERIMENT STATION WEB PAGE: WWW.CT.GOV/CAES

EMAIL US AT: CAES@CT.GOV

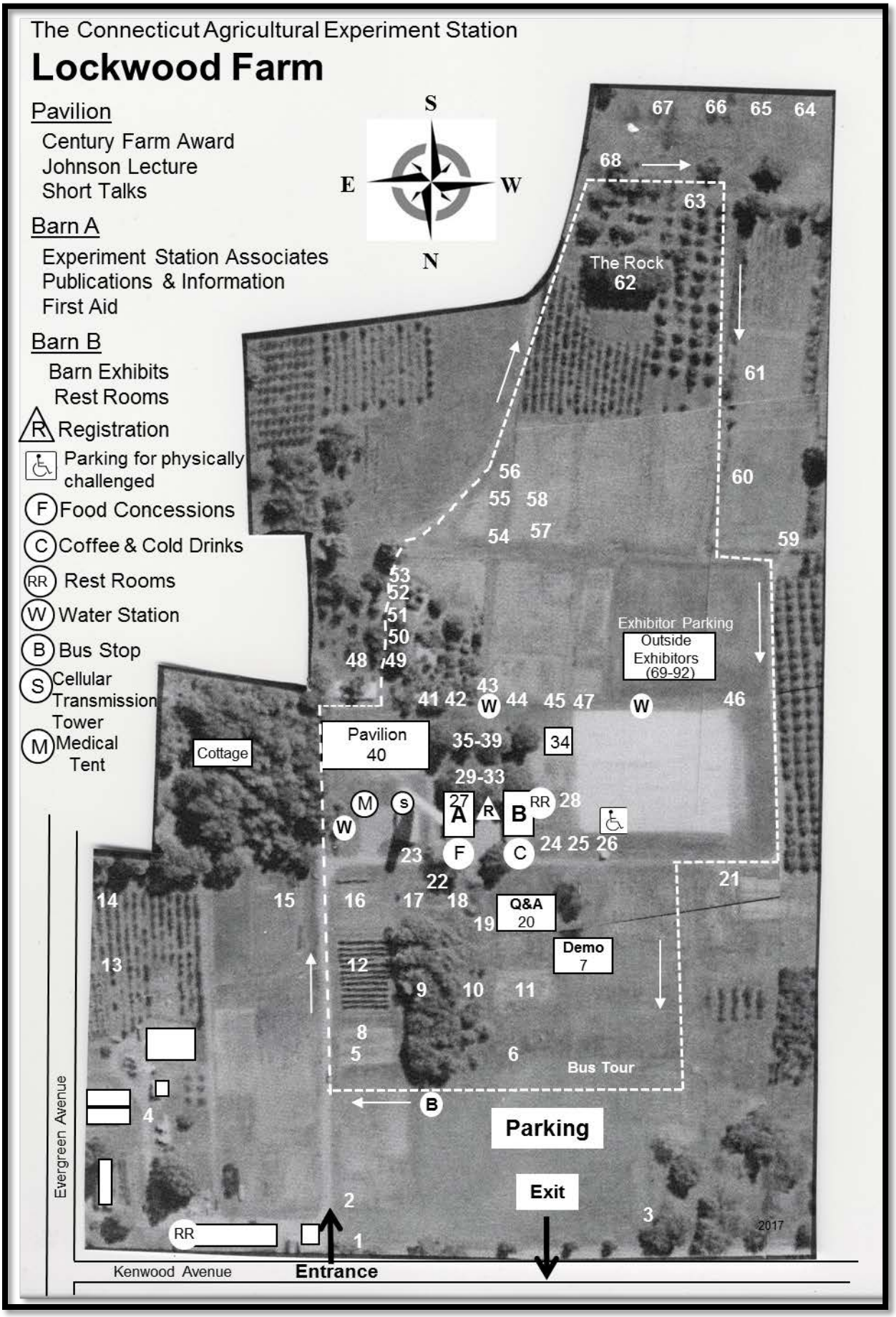
TO RECEIVE A COMPLETE LIST OF STATION SPEAKERS:

Inquire at the publications table in BARN A, or write to:
Publications; The Connecticut Agricultural Experiment Station; P.O. Box 1106; New Haven, CT 06504-1106, phone 203-974-8447, fax 203-974-8502, e-mail Vickie.Bomba-Lewandoski@ct.gov, or on the web at http://www.ct.gov/caes/speakers

TO RECEIVE A COMPLETE LIST OF AVAILABLE EXPERIMENT STATION PUBLICATIONS:

Inquire at the publications table in BARN A, or write to: Publications; The Connecticut Agricultural Experiment Station; P.O. Box 1106; New Haven, CT 06504-1106, phone 203-974-8447, fax 203-974-8502, e-mail Vickie.Bomba-Lewandoski@ct.gov, or on the web at http://www.ct.gov/caes/publications

CAES
The Connecticut Agricultural Experiment Station
Putting Science to Work for Society since 1875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2017

FIELD PLOT LISTING

Outside Exhibitors (Plots 22, 23, 24, 69-92) are invited to participate.

The plots at Lockwood Farm are planted and maintained by The Connecticut Agricultural Experiment Station's scientists and technical staff along with the help of Farm Manager Mr. Richard Cecarelli and his Research Technicians Mr. Rollin Hannan and Mr. Michael McHill as well as seasonal resource assistants Mr. Frank Cervo and Mr. Hunter Naizby.

1. **Chinese Chestnut Trees**
2. **Sheet Composting with Maple and Oak Leaves**
3. **Nut Orchard**
4. **Fig Trials in Self-Watering Planters**
5. **Commercial Chestnut Cultivars**
6. **Remote Access Weather Station**
7. **Technical Demonstration Tent**
8. **Commercial Chestnut Seedlings**
9. **Control of Blight on American Chestnuts**
10. **New Hybrid Chestnut Orchard**
11. **Use of Nanoparticles of Metal Oxides to Suppress Soil-borne Diseases of Eggplant and Watermelon**
12. **Comparison of Graft Union Height on Chardonnay Grapevines**
13. **Environmentally-Friendly Control of Powdery Mildew on Landscape Plants**
14. **Nanoparticle Control of Powdery Mildew on Chardonnay Wine Grapes**
15. **Use of Nanoparticles of Metal Oxides to Suppress Fusarium Wilt of Chrysanthemum**
16. **Table Grape Demonstration Plot**
17. **Seedlings of Old Surviving American Chestnuts**
18. **Wild Chestnuts from Turkey**
19. **A Rendezvous with Non-native Invasive Plants in Connecticut: Their Identification and Control**
20. **Questions and Answers Tent**
21. **Composting Leaves Using the Static Pile Method**
22. **Hamden Police Department**
23. **Verizon Wireless**
24. **The Farmer's Cow**
25. **Kids' Korner**

26. Self-Guided Activity for All Children, Including Girl Scouts

27. Experiment Station Associates

28. Fiddlehead Trials

29. Potential Roles for Carbon Materials in the Breakdown of Pollutants

30. Hands-on Chemistry

31. Nanomaterials in Agriculture: Interactions with Co-existing Contaminants

32. Integrating Forest and Roadside Management Objectives to Create Storm Resilient Forests

33. Soil pH Affects Health of Christmas Trees

34. The Public Health and Entomology Tent

a. The "Deer" Tick *Ixodes scapularis*

b. Statewide Mosquito Monitoring Program for Mosquito-Borne Viral Diseases

c. Tick Testing Program for Lyme and Allied Diseases

35. A World of Viruses

36. Diversity and Dilution: The Impact of Medium-Sized Mammal Diversity on *Borrelia burgdorferi* Prevalence in Fragmented and Unfragmented Habitats in Connecticut, USA

37. Invasive Insects in the Northeast

38. A New Species *Bactrodesmiastrum domesticum* and a Noteworthy Mold from Indoor Environments

39. Organic Control of Fireblight on Apples

40. The Pavilion at Lockwood Farm

41. Native Woody Shrubs

42. Oak Success Following Regeneration Harvesting in Connecticut

43. Bird and Butterfly Garden

44. Variation in Attraction to Pollinators Among Cultivated Varieties of Ornamental Plants

45. Environmentally-Friendly Control of Powdery Mildew on Vegetable Plants

46. Suppression of Powdery Mildew of Pumpkin with Nanoparticles of Metal Oxides

47. Invasive Aquatic Plant Program

48. Chestnut Species and Hybrids

49. Healthy Plants—Healthy Business: Support of the Green Industry by Inspection

50. The Cooperative Agricultural Pest Survey (CAPS) Program and Farm Bill Surveys

51. Boxwood Blight - Means of Spread and Implications for Management

52. **Biological Control of Hemlock Woolly Adelgid and Mile-A-Minute Weed in Connecticut**
53. **10 Years of Wasp Watching: What Have We Learned About Connecticut's Jewel Beetles**
54. **Okra Trials**
55. **Brussels Sprouts Trials**
56. **Sweet Potato Trials**
57. **Butternut Squash Trials**
58. **Curiosity Garden**
59. **Hops – Additional Varieties for Connecticut**
60. **Hybrid and Vinifera Winegrape Cultivar Trial**
61. **Pinot Gris Cultural Trials**
62. **The Rock**
63. **Rocky Hill American Chestnut Trees**
64. **Hybrid Elm Trees**
65. **Japanese Plum Variety Trials**
66. **Pawpaw Trials**
67. **Beach Plum Trials**
68. **Asian Chestnut Gall Wasp on Chestnut**

OUTSIDE EXHIBITORS (69-92)

69. **Connecticut Botanical Society**
70. **Connecticut College Arboretum**
71. **Connecticut Department of Agriculture**
    - **a. Connecticut Department of Agriculture**
    - **b. The Connecticut Department of Agriculture and the Animal Feed Regulatory Program Standards (AFRPS)**
72. **Connecticut Department of Energy and Environmental Protection: Wildlife Division (CT DEEP Wildlife Division)**
73. **Connecticut Department of Labor Occupational Safety and Health Administration (CONN-OSHA)**
74. **Connecticut Environmental Council (CTEC)**
75. **Connecticut Farm Bureau Association (CFBA)**
76. **Connecticut Farmland Trust**
77. **Connecticut Forest and Parks Association (CFPA)**

78. Connecticut Horticultural Society

79. Connecticut Invasive Plant Working Group (CIPWG)

80. Connecticut Professional Timber Producers Association (TIMPRO CT)

81. Connecticut Tree Protective Association (CTPA)

82. Federated Garden Clubs of Connecticut, Inc.

83. Lyman Hall High School Agricultural Science and Technology Program

84. Sleeping Giant Park Association

85. South Central Connecticut Regional Water Authority

86. Tree-Savers, LLC

87. University of Connecticut Extension Master Gardener Program (UCONN Extension Master Gardeners Program)

88. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA APHIS-PPQ)

89. United States Department of Agriculture, Farm Service Agency (USDA FSA)

90. United States Department of Agriculture, Natural Resources Conservation Service (USDA NRCS)

91. United States Department of Labor, Occupational Safety and Health Administration (US OSHA)

92. United States Department of Agriculture National Agriculture Statistics Service, New England (USDA NASS)

*Other plots here at the farm provide food for the Connecticut Food Bank.

FIELD PLOT ABSTRACTS

1. Chinese Chestnut Trees
Dr. Sandra Anagnostakis *Assisted by* Ms. Pamela Sletten
These Chinese chestnut trees, planted by Donald Jones in 1941, were selected by chestnut grower W.C. Deming of Litchfield and grafted by the Hartford Park Department. The second tree from the gate is a graft of the cultivar Bartlett that was developed by the Bartlett Tree Co. in Stamford. All have been used by The Experiment Station and the American Chestnut Foundation in crosses with American chestnut trees to produce blight-resistant forest and orchard trees.

2. Sheet Composting with Maple and Oak Leaves
Dr. Abigail Maynard and Dr. David Hill
Many homeowners have a predominance of oak trees in their backyards. Oak leaves are known to be more resistant to decomposition than maple leaves. This experiment is investigating whether this difference in the rate of decomposition leads to decreased yields in soils amended with oak leaves compared to maple leaves and unamended controls. Undecomposed oak and maple leaves were layered about 6 inches thick in the falls of 1995-2016 and incorporated into the soil by rototilling. Yields from plots amended with oak leaves were compared to plots amended with maple leaves and the unamended controls. Yields from plots amended with oak leaves were compared to plots amended with maple leaves and the unamended controls. In 2016, the greatest squash yields were from the unamended control plots (7.4 lbs/plant) followed by plots amended with maple leaves (5.4 lbs/plant) and plots amended with oak leaves (4.8 lbs/plant). Average yields of 12 vegetable crops over 22 years show no significant differences between the treatments.

3. Nut Orchard
Dr. Sandra Anagnostakis *Assisted by* Ms. Pamela Sletten
This orchard of nut trees was begun by Richard Jaynes in the spring of 1981. There are several named cultivars of chestnut and other nut trees included. Trees that fail to survive or produce well are replaced with new nut cultivars that we want to test for their production potential in Connecticut. All of the recently planted trees (in tree shelters) are butternuts (*Juglans cinerea*), seedlings from trees that may have some resistance to the butternut canker fungi that have nearly killed the large, grafted butternut trees in this plot.

4. Fig Trials in Self-Watering Planters
Dr. Charles R. Vossbrinck
Figs promise to be a rewarding crop for agriculturists in Connecticut both for home gardeners and for commercial growers. For commercial applications, we have been testing 5 fig varieties in 25-gallon self-watering (sub-irrigation) pots and recording numbers and weight as a function of time for each tree. For the home gardener, we are testing trees in 7-gallon pots and recording fig numbers over time. Diseases we have encountered include: mosaic virus, rust, spidermites, scale insects, and sooty mold.

5. Commercial Chestnut Cultivars
Dr. Sandra Anagnostakis *Assisted by* Ms. Pamela Sletten
These trees are commercial cultivars of orchard chestnut trees. The largest trees are cultivar 'Colossal' (Japanese x European) which is the most frequently planted commercial cultivar in the U.S., with large acreages in Michigan and on the West Coast. The other trees are cultivar CAES hybrids, planted last year. We are evaluating the potential of these commercial chestnut cultivars for nut production here in Connecticut.

6. Remote Access Weather Station
Dr. Francis J. Ferrandino *Assisted by* Ms. Joan L. Bravo
Remote-access weather stations are deployed at the three Connecticut Agricultural Experiment Station experimental farms located in Hamden CT, Windsor CT, and Griswold CT. One additional unit is located at Gouveia Vineyards in Wallingford, CT. Cumulative precipitation, growing degree days (GDD), frost events, and disease-risk assessments are recorded and/or calculated from the data collected.

7. Technical Demonstration Tent
See program pages 9-11 for a schedule of Technical Demonstrations.

8. Commercial Chestnut Seedlings
Dr. Sandra Anagnostakis *Assisted by* Ms. Pamela Sletten
These seedling trees are open pollinated (mostly Chinese) Dunstan chestnuts. They are not a cultivar (clones from a single tree), but a variety (a type) and are widely available for sale in garden centers. We will compare their growth and nut production with the orchard cultivars in plot # 5.

9. Control of Blight on American Chestnuts

Dr. Sandra Anagnostakis *Assisted by* Ms. Pamela Sletten

These American chestnut trees were planted in 1976 when they were 3 years old. Chestnut blight cankers were treated for 4 years, from 1978 to 1981, with our biological control using hypovirulent strains of the blight fungus. The control is working well to keep the trees alive and fruiting. Some of the trees are growing better than others. We do not know which trees were from seed collected in Wisconsin and which were from Michigan. It is possible that the difference in their ability to thrive in the presence of blight and hypovirulence indicates genetic differences in resistance. The grafted tree in the center of the east row is from an "American" chestnut in Scientist's Cliffs, MD, and the original tree resisted blight for many years (it may be a European hybrid). It definitely has some resistance, and is the best looking tree in the plot. Two grafted trees at the southeast corner are (*Chinese* x *American*) x *American* named cultivar 'Clapper' and have intermediate resistance to blight.

10. New Hybrid Chestnut Orchard

Dr. Sandra Anagnostakis *Assisted by* Ms. Pamela Sletten

These trees are from some of our hand-pollinated crosses done in previous years, and were planted as seedlings. All are hybrids of American chestnut trees and blight-resistant Chinese, Japanese, or hybrid trees. They will be grown to evaluate their blight resistance in the presence of the biological control that we assume will move over from the adjoining plot. The trees that look most like American chestnut trees and have good blight resistance will be used in future crosses for timber trees. Others will be developed as orchard trees for Connecticut growers. The paper bags on the trees cover hand-pollinated flowers from this year's crosses.

11. Use of Nanoparticles of Metal Oxides to Suppress Soil-borne Diseases of Eggplant and Watermelon

Dr. Wade Elmer, Dr. Roberto De La Torre -Roche, Dr. Nubia Zuverza-Mena, Dr. Chaunxin Ma, and Dr. Jason White. *Assisted by* Mr. Peter Thiel, Mr. Cristian Perez, and Mr. Benson Chan

When metallic oxides of copper (Cu), manganese (Mn), and Zinc (Zn) are manufactured at the nanoscale (<0.000,001 mm), they are called nanoparticles (NP). These particles have unique chemical and physical properties not observed in equivalent bulk materials. We have observed that applying certain NP to plant leaves produces more yield. Although NP of CuO have outperformed the other oxides, these plots are designed to examine combinations of MnO and ZnO with CuO to see if their efficacy can be increased.

12. Comparison of Graft Union Height on Chardonnay Grapevines

Dr. Francis J. Ferrandino *Assisted by* Ms. Joan Bravo and Ms. Catherine Walters

The coldest layer of air during a radiation freeze (clear sky) is immediately above the soil or snow level. By elevating the graft union, the labor and expense of burying the graft union might be avoided. Chardonnay vines, Dijon clone 95 on C3309 rootstock, were transplanted to the vineyard in spring, 2007. Half are of standard grafting height and half have the graft union 26 inches above ground. Over the past 3 years, yields have remained the same in spite of the height of the graft union.

13. Environmentally-Friendly Control of Powdery Mildew on Landscape Plants

Dr. Francis J. Ferrandino *Assisted by* Ms. Joan L. Bravo

Many ornamental plants commonly used around Connecticut homes are subject to powdery mildew. This disease is caused by a fungus that grows on the surface of plant tissue giving the foliage a white powdery appearance. The result is relatively unsightly and the fungus weakens infected plants by feeding on the sugar the plant produces and by blocking sunlight, which limits the ability of the plant to produce more sugar. This plot is planted to a number of common perennial landscape plants (lilac, deciduous azalea, bee balm, peony and phlox, rudbeckia, (commonly called "black-eyed susan"), which are susceptible to powdery mildew. Environmentally-friendly foliar sprays, including milk (20% in water), potassium bicarbonate (1% in water), and light horticultural oil (1% in water), will be compared to chemical fungicides in their ability to control the disease.

14. Nanoparticle Control of Powdery Mildew on Chardonnay Wine Grapes

Dr. Wade Elmer and Dr. Francis J. Ferrandino *Assisted by* Ms. Joan L. Bravo

Wine grapes and wineries are a relatively new industry in Connecticut. In the past 21 years, acreage planted to wine grapes has gone from 160 A to 700 A and the number of wineries has gone from 15 to 43, producing about 700,000 gallons of wine valued at between 15-20 million dollars per year. In our climate, powdery mildew has the greatest impact on wine-grape yield of all pathogens and pests. This plot is planted with Chardonnay vines, which are prized for the quality of the wine they produce, but are very susceptible to powdery mildew. Copper oxides (CuO) manufactured at the nanoscale (<0.000,001 mm) are called nanoparticles (NP), which behave differently than their larger bulked forms of CuO. These plots were designed to compare NP of CuO, to the larger equivalent form of CuO to an untreated control for control of powdery mildew. Disease will be monitored to assess the treatment effect.

15. Use of Nanoparticles of Metal Oxides to Suppress Fusarium Wilt of Chrysanthemum

Dr. Wade Elmer *Assisted by* Mr. Peter Thiel, Ms. Taylor Abendroth, Mr. Benson Chan, Mr. Joe Clark, Mr. Jesse Farrell, Ms. Julie Fitzgerald, Ms. Mia Forgione, Ms. Courtney Haigle, Ms. Alexa Ornstein, Ms. Claire Walsh, and Ms. Jada Ward

Fusarium wilt of chrysanthemum is a very destructive root disease caused by *Fusarium oxysporum* f. sp. *chrysanthemi.* Currently, the grower must drench the soil with expensive fungicides to suppress this disease. This plot contains chrysanthemum plants that were inoculated with the fungal pathogen or left untreated. Both inoculated and non-inoculated plants were treated with several foliar sprays of nanoparticles of Cu, Mn, and Zn. Nanoparticles are metallic oxides manufactured at the nanoscale (<0.000,001 mm). Our objectives are to compare each nanoparticle treatment to the untreated and conventional applications to see if nanoparticles can suppress this disease.

16. Table Grape Demonstration Plot

Dr. Francis J. Ferrandino *Assisted by* Ms. Joan L. Bravo

Three 12-vine rows are the seedless table grapes Canadice and Vanessa (red), Himrod (green), and Jupiter (black). The vines were planted in 2006 and bore their first (small) crop in 2008, with full crops since. Each row is trained to a different training system: Vertical Shoot Positioning, Hudson River Umbrella, and Smart-Dyson.

17. Seedlings of Old Surviving American Chestnuts

Dr. Sandra Anagnostakis *Assisted by* Ms. Pamela Sletten

In the southern U.S., large surviving American chestnut trees have been found scattered through the range. When we checked the blight fungi in the cankers on these old trees, we found several new kinds of hypovirulence viruses. We believe that these trees have a little more resistance than surrounding trees, which all died of blight, and that allowed viruses from other fungi in the area to infect the blight fungus. The American Chestnut Cooperators Foundation (www.ppws.vt.edu/griffin/accf.html) has been collecting cuttings from these survivors and grafting them together in orchards where they can cross with each other. This will allow any resistance genes present in individuals to be joined together in the resulting seedlings. The ACCF sent us this collection of seedlings that we have inter-planted with seedlings from crosses of American trees here at Lockwood Farm. We will compare their winter hardiness and blight resistance with that of the European chestnut trees from Turkey and the old American chestnut trees north of them.

18. Wild Chestnuts from Turkey

Dr. Sandra Anagnostakis *Assisted by* Ms. Pamela Sletten

These seedling trees are from six wild populations along the Black Sea in Turkey. Those from the eastern border are near the population in the Caucasus Mountains where European chestnuts (*Castanea sativa*) survived the ice ages, and are genetically quite diverse. Those from the western border are much less diverse. We are growing these here to compare their winter hardiness (not very!) and resistance to chestnut blight disease (also not very!) with that of American chestnut trees and with the seedlings from "old survivors" planted next to them.

19. A Rendezvous with Non-native Invasive Plants in Connecticut: Their Identification and Control

Dr. Jatinder S. Aulakh

Non-native invasive plants are a serious threat to biodiversity and the normal functioning of natural ecosystems. Approximately 42 percent of the nation's endangered and threatened species have seriously declined as a result of encroaching invasive plants and animals. Over 90 species of invasive plants are present in Connecticut. Correct identification is very critical not only to effectively manage the invasive plants but also to protect the native species. On Plant Science Day, the weed management booth will provide information on identification of non-native invasive plants and chemical and nonchemical options for their management. Live specimens of non-native invasive plants will be displayed and literature on their identification and management will be available.

20. Questions and Answers Tent

Mr. Robert Durgy, Ms. Rose Hiskes, Dr. Yonghao Li, Ms. Lindsay Patrick, Ms. Diane Riddle, and Dr. Gale E. Ridge

This is a great opportunity to ask the experts about growing plants, testing soil, and identifying plants, plant diseases, and insects. Bring samples of soil, symptomatic plants, and insects for testing and identification. Visit the displays and pick up fact sheets about current insect and disease problems**.**

21. Composting Leaves Using the Static Pile Method

Dr. Abigail Maynard and Dr. David Hill

Since the 1991 ban on disposing leaves in landfills, large-scale leaf composting has spread throughout Connecticut. Some 84 municipalities are currently composting their leaves. In static pile composting, leaves are piled and the internal temperature of the pile is monitored. As the leaves decompose, the temperature in the center of the pile reaches a temperature of about 140^{o}F. When the temperature decreases, the pile is turned and fresh material is introduced to the center of the pile. Turning also aerates the pile. Leaf compost is seen here in various stages of decomposition. The finished compost is used in experiments here at Lockwood Farm and at the Valley Laboratory in Windsor.

22. Hamden Police Department
The Hamden Police Department's goal is to enforce the law in a fair and impartial manner, recognizing both the statutory and judicial limitations of police authority and the constitutional rights of all persons**.** http://www.hamden.com/content/219/228/default.aspx

23. Verizon Wireless
Learn about the cellular transmission tower.

24. The Farmer's Cow
Ms. Kathy Smith
The Farmer's Cow is an innovative, premium milk brand produced and marketed by Connecticut family-owned dairy farms. The Farmer's Cow was formed in response to consumers' interest in purchasing fresh, naturally produced, local products. Collectively, The Farmer's Cow member farms milk 2,300 cows and manage over 6,000 acres of Connecticut farmland. The Farmer's Cow milk is currently available in over 100 grocery stores throughout the state. A complete listing of retailers is shown at www.thefarmerscow.com. The Farmer's Cow milk is sold in half gallon cartons in whole, 2 percent, 1 percent, and skim varieties. Chocolate milk and single-serve packaging are under development. The owners of The Farmer's Cow are active members in The Connecticut Farmland Trust and The Working Lands Alliance who are working to protect and preserve Connecticut farmland. They were also the founding members of "Very Alive," a non-profit organization dedicated to the promotion of Connecticut Agriculture. Connecticut farms contribute $2 billion annually to the local economy. 51 percent of Connecticut farmland is in dairy or dairy support. In 2003, there were 191 dairy farms remaining in Connecticut. The Farmer's Cow owners are: Paul and Diane Miller, Fairvue Farms, Woodstock; Bill, Tom and Greg Peracchio, Hytone Farm, Coventry; Ned and Renee Ellis, Mapleleaf Farm, Hebron; Jim and Don Smith, and Nate Cushman, Cushman Farms, Franklin; Peter Orr and Family, Fort Hill Farms, Thompson; Robin and Lincoln Chesmer, Graywall Farms, Lebanon. Further information can be found at www.thefarmerscow.com, www.ctfarmland.org, and www.workinglandsalliance.org.

25. Kids' Korner
Ms. Kathryn Soleski, Ms. Lisa Kaczenski Corsaro, and Ms. Tracy Zarrillo
Come to the Kids' Korner to pick up your child's passport and a gift. The passport is a special activity for young children to help them enjoy and explore Plant Science Day. There are six different stations located throughout Lockwood Farm that they can visit, where they can ask questions, learn about the topic featured at the station, and then receive a special stamp for their passport. Once the passport is complete, they can go to the Girl Scouts' (plot 26) to collect a CAES patch.

26. Self-Guided Activity for All Children, Including Girl Scouts
Ms. Terri Arsenault
Children can come to this plot to complete an age appropriate, self-guided activity, to earn a patch of their choosing among several options. Children are directed to a few of the many exhibits where age appropriate activities and speakers are available just for them. In addition, Girl Scouts will have the option to earn the Naturalist Legacy badge appropriate for their level of scouting. On October 1, 2007, Girl Scouts of Connecticut became the largest organization of women and girls in Connecticut, serving over 47,300 girls. The mission of Girl Scouts is to build girls of courage, confidence, and character, who make the world a better place through a diverse range of fun, and horizon-stretching experiences. We encourage everyone to use this opportunity to learn something new about the natural world, and use your new knowledge to make the world a better place.

27. Experiment Station Associates
Ms. Barbara Yaeger
Information is available on this organization formed to help promote scientific advances at The Connecticut Agricultural Experiment Station. Visit their webpage at: http://www.ct.gov/caes/ESA or http://www.agstationfriends.org.

28. Fiddlehead Trials
Dr. Abigail Maynard and Dr. David Hill
Fiddleheads are the furled fronds of a young fern, harvested in spring for use as a vegetable. Ultimately, each fiddlehead would unroll into a mature frond. The most popular fiddlehead is that of the ostrich fern (*Metteuccia struthiopteris)*, often called the fiddlehead fern. The ferns are available commercially either canned or frozen, but since the early 1980s, farmers' markets and supermarket chains have sold fresh ferns in season. Its flavor is similar to asparagus with a pleasantly crunchy, tender-firm texture. In this trial, we are determining the number of fiddleheads that can be harvested from each clump to optimize both the yield of fiddleheads and growth and health of the fern plant.

29. Potential Roles for Carbon Materials in the Breakdown of Pollutants

Dr. Joseph J. Pignatello

Carbons such as activated carbon and biochar are made by heating waste plant materials to high temperature in the absence of air. Carbons have been used commercially for a long time as effective adsorbents for removing chemical pollutants from water and soil. Biochar is claimed to improve soil fertility by retaining moisture and nutrients. In such roles, the carbon acts passively and the pollutant or nutrient is not chemically altered. Recent research, however, has shown that carbons may actively assist in the decomposition of certain pollutant compounds. Some examples of our work on this topic will be displayed. Biochars are shown to possess intrinsic chemical reactivity towards some compounds such as nitrophenols, which are used in industrial manufacturing and processing to produce dyes, rubbers, and fungicides. We found two types of reactions biochar causes. Carbons can also act as catalysts to accomplish the alkaline breakdown of some types of compounds. We showed this catalytic activity for methyl bromide, a vaporous fumigant used in the sterilization of soil and agricultural commodities (food, lumber) in international trade.

30. Hands-on Chemistry

Dr. Christina Robb, Ms. Kitty P. Riveros, Dr. Walter Krol, Ms. Terri Arsenault, Mr. Michael Cavadini, and Dr. Jason C. White

This display will include a number of "hands-on" experiments that will allow you to get up close and personal with chemistry in action. You will not only get to "play" with our chemists but also CAES staff members will explain the mechanisms and principles behind the chemistry.

31. Nanomaterials in Agriculture: Interactions with Co-existing Contaminants

Dr. Roberto De La Torre Roche, Dr. Nubia Zuverza-Mena, Dr. Chuanxin Ma, and Dr. Jason C. White

Nanomaterials (NMs) have at least one dimension less than 100 nanometers (one billionth of a meter) and this small size results in unique and useful properties. For example, at that size range, materials that are normally good insulators actually become conductive (silicon) and other elements that are generally stable actually become chemically reactive (gold). Current nanomaterial use is ubiquitous; over 1600-NM containing products are commercially available in areas such as electronics, health-care, cosmetics, pharmaceuticals, agriculture, and food processing/packaging. One area of research within the Department of Analytical Chemistry is investigating the interactions of NMs with co-existing contaminants, such as pesticides and heavy metals. Nanomaterials were added to soils containing currently used pesticides (imidacloprid), pharmaceutical compounds (carbamazepine, tetracycline), or legacy pesticides (chlordane). Plants or earthworms were then added to the soils and the movement of NM and contaminants into the organisms was then tracked as a function of co-exposure. The results show that the presence of a NM can significantly alter contaminant uptake; in some cases, accumulation is increased and in others, it is decreased.

32. Integrating Forest and Roadside Management Objectives to Create Storm Resilient Forests

Dr. Jeffrey S. Ward and Mr. Thomas E. Worthley (UConn) *Assisted by* Mr. Joseph P. Barsky

Abstract: Residents throughout the region have been affected by recent storms that negatively impacted both utility and transportation infrastructures through prolonged outages and impassable roads. Hanging, fallen, and/or broken trees have contributed to many outages. We have begun a collaborative project of managing roadside forests to increase utility reliability while maintaining their aesthetic appeal by integrating silvicultural and arboricultural practices. Collaborators on this project include: Audubon Connecticut, University of Connecticut, Connecticut Light and Power, Connecticut Department of Energy and Environmental Protection, and several forest landowners.

33. Soil pH Affects Health of Christmas Trees

Dr. Richard S. Cowles, Dr. James LaMondia, A*ssisted by* Mr. Nathaniel Child and Mr. Ethan Paine

True firs grown as Christmas trees are subject to losses from various root diseases, of which phytophthora root rot is the most important. Firs native to eastern North America are adapted to growing in low fertility, highly acid soils in the Appalachian Mountains, northern New England, and the Maritime provinces of Canada. We investigated whether modifying soil pH could benefit the growth of Canaan fir and Fraser fir at a field site where losses from root rots were consistently high. The hypothesis was that the trees may be tolerate lower pH soils than the disease organism; thus, low pH could allow phytophthora-susceptible trees to grow in this infested soil. Sulfur was amended in the soil in late summer of 2014 to bring the pH from ~6 to 4, and trees were planted in the spring of 2015. Color was improved in the transplants during the year following planting, which is a good indicator of better root health. In 2016, trees in the acid soil had terminal growth twice that of the trees in soil with a pH of 6. Laboratory experiments investigated whether the growth of four species of *Phytophthora*, isolated from Christmas trees in Connecticut, was affected by the pH of growing media. The dose-response curves generated for these four species demonstrated that *Phytophthora* spp. are sensitive to low pH conditions, and that they vary in their pH sensitivity.

34. The Public Health and Entomology Tent

a. The "Deer" Tick *Ixodes scapularis*

Dr. Kirby C. Stafford III *Assisted by* Ms. Heidi Stuber and Ms. Megan Linske

The blacklegged tick or "deer" tick *Ixodes scapularis* transmits the agents of Lyme disease, babesiosis, anaplasmosis, and a new relapsing fever Borrelia in Connecticut. Observe live and preserved ticks under the microscope. The latest information

on natural, biological, and integrated control is available.

b. Statewide Mosquito Monitoring Program for Mosquito-Borne Viral Diseases

Dr. Philip Armstrong, Dr. Theodore Andreadis, and Mr. John Shepard *Assisted by* Ms. Angela Bransfield, Mr. Michael Misencik, Mr. Michael Thomas, Ms. Stephanie Canales, Mr. Daniel Cole, Mr. Duncan Cozens, Mr. Christopher Driscoll, Mr. Max Engel, Mr. David Guzhnay, Ms. Noelle Khalil, Mr. Michael Olson, Ms. Sofia Moscovitz, Ms. Demi Rodriguez, and Ms. Danielle Sohai

Mosquito-borne viral diseases constitute an annual threat to human health in Connecticut. A comprehensive surveillance program complemented by science-based controls and timely public outreach are the most effective ways of protecting the public and reducing the risk of human disease. The Connecticut Agricultural Experiment Station (CAES) maintains a network of 91 mosquito-trapping stations in 72 municipalities throughout the state. The surveillance program monitors the types, numbers, and locations of mosquitoes and tests them for the presence of viruses that can cause illness including West Nile virus (WNV), eastern equine encephalitis virus (EEE), and Zika virus. To date, more than 3 million mosquitoes representing 52 different species have been collected, identified, and tested since 1997. A total of 1,840 WNV isolations have been recovered from 21 different mosquito species and a total of 400 isolations of EEE isolations have come from 19 species of mosquitoes. WNV has been detected every year since its introduction into Connecticut in 1999, virus activity peaks from July-September and is most frequently detected in densely-populated areas of lower Fairfield and New Haven Counties, and the Hartford metropolitan area. Seasonal transmission of EEE occurs sporadically and the focal areas are located near forested swamps in southeastern Connecticut. Further information on weekly test results and annual summaries for previous years can be found on the CAES web site (www.ct.gov/caes/mosquitotesting).

c. Tick Testing Program for Lyme and Allied Diseases

Dr. Goudarz Molaei *Assisted by* Mr. Alex Diaz, Ms. Mallery Breban, Ms. Pauline Dutka, and Ms. Kristina D'Agostino

Tick-associated illnesses including Lyme disease (LD) constitute a major threat to human health in Connecticut. In 2015, 96% of confirmed LD cases in the U.S. were reported from 14 states including Connecticut with the 5th highest number of confirmed cases of LD (*n*=1873) and 5th highest incidence (confirmed cases per 100,000 persons) rate of 52.2. The blacklegged tick, *Ixodes scapularis*, is the most important species in transmitting *Borrelia burgdorferi*, *Anaplasma phagocytophilum*, *Babesia microti*, and Powassan virus, the causative agents of LD, babesiosis, anaplasmosis, and Powassan virus illness, respectively. The Tick Testing Program at the Connecticut Agricultural Experiment Station was established in 1990 following an earlier outbreak of an unknown illness and hospitalization of a large number of children in Lyme, Connecticut with arthritic and other symptoms. Each year, an average of 3,000 ticks are submitted by the state residents, health departments and physicians' offices for testing. Tick testing results in 2016 indicate that greater than 35% of ticks in Connecticut are infected with at least one pathogen capable of causing debilitating human illness. Of the 2177 ticks tested in 2016, 29%, 7.4% and 4.6% were positive for the causative agents of LD, babesiosis, and anaplasmosis, respectively.

35. A World of Viruses

Dr. Doug Brackney *Assisted by* Ms. Maria Correa

Viruses are parasitic microorganisms that replicate within infected cells. Composed of genetic material bundled in a protein shell, viruses are relatively simple. Yet, despite their simplicity, viruses play a significant role in shaping the world we live from global economics to human health. They infect all living organisms from bacteria in deep-water vents to plants and animals. This exhibit will explore the fascinating world of viruses from their diversity and size to their medical and agricultural importance. Bring the kids and join us in constructing our own virus models.

36. Diversity and Dilution: The Impact of Medium-Sized Mammal Diversity on *Borrelia burgdorferi* Prevalence in Fragmented and Unfragmented Habitats in Connecticut, USA

Dr. Scott C. Williams *Assisted by* Mr. Michael R. Short and Ms. Megan A. Linske

Small to medium-sized mammals can serve as reservoir hosts for *Borrelia burgdorferi*, the causal agent of Lyme disease. Dilution effect theorizes that when there is a greater diversity of hosts, there is a reduction in local infection prevalence in fragmented versus unfragmented habitats. This study focuses on medium-sized mammal diversity and abundance, and the role they play in Lyme disease amplification or dilution in Connecticut woodlands and residential areas. Using camera traps, imagery data were analyzed to determine differences in total host encounters, species richness, evenness, and diversity at our study sites. Sherman live traps were utilized to capture white-footed mice, the primary reservoir host for *B. burgdorferi*. Mice will be used as a sentinel species to determine the difference in infection between unfragmented and fragmented areas. Understanding the dynamics of host diversity and their interaction with blacklegged ticks can play a crucial role in preparing management strategies for both the disease and its vector.

37. Invasive Insects in the Northeast

Dr. Chris T. Maier *Assisted by* Ms. Tracy Zarrillo and Ms. Morgan Lowry

Invasive insects pose a significant threat to the economy and the biodiversity of our region. Annually, state and federal workers conduct surveys to detect new non-native insects and to determine the distributional range of established ones. Early detection, in particular, greatly decreases the cost of coping with invasive insects. The cost of foreign insects can be reduced even further by conducting research on their behavior and ecology to develop effective strategies to slow their spread or to eradicate them. During the last few years, we have examined the distribution and biology of the brown marmorated stink bug, the lily leaf beetle, the Eurasian spruce needleminer, the barberry fly, and several non-native bees. In surveys conducted in 2016 and 2017, we have discovered that two invasives, the Japanese cedar longhorned beetle and the viburnum leaf beetle have expanded their distributional range in Connecticut.

38. A New Species *Bactrodesmiastrum domesticum* and a Noteworthy Mold from Indoor Environments

Dr. De-Wei Li *Assisted by* Chin S. Yang and Ariunaa Jalsrai

Two molds were collected from residences. *Bactrodesmiastrum domesticum* is described as a new species. The other one, *Conioscypha varia* is reported from an indoor environment for the first time.

39. Organic Control of Fireblight on Apples

Dr. Quan Zeng and Dr. Zhouqi Cui

Fire blight is a serious bacterial disease of apple and pears in Connecticut and in the United States. Most apple and pear varieties sought after by consumers, such as 'Gala', 'Fuji', and 'Bartlett', are either susceptible or highly-susceptible to fire blight. As the fire blight pathogens enter plant through flowers during bloom, application of antibiotic streptomycin at bloom is by far the most effective management option for fire blight. However, the intensive, long-term use of streptomycin not only leads to the evolution of streptomycin resistance in the pathogen population, but also raises concerns of its potential impact to the environment and human health. On October 21st, 2014, the National Organic Standards Board terminated the use of streptomycin in the organic fruit production in the US. We aim to develop effective, environmental friendly, non-antibiotic management options of fire blight. This plot demonstrates the 'Red Delicious' apple trees infected with fire blight. We are testing the efficacy of non-antibiotic treatments, a plant sanitizing product (hydrogen peroxide), copper, and three different biological control agents, to the antibiotic treatment (streptomycin) in controlling fire blight.

40. The Pavilion at Lockwood Farm

See program pages 9-11 for a schedule of short talks under the pavilion.

The pavilion at Lockwood Farm was commissioned by the Experiment Station's Board of Control with funds provided by the William R. Lockwood Trust. Completed in May of 2016, it was designed and built by Steven Strong of Strong Timber Frames, East Hampton, CT. All wood products used in construction of the pavilion are Connecticut grown. The posts, beams and walls are eastern white pine, grown and harvested from Babcock Pond Wildlife Management Area in Westchester, CT. The pegs and splines are white oak, harvested from the Strong 50-acre farm in East Hampton, CT. The pavilion is constructed using traditional timber framing post and beam techniques with large heart sawn timbers. The pavilion design features a large cupola with window and louver units that were constructed from the edges of the timbers. It functions to allow natural light and ventilation which provide an open feel in the interior of the building.

41. Native Woody Shrubs

Dr. Jeffrey S. Ward *Assisted by* Mr. Joseph P. Barsky

Native woody shrubs offer an alternative to exotics commonly used in landscaping. This collection of shrubs was assembled in 1962 and in 1976 it was arranged in its present form with a dry site on the gravel mound and moist site in the shallow, plastic-lined depression. Many of these shrubs flower in the spring; their flowers can be seen in the photographs. Others, such as sweet pepperbush, spirea, and buttonbush, flower in summer. Witch-hazel flower in early autumn. Birds are frequent visitors to the garden and quickly eat the mature fruit. These shrubs survive with minimal maintenance. Occasional mowing, annual removal of dead stems, and replenishment of mulch are performed. These shrubs have never been fertilized, watered, or treated for disease.

42. Oak Success Following Regeneration Harvesting in Connecticut

Dr. Jeffrey S. Ward *Assisted by* Mr. Joseph P. Barsky

Over 1100 points on 57 forested stands were surveyed during 2015-16 to ascertain quantity and quality of tree species regeneration on hunted versus non-hunted locations across three regeneration prescriptions: overstory removal, shelterwood, and irregular shelterwood. These areas were harvested between 2004 and 2014 and represent over 2269 forested acres throughout Connecticut. Preliminary results indicate a management goal of 60 Free-To-Grow (FTG) oaks per acre (150/ha) was achieved on 52% of hunted stands but only on 7% of non-hunted stands following regeneration harvests. Oak regeneration success was much higher following shelterwood or overstory removal harvests (54-67% of stands) than on stands with irregular shelterwoods (33% of stands). Land

managers looking to retain a high proportion of competitive oak stems should consider deer density and complete overstory removal when developing silvicultural prescriptions.

43. Bird and Butterfly Garden
Ms. Jane Canepa-Morrison and Mr. Jeffrey Fengler
The Bird and Butterfly Garden creates several favorable habitats for our native birds, butterflies, and pollinating insects and helps us determine which plants may work best in southern Connecticut gardens. At this time of year, the garden is at its peak performance with plants thriving in the garden and meadow. Plant labels are placed near the plants in the garden to provide the botanical and common name. Throughout the day, we update our list of birds, butterflies, and moths spotted in the garden. The Bird & Butterfly Garden at Lockwood Farm is listed in the "Nature Conservancy Open Days Directory for New England." Do you have a butterfly garden or would like to start one? Experiment Station staff members can provide you support by answering your questions and suggesting ways for you to enjoy a butterfly garden small or large on your patio or in your yard.

44. Variation in Attraction to Pollinators Among Cultivated Varieties of Ornamental Plants
Dr. Kimberly Stoner *Assisted by* Ms. Morgan Lowry, Ms. Tracy Zarrillo, Ms. Damaris Chenoweth, Mr. Sawyer Badey, and Mr. James Durrell
The normal biological function of flowers is sexual reproduction of the plant, which requires fertilization of the female flower parts with pollen. For about 90% of flowering plants, a pollinator is involved in moving the pollen, and many characteristics of flowers – scent, visual cues, and offerings of nectar – evolved to attract pollinators to the flowers. However, plant breeders have often modified flowering plants in ways that may make them more attractive to humans, but less attractive to pollinators. In this plot, we are comparing the pollinator visitation to different cultivated varieties of flowering ornamental annual and perennial plants, and we expect to relate differences in visitation to differences in flower characteristics.

45. Environmentally-Friendly Control of Powdery Mildew on Vegetable Plants
Dr. Francis J. Ferrandino *Assisted by* Ms. Joan L. Bravo
Many vegetable plants commonly used in Connecticut gardens are subject to powdery mildew. This disease is caused by a fungus that grows on the surface of plant tissue giving the foliage a white powdery appearance. The result is relatively unsightly and the fungus weakens infected plants by feeding on the sugar the plant produces and by blocking sunlight, which limits the ability of the plant to produce more sugar. This plot is planted to a number of common vegetables (tomato, pepper, eggplant, pumpkin, and muskmelon) which are susceptible to powdery mildew. Environmentally-friendly foliar sprays, including milk (20% in water), Potassium bicarbonate (1% in water) and light horticultural oil (1% in water), will be compared to chemical fungicides in their ability to control the disease.

46. Suppression of Powdery Mildew of Pumpkin with Nanoparticles of Metal Oxides
Dr. Wade Elmer and Dr. Jason White *Assisted by* Mr. Peter Thiel and Mr. Benson Chan
Pumpkins routinely get powdery mildew, a destructive foliar disease caused by a pathogenic fungus. Growers typically spray pumpkin fields with expensive fungicides 5 to 8 times during the summer to suppress powdery mildew, which places exorbitant costs on the grower. These plots are designed to compare various nanoparticle preparations to an untreated control and a conventional fungicide spray.

47. Invasive Aquatic Plant Program
Mr. Gregory Bugbee *Assisted by* Ms. Amanda Massa, Ms. Summer Stebbins, and Ms. Abigail Wiegand
Connecticut lakes and ponds are becoming increasing degraded by the spread of non-native invasive plants. Plants such as Eurasian watermilfoil, variable watermilfoil and fanwort are of great concern because they disrupt native ecosystems, interfere with recreational uses and reduce property values. Researchers in the Department of Environmental Sciences are documenting our State's invasive aquatic plant problem. From 2004 - 2016, we surveyed and mapped the invasive and native plants in over 230 Connecticut lakes and ponds. We documented over 100 plant species, 14 of which are invasive. Approximately two-thirds of the water bodies contained one or more invasive species. In 2010, we began resurveying lakes that were originally done over five years ago and are beginning to quantify long-term changes. We have found and continue to search for novel management options including; reduced risk herbicides, biological controls and winter drawdown. We also have developed models to predict at-risk lakes based on their water chemistry. Requests for Station assistance in managing unwanted aquatic vegetation are common and we often visit water bodies to help solve imminent problems. At this plot you will see our aquatic plant surveillance boats, state of the art global positioning systems and the underwater video equipment we use to conduct our surveys. In addition, there will be live specimens of invasive plants on display to hone your identification skills. A researcher will be available to discuss our program and answer questions about lakes and ponds.

48. Chestnut Species and Hybrids
Dr. Sandra Anagnostakis *Assisted by* Ms. Pamela Sletten
These trees are part of the large collection of species and hybrids of chestnut maintained by The Experiment Station. Great differences can be seen in chestnut blight resistance, Asian chestnut gall wasp resistance, form, and nut production. Hypovirulent strains of the

blight fungus help protect the trees from lethal cankers (see CONTROL OF BLIGHT ON AMERICAN CHESTNUTS plot 9). Plants of all seven species of chestnut are growing here. One seedling from the Caucasus Mountains of Russia (a true European chestnut), planted in 1994, has not survived well through our Connecticut winters. Commercial European chestnut trees from Northern Turkey have also done poorly. Two trees of the chinquapin native to Florida are planted across the road from an Allegheny chinquapin from Pennsylvania. The original tree (the "ortet") of the cultivar 'Lockwood' is at the southwest corner of the plot.

49. Healthy Plants—Healthy Business: Support of the Green Industry by Inspection

Dr. Victoria Lynn Smith *Assisted by* Ms. Tia Blevins, Mr. Zachary Brown, Mr. Mark Creighton, Ms. Joann Klein, and Mr. Jeff Fengler

We work to assure the quality of the agricultural products leaving the state and to maintain the health of forests and Connecticut's agricultural industry. In 2016, the Office of the State Entomologist completed registration and inspections for 275 nursery growers and dealers of plants and plant products. Over 350 certificates of export were issued for plant commodities moving out of state or out of country. Nearly 1,000 beekeepers registered 7,000 hives, and over 1,000 of these were inspected for diseases of honeybees. In addition, surveys were conducted for a variety of exotic pests and diseases, including a comprehensive honey bee disease survey. The health of our forests was assessed by aerial survey. Our goal is to safeguard agriculture and forests of Connecticut through surveys to detect infestations, through monitoring of the health and vitality of the forests, and through inspection and registration of commodities and producers to assure their fine quality.

50. The Cooperative Agricultural Pest Survey (CAPS) Program and Farm Bill Surveys

Ms. Katherine Dugas *Assisted by* Mr. Zachary Brown

The Cooperative Agricultural Pest Survey (CAPS) Program conducts science-based national and state surveys targeted at specific exotic plant pests, diseases, and weeds identified as threats to U.S. agriculture and/or the environment. These activities are accomplished primarily under USDA funding that is provided through cooperative agreements with state departments of agriculture, universities, and other entities. Surveys conducted through the CAPS Program represent a second line of defense against the entry of harmful plant pests and weeds. This year in Connecticut, CAPS pest surveys are being conducted in nurseries, in forest lands, and in Christmas tree farms. Additionally, CAES is also conducting pest surveys with funding from the Farm Bill in vineyards.

51. Boxwood Blight - Means of Spread and Implications for Management

Dr. James A. LaMondia, *Assisted by* Ms. Michelle Salvas and Mr. Nathaniel Child

Boxwood blight, caused by the pathogenic fungus *Calonectria pseudonaviculata,* is a recent, introduced disease in Connecticut. The impact of the disease has been great; boxwood plant losses have been estimated at over $5 million in Connecticut since 2011. The pathogen produces sticky spores on leaf and stem lesions under warm and humid conditions. We conducted experiments to investigate the means of spore dispersal using sporulating cultures and infected leaves. Spores were not dispersed by wind alone. Spores are spread locally by water splash and wind-driven rain. Movement of the pathogen, sometimes long distances, may also occur by movement of infected plants, dispersal of infected leaves and distribution on equipment such as pruning shears, humans and animals. Inspection and prevention of disease on planting stock, sanitation of equipment, pruning under dry conditions and management of the pathogen during wet periods conducive to spread all contribute to reduced pathogen spread and disease.

52. Biological Control of Hemlock Woolly Adelgid and Mile-A-Minute Weed in Connecticut

Dr. Carole Cheah, *Assisted by* Mr. Emmett Varricchio

Updates on two of Connecticut's biological control programs are presented. Hemlock woolly adelgid, *Adelges tsugae* (HWA), a serious forest and nursery threat to native eastern and Carolina hemlocks, currently impacts 20 states in the Eastern U.S. It was first detected in Connecticut in 1985. However, recent consecutive severe winters from 2014-2016 have greatly reduced populations of HWA in the Connecticut landscape, giving hemlocks a statewide reprieve from adelgid attack. In addition, substantial releases of the tiny ladybeetle, *Sasajiscymnus (=Pseudoscymnus) tsugae,* native to southern Japan, were implemented for biological control of HWA in Connecticut between 1995 and 2007. This efficient HWA predator, discovered, evaluated and reared by CAES scientists, is now commercially available to the public to combat the resurgence of HWA after milder winters. However, changing climate conditions and hotter temperatures are also stressing native hemlocks and increasing other pest attacks. The current prolonged, extreme drought has affected the recent widespread recovery of forest hemlocks in Connecticut, especially on marginal sites. The efficacy and impact of these earlier releases in the context of these other stressors are currently being assessed. Another threat to native vegetation diversity is the non-native mile-a-minute weed, *Persicaria perfoliata* (MAM). This invasive, rampant and prickly vine was initially reported in Connecticut in 2000, but has now spread to 43 towns. As part of the federal biological control program for MAM supported by USDA APHIS PPQ, a tiny weevil, *Rhinoncomimus latipes*, imported from China to feed and reproduce exclusively on MAM, was first released in Connecticut in 2009. In collaboration with the University of Connecticut, >49,000 weevils have been released and monitored since 2009, in the most heavily infested 24 towns to control MAM. Weevils have survived Connecticut winters, adapted to challenging environmental conditions and spread widely in many areas to feed on MAM.

53. 10 Years of Wasp Watching: What Have We Learned About Connecticut's Jewel Beetles

Dr. Claire Rutledge, *Assisted by* Ms. Mioara Scott

My laboratory began monitoring the predatory wasp *Cerceris fumipennis* in 2008. The wasp uses jewel beetles, also known as flat-headed borers, to provision their young. The goal was to detect emerald ash borer, an invasive jewel beetle from Asia. We detected emerald ash borer in 2012, and since then have tracked its spread and population growth within the state using the wasp. However, we have also collected 19,000+ native jewel beetles. This is a rich sample of a group of beetles that is rarely collected and we can use it to learn about the distribution, abundance and phenology of an important and charismatic group of Connecticut's native fauna.

54. Okra Trials

Dr. Abigail Maynard and Dr. David Hill

Okra is grown for its long pointed seed pods, which are used in gumbos and soups. It is best picked when the pods are young and immature or about 2-4 inches long. It is considered a delicacy in the southern United States particularly when breaded with corn meal and deep fried. It is in the same family as cotton, hollyhocks, and hibiscus which make it a nice ornamental plant as well. Okra plants are extremely drought resistant which make a popular vegetable in countries with difficult growing conditions. It grows best in hot weather with warm soils so that yields are usually increased when grown with black plastic mulch in the Northeast. In this trial, we are growing 8 cultivars of okra to determine which performs best in Connecticut's climate and soils. In addition, we are growing the crop with and without black plastic mulch to determine whether the expected increased yields utilizing the black plastic mulch is enough to offset the added expense of the plastic. Last year, Emerald Green averaged the highest yields (98 pods/plant). Yields from the black plastic amended plots averaged 61% greater when compared to plots with no plastic. This 3-year trial is also repeated at our Valley Laboratory in Windsor.

55. Brussels Sprouts Trials

Dr. Abigail Maynard and Dr. David Hill

Brussels sprouts are related to other better-known vegetables in the mustard family including broccoli, cabbage, and cauliflower. Typically, it is grown as an annual and the axillary buds, which resemble miniature cabbages, are harvested either by hand with several harvests of 5-15 sprouts, or by cutting the entire stalk at once for processing. Each stalk can produce 2-3 lbs. per stalk. Brussels sprouts grow best in temperatures ranges of 45-75^{o}F with the highest yields at 60-65^{o}F. Quality does not decrease from freezing, and, in fact, sprouts are considered to be sweetest after a frost. Sprouts that develop in hot weather often do not form compact heads and can be bitter. In this trial, we are growing 10 cultivars of Brussels sprouts to determine which performs best in Connecticut's climate and soils. In addition, we are growing the crop with and without black plastic mulch. Black plastic mulch controls weeds. However, as Brussels sprouts are cool loving plants and black plastic raises the soil temperature, it is important to determine the effect of plasticulture on the yield and quality of marketable sprouts in Connecticut. Last year, Jade Cross E averaged the greatest yields (84 sprouts/plant) with Dimetri with the second greatest yields (79 sprouts/plant). Yields from plastic amended plots averaged 11% greater compared to yields from the bare soil plots. This 3-year trial is also repeated at our Valley Laboratory in Windsor.

56. Sweet Potato Trials

Dr. Abigail Maynard and Dr. David Hill

A 1998 Connecticut Department of Agriculture survey showed that sweet potato is one of the most popular specialty vegetables. In the South, the sweet potato is also called yam, but both are identical species. In the United States, North Carolina and Louisiana are the leading producers where they are grown in hilled soil. Since they have a long growing season and thrive in warm soil, they have always been grown in the Northeast with black plastic mulch. However, black plastic mulch and hilling the soil increases both the labor and the cost per acre of producing the crop. In this trial, we are determining whether black plastic mulch and hilled soil are necessary for optimum production of sweet potatoes in Connecticut. We have 4 treatments: black plastic/flat soil, black plastic/hilled soil, no mulch/flat soil, and no mulch/hilled soil. In this way, we will determine the cultural method for growing sweet potatoes which is most productive and economically the most feasible. Last year, the hilled treatments produced the greatest yields; however, the rows with flat soil were decimated by deer early in the season and had to resprout.

57. Butternut Squash Trials

Dr. Abigail Maynard and Dr. David Hill

Winter squash varieties such as butternut, buttercup, acorn, and Hubbard have long been favorite fall crops for vegetable growers who operate roadside stands and attend farmers' markets. An Experiment Station survey of vegetable growers found that 93% grow winter squash with butternut squash the most popular. Consumers often purchase by the bushel because they store well and can be eaten well into the winter months. Most squash varieties are long-vined and discourage home growers with limited space. New cultivars have been developed that produce fruit on shorter vines, allowing closer spacing. We are evaluating the yield and quality of 5 semi bush butternut squash varieties and comparing them to 5 traditional long vined varieties. This 3-year trial is repeated at our Valley Laboratory in Windsor.

58. Curiosity Garden

Dr. Abigail Maynard and Dr. David Hill

This demonstration plot contains a potpourri of vegetables grown to pique the interest of home gardeners and growers of specialty crops. Included are two varieties of globe artichokes, grown specifically for annual culture from seed. One is a green colored variety (Imperial Star); the other is a purple colored variety (Colorado Star). Also being grown is luffa. This vine, which is a member of the cucumber family, has two uses. It is edible if it is harvested when it is very small (4-5 inches) and cooked as a vegetable. When the fruit is fully ripened, it is very fibrous and is the source of the loofa scrubbing sponge, used in bathrooms and kitchens. Also included in the garden are celery, basil, multicolored Swiss chard, and ornamental gourds.

59. Hops – Additional Varieties for Connecticut

Dr. Katja Maurer and Dr. James A. LaMondia *Assisted by* Mr. Nathaniel Child and Ms. Michelle Salvas

Commercial hop production has just started in CT. There is wide interest in the production of locally grown hops among commercial growers, craft brewers, home brewers, and hobby gardeners. CAES scientists have established two hop yards with several cultivars using high and low trellis systems at the Lockwood Farm in Hamden and at the Valley Laboratory in Windsor. The main hop yards with five varieties have proven the general feasibility of successful hop production in CT. In 2016, 23 more varieties were planted at Lockwood Farm, in total 46 varieties over the last 4 years, and 10 more varieties were planted in Windsor. We are evaluating growth, yield, disease resistance, and quality characteristics for this large number of hop varieties to enable growers to plant suitable varieties for successful commercial production. Not every variety does well in CT. The most common diseases and pests are downy mildew, which is the most dreaded disease in the Northeastern U.S., two-spotted spider mites, potato leafhoppers, and hop aphids. Therefore, we are establishing a region-specific integrated pest management program, which includes intensive scouting and timely control measures. Our results point to hops as a promising new crop for CT.

60. Hybrid and Vinifera Winegrape Cultivar Trial

Ms. Joan Bravo and Dr. Francis J. Ferrandino

This vineyard was planted in late spring, 2008. Some of the new cultivars are selections from breeding programs at Cornell University and the University of Minnesota and have not yet been released, while others are newly available cultivars from cool and cold climate areas of Europe. The new cultivars are being compared to established cultivars. Another, smaller, cultivar evaluation plot has been established at the Windsor station.

61. Pinot Gris Cultural Trials

Ms. Joan L. Bravo and Dr. Francis J. Ferrandino

A planting of 288 Pinot Gris vines was established in 2004. Half of the vines are on 101-14 rootstock, and the other half are on C3309. Vines on C3309 have had greater winter mortality and increased incidence of crown gall. Horticultural oil was applied at bloom in 2006-2008. Application of oil reduced photosynthesis and fruit set, resulting in less compact clusters that may be more resistant to late-season fruit rot diseases. This summer, the half-acre plot is being used to measure detailed wind statistics in the vineyard.

62. The Rock

This rock is (technically) a Glacial Boulder composed of Diabase. It was moved by flowing ice from its place of origin, and is therefore also known as a Glacial Erratic. The boulder probably fell onto the top of the glacier oozing its way down past the Sleeping Giant's head during the waning stage of the last continental glaciation. It was deposited here, near the toe of the waning glacier, onto "till," an unsorted mass of sandy or silty material mixed with rounded pebbles and boulders that had been pushed in front of, or under, the glacier, and deposited as the ice melted. Most of the boulders around the area, such as those in the nearby stone walls, are rounded and their surfaces have been ground smooth by abrasion beneath the glacier. Diabase has a fine crystalline texture, having been pushed up as magma close to the surface where it cooled quickly. The "trap rock" of this region is either diabase, or its compositional equivalent basalt that was extruded onto the surface as lava flows that form topographic "trappa" or "trappe" (steps or stairs).

63. Rocky Hill American Chestnut Trees

Dr. Sandra Anagnostakis *Assisted by* Ms. Pamela Sletten

Seed collected from selected American chestnut trees in a woodlot in Rocky Hill, CT in 1985 grew into the trees planted here. They are used as female parents in our crosses and are being treated with hypovirulence (see CONTROL OF BLIGHT ON AMERICAN CHESTNUTS plot # 9) to keep them alive.

64. Hybrid Elm Trees

Dr. Sandra Anagnostakis *Assisted by* Ms. Pamela Sletten

The late Eugene Smalley spent his whole career at the University of Wisconsin breeding elm trees for resistance to Dutch Elm Disease and for the tall, vase-shaped form of American elm trees (*Ulmus americana*). The problem with this kind of breeding is that American elms have four sets of chromosomes, and all the other species of elm have two sets. They bloom at different times, but stored pollen can be used to make crosses. In 1992, Dr. Smalley sent us trees of Chinese elm (*Ulmus parvifolia*) and some of his successful crosses.

Mortality has been high, but some of the trees still survive. A few of them look like good replacements for American elms as street trees.

65. Japanese Plum Variety Trials
Dr. Abigail Maynard and Dr. David Hill
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. Consequently, we have expanded our New Crops Program to include fruits. This trial, also repeated at the Valley Laboratory in Windsor, includes 12 cultivar/rootstock combinations of Japanese plum. Many trees were severely damaged by black knot disease and were removed from the orchard. However, the cultivar Obilinaja (planted in the first row) has been relatively free of the disease.

66. Pawpaw Trials
Dr. Abigail Maynard and Dr. David Hill
Pawpaws are shrubby trees that are native to the temperate woodlands of the eastern United States. The American Indian is credited with spreading pawpaws across the eastern U.S. to eastern Kansas and Texas, and from the Great Lakes almost to the Gulf. They are woodland understory plants that need shade to protect the seedlings but once established prefer full sun. They produce maroon, upside-down flowers which are self-incompatible, requiring cross pollination from another unrelated pawpaw tree. They are not pollinated by bees but by flies and beetles. The pawpaw is the largest edible fruit native to America. Individual fruits weigh 5 to 16 ounces and are 3 to 6 inches in length. The tasty fruit has a smooth, custard texture. In this trial, 4 cultivars of pawpaws were planted in 2002. Since 2013, annual yields were recorded from each tree. Thus far, the cultivars Rebecca's Gold and Overleese have averaged the greatest yields (43 and 39 fruit/tree, respectively) with Sunflower producing the largest fruit (6.9 oz/fruit).

67. Beach Plum Trials
Dr. Abigail Maynard and Dr. David Hill
Beach plum (*Prunus maritime* Marsh.) is a fruiting shrub native to the coastal dunes of the Northeastern United States. Beach plum jam has become a premium product especially in the Cape Cod region. Currently, consumer demand for beach plums is greater than the supply. Commercial production is the only way to meet the demand for beach plums and its relatively low growth habit makes it ideal for a pick-your-own operation. In its native seaside habitat, beach plums grow very slowly and bear fruit sporadically. Growth in more fertile soil should be more vigorous and crop size will be improved. 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 are evaluated annually and select elite individuals will be propagated as possible cultivars in the future.

68. Asian Chestnut Gall Wasp on Chestnut
Dr. Sandra Anagnostakis *Assisted by* Ms. Pamela Sletten
Many of the chestnut trees hear at Lockwood Farm are heavily infested with Asian chestnut gall wasp (*Dryocosmus kuriphyllis*). The insect was first detected in CT in 2011, but has done serious damage to commercial orchards in the mid-west and in Italy. We have been making crosses of susceptible trees with chinquapins which seem to have good resistance to this insect, and some are planted here. There are more wasp galls on some of these trees than on others, and we will continue to evaluate the effect of these galls on the growth and nut production of the trees.

OUTSIDE EXHIBITORS (69-92)

69. Connecticut Botanical Society
Truda Steinnagel
We are a group of amateur and professional botanists who share an interest in the plants and habitats of Connecticut and the surrounding region since it was founded in 1903. Our goals are to increase knowledge of the state's flora, to accumulate a permanent botanical record, and to promote conservation and public awareness of the state's rich natural heritage. Our social media connections are: www.ct-botanical-society.org, www.facebook.com/pages/CT-Botanical-Society/486881834720804, and www.facebook.com/CTNotableTrees.
Botanical Society Activities

- We run field trips, led by knowledgeable botanists, on weekends from spring to fall. The trips provide a great opportunity to learn about wild plants and about the state's diverse ecosystems.
- We hold meetings in spring and autumn, each with an illustrated lecture by a naturalist or other scientist.
- We publish a semi-annual Newsletter with botanical articles and news.
- We created the Connecticut Botanical Society Herbarium, a "dried plant library" with over 36,000 sheets of plants. This collection records the changing distribution of Connecticut flora. Our herbarium is integrated with the Yale Herbarium at the Peabody Museum.

- We created and maintain the Vascular Plants of Connecticut Checklist, a comprehensive list of plants that grow wild in the state. The list is available free for download.

Along with the Connecticut College Arboretum and the Connecticut Urban Forest Council, we collect and distribute information on Notable Trees: the state's historic trees and its largest trees.

70. Connecticut College Arboretum

Christine Donovan, Glenn Dreyer

The Connecticut College Arboretum provides a welcome connection with the natural world, offering opportunities for teaching, research, conservation, recreation and public education. We will use the exhibit to connect with people attending Plant Science Day about ecological landscaping and native plants and why it is important to sustain them.

71. Connecticut Department of Agriculture

a. Connecticut Department of Agriculture

Rebecca Eddy

The Connecticut Department of Agriculture's mission is to foster a healthy economic, environmental and social climate for agriculture by developing, promoting and regulating agricultural businesses; protecting agricultural and aquacultural resources; enforcing laws pertaining to domestic animals; and promoting an understanding among the state's citizens of the diversity of Connecticut agriculture, its cultural heritage and its contribution to the state's economy. www.CTGrown.gov.

b. The Connecticut Department of Agriculture and The Animal Feed Regulatory Program Standards (AFRPS)

Wayne Nelson, Kate Ciarletta, and Mary Joaquin

In 2011, the FDA and the Association of American Feed Control Officials (AAFCO) partnered to develop the Animal Feed Regulatory Program Standards (AFRPS). These standards establish a uniform foundation for the design and management of State programs responsible for the regulation of animal feed. Animal feeds include foods manufactured for livestock and poultry feeds, pet foods, pet treats, foods for fish, amphibians, reptiles, and insects and foods for birds and wildlife. To ensure achievement of compliance, the FDA instituted a Cooperative Agreement Program, which provides funding from 2015 to 2020. By implementing these feed standards with the FDA's support, CT will be better able to achieve and maintain programmatic improvements that help ensure the safety and integrity of both the CT and U.S. animal feed supply. The goal of these standards, eleven in total, is to leverage resources and share common successes to build systems within state regulatory feed programs. Training, inspection programs, auditing, outreach activities, and sampling plans are examples of the systems covered by the AFRPS. Standard ten, in particular, concerns laboratory services. The Department of Agriculture works closely with the Connecticut Agricultural Experiment Station's Department of Analytical chemistry to develop a system in which sampling, testing, and regulatory action occur smoothly and efficiently as a result of open communication and coordination between the two agencies. Further information on the sampling and testing orchestrated by the AFRPS can be found at the Department of Analytical Chemistry's Barn Exhibit, which covers the surveying of mycotoxins in feed.

72. Connecticut Department of Energy & Environmental Protection: Wildlife Division (CT DEEP Wildlife Division)

Katerina Hutchins

The CT DEEP Wildlife Division is responsible for managing the state's wildlife through a program of regulation, research, management, and public education. The Outreach Program within the Division will be displaying hands-on materials, and will provide information on current wildlife issues. www.ct.gov/deep/wildlife.

73. Connecticut Department of Labor Occupational Safety and Health Administration (CONN-OSHA)

Catherine Zinsser

The Connecticut Department of Labor's Division of Occupational Safety and Health is referred to as CONN-OSHA administers Connecticut's Public Employer Only State Plan and enforces occupational safety and health standards as they apply to all municipal and state employees. In addition to having enforcement responsibilities in the public sector, CONN-OSHA provides on-site consultations to both public and private sector employers. The mission of the Connecticut Consultation Program is to provide timely, courteous, and professional service to Connecticut employers to help them recognize and control workplace hazards and prevent work-related injuries, illnesses, and fatalities. Our consultants also provide assistance in developing and implementing effective safety and health programs. These consultations are provided at the request of the employer and are free of charge. CONN-OSHA offers comprehensive training and education programs covering all aspects of occupational safety and health. Provided at no charge, these programs are designed to be utilized in conjunction with both consultation and enforcement activities.http://www.ctdol.state.ct.us/osha/osha.htm.

74. Connecticut Environmental Council (CTEC)
Erica Fearn
People and pets are susceptible to tick-borne diseases like Lyme, but there are precautions you can take to make your yard less attractive to ticks and to help reduce its tick population. Making Connecticut's spaces and places beautiful, safe and pest-free. www.ctenvironmentalfacts.org, 860-586-7508

75. Connecticut Farm Bureau Association (CFBA)
Joan Nichols
The Mission of the Connecticut Farm Bureau is to elevate the stature of agriculture in our state. Through education, market promotion and legislative advocacy, we strive to increase farm income and to improve the quality of life not only for Connecticut farmers, but also for their consumers. www.cfba.org

76. Connecticut Farmland Trust
Brianna Dunlap
Connecticut Farmland Trust is a statewide nonprofit organization working to protect farmland from the constant threat of development. Keeping land in farms helps establish a local, sustainable food system, supports our economy, and contributes to improving the quality of land, air, and water. Our goal is to make working lands available to Connecticut farmers for the indefinite future. www.ctfarmland.org, 860-247-0202

77. Connecticut Forest and Parks Association (CFPA)
Liz Fossett
The Connecticut Forest & Park Association (CFPA) is a 501c3 nonprofit organization dedicated to connecting people to the land in order to protect forests, parks, walking trails, and open spaces in Connecticut for future generations. With a staff of experienced conservation professionals and a Board of Directors who strongly support CFPA's mission and values, CFPA delivers programs on Blue-Blazed Hiking Trails, Environmental Education, Land Conservation, and Public Policy. Our headquarters is located at the James L. Goodwin Forest & Park Center in the Rockfall section of Middlefield. For more information go to www.ctwoodlands.org or call 860-346-8733.

78. Connecticut Horticultural Society
Cheryl Marino
The Connecticut Horticultural Society is an educational organization dedicated to encouraging and improving the practice of gardening and the dissemination of horticultural information to its members and the public. The society through its many and varied programs seeks to encourage the enjoyment, appreciation and understanding of plants, the environment, and the art and science of gardening.

Established in 1887, Connecticut Horticultural Society is a 501(c)3 non-profit, membership-supported organization with an office in Rocky Hill. The society was established as a means for estate gardeners, florists and gardening enthusiasts to socialize, share their common interests and learn from each other. Its hallmark has always been an off-season speakers program featuring fine quality experts in the art and science of horticulture. Over time its offerings to members have expanded to include hands on workshops and a travel program. For nearly five decades, the society has honored and supported students of horticulture with scholarships. Each February, for more than forty years, the society has participated in the CT Flower & Garden Show as a branding and membership opportunity that helps promote its educational mission to show-goers. Ten issues per year of our professional newsletter are electronically mailed to members. www.cthort.org, 860-529-8713.

79. Connecticut Invasive Plant Working Group (CIPWG)
Donna Ellis
The Connecticut Invasive Plant Working Group (CIPWG) is a statewide organization whose members gather and convey information on the presence, distribution, ecological impacts, and management of invasive plant species. We promote the use of native or other non-invasive ornamental alternatives throughout Connecticut and work cooperatively with researchers, conservation organizations, government agencies, the green industry, and the general public to identify and manage invasive species pro-actively and effectively. The CIPWG website, www.cipwg.uconn.edu provides timely information on non-native invasive plants and their alternatives, including a list of Connecticut invasive species, management information, invasive plant alerts, fact sheets, invasive plant legislation, photos, alternative replacements for invasives, and a calendar of events. For additional information, or to become a member of CIPWG and subscribe to the list serve, please contact Donna Ellis at 860-486-6448; email donna.ellis@uconn.edu, www.hort.uconn.edu/cipwg.

80. Connecticut Professional Timber Producers Association (TIMPRO CT)
Brennan Sheahan
The mission of the Association is to enhance the image and understanding of the forest products profession in Connecticut through public outreach programs, education and a commitment to professionalism amongst its members. The Association strives to enhance the image of the industry by:

- Communicating information to members
- Instituting ethical guidelines and demanding a high degree of professional ethics among its members.
- Establishing forest practice standards for the timber harvesting and forest products profession.
- Promoting safety within the profession.
- Promoting Best Management Practices for the timber harvesting profession.
- Promoting education in the fields of forestry, timber harvesting, & forest products both within and outside the Association.
- Promoting superior utilization of forest products.
- Promoting the use of Connecticut wood products.
- Publishing a Connecticut Forest Profession Directory and a periodic newsletter.

Contact us at www.timproct.org or 860-948-0432.

81. Connecticut Tree Protective Association (CTPA)
Cathy Dvorsky
CTPA is an educational association dedicated to advancing the care of Connecticut's trees. Currently, we have over 780 members, of whom approximately three-quarters are licensed arborists. About two-thirds of the licensed arborists in Connecticut are CTPA members. The majority of CTPA's members are licensed arborists, but the Association is not geared exclusively towards arborists. Anyone with a strong interest in trees is invited to join, with much to gain. www.ctpa.org.

82. Federated Garden Clubs of Connecticut, Inc.
Polly Brooks
The Federated Garden Clubs of Connecticut, Inc. is an educational, charitable non-profit organization comprised of 6,557 individual members, 125 clubs and 15 affiliate organizations. It is one of thirteen charter members of the National Council of State Garden Clubs, Inc., now known as National Garden Clubs, Inc. Our mission is to coordinate, stimulate and encourage higher standards in all aspects of Garden Club work and to protect and conserve natural resources, preserve our heritage and promote civic beauty. Our focus under our current President, Jane Waugh, is the planting of native oak trees in public locations across our state. It's our state tree and the best tree for supporting local wildlife. The Federation offers educational programs to our members and the community at large through our national curriculum across four schools: Flower Show School, Landscape Design Study School, Garden Study School and Environmental Studies School. Additionally, we have resources to address Garden Therapy, Historic/Memorial and Public Gardens, Horticulture, Legislative/Government Action, Public Relations, Scholarships and Youth Activities. The Federation sponsors The Connecticut State Flower Show held each February at the Convention Center in Hartford. Visit our website at www.ctgardenclubs.org.

83. Lyman Hall High School Agricultural Science and Technology Program
Emily Picard
Lyman Hall High School's Agricultural Science and Technology program offers enrollment to students from 9 sending towns, including West Haven, East Haven, Branford, North Branford, North Haven, Hamden, Meriden, Cheshire and Wallingford. Students have the option of focusing in agricultural mechanics, plant science, food science, large animal science, small animal science, veterinary science, aquaculture or wildlife biology over four years. The program follows the three circle model, incorporating FFA, Supervised Agricultural Experience (SAE) and classroom content into a comprehensive program for students. Students entering 8th grade who are interested in applying should talk to their guidance counselors in the fall or contact the ag science program directly. For more information go to www.LHAgEd.org. 203-927-9193

84. Sleeping Giant Park Association
Julie Hulten
The Sleeping Giant Park Association is an all-volunteer 'friends group' dedicated to the care and upkeep of the Giant and the Sleeping Giant State Park since 1924. We field groups that engage in trail maintenance, environmental stewardship projects, and care-taking of a small garden designed to attract birds and butterflies. To encourage exploration of the Giant we offer at least 15 guided and/or themed hikes throughout the year and promote hiking through our Giant Master's program (hike all 32 miles for a badge and certificate). We welcome all who hold the Giant dear. www.sgpa.org.

85. South Central Connecticut Regional Water Authority
Kate Powell, Ron Walters, and Jeff Yale
The South Central Connecticut Regional Water Authority is a non-profit public corporation. We own more than 27,000-acres of land

and provide a wide array of recreational opportunities and water-related services. Through our Whitney Water Center, we offer hands-on water science programs to thousands of students annually.

On average, we supply 46 million gallons of water a day to a population of some 430,000 persons. We provide water and other services in all or portions of Ansonia, Bethany, Branford, Cheshire, Derby, East Haven, Hamden, Milford, New Haven, North Branford, North Haven, Orange, Seymour, West Haven and Woodbridge. We own land in Beacon Falls, Guilford, Killingworth, Madison, and Prospect.

Our display emphasizes the importance of forest management practices in maintaining healthy land around our reservoirs and the impact on water quality. 203-777-1142 http://www.rwater.com.

86. Tree-Savers, LLC
Jayme Boniewicz and Fred Lishman
Hemlock Wooly Adelgid (HWA) is a relentless invasive pest that decimates hemlock trees and is damaging entire ecosystems across the Eastern United States. Chemical pesticides, the conventional approach to controlling this invasive pest, have failed to stop the devastation. Fortunately, nature has the answer for saving Hemlocks from death by HWA – the *Sasajiscymnus tsugae* (*S. tsugae*) beetle. This remarkable insect literally eats HWA for lunch (and breakfast and dinner!). Tree-Savers is here to balance the equation. We raise *S. tsugae* beetles in our specialized laboratory by the tens of thousands and send them into the fight to save hemlock trees from HWA. www.tree-savers.com, 570-871-0088.

87. University of Connecticut Extension Master Gardener Program (UCONN Extension Master Gardeners Program)
Jude Hsiang
Today we have an emphasis on water issues, with activities for kids. We have information on a wide variety of horticultural and environmental topics. The UConn Extension Master Gardener Program is an Educational Outreach Program of the University of Connecticut Extension System. Following their special training course, Master Gardeners commit time as volunteers to provide horticultural-related information to the community. Master Gardeners in New Haven County collaborate with parks departments, land trusts, community groups, and educational institutions at all levels to increase environmental awareness through hands-on programs. The University of Connecticut is an Equal Opportunity Employer and Program Provider. New Haven County Extension Center, 305 Skiff Street, North Haven, CT 06473, 203 407-3167. http://mastergardener.uconn.edu/

88. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA APHIS-PPQ)
Eric Chamberlain
APHIS-PPQ safeguards U.S. agriculture and natural resources against the entry, establishment, and spread of animal and plant pests and noxious weeds. Fulfillment of its safeguarding role ensures an abundant, high-quality, and varied food supply, strengthens the marketability of U.S. agriculture in domestic and international commerce, and contributes to the preservation of the global environment. 203-741-5643, http://www.aphis.usda.gov/aphis/ourfocus/planthealth, Eric.a.chamberlain@aphis.usda.gov

89. United States Department of Agriculture, Farm Service Agency (USDA FSA)
Debbie Castle, Teresa Peavey
The Farm Service Agency equitably serves all farmers, ranchers, and agricultural partners through the delivery of effective, efficient agricultural programs for all Americans. We are a customer-driven agency with a diverse and multi-talented work force, dedicated to achieving an economically and environmentally sound future for American Agriculture. The goal of our agency is to create a market-oriented, economically and environmentally sound American agriculture by delivering an abundant, safe, and affordable food and fiber supply while sustaining quality agricultural communities. The foundation of FSA's mission and vision rests upon the USDA's long-standing core values of strong ethics, customer service, team work, inclusive decision-making, and fiscal responsibility. For more information visit us at http://www.fsa.usda.gov. 203 269-6665 x100.

90. United States Department of Agriculture, Natural Resources Conservation Service (USDA NRCS)
Lisa Krall
The Natural Resources Conservation Service (NRCS) is an agency of the United States Department of Agriculture with offices at six locations in Connecticut. For over 75 years, we have worked cooperatively with landowners, conservation districts, federal, state, and local governments, and citizens from urban and rural communities to restore, enhance, and protect natural resources. NRCS conservation specialists promote land stewardship by providing technical and financial assistance to agricultural and forest landowners and producers to address water quality and quantity; restore and protect habitat; improve air quality and energy conservation, and protect farmland from development. NRCS also provides soils and other natural resource information and analysis to help land owners and managers make informed decisions. For more information visit us at: http://www.ct.nrcs.usda.gov. 860-871-4051

91. United States Department of Labor, Occupational Safety and Health Administration (US OSHA)
Leona May
Our agency's purpose is to assure safe and healthy working conditions for working men and women. We have literature available on topics including, but not limited to: chemical safety, tree trimming, chain saws, wood chippers, heat stress, teen worker safety, and construction. Our local offices are located in Hartford and Bridgeport, CT. To contact your local office call: Hartford 860-240-315 or Bridgeport 203-579-5581. The Federal website is: www.osha.gov.

92. United States Department of Agriculture National Agriculture Statistics Service, New England (USDA NASS)
Gary Keough
Agricultural statistics are important because they provide an accurate, unbiased picture of the New England region and U.S. agriculture. Measurement of present and prospective supplies furnishes a sound basis for judgment and action by farmers, agri-businesses, researchers, marketing programs, and agencies which service farmers who take the time to provide the data to make these reports possible. USDA's National Agricultural Statistics Service (NASS) is a network of 12 Regional Field Offices 34 Field Offices (including the New England office in Concord, NH) serving all 50 states and Puerto Rico through cooperative agreements with state departments of agriculture or universities. These field offices regularly survey thousands of farm operators, ranchers, and agri-businesses who voluntarily provide information on a confidential basis. Consolidating these reports with field observations, objective yield measurements, and other data, statisticians then produce state statistics. These statistics are forwarded to NASS headquarters in Washington, D.C., where they are combined and released to the public. The national website is at http://www.nass.usda.gov/ while the homepages for New England and each of the six states are at http://www.nass.usda.gov/Statistics_by_State/New_England (CT, NH, ME, MA, RI, VT) 603 227-3129.

*Other plots here at the farm provide food for the Connecticut Food Bank.

Index of Scientists' & Staff Names and their Field Plot Numbers

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History of The Connecticut Agricultural Experiment Station

The Connecticut Agricultural Experiment Station (CAES) is one of a national network of state agricultural experiment stations. Experiment Station scientists collaborate with researchers in other states and the federal government to solve local, regional, and national problems.

The CAES is the first state agricultural experiment station in the United States. It was founded by the efforts of Samuel W. Johnson, a professor of agricultural chemistry at Yale University. Johnson had seen an agricultural experiment station when he did his studies in Germany during the 1850s. He saw how the science of chemistry could be used to aid farmers and campaigned for 20 years until one was established by the Connecticut legislature in 1875. Initially opened as a chemistry laboratory at Wesleyan University in Middletown, the Station was moved to Yale in 1877, where its first bulletin reported on analysis of a fertilizer that had little agricultural value. In 1882, the Experiment Station moved to its present location on Huntington Street (previously named as Suburban Street) in New Haven. Besides Lockwood Farm, its outdoor laboratory in Hamden, the Experiment Station also has a research farm and laboratories in Griswold and Windsor.

Through the years, many important discoveries have been made by researchers at the CAES. For example, vitamin A was discovered as an outgrowth of studies of the chemical composition of foods. The first practical hybrid of corn was developed, and many experiments in increasing the yield of corn were conducted at Lockwood Farm by Donald F. Jones. This discovery led to the doubling of yields of corn crops throughout the nation and led to more abundant and lower cost of food for mankind. Also, at Lockwood Farm, experiments were conducted, which led to the development of organic fungicides, some of which are still in use to combat plant diseases. These fungicides replaced toxic heavy metals previously used to control plant pathogens. The first culture of the West Nile virus in North America was made at the main campus in New Haven.

Research at the Experiment Station covers plants and their pests, such as diseases and insects; the pests of man and animals such as mosquitoes and ticks; growth of the state's forests; methods of enhancing the growth of plants by protecting them from pests and increasing crop yields through cloning of genes; and studies of environmental contamination and ways to reduce application of pesticides or their impact on the environment. Research continues on crops for biodiesel fuel production and for nematode control. Staff at the Station also analyze fresh fruits and vegetables for excess pesticide residues, test fertilizers and animal feeds for compliance with label claims, and screen a wide variety of foods as a part of the federal and state's food and product safety monitoring programs.

Some current research includes:

- Release of a lady beetle to control the hemlock woolly adelgid, which can kill hemlocks throughout the state.
- Studies of the pathogen that causes Lyme disease and means of controlling the tick vector.
- Treatments to reduce the toxicity of organic contaminants in soil and water.
- Studies of natural changes in Connecticut's forests and control of exotic plant species.
- Ways to control insect pests of plants using non-chemical means.
- Surveys and studies of the eastern equine encephalitis virus, West Nile virus, and other encephalitis viruses in mosquitoes.
- Enhancing growth of crops through the use of compost as a substitute for fertilizer.
- Finding new crops for Connecticut farmers and developing the best growing practices for existing crops in Connecticut.
- Studies of invasive aquatic plants and methods of control.
- Deciphering the cause of Sudden Vegetation Dieback in Connecticut salt marshes.
- Surveys for the emerald ash borer and the release of parasitoids to help control this invasive insect.
- Studies of native pollinators and floral resources for wild bees.

The experiments at Lockwood Farm are only a portion of these conducted by Station scientists. Scientists also perform experiments in New Haven, Griswold, and Windsor and carry out other experiments in state forests and on private lands.

Revised: June 13, 2016

NOTES

CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

PLANT SCIENCE DAY is held annually the first Wednesday in August at Lockwood Farm, 890 Evergreen Avenue, Mt. Carmel, Hamden.

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION, founded in 1875, is the first state agricultural experiment station in America. It is chartered by the General Assembly to make scientific inquiries and experiments regarding plants and their pests, insects, soil and water, and to perform analyses for State agencies.

OFFICE AND MAIN LABORATORIES
123 Huntington Street; New Haven, CT 06511-2016, (203)-974-8500,
toll-free, statewide, 1-(877)-855-2237

VALLEY LABORATORY
153 Cook Hill Road; Windsor, CT 06095-0248, (860)-683-4977

LOCKWOOD FARM
890 Evergreen Avenue; Hamden, CT 06518-2361, (203)-974-8618

GRISWOLD RESEARCH CENTER
190 Sheldon Road; Griswold, CT 06351-3627, (860)-376-0365

THE EXPERIMENT STATION'S WEB PAGE: WWW.CT.GOV/CAES
or just scan our QR code below with your smartphone.

Revised: Monday, July 10, 2017, 2:58 p.m.