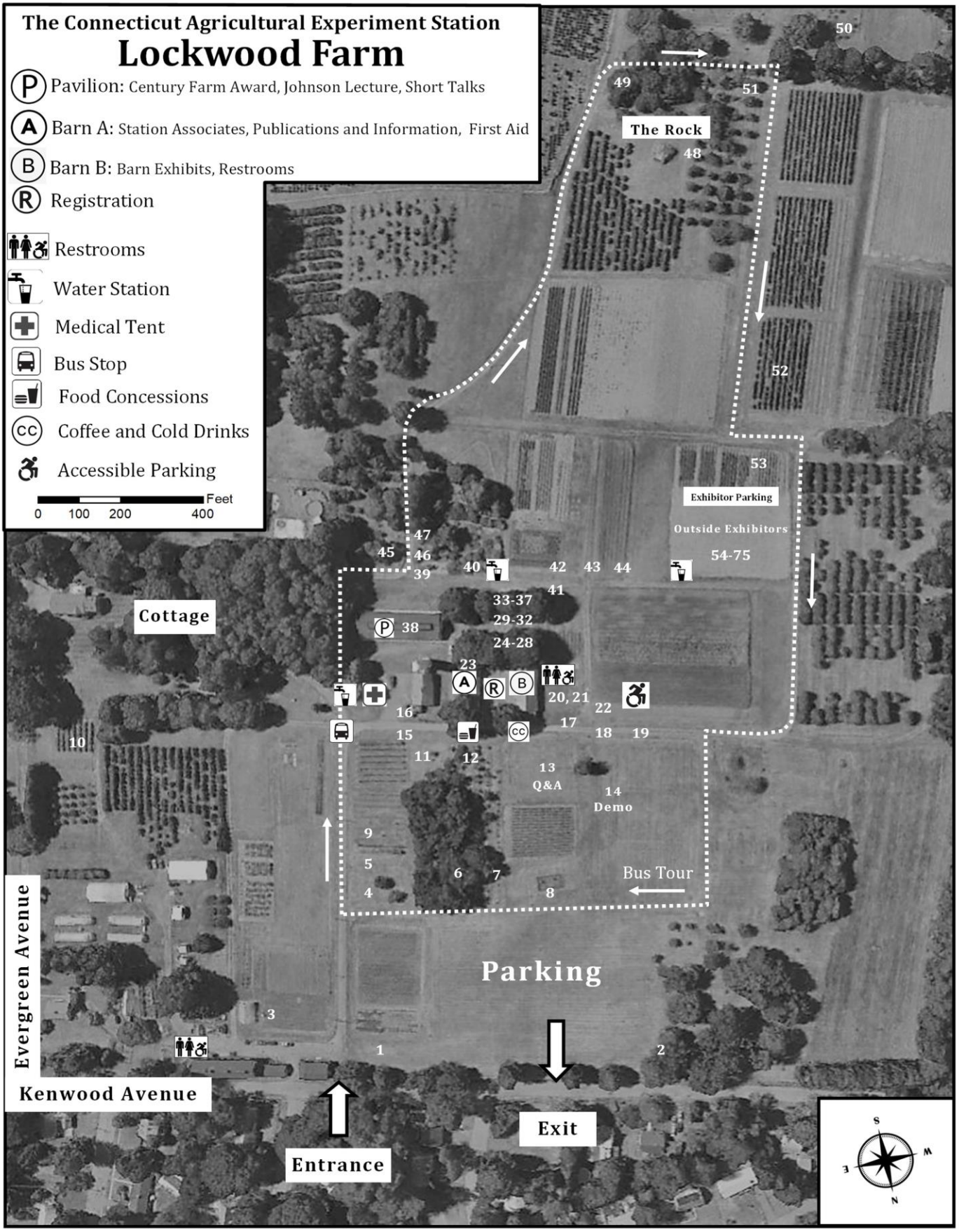
The Connecticut Agricultural Experiment Station
113th Plant Science Day

Lockwood Farm
890 Evergreen Avenue, Hamden, CT 06518
Wednesday, August 2, 2023

CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875


The Connecticut Agricultural Experiment Station
Lockwood Farm
P Pavilion: Century Farm Award, Johnson Lecture, Short Talks
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B Barn B: Barn Exhibits, Restrooms
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Water Station
Medical Tent
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Food Concessions
CC Coffee and Cold Drinks
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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 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 Planning Committee

Michael Ammirata
Terri Arsenault
Joseph Barsky
Douglas Brackney
Gregory Bugbee
Meghan Cahill
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Vickie Bomba-Lewandoski
Richard Cecarelli
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Lindsay Triplett
Jason White
Quan Zeng
Nubia Zuverza-Mena

Program booklet created, compiled, and edited by
Vickie Bomba-Lewandoski, Kelly Fairbrother, and Summer Stebbins

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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.

2023 CONNECTICUT CENTURY FARM AWARD

The Century Farm Award is selected by the Connecticut Agricultural Information Council and goes to a deserving farm that has been in operation for more than 100 years. The award is presented at the CAES Plant Science Day in August and recognized at Ag Day at the Capitol.

The 2023 winner of the Century Farm Award is:

Horton Farm
South Glastonbury, CT

Proclamation from Governor Ned Lamont:

In 1860, Sampson Horton purchased a house and 16 acres of farmland along the Connecticut River from the Treat family that became the Horton Farm. Sampson was a shipping merchant who sold textiles produced in Glastonbury in the Caribbean Islands and returned with rum and molasses which he sold along the East Coast on his way back to Glastonbury. He also farmed dairy and tobacco. The Hortons still have the receipt for his first tobacco crop in 1860, $5 for '2 acres of tobacco, more or less'. His son Howard was followed by two additional Howard Hortons. The fourth generation on the farm consisted of brothers Howard Hamilton Horton and Ken Horton. Howard was the Fire Marshall in Glastonbury for 45 years and a 4H leader. The whole family was and continues to be involved in agricultural education and the Future Farmers of America (FFA). Howard's son Kenneth currently runs the farm assisted by his children Brian, Natalie, and Emily. The family still lives in the 1760 farmhouse. The farm was expanded in 1936 to 1938 by 20 acres and again in 2011 by an additional 20 acres. Dairy production stopped in the 1960's and tobacco and vegetables were increased over time, resulting in the building of a new tobacco shed in 2020. Currently, broadleaf tobacco is being grown on 22 acres, as well as 13,000 tomato plants and additional acres of winter and butternut squash. Additionally, smaller plantings of a variety of vegetables and laying chickens supply a farm stand on the farm. The sixth generation of Hortons is currently involved in building the future of this historic Connecticut farm.

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 13)

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

KIDS' CORNER (Plot 18)

Come to the Kids' Corner 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 22) to collect a CAES patch.

SELF-GUIDED ACTIVITY FOR ALL CHILDREN, INCLUDING GIRL SCOUTS (Plot 19)

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., to obtain your Pesticide Credit Passport, which you must have validated after you have attended or visited each of the required talks, demonstrations, and barn exhibits. Sign out begins at 3:35 p.m. at the Registration Desk (R), where you will redeem your Passport for your Pesticide Credit Form.

Connecticut Pesticide Credits Offered: **ALL CATEGORIES and PRIVATE APPLICATOR (PA) CATEGORY / 3.25 TOTAL CREDIT HOURS.**

SOCIAL MEDIA LINKS

Keep current with The Connecticut Agricultural Experiment Station by using our **Social media** and **email alert** resources.

The CAES is encouraging our constituents to share their photos about **The CAES** and **Plant Science Day** on social media using the hashtag **#CT_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/)

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

Pinterest (www.pinterest.com/caes123)

Spotify (https://open.spotify.com/show/3ZDVEkmebY1rubzb9Gc936)

To visit our webpage, go to https://portal.ct.gov/caes,
or scan our QR code below with your smartphone.

E-mail mailing list

Mail Chimp sign up for our CAES e-mail list
https://mailchi.mp/d0807919f3d2/caes-email-notifications

NO PETS, PLEASE. SERVICE DOGS ONLY.

Under the Americans with Disabilities Act (ADA), "a service animal is defined as a dog that has been individually trained to do work or perform tasks for an individual with a disability."

Also, under the ADA, "emotional support animals, comfort animals, and therapy dogs are not service animals under Title II and Title III of the ADA."

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

113th 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 – Vickie M. Bomba-Lewandoski, Information Officer

10:00 a.m. – 10:15 a.m. **PAVILION**
MORNING GREETING AND OPENING REMARKS
Jason C. White, Ph.D., Director
The Connecticut Agricultural Experiment Station

10:15 a.m. - 10:45 a.m. **PAVILION**
Anuja Bharadwaj, Ph.D., Assistant Agricultural Scientist II, Department of Analytical Chemistry
Analysis of Marijuana Products for Cannabinoids
In recent years, a growing number of states have legalized the use of cannabis products for both medical and adult use purposes. This regulatory shift has led to an increased demand for the testing of these products to ensure compliance with quality and safety standards. Testing typically encompasses a range of factors, including cannabinoid content, pesticide and heavy metal levels, mycotoxin presence, and terpenoid profiles. Despite these requirements, the testing process faces significant challenges due to a lack of standardization in procedures, reference materials, and proficiency testing. For medical marijuana, testing is critical to ensuring consistent dosing of cannabinoids across different matrices, such as oils, slips, and pills. For adult-use marijuana, testing is essential to guarantee that products are free from contamination and that the stated cannabinoid content matches label claims. This presentation will focus on the analysis of cannabinoids in marijuana samples submitted to The Connecticut Agricultural Experiment Station by the Connecticut Department of Consumer Protection.

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.)
Mark Creighton, Agricultural Research Technician I, Department of Entomology
Beekeeping in Connecticut, Planting Pollinator Habitat
Interested in joining Connecticut's beekeeping community or planting pollinator habitat? Many have found that working with Honey bees is a very rewarding experience and gardening is fun too! Did you know that Honey bees have been on this planet for over 100 million years! Come and explore the art of beekeeping, learn about the different styles of hives used in Connecticut and consider becoming a beekeeper today. A major challenge of bees today is the loss of bee habitat, learn a simple technique using straw bales to plant food for the bees and yourself.

10:40 a.m. – 11:00 a.m. **TECHNICAL DEMONSTRATION TENT**
(20-minute demonstration, repeated twice during the day, 10:40 a.m. & 3:15 p.m.)
Felicia Millett, Agricultural Research Technician I, Department of Plant Pathology and Ecology
Pruning Woody Plants
Trees and shrubs are often the most dominant forms in a home landscape. Proper pruning techniques will contribute to the formation of good structure and long term health of landscape trees and shrubs. This discussion will cover common pruning objectives and the methods, tools, and timing recommended to achieve these goals.

10:45 a.m. - 11:05 a.m. **PAVILION**
CENTURY FARM AWARD
Horton Farm, South Glastonbury, CT

11:05 a.m. – 11:15 a.m. **PAVILION**
EXPERIMENT STATION ASSOCIATES
Cheryl Cappiali, President, Experiment Station Associates

11:15 a.m. – 12:00 noon **PAVILION**

THE SAMUEL W. JOHNSON MEMORIAL LECTURE

Gil Simmons, Chief Meteorologist
WTNH, Storm Team 8

Forecasting The Weather in Connecticut: Small State, Big Challenges

1:15 p.m.-1:45 p.m. **PAVILION**

Megan A. Linske, Ph.D., Assistant Agricultural Scientist II, Department of Entomology

Optimizing Integrated Tick Management Strategies

Ticks and tick-borne pathogens have been increasing both in density and distribution for decades. Proper management can aid in reducing tick densities and can subsequently reduce pathogen presence across the landscape. When it comes to management, an integrated approach will achieve the most significant and sustained impact. Integrated tick management strategies combine host and non-host targeted treatments, resulting in a more comprehensive approach. Acaricide and pesticide applications can be controversial based on historic uses, however, there are modes of application that can result in the optimal reduction in ticks while having minimal impact on beneficial/non-target species and their habitats. This lecture will address recent advances in integrated tick management strategies that will reduce impacts to non-target species while also resulting in more efficient and effective control of ticks and their pathogens.

1:45 p.m.-2:15 p.m. **PAVILION**

Robert E. Marra, Ph.D., Associate Agricultrual Scientist, Plant Pathology and Ecology and Richard S. Cowles, Ph.D., Agricultural Scientist, Valley Laboratory

Beech Leaf Disease: Biology and Management

Beech Leaf Disease (BLD), first observed in Connecticut in 2019 and now well established throughout most of the state, first appeared on American beech (*Fagus grandifolia*) in Lake County, Ohio in 2012. The disease manifests in foliage as dark interveinal banding and necrosis, which appears imediately upon leaf emergence in the spring; more severe symptoms include aborted buds and tip dieback. Similar symptoms have also been seen on landscape plantings of European beech (*F. sylvatica*) and oriental beech (*F. orientalis*). BLD has now been confirmed in much of the Northeast, including Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Pennsylvania, Virginia, West Virginia, and Ontario. A foliar nematode was confirmed in 2020 as the cause of the disease, and named *Litylenchus crenatae* subsp. *mccannii*, in acknowledgment of the very closely related and recently identified *L. crenatae* subsp. *crenatae*, observed in Japan and presumed to be native there, as it causes similar but much milder symptoms on Japanese beech (*F. japonica*), resulting in neither aborted buds, tip dieback, nor mortality of host trees. Studies of beech leaf disease progression on American beech and the biology of the causal subspecies *mccannii* are being pursued by members of a region-wide Beech Leaf Disease Working Group; as a member of the Group, Robert Marra is leading research on the genetic diversity of the nematode, using DNA fingerprinting to identify pathways of spread and to gain insights into modes of transmission. The origin of the nematode is currently unknown, but DNA fingerprinting supports a hypothesis that the nematode is exotic. Given the degree of morphological and genetic similarity between the two subspecies, Robert Marra will join a U.S. Forest Service expedition to Japan in 2024 to study the Japanese pathosystem, and to investigate the possibility that the *mccannii* subspecies is native to Japan. Robert Marra has established eleven long-term BLD monitoring plots in Connecticut as part of a network of plots throughout the Northeast coordinated by the U.S. Forest Service. These plots, measured and evaluated annually, are essential to studies focused on interactions between BLD and other ecological and environmental factors, including beech bark disease, and will facilitate the identification of BLD-resistant genotypes.

Scientists from The Connecticut Agricultural Experiment Station, University of Rhode Island, Davey Tree, Bartlett Tree, and Rainbow EcoScience collaborated to screen various products to determine whether they are useful against nematodes that cause BLD. Three products were active against nematodes in leaves, two of which are already registered for use on landscape ornamental beech trees. Potassium phosphite is already used on beech trees to protect against bleeding canker, a different disease. It has a moderate effect on suppressing nematode populations and has been demonstrated to preserve the health of small beech trees (up to 4 inch stem diameter). Products containing the active ingredient fluopyram are potent nematicides when applied as a foliar spray. Work is continuing to determine the number of treatments, dosage, and optimal treatment timing to achieve the least expensive, least environmentally damaging, and most effective options for managing this disease.

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*.)
Mark Creighton, Agricultural Research Technician I, Department of Entomology
Beekeeping in Connecticut, Planting Pollinator Habitat
Interested in joining Connecticut's beekeeping community or planting pollinator habitat? Many have found that working with Honey bees is a very rewarding experience and gardening is fun too! Did you know that Honey bees have been on this planet for over 100 million years! Come and explore the art of beekeeping, learn about the different styles of hives used in Connecticut and consider becoming a beekeeper today. A major challenge of bees today is the loss of bee habitat, learn a simple technique using straw bales to plant food for the bees and yourself.

3:15 p.m.-3:35 p.m. **TECHNICAL DEMONSTRATION TENT**
(*20-minute demonstration, repeated twice during the day, 10:40 a.m. & 3:15 p.m*.)
Felicia Millett, Agricultural Research Technician I, Department of Plant Pathology and Ecology
Pruning Woody Plants
Trees and shrubs are often the most dominant forms in a home landscape. Proper pruning techniques will contribute to the formation of good structure and long term health of landscape trees and shrubs. This discussion will cover common pruning objectives and the methods, tools, and timing recommended to achieve these goals.

3:35 p.m. **TECHNICAL DEMONSTRATION TENT**
Adjourn Technical Demonstrations

3:35 p.m. SIGN-OUT **(For those requesting pesticide credits) (R)**
Attendees can pick up their Pesticide Credit forms at the registration table (R).

LOCKWOOD FARM WALKING TOUR
(Meet at the Registration Desk, R)
11:00 a.m.–12:00 p.m.

11:00 a.m. - 12:00 p.m. **MEET AT REGISTRATION DESK (R):**
Robert E. Marra, Ph.D., Associate Agricultural Scientist, Department of Plant Pathology and Ecology
A one-hour guided tour of selected "off the beaten path" field plots.

TOUR OF NATIVE WOODY SHRUBS (PLOT 39)
1:00 p.m.-1:30 p.m.

1:00 p.m. - 1:30 p.m. **MEET AT THE WOOD ARBOR OF THE NATIVE WOODY SHRUBS (Plot 39)**
Jeffrey S. Ward, Ph.D., Emeritus Scientist, Department of Environmental Science and Forestry and Elisabeth B. Ward, Ph.D., Assistant Agricultural Scientist II, Department of Environmental Science and Forestry
A ½ hour guided tour of our Native Shrub planting. Learn about using native shrubs for naturalistic landscapes without the use of pesticides and fertilizers.

BARN EXHIBITS (BARN B)

The Pest Fly of Soft-Skin Fruits in Connecticut
Department: Entomology
Investigator: Hany K. Dweck, Ph.D.
Abstract: The spotted wing *Drosophila* (SWD), first found in Connecticut in 2011, is a destructive pest of soft-skin fruits, including strawberries, raspberries, and blueberries. Unlike most *Drosophila* fly species, including the commonly used model organism *Drosophila melanogaster*, SWD's egg-laying preference is for ripe, intact fruits, facilitated by its enlarged, saw-like ovipositor that pierces the fruit skin to deposit eggs. The change in the egg-laying preference requires alterations in the sensation of various sensory stimuli. As fruits progress through stages of ripening and fermentation, they undergo many changes, including alterations in softness, sugar content, acidity, and odor. A priori, any of these changes could serve as fruit stage indicators for the fly, and alterations in the sensation of any of these changes could contribute to the unusual egg-laying preference of SWD. By studying the mechanisms underlying this unusual behavior using approaches in behavior, analytical chemistry, electrophysiology, molecular biology, and genetics, my research group aims to develop innovative methods for controlling this pest.

Urban Agriculture: How Research Addresses Challenges in Production
Department: Environmental Science and Forestry
Investigator: Leigh J. Whittinghill, Ph.D.
Abstract: Although urban agriculture is not a new practice, it has been gaining popularity in recent years. Urban agriculture has numerous benefits beyond food production including supplying jobs and income, education, ecosystem services, mitigating urban heat island effects, community building, physical and mental health improvements. Combating issues of food insecurity and lack of access to fresh fruits and vegetables is one of the major drivers of urban agriculture, and production could achieve as much as 30-50% of that food supply. There are however numerous barriers to achieving that potential, including lack of available space, contaminated soil, land tenure, and grower knowledge and experience. Research can assist with some of these issues, by examining solutions that maximize production in smaller spaces and enabling production in previously unused spaces, without requiring access to soil. Dr. Whittinghill's research has focused on several of these areas. The use of green roof technology can enable vegetable production on rooftops, a typically underutilized space resource. The use of small plastic wading pools as containers can also increase available space for production without requiring access uncontaminated soil at a lower cost to growers than more traditional pots, containers, and raised beds. Dr. Whittinghill has also incorporated a variety of vegetable crops including greens. Greens offer quick turnaround from planting to harvest, increase the amount of food that can be produced in a small space, and are high in vitamins and nutrients, which can be especially important in food insecure communities. Greens are also a prime crop for cut-and-come-again, or repeat harvesting, which means multiple harvests from a single planting, and potentially lower materials and labor costs for producers. Increases in urban agriculture also run the risk of contributing to eutrophication in waterways. This is the result of nutrients, nitrogen, and phosphorus in particular, running off of agricultural lands and entering water ways where they encourage excessive algae growth. Understanding how different production systems, and different nutrient management strategies impact nutrient leaching can help reduce these nutrient losses and downstream water quality issues.

Using Biocontrols for Plant Disease Management
Department: Plant Pathology and Ecology
Investigators: Quan Zeng, Ph.D. and Neil P. Schultes, Ph.D.
Abstract: Plant diseases, caused by different bacteria, fungi, oomycetes, and nematodes, cause significant economic losses to our agriculture and represent great threat to our food security. Different approaches have been used to prevent, mitigate or control plant diseases. Beyond good agronomic and horticultural practices, growers often rely heavily on chemical pesticides, such as fungicides, antibiotics and fumigants. Such inputs, although effective in improving our crop productivity and quality, negatively impact our environment and cause great concern to human health. The awareness of such changes people's attitudes towards the use of pesticides in agriculture, and increases demands for sustainable methods for controlling plant diseases. Biological controls, which utilize beneficial microorganisms to suppress the occurrence of plant diseases, are a critical component of an integrated pest management. In this exhibit, we will discuss i) key mechanisms of biocontrol and how it works, ii) successful examples of biological controls in plant disease management, iii) current research and application of biological controls.

Asiatic Dayflower Management in Christmas Trees
Department: Valley Laboratory
Investigator: Jatinder S. Aulakh, Ph.D.
Abstract: Asiatic dayflower (*Commelina communis* L.) has invaded many Christmas tree plantations in the U.S. Northeast. It usually grows into the lower branches of Christmas trees but may ascend up into the tree using tree branches for support. Asiatic dayflower may significantly reduce the growth of newly transplanted trees and disfigure the shape of established trees. It is a highly competitive and difficult to control weed, and few herbicides have provided consistent control. Field research conducted at a Christmas tree farm

in Shelton, CT revealed 80% to 92% preemergence control with flumioxazin (Sureguard at 12 oz/A), hexazinone plus sulfometuron-methyl (Westar at 10 oz/A), indaziflam (Marengo at 15 fl oz/A), and S-metolachlor (Pennant Magnum at 2 qt/A) herbicides. In greenhouse experiments conducted at Valley laboratory in Windsor, CT, the postemergence application of mesotrione (Tenacity at 15 fl oz/A), topramezone (Frequency at 12 fl oz/A), and triclopyr (Garlon 3A at 1 qt/A) provided 76% to 90% control of 10- to 12-leaf Asiatic dayflower. These studies showed that Asiatic dayflower can be managed effectively with preemergence and postemergence herbicides in Christmas trees.

Per- and Polyfluoroalkyl Substances (PFAS): An Emerging Class of Toxic Environmental Contaminants

Department: Analytical Chemistry

Investigators: Sara L. Nason, Ph.D. *Assisted by:* Sara Thomas, Ph.D. and Trung Bui, Ph.D.

Abstract: Per-and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that are used in many products including firefighting foams, stainproof and waterproof coatings, Teflon™ pans, and food packaging materials. However, recent evidence shows that PFAS have accumulated in the environment and can have toxic effects on humans at very low levels. At CAES, we have developed methods for measuring PFAS in many types of samples including water, soil, plant tissues, and dried blood spots from medical archives. We are also studying different strategies to clean-up PFAS in the environment. One includes the use of plants to take up PFAS from soil or water (phytoremediation). Another approach is to use biochar to lock PFAS into the soil and prevent leaching to groundwater and uptake by crops. Join us and learn about how CAES is studying PFAS contamination in the environment.

Office of Aquatic Invasive Species

Department: Environmental Science and Forestry

Investigators: Gregory J. Bugbee and Jeremiah R. Foley IV, Ph.D. *Assisted by:* Summer Stebbins and Riley Doherty

Abstract: The Office of Aquatic Invasive Species (OAIS) was established at CAES through legislation adopted on July 1, 2022. OAIS is an expansion of the existing CAES Invasive Aquatic Plant Program (IAPP) and formalizes Connecticut's commitment to protecting its lakes, ponds, and rivers from nonnative species. Currently, nearly 60 percent of the State's waterbodies are infested with one or more invasive plants such as Eurasian watermilfoil, variable watermilfoil, hydrilla, and fanwort. They disrupt native ecosystems, interfere with recreational uses, and reduce property values. Spread by human activities and climate change likely play a major role in the severity of the problem. A major driver in the formation of OAIS was the CAES discovery of a unique strain of hydrilla in the Connecticut River. The strain is extremely aggressive and has rapidly engulfed nearly 1000 acres of the river's mainstem, tributaries, and coves. OAIS is charged with (1) coordinating research to reduce duplication of efforts and costs, (2) serving as an aquatic invasive species data repository, (3) performing surveys on the health and ecology of waterways, (4) providing public education, (5) advising municipalities, (6) serving as a liaison among government and private entities, and (7) collaborating with the Connecticut Invasive Plants Council. Funding for OAIS provides for a scientist and two technician positions. We are delighted to announce that the three positions are now filled. Jeremiah Foley IV, PhD fills the scientist position and brings expertise in invasive species fieldwork, data analysis, and experimental design. He comes from the USDA-Invasive Plant Research Laboratory in Fort Lauderdale. Summer Stebbins and Riley Doherty fill the technician positions. Summer has spent five years with CAES IAPP specializing in aquatic plant surveys and geospatial technology. Riley spent a summer with CAES IAPP and over three years with the Eightmile River Wild and Scenic Watershed. She specializes in water quality, geographic information systems, and community outreach.

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: http://portal.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; New Haven, CT 06511, phone 203-974-8447, fax 203-974-8502, e-mail Vickie.Bomba-Lewandoski@ct.gov, or on the web at https://portal.ct.gov/CAES/ABOUT-CAES/Speakers/Available-Speakers

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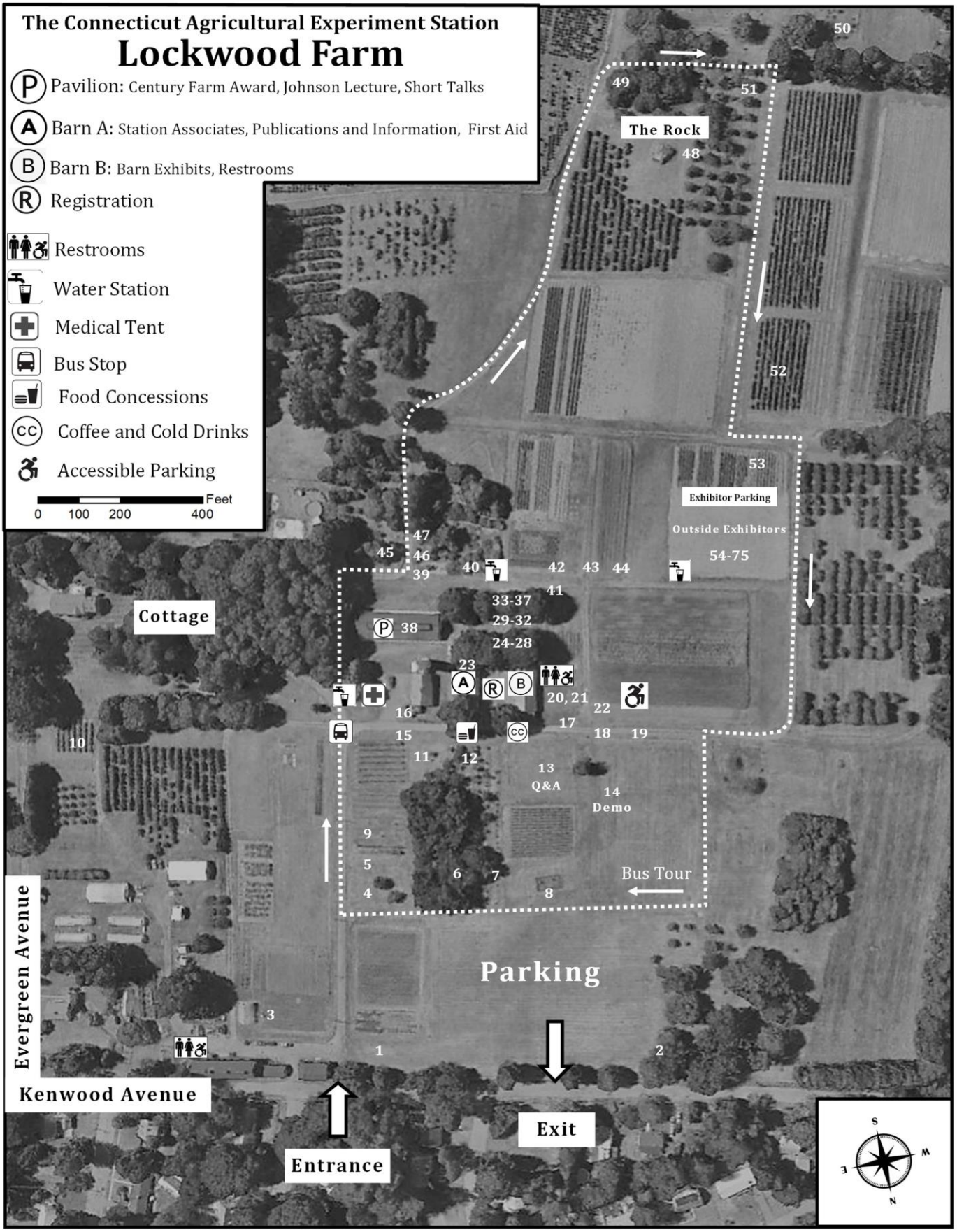
The Connecticut Agricultural Experiment Station
Lockwood Farm
P Pavilion: Century Farm Award, Johnson Lecture, Short Talks
A Barn A: Station Associates, Publications and Information, First Aid
B Barn B: Barn Exhibits, Restrooms
R Registration
Restrooms
Water Station
Medical Tent
Bus Stop
Food Concessions
CC Coffee and Cold Drinks
Accessible Parking
0 100 200 400 Feet
The Rock
Exhibitor Parking
Outside Exhibitors
54-75
Cottage
Q&A
Demo
Bus Tour
Parking
Evergreen Avenue
Kenwood Avenue
Entrance
Exit
S
W
M
N

FIELD PLOT LISTING

Outside Exhibitors (Plots 15-17, 54-75) 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 Richard Cecarelli, Agricultural Research Technician II, Rollin Hannan, and Farmer, Joseph Toth as well as Seasonal Resource Assistant Miles Houston. Other plots here at the farm provide food for the Connecticut Food Bank.

1. Chinese Chestnut Trees
2. Nut Orchard
3. The Fight Against Potato Viruses
4. Commercial Chestnut Cultivars
5. Commercial Chestnut Seedlings
6. Control of Blight on American Chestnuts
7. New Hybrid Chestnut Orchard
8. Remote Access Weather Station
9. Grapevine Demonstration Plot: Table Grapes
10. Grapevine Demonstration Plot: Chardonnay Wine Grapes
11. Seedlings of Old Surviving American Chestnuts
12. Wild Chestnuts from Turkey
13. Questions and Answers Tent
14. Technical Demonstration Tent
15. Hamden Police Department
16. Crown Castle Cellular Tower
17. The Big Dipper
18. Kids' Corner
19. Self-Guided Activity for All Children, Including Girl Scouts
20. Baby Pools: Low-Cost Containers for Vegetable Production in Urban Agriculture
21. Cut-and-Come-Again Greens: Determining Fertilizer Application Rates to Promote Higher Yields and Nutrient Content in Later Harvests
22. Farm Equipment Used at Lockwood Farm
23. Experiment Station Associates
24. The Ministry of Molecular Magic
25. Microbiome on Plants and Its Role in Plant Disease Management
26. New Species, *Fistulina americana* from Connecticut and Massachusetts
27. Understanding Leaching and Phosphorus Uptake of Five Different Biodegradable Polymer-Fertilizer Composite
28. A World of Viruses
29. CuO Nanoparticle Coating Controls Foliar Uptake and Plant Health
30. Using Treated Wastewater to Irrigate Crops: What are the Impacts?
31. Understanding How Root Exudates Form Soil Organic Carbon
32. Mycorrhizal Inoculation: Promoting Tree Health and Survival in a Changing Climate
33. Environmental Factors Affecting Urban Maple Health in New Haven
34. Deep Understanding of Crop Growth and Food Quality by "Multi-omic" Approach Using LC-MS
35. Insect Movement Ecology Informs Management Strategies
36. Finding the Root of the Problem: How Nematodes Manipulate Plants
37. Hope for Connecticut's Ash Trees: Emerald Ash Borer Biocontrol Update
38. The Pavilion at Lockwood Farm
39. Native Woody Shrubs
40. Bird & Butterfly Garden
41. The Public Health and Entomology Tent
    a. Statewide Monitoring Program for Mosquito-borne Viral Diseases in Connecticut
    b. Treating White-Tailed Deer for Tick Management in Connecticut

c. Range Expansion of Native and Invasive Ticks: A Looming Public Health Threat

42. Assessing Pollinator Response to Ecotype Native Plants
43. Invasive Aquatic Plant Program – Office of Aquatic Invasive Species
44. Hemp Demonstration Plot
45. Chestnut Species and Hybrids
46. Healthy Plants—Healthy Business: Support of The Green Industry by Inspection
47. A Welcome Reprieve for Eastern Hemlocks in 2023
48. The Rock
49. Asian Chestnut Gall Wasp on Chestnut
50. Hybrid Elm Trees
51. Rocky Hill American Chestnut Trees
52. Grapevine Demonstration Plot: Hybrid and Vinifera Grape Cultivars
53. The Fight Against Potato Viruses
54. Connecticut College Arboretum
55. USDA Farm Service Agency
56. Connecticut Farm Bureau Association
57. The American Chestnut Foundation - CT Chapter
58. The Connecticut Tree Protective Association
59. CT DEEP Forestry - Private & Municipal Lands
60. USDA, APHIS, PPQ
61. Connecticut Professional Timber Producers Association
62. DEEP Pesticide Management & Arborist Program
63. U.S. Department of Labor, Wage and Hour Division
64. Connecticut Invasive Plant Working Group
65. Connecticut Christmas Tree Growers Association
66. Wild Ones Mountain Laurel Chapter
67. Master Gardeners
68. CONN-OSHA
69. Hamden Land Conservation Trust
70. Connecticut Department of Agriculture
71. Bonsai Society of Greater New Haven
72. DEEP Wildlife Division
73. Federated Garden Clubs of Connecticut
74. Levo International, Inc.
75. Connecticut Federation of Lakes

FIELD PLOT ABSTRACTS

1. **Chinese Chestnut Trees**
   Sandra Anagnostakis, Ph.D. (Emeritus)
   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. **Nut Orchard**
   Sandra Anagnostakis, Ph.D. (Emeritus), *Assisted by* Pamela Sletten (Retired)
   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 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.
3. **The Fight Against Potato Viruses**
   Washington da Silva, Ph.D. and Richard Cecarelli, *Assisted by* Raja Muthuramalingam, Ph.D., Rania Eltanbouly, Ph.D., and Francisco Faggion, Ph.D., and by the graduate students Juliana Milagres and Talison da Costa
   Potato (*Solanum tuberosum* subsp. *tuberosum*) is the fourth main staple crop in the world, behind rice, wheat, and corn. It is grown on all continents and because it is a vegetatively propagated crop, potato is particularly vulnerable to destructive viruses such as potato virus Y (PVY), potato leafroll virus (PLRV), and potato mop-top virus (PMTV). Endemic and emerging viruses are becoming a major threat to smallholding farms because of the negative effects on yield and quality that they induce on the marketable product. In Connecticut, like much of New England, potato is planted primarily for the local market where quality is paramount and any blemishes reduce marketability and farm value, directly impacting growers's income. The da Silva Lab at CAES is working on new sustainable technologies to help in the fight against potato viruses. In his recent work, Dr. da Silva has identified specific ribonucleic acid (RNA) molecules that induce RNA interference (RNAi), an evolved plant defense mechanism that we are seeking to activate or enhance, in plants and prime plants to successfully resist viruses. His team is now developing nanocarriers to deliver those RNA molecules into potato plants to activate RNAi and induce a "vaccination effect" against destructive potato viruses. The several potato varieties planted in the Lockwood farm will be used to test this virus control strategy. (Identical to Plot 53)
4. **Commercial Chestnut Cultivars**
   Sandra Anagnostakis, Ph.D. (Emeritus), *Assisted by* Pamela Sletten (Retired)
   These trees are potential commercial cultivars of orchard chestnut trees. The largest tree (grafted) is 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 seedlings from a cross of 'Colossal' x 'Lockwood' made here in 2014. We are evaluating the potential of these trees for nut production here in Connecticut.
5. **Commercial Chestnut Seedlings**
   Sandra Anagnostakis, Ph.D. (Emeritus), *Assisted by* Pamela Sletten (Retired)
   These seedling trees are open pollinated (Chinese) Dunstan chestnuts (a trademarked name). They are not a cultivar (clones from a single tree), but a variety (a type) and are widely available for sale in garden centers.
6. **Control of Blight on American Chestnuts**
   Sandra Anagnostakis, Ph.D. (Emeritus), *Assisted by* Pamela Sletten (Retired)
   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.
7. **New Hybrid Chestnut Orchard**
   Sandra Anagnostakis, Ph.D. (Emeritus), *Assisted by* Pamela Sletten (Retired)
   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 are being 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.

8. **Remote Access Weather Station**

   Remote-access weather stations are deployed at the three Connecticut Agricultural Experiment Station farms located in Hamden, Windsor, and Griswold, CT. One additional unit is located at Gouveia Vineyards in Wallingford, CT, where a wine making trial for Saint Croix grapes is underway. Cumulative precipitation, growing degree days (GDD), frost events, and disease-risk assessments are recorded and/or calculated from the data collected.

9. **Grapevine Demonstration Plot: Table Grapes**

   Washington da Silva, Ph.D., *Assisted by* Raja Muthuramalingam, Ph.D., Rania Eltanbouly, Ph.D., and Francisco Faggion, Ph.D., and by the Ph.D. student Talison da Costa

   Wine grapes and wineries are a relatively new industry in Connecticut. In the past 20 years, acreage planted to wine grapes has gone from 160 A to 620 A and the number of wineries has grown from 15 to 42, producing about 550,000 gallons of wine valued at between 12-14 million dollars per year. Three grape plots are being maintained at Lockwood farm to carry on the CAES legacy of grapevine research: Table Grape – 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.

10. **Grapevine Demonstration Plot: Chardonnay Wine Grapes**

    Washington da Silva, Ph.D., *Assisted by* Raja Muthuramalingam, Ph.D., Rania Eltanbouly, Ph.D., and Francisco Faggion, Ph.D., and by the Ph.D. student Talison da Costa

    Wine grapes and wineries are a relatively new industry in Connecticut. In the past 20 years, acreage planted to wine grapes has gone from 160 A to 620 A and the number of wineries has grown from 15 to 42, producing about 550,000 gallons of wine valued at between 12-14 million dollars per year. Three grape plots are being maintained at Lockwood farm to carry on the CAES legacy of grapevine research: Chardonnay Wine Grapes - Chardonnay vines are prized for the quality of the wine they produce but are very susceptible to powdery mildew. This plot was first planted to study the relationship between the onset of powdery mildew and climate in order to attune disease-risk models to our local weather conditions.

11. **Seedlings of Old Surviving American Chestnuts**

    Sandra Anagnostakis, Ph.D. (Emeritus), *Assisted by* Pamela Sletten (Retired)

    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.

12. **Wild Chestnuts from Turkey**

    Sandra Anagnostakis, Ph.D. (Emeritus), *Assisted by* Pamela Sletten (Retired)

    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.

13. **Questions and Answers Tent**

    Katherine Dugas, Rose Hiskes, Yonghao Li, Ph.D., Diane Riddle, and Gale E. Ridge, Ph.D.

    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.

14. **Technical Demonstration Tent**

    See program page 10 for a schedule of Technical Demonstrations.

15. **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.hamdenpd.com.

16. **Crown Castle Cellular Tower**

    Learn about the cellular transmission tower.

17. **The Big Dipper**
    Harry Rowe
    Our home-style ice cream is freshly made on the premises in small batches to ensure the finest product. In our search to bring you premium, gourmet ice cream we use the world's highest quality vanilla from the island of Madagascar and the best cocoa made from Holland. We combine farm fresh dairy cream from one of the leading dairies on the east coast with choice chocolates, nuts, berries, and the purest of flavors and extracts. With over 25 years and two generations of making ice cream, we strive to make your experience one that you will come back to for years to come. www.bigdipper.com, harry@bigdipper.com, 203-758-3200, 75 Waterbury Rd, Prospect, CT.
18. **Kids' Corner**
    Bring your children to the Kids' Corner to make fun crafts and learn interesting facts about insects, plants, and more! Don't miss out the opportunity to make your own pipe cleaner insects and plants, do some coloring, play with bubbles, and grab a cold treat! Children can come to this plot to collect 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 (Bugs, Flowers, or Trees). Once the activity is complete, return to this location to collect your patch or badge!
19. **Self-Guided Activity for All Children, Including Girl Scouts**
    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.
20. **Baby Pools: Low-Cost Containers for Vegetable Production in Urban Agriculture**
    Leigh Whittinghill, Ph.D., *Assisted by* The Plant Health Fellows Summer Interns: Leo Babicz, Ananda Turner, Karena Kulakowski, Eva Rodriguez, Talia Tracton, Oliver Kelsey, Charles McLean, Alexandra Carabetta, Aoife Collier-Clarke, Justice Glasgow, Ana DiMauro, and Tessa Lancaster
    Vegetable production in urban areas is growing in popularity, but cost, contaminated soils, and limited growing space can be a problem. The use of inexpensive containers, such as small plastic pools, could help expand production to contaminated or paved areas. Plastic pools have a lower cost per growing area than most growing containers but may also have different drainage and media needs that have not been studied yet. Students in the Plant Health Fellow summer internship program conducted an experiment 1) to compare cucumber production in pools to traditional nursery pots, 2) to find the optimal growing media/compost mixture, and 3) to optimize the drainage strategy (drainage hole and pine bark placement) for growing vegetables in pools. The students measured soil temperature and moisture content, plant growth, cucumber yield (number of fruits and weight), and cucumber quality based on USDA grading standards. During the first growing season (2022) unexpected results of higher germination rates, faster crop development, and higher yields in the growing media without compost were observed. There were several theories about why this occurred, but is not expected to take place in the second growing season (2023).
21. **Cut-and-Come-Again Greens: Determining Fertilizer Application Rates to Promote Higher Yields and Nutrient Content in Later Harvests.**
    Leigh Whittinghill, Ph.D., *Assisted by* Leo Babicz
    Cut-and-come-again harvesting is a practice in which a single planting of greens is harvested multiple times. Often this is done by removing the outer leaves, leaving the growing center of the plant intact. Depending on the desired leaf size and weather conditions, harvests can be repeated every 7-14 days, for as many as 6-10 harvests. Currently, there are no research-based fertilizer recommendations for this practice and general guidance simply suggests applying fertilizer and to use nitrogen-heavy fertilizers to ensure more harvests. This research project was designed to examine eight different fertilizer application strategies to determine which provides better growth and nutritional quality in later crop harvests. All treatments receive an initial application of nitrogen, phosphorus, and potassium. One treatment receives no further nutrients and one receives a single side dressing of nitrogen three weeks after planting. The remaining treatments include a repeat of the initial fertilizer application at every three, every other, and every harvest, and a side dressing of nitrogen at every three, every other, and every harvest. In 2022, kale was grown during the spring and fall seasons. For that growing season, few differences were seen among fertilizer treatments for yield. Leachate water quality does not seem to change with increasing amounts of fertilizer. Overall pH and color increased with time while conductivity, turbidity, and macronutrients decreased with time. There were also some differences in water quality between the spring and fall seasons. Leaf and soil analysis are in progress. In 2023, both kale and collards were grown in the spring and are currently being grown for the fall season.

22. **Farm Equipment Used at Lockwood Farm**
    Lockwood Farm is a 75-acre working research farm. Here are some examples of the tractors and other equipment used for plowing, cultivating, tilling, and mowing the farm to assist the scientists in their research.
23. **Experiment Station Associates**
    Cheryl Cappiali, ESA President
    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.
24. **The Ministry of Molecular Magic**
    Michael Ammirata and Meghan Cahill
    The analytical chemistry department has synthesized a range of experiments which demonstrate the roles of chemistry and energy in everyday life. We have both individually oriented experiments and group demonstrations. Learn scientific principles while having fun conducting or observing the experiments. Come and explore the wonders of science with the Ministry of Molecular Magic.
25. **Microbiome on Plants and Its Role in Plant Disease Management**
    Mohamed-Amine Hassani, Ph.D., Salma Mukhtar, Ph.D., Blaire Steven, Ph.D., and Quan Zeng, Ph.D.
    Microbiomes are the assembly of microorganisms found in a specific environment. Members of a microbiome could include bacteria, virus, archaea, fungi, and protozoa, and the microbiome members often interact with each other and with the host, forming commensal, symbiotic, and pathogenic relationships. Plants exudate extra carbon generated from photosynthesis to plant surface in the form of exudate. Such carbon becomes energy sources of various microorganisms namely the plant microbiome. Microbiomes can be found on the leaves, stems, roots, flowers, and fruits of a plant. The plant microbiome is a key determinant of plant health and productivity.
26. **New Species, *Fistulina americana* from Connecticut and Massachusetts**
    DeWei Li, Ph.D. and Yu-Cheng Dai, Ph.D.
    Fistulina hepatica is a name widely used in the US and has been considered as a common species in Europe, North America, and North Asia. It is known as a tongue mushroom or beefsteak polypore because the juvenile fruiting body resembles a huge tongue in pinkish-red color. However, our recent study shows that the fungus in North America is actually an undescribed species based on morphological study of three specimens collected from CT, MA and phylogenetic analyses using ITS and LSU. It is described as *Fistulina americana* Y.C. Dai, D.W. Li, and Meng Zhou, sp. Nov.
27. **Understanding Leaching and Phosphorus Uptake of Five Different Biodegradable Polymer-Fertilizer Composite**
    Shital Vaidya, Ph.D., Christian Dimkpa, Ph.D., Wade Elmer, Ph.D. (Emeritus), and Jason. C. White, Ph.D.
    Use of conventional phosphate (P) fertilizers is associated with high solubility and thus, high, leaching and run-off. P loss into the environment demands overapplication for better crop yield which inadvertently leads to P-nutrient loading in nearby water bodies, eutrophication, algal blooms and hazard to aquatic life. Herein, in order to reduce P loss from run-off and leaching, we developed polymer-fertilizer composites by using biodegradable polymers including polyhydroxyalkanoate (PHA), starch, and cellulose nanocrystals. We tested five different P sources namely, calcium phosphate monobasic (MCP), calcium phosphate dibasic (DCP), calcium pyrophosphate (CAP), hydroxyapatite microparticles (HAM), and hydroxyapatite nanoparticles (HAN). We set up a greenhouse pot experiment to understand P loss in leachate, P run-off in a simulator, and P uptake in tomato plants. Our studies suggest that biodegradation of PHA into the soil releases P in a controlled manner, compared to non-PHA P fertilizers. Amongst five different polymer-fertilizer composites, PHA-CAP and PHA-DI showed better performance in terms of lowering P loss in leachate and run off, along with improving P uptake and retention of bioavailable P in the soil.
28. **A World of Viruses**
    Anurag Kushwaha, Ph.D. and Rebecca Johnson, Ph.D., *Assisted by* Duncan Cozens
    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.
29. **CuO Nanoparticle Coating Controls Foliar Uptake and Plant Health**
    Chaoyi Deng, Ph.D., Jingyi Zhou, Ph.D., Yi Wang, Ph.D., Neil Schultes, Ph.D., Christian Dimkpa, Ph.D., and Jason. C. White, Ph.D.
    Nanoparticles of essential elements have been proposed to deliver micronutrients to enhance plant health and suppress disease, thereby improving yield. The properties of nanomaterials such as morphology, size, composition, and surface chemistry have been shown to influence nanomaterials interaction with plant-soil systems. But the relationship between the surface coating of nanomaterials and plant leaf surface is still largely unknown. In this study, we coated citric acid on CuO NPs. FTIR and zetasizer show that the citric acid was successfully coated on NP surface. The synthesized nanoparticles were used to treat Fusarium virguliforme in soybean (Glycine max). We hypothesize that the surface coated nanoparticles will significantly reduce the disease progression and increase biomass, compared to the control and uncoated nanoparticles.

However, we hypothesize that the extent of this process is subject to leaf surface property since we foliar applied NPs, which directly impacts particle dissolution at this important biointerface. To evaluate the impact of leaf characteristics on NP absorption, two methods are being employed: dividing the leaf into three fractions and measuring the dissolution of NPs on each fraction, as well as using four different solutions to simulate the internal environments of the leaf and assess the rate of NP dissolution. We will correlate those measurements with particle transformation on the leaf. Additional endpoints of interest in the study include elemental analysis of the plant tissues, disease progression, photosynthetic pigments, and gene expression determination. To understand the intermolecular interactions between the plant leaf system and the transformation of nanoscale micronutrients will enable design of materials with optimal success nano-enabled agriculture.

30. Using Treated Wastewater to Irrigate Crops: What are the impacts?

Sara L. Nason, Ph.D. and Nubia Zuverza-Mena, Ph.D., Assisted by: Jingyi Zhou, Ph.D. and Jasmine Jones

Water scarcity is a cause of concern across the world. Recent population expansion and climate changes have resulted in a shortage of freshwater supplies needed to support society's basic needs. Wastewater reuse for irrigation is a commonly proposed strategy to combat water scarcity. Additional benefits of wastewater reuse for irrigation include reducing energy required to pump groundwater, as well as reducing fertilizer needs. Nonetheless, there are risks associated with reuse of wastewater, such as the presence of chemical contaminants like heavy metals and pharmaceuticals and personal care products. An increasing number of studies show that even trace level contaminants can be taken up into crop plants and consumed by humans. Here, we are growing plants using an irrigation system that uses water collected from the East Shore Water Pollution Abatement Facility in New Haven and investigating the effects of irrigation water source on plant growth and the presence of chemical contaminants in crops.

31. Understanding How Root Exudates Form Soil Organic Carbon

Itamar Shabtai, Ph.D.

Plants allocate an estimated 11% of their photosynthates to root exudates, a complex mixture of organic molecules used to engineer rootzone conditions. For example, root exudates help stabilize soil aggregates and improve water retention. Exudate carbon (C) serves as an energy source and helps support a thriving microbial population. In fact, it has been shown that exudate-C that is taken up by microbes tends to interact with soil mineral surfaces and form soil organic C which persists in the soil. These organo-mineral associations are critical for the stabilization of soil organic C, however since they occur at smaller than micrometer scales, they are challenging to study. Therefore, there is little visual and chemical information on organo-mineral interactions in the soil, and particularly in the rhizosphere. To address this gap, we isolated the <2 μm size fraction from a corn rhizosphere and non-rhizosphere soil and investigated the chemical and spatial characteristics of the organo-mineral interactions using state of the art methods which combine microscopy (visual information) and spectroscopy (chemical information). We found evidence for an iron-carbon cycling mechanism which is unique to the rhizosphere, and likely resulting from root exudates. A better understanding of the rhizosphere will help inform soil management practices which rely on living roots.

32. Mycorrhizal Inoculation: Promoting Tree Health and Survival in a Changing Climate

Faisal Qaseem, Ph.D. and Susanna Keriö, Ph.D., *Assisted by* Liberty Bednarz, Ana DiMauro, Susan Yang, and Eveleen Jiang

Planting and maintaining a healthy tree canopy are listed as some of the most effective ways to combat the negative impacts of climate change. Due to the more frequent and intense droughts caused by climate change, improving the drought resilience of newly established trees is of high priority. The combined impacts of abiotic and biotic stress agents make drought resilience a critical concern for tree planting efforts. Mycorrhizal inoculation has the potential to improve tree survival and drought stress tolerance. Mycorrhizal fungi form intricate networks of fine hyphae that explore a greater soil volume, thus increasing access to water and improving water-use efficiency. We will outline the strategies for achieving successful mycorrhizal inoculation, with insights into the key factors that contribute to successful outcomes. We will present results from experiments showing how mycorrhizal inoculation impacts the growth and stress tolerance of chestnut trees. We will showcase examples of tree root systems that have benefited from mycorrhizal inoculation to demonstrate how this strategy can extend the reach of tree roots, resulting in increased surface area for nutrient and water absorption.

33. Environmental Factors Affecting Urban Maple Health in New Haven

Susanna Keriö, PhD., Faisal Qaseem, Ph.D., Leigh Whttinghill, Ph.D., and Nubia Zuverza, Ph.D., *Assisted by* Liberty Bednarz, Ana DiMauro, Susan Yang, and Eveleen Jiang.

Urban trees are a critical part of the green infrastructure that provides various ecological and economical benefits to cities. However, urban conditions pose several challenges for healthy tree growth, and climate change will further amplify urban tree stress. Studying how various urban site factors such as urban heat island effects and soil conditions associate with street tree condition could support urban tree management decisions. We present findings from a tree survey conducted in New Haven, Connecticut. We rated tree conditions for 115 maples growing as street trees or park-like settings in Prospect Hill, East Rock, or Westville neighborhoods. The data set included 39 Norway maples (*Acer platanoides*), 41 red maples (*A. rubrum*), and 38 sugar maples (*A. saccharum*). We present how tree condition varies among neighborhoods and species and explore the association of impermeable area, neighborhood temperature, and soil conditions with tree health. In the following stages of the project, we will analyze the levels of non-structural carbohydrate levels as a proxy for tree health. The results of

this project may have applications in detecting stressed street trees, and in quantifying the impacts of urban heat island effects on tree health.

34. Deep Understanding of Crop Growth and Food Quality by "Multi-omic" Approach Using LC-MS

Yi Wang, Ph.D., Chaoyi Deng, Ph.D., Christian Dimkpa, Ph.D., and Jason. C. White, Ph.D.

Metabolomics and proteomics, the global profiling of the composition of metabolites and proteins, have emerged as a useful tool to gain comprehensive perspectives of the molecular processes involved in plant growth, development, and response to environmental stress. By analyzing the metabolite and protein profile of a plant tissue or cell, researchers can gain insight into the biochemical pathways that are active in that tissue, as well as the changes that occur in response to environmental stressors such as drought or pathogens. Metabolomics has been used to identify novel compounds with potential applications in medicine, agriculture, and industry. Proteomics has also been used to identify novel proteins with potential applications in crop improvement and biotechnology. Liquid chromatography-mass spectrometry (LC-MS) is a widely used technique in both metabolomics and proteomics research. LC-MS has been used in plant metabolomics and proteomics to identify and quantify metabolites such as amino acids, organic acids, sugars, and flavonoids, as well as proteins involved in various processes such as photosynthesis, stress responses, and signaling pathways. They are important for plant growth, development, and defense mechanisms, and their identification and quantification can provide insights into plant physiology and biochemistry. The integration of these techniques can provide a more comprehensive understanding of plant physiology and biochemistry and can lead to the development of new plant-based products and breeding strategies.

35. Insect Movement Ecology Informs Management Strategies

Kelsey E. Fisher, Ph.D.

Habitat fragmentation provides a significant barrier to insect movement across the landscape. Individuals that can traverse an unsuitable matrix, like concrete parking lots, turfgrass, and other urban structures, often do so at an energetic cost, while those that cannot suffer from potential resource limitation and genetic inbreeding from habitat isolation. Connecting habitat patches, either directly with corridors or functionally with 'steppingstones of habitat' facilitates the efficient movement of individuals across fragmented landscapes to increase population sizes and gene-flow. Understandings of movement and how space is used by beneficial insects and pollinators within landscape constraints are fundamental to advancing natural resource management and conservation program. Many are doing their part by establishing and maintaining small pollinator gardens in Connecticut. While commendable, the efficacy of these efforts and the impact of these small habitat establishments on insect communities remains unknown. Here, I will present on the work currently being conducted in the Fisher Lab to better understand habitat connectivity for monarch butterflies and bumble bees. This work will ensure that our efforts for pollinator conservation are effective.

36. Finding the Root of the Problem: How Nematodes Manipulate Plants

Raquel Rocha, Ph.D., *Assisted by* Regan Huntley and Eva Rodriguez

Plant-parasitic nematodes (PPN) cost the global economy billions of dollars in annual yield losses. Among PPN, the northern root-knot nematode (NRKN) is a common problem in the vegetable and nursery industries in the Northeast of the United States. Root-knot nematodes induce the formation of galls, or "knots", on the host root system. Aboveground symptoms caused by them include stunting, wilting, and chlorosis, resulting in reduced quality and quantity of crop yield or, in some cases, total crop loss. Unfortunately, there are very few options to manage areas affected by RKN. Chemical control is the most commonly used strategy. Still, due to their high cost and toxicity, developing new and durable control strategies for this devastating pathogen is necessary. In this exhibit, audiences will learn how root-knot nematodes manipulate and modify plant roots for their own benefit. They will also learn about the research conducted at the Rocha Lab, which aims to identify the molecular and cellular processes underlying plant-nematode interaction and how they can be perturbed to prevent nematode parasitism.

37. Hope for Connecticut's Ash Trees: Emerald Ash Borer Biocontrol Update

Claire Rutledge, Ph.D., *Assisted by* Oliver and Jane Rusher

Emerald ash borer was first detected in Connecticut in 2012. Since then, it has spread across the state and killed many thousands of ash trees. Starting in 2013, my laboratory has been collaborating with the USDA APHIS national biological control program to release three species of parasitic wasps in Connecticut's forests. These small wasps are from EAB's native range and are highly specialized, only attacking EAB. Since that time, we have released over 100,000 wasps in 17 locations. While the wasps cannot halt the initial outbreak of EAB, thousands of wasps against millions of EAB, these wasps have an important role after the initial EAB population has dropped. As the ash regrows, the wasps can keep this lower population low. Our current research is focused on understanding how well the wasps have established in the release areas, spread beyond those areas, and if they are having an impact on EAB density and ash regrowth in the state.

38. The Pavilion at Lockwood Farm

See program page 10 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's 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 provides an open feel in the interior of the building.

39. **Native Woody Shrubs**

Elisabeth B. Ward, Ph.D. and Jeffrey S. Ward, Ph.D., *Assisted by* 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.

40. **Bird & Butterfly Garden**

Jeffrey Fengler and Lisa Kaczenski-Corsaro

The Bird & 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.

41. **The Public Health and Entomology Tent**

    a. **Statewide Monitoring Program for Mosquito-borne Viral Diseases in Connecticut**

    Philip Armstrong, Ph.D., John Shepard, Andrea Gloria-Soria, Ph.D., Angela Bransfield, Michael Misencik, and Tanya Petruff, *Assisted by* Hunter Badey, Emily Beltz, Ben Chiasson, Steph Davies, Matt DeLucia, Scott Korman, Shaun Kusmit, Cam Logalbo, Mike Pazareskis, Mike Olson, Sam Rudolph, LuAnn Shaw, and Liz Triana

    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 to protect the public and reduce the risk of human disease. The Connecticut Agricultural Experiment Station (CAES) maintains a network of 108 mosquito-trapping stations in 88 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) and eastern equine encephalitis virus (EEEV). To date, more than 5 million mosquitoes representing 48 different species have been collected, identified, and tested since 1996. A total of 2,976 WNV isolations have been recovered from 24 different mosquito species and a total of 538 isolations of EEEV isolations have come from 21 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 EEEV 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.

    b. **Treating White-Tailed Deer For Tick Management in Connecticut**

    Scott C. Williams, Ph.D. and Megan A. Linske, Ph.D., *Assisted by* Heidi Stuber, Madison Grieger, and Matilda Kutschinski

    White-tailed deer and white-footed mice play critical roles in blacklegged tick ecology both in their reproduction and pathogen transfer, respectively. If we can figure out a strategy to target ticks on these hosts during the time of year they are known to be feeding on them, we can effectively make these animals tick killing machines instead of reproductive hosts. But in order to do so, we need to be sure that any product introduced is going to be safe for them and safe for the environment, which includes beneficial insects like pollinators. As a result, we tested the oral delivery of a product meant to kill parasites including ticks on cattle to white-tailed deer in Connecticut. Our goal was to see if we could get deer to consume corn treated with the product and determine if we could document levels of active ingredient in the animals shown to be lethal in previous efforts. Over two years, we fed treated corn to a semi-isolated deer herd in Norwalk, CT and captured deer to investigate tick abundances and determine active ingredient levels within the blood. We determined levels were sufficient for killing ticks (> 5-8 parts per billion) in 24 of 29 (83%) of captured white-tailed deer. We also documented far fewer blood-feeding ticks on animals with higher levels of active ingredients in their syste A strategy such as this has potential to reduce, if not eliminate ticks over large areas and reduce public exposure to ticks and tick-borne pathogens.

c. Range Expansion of Native and Invasive Ticks: A Looming Public Health Threat

Goudarz Molaei, Ph.D., *Assisted by* Noelle Khalil, Kristy Lok, Yarida Abigail Urbina Espinoza, and Emily Siegel

Native and invasive tick species are serious public health concerns in the United States. The range expansion of medically important ticks (blacklegged tick, *Ixodes scapularis*; lone star tick, *Amblyomma americanum*; Gulf Coast tick, *Amblyomma maculatum*) has placed new communities at risk for tick exposure, and novel pathogens associated with these ticks have been discovered in recent decades. The number of reported tick-borne disease (TBD) cases increased from 22,527 in 2004 to 50,865 in 2019, for a total of 649,628, but the actual case number is undoubtedly higher. Most TBD cases are associated with *I. scapularis*, the primary vector of Borrelia burgdorferi and *Borrelia mayonii* (Lyme disease [LD]), *Borrelia miyamotoi* (B. miyamotoi disease), *Anaplasma phagocytophilum* (anaplasmosis), *Ehrlichia muris eauclairensis* (ehrlichiosis), *Babesia microti* (babesiosis), and Powassan virus (Powassan virus disease). Climate warming, anthropogenic environmental changes, and increases in populations of key animal hosts, particularly white-tailed deer, have allowed *I. scapularis* and other tick species to proliferate and expand their ranges. Additionally, human encroachment on tick habitat has led to increased human-tick contact. From 2008–2020, Connecticut had 32,147 reported cases of LD and the 10th highest incidence rate (cases per 100,000 persons) of 17.3 in 2020. In 2022, the Connecticut Agricultural Experiment Station-Tick Testing Laboratory (CAES-TTL) received 3,895 ticks, of which 78.3% were blacklegged ticks, 15.0% were American dog ticks, 6.3% were lone star ticks, and 0.4% were other tick species. Of the 2,950 engorged nymphs and adult female blacklegged ticks screened in 2022, 31.1%, 5.3%, and 7.3% tested positive for the causative agents of LD, anaplasmosis, and babesiosis, respectively. In addition, more than 4.0% of these ticks were identified as positive for two or three of these disease agents simultaneously.

42. Assessing Pollinator Response to Ecotype Native Plants

Tracy Zarrillo, *Assisted by* David Rubin, Anais Bolduc, and Connor Grace

State and federal agencies, land trusts, private landowners, farmers, and pollinator conservation groups are investing time and money creating pollinator habitat and meadows throughout Connecticut. One aspect of many of these projects is the use of native plants. In response to demand for locally adapted native plants, ecotypic flower seed is being developed as a new commodity in Connecticut. Ecotype seeds are seeds grown from a parent stock that have genetically evolved over time to be adapted to the environment of a particular ecoregion. Ecotype seeds could be used by nurseries, farmers, state agencies, land trusts, landscapers, and private landowners to help increase native habitat in Connecticut. However, we have limited information about which bee species are supported by these native plants, or if the bee species are equally attracted to these native plants throughout the state. Some of the native flower species being grown for ecotype seed are hosts plants of specialist bees. Specialist bees can only use pollen from one plant species, one plant genus, or one plant family. Some specialist bee species, such as the squash bee, *Peponapis pruinosa*, are ubiquitous in the Connecticut landscape and consequently will show up wherever their host plant is grown. In this experiment, I am exploring how readily three specialist bee species, *Melissodes denticulata*, *Dufourea monardae*, and *Osmia distincta*, find their associated host plants, *Vernonia noveboracensis*, *Monarda fistulosa*, and *Penstemon digitalis* respectively. I will also document the other bee species in the landscape that are using these host plants. Knowing which bee species are attracted and where they can be supported by certain flower species can help guide flower species selection for commercial development. The ecotype seeds for this project were generously donated by The Hickories Farm in Ridgefield, CT. The seeds grown out from this experiment will be distributed to other state agencies for use in habitat restoration projects.

43. Invasive Aquatic Plant Program – Office of Aquatic Invasive Species

Gregory Bugbee, Jeremiah Foley IV, Ph.D., Summer Stebbins, and Riley Doherty, *Assisted by* Madison Manke

Connecticut lakes and ponds are degraded by the spread of non-native invasive plants. Plants such as Eurasian watermilfoil, fanwort, water chestnut, and hydrilla are of great concern because they disrupt native ecosystems, interfere with recreation, reduce property values, and can harbor harmful algae. The Department of Environmental Science and Forestry at CAES houses both the Invasive Aquatic Plant Program and the newly formed Office of Aquatic Invasive Species. These entities formalize Connecticut's commitment to protecting aquatic ecosystems. Over 400 aquatic vegetation surveys of Connecticut lakes and ponds have been performed since 2004. Over 100 plant species have been documented of which 14 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. In 2018, we discovered a new biotype of hydrilla in the Connecticut River. In 2021, we completed a survey of the Connecticut portion of the river and documented an extensive well-established population of the plant covering nearly 1000 acres. 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 waterbodies to help solve imminent problems. At this plot you will see our aquatic plant surveillance boats, state of the art global positioning systems, and 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.

44. Hemp Demonstration Plot

Terri Arsenault, Richard Cecarelli and Anuja Bharadwaj, Ph.D.

CAES began testing hemp in 2019 following the legalization of the growing of hemp with passage of the Agricultural Improvements Act in December of 2018. The bill allowed growing Cannabis sativa as long as it has <0.3% total delta-9 THC, which is federally legal and referred to as hemp (versus marijuana). In 2019, CAES began growing various hemp cultivars and monitoring levels of THC for conformance to the limit. In 2019, cultivars were found to be highly variable in both physical appearance and THC level, and two varieties contained individual plants with psychoactive levels of THC. Cultivars tested in 2022 were more consistent in THC level between plants of the same cultivar and met the criteria for hemp at maximum maturity. Growers still need to be mindful of the rapid escalation in THC content as plants mature and may need to harvest prior to full maturity to prevent crop embargoes.

45. Chestnut Species and Hybrids

Sandra Anagnostakis, Ph.D. (Emeritus), *Assisted by* Pamela Sletten (Retired)

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). 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 northern Florida are planted across the road from an Allegheny chinquapin from Ohio. The original tree (the "ortet") of the cultivar 'Lockwood' is at the southwest corner of the plot.

46. Healthy Plants—Healthy Business: Support of The Green Industry by Inspection

Victoria Lynn Smith, Ph.D., *Assisted by* Tia Blevins, Mark Creighton, Jeff Fengler, and Jacob Ricker

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 2022, the Office of the State Entomologist completed registration and inspections for 190 nursery growers and dealers of plants and plant products. Over 397 certificates of export were issued for plant commodities moving out of country, to 33 destination countries. Over 103 certificates of export were issued for plant commodities moving out of state, to 11 destination states or US territories. Nearly 700 beekeepers registered 6,750 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 many non-native moths and wood boring insects. Box tree moth, a federally regulated pest, was found at one location in CT in 2021, and surveys continue for this pest. The health of our forests was assessed by an aerial survey and by winter-time gypsy moth egg mass 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.

47. A Welcome Reprieve for Eastern Hemlocks in 2023

Carole Cheah, Ph.D.

Hemlock woolly adelgid, *Adelges tsugae* (HWA), continues to be a serious exotic forest and landscape pest of native hemlocks, *Tsuga* spp, in eastern North America. After a string of successive warm winters, HWA was again invasive and widespread in many areas of Connecticut going into the winter of 2023. Biological control of HWA using the introduced specialist predatory ladybeetle, *Sasajiscymnus* (=*Pseudoscymnus*) *tsugae*, native to southern Japan, continues to be Connecticut's major strategy of managing HWA since 1995. This strategy has saved Connecticut's hemlock forests in an environmentally friendly way. In recent years, biological control with *S. tsugae* has been increasingly expanded to other private and municipal hemlock stands through partnerships with towns, land trusts, water companies, nature preserves, residential communities, and homeowners. By the end of 2022, > 222,000 *S. tsugae* had been released in >80 sites throughout Connecticut since 1995. The winter of 2023 had been abnormally warm. But in the early hours of February 4, a brief but potent polar vortex outbreak of significant subzero cold from the Arctic descended suddenly over Connecticut (and the Northeast). Impacts on HWA were highly significant. Dr. Cheah's research has shown that significant high mortality of HWA results at certain critical subzero minimum temperatures in the different climate divisions of Connecticut, and this recent event has validated the model. In most areas of Connecticut, around 90% or more of HWA kill was recorded after the polar vortex of 2023. With this dramatic natural reduction of HWA, hemlocks are getting a very beneficial reprieve from recent HWA invasions and resurgence. As HWA survival was slightly higher along water courses, multiple collaborations for implementing the HWA specialist ladybeetle predator, *Sasajiscymnus tsugae*, are targeting these areas in 2023 to further reduce HWA populations to maintain and sustain long term recovery of Connecticut's hemlocks.

48. 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).

49. Asian Chestnut Gall Wasp on Chestnut

Sandra Anagnostakis, Ph.D. (Emeritus), *Assisted by* Pamela Sletten (Retired)

Many of the chestnut trees here 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 species of 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.

50. Hybrid Elm Trees

Sandra Anagnostakis, Ph.D. (Emeritus), *Assisted by* Pamela Sletten (Retired)

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.

51. Rocky Hill American Chestnut Trees

Sandra Anagnostakis, Ph.D. (Emeritus), *Assisted by* Pamela Sletten (Retired)

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) to keep them alive.

52. Grapevine Demonstration Plot: Hybrid and Vinifera Grape Cultivars

Washington da Silva, Ph.D., *Assisted by* Raja Muthuramalingam, Ph.D., Rania Eltanbouly, Ph.D., and Francisco Faggion, Ph.D., and by the Ph.D. student Talison da Costa

Wine grapes and wineries are a relatively new industry in Connecticut. In the past 20 years, acreage planted to wine grapes has gone from 160 A to 620 A and the number of wineries has grown from 15 to 42, producing about 550,000 gallons of wine valued at between 12-14 million dollars per year. Three grape plots are being maintained at Lockwood farm to carry on the CAES legacy of grapevine research: Hybrid and Vinifera Grape Cultivars Plot - This vineyard was planted in late spring, 2008. Some of the newer cultivars were selections from breeding programs at Cornell University and the University of Minnesota and have not yet been released. Others are newly available cultivars from cool and cold climate areas of Europe.

53. The Fight Against Potato Viruses

Washington da Silva, Ph.D. and Richard Cecarelli, *Assisted by* Raja Muthuramalingam, Ph.D., Rania Eltanbouly, Ph.D., and Francisco Faggion, Ph.D., and by the graduate students Juliana Milagres and Talison da Costa

Potato (*Solanum tuberosum* subsp. *tuberosum*) is the fourth main staple crop in the world, behind rice, wheat, and corn. It is grown on all continents and because it is a vegetatively propagated crop, potato is particularly vulnerable to destructive viruses such as potato virus Y (PVY), potato leafroll virus (PLRV), and potato mop-top virus (PMTV). Endemic and emerging viruses are becoming a major threat to smallholding farms because of the negative effects on yield and quality that they induce on the marketable product. In Connecticut, like much of New England, potato is planted primarily for the local market where quality is paramount and any blemishes reduce marketability and farm value, directly impacting growers's income. The da Silva Lab at CAES is working on new sustainable technologies to help in the fight against potato viruses. In his recent work, Dr. da Silva has identified specific ribonucleic acid (RNA) molecules that induce RNA interference (RNAi), an evolved plant defense mechanism that we are seeking to activate or enhance, in plants and prime plants to successfully resist viruses. His team is now developing nanocarriers to deliver those RNA molecules into potato plants to activate RNAi and induce a "vaccination effect" against destructive potato viruses. The several potato varieties planted in the Lockwood farm will be used to test this virus control strategy. (Identical to Plot 3)

54. Connecticut College Arboretum

Maggie Redfern

The Arboretum, established in 1931, is a signature feature of Connecticut College. Today it encompasses 750 acres, including the landscaped grounds of the College campus as well as the surrounding plant collections, natural areas and managed landscapes. The Arboretum offers visitors a chance to explore a diverse collection of native plants and natural habitats or simply wander and enjoy the beauty of this precious natural resource. Taking a self-guided tour is an excellent way for first-time visitors to experience many interesting features in the Native Plant Collection. Approximately 2,500 trees, shrubs and vines native to eastern North America and hardy in southeastern Connecticut are labeled with scientific names and accession numbers. The various species take turns displaying their beauty throughout the seasons: shadbush and willows in

April; dogwood and azaleas in May; mountain laurel and magnolias in June; giant rhododendron, sourwood and sweet pepperbush in July; Franklin tree in September; brilliant autumn foliage in October; evergreens and conifers year-round. Spring blooming wildflowers and late summer blooming perennials add color and pollinator habitat across the landscape. The Arboretum is open to the public, free of charge, every day of the year from sunrise to sunset. mredfern@conncoll.edu, arboretum.conncoll.edu, 860-439-5060

55. **USDA Farm Service Agency (USDA-FSA)**
Teresa Peavey
USDA FSA assists producers with commodity loans and programs, Ad-Hoc disaster programs, Non-Insured Crop Disaster Program Insurance for annually tilled crops not covered by RMA, Tree Assistance Program for Orchard or vine damage, Conservation programs and disaster assistance, Farm Storage Facility Loans for low interest financing of storage needs; Reports of Acreage to remain in compliance with FSA and NRCS programs; County Committees represent grassroots input and local administration of federal farm programs to local producers; Organic Certification Cost Share Program; Farm Ownership Loans; and many more programs. teresa.peavey@usda.gov, https://www.fsa.usda.gov, 203-303-5528
56. **Connecticut Farm Bureau Association (CFBA)**
Joan Nichols
The Connecticut Farm Bureau Association is a non-profit membership organization dedicated to farming and the future of Connecticut farms. Representing the interest of nearly 2,500 members, CFBA serves its members by advocating for agriculture. Representing the cross-section of Connecticut agriculture, CFBA focuses on the issues that keep farm families productive. Display is focused on educating visitors about Connecticut agriculture and Connecticut Farm Bureau. www.cfba.org, joann@cfba.org, 860-768-1100
57. **The American Chestnut Foundation - CT Chapter (TACF)**
Florian Carle
More than a century ago, nearly four billion American chestnut trees were growing in the eastern U.S. They were among the largest, tallest, and fastest-growing trees. The wood was rot-resistant, straight-grained, and suitable for furniture, fencing, and building. The nuts fed billions of wildlife, people, and their livestock. It was almost a perfect tree, that is, until a blight fungus accidentally introduced by humans killed it more than a century ago. Since then, The American Chestnut Foundation (TACF) is committed to restoring the American chestnut tree to its native range (200 million acres of eastern woodlands). Unlike other environmental organizations, TACF's mission is not about preventing environmental loss or preserving what we already have. The loss already occurred and TACF is trying to restore an entire ecosystem. Our goal is to create a template for the restoration of other chestnut tree species throughout the world. During Plant Science Day Event, members of the TACF Connecticut Chapter will be there to answer all your chestnut-related questions and show you the various species of chestnut trees in the Lockwood orchard we are using to help restore this great tree to Connecticut and the US. http://tacf.org/ct, CTchapter@acf.org, 203-821-1021
58. **The Connecticut Tree Protective Association (CTPA)**
Cathy Dvorsky
The Connecticut Tree Protective Association is in its 100th year as an association and is going strong. We are a non-profit organization that supports arboriculture in the State of Connecticut.www.ctpa.org, cathy@ctpa.org, 203-484-2512
59. **Connecticut Department of Energy & Environmental Protection (DEEP) Forestry - Private & Municipal Lands**
Daniel Thomas
DEEP Forestry performs a wide range of public services regarding the State of Connecticut's urban and rural forests. This includes forests on both public and private land. The Private and Municipal Lands component of DEEP Forestry will be out in force at Plant Science Day, as we have found it to be an excellent venue at which to make contact with our constituents, be that public officials, private forestland owners or just people in general interested in trees and in the welfare of the trees and forests in the state. https://portal.ct.gov/DEEP/Forestry/Service-Forestry-in-CT, Daniel.Thomas@ct.gov, 203-584-5232
60. **United States Department of Agriculture. Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA APHIS-PPQ)**
Eric Chamberlain
APHIS' Plant Protection and Quarantine (PPQ) program safeguards U.S. agriculture and natural resources against the entry, establishment, and spread of economically and environmentally significant pests, and facilitates the safe trade of agricultural products. eric.a.chamberlain@usda.gov, https://www.aphis.usda.gov/aphis/ourfocus/planthealth, 203-741-5643
61. **Connecticut Professional Timber Producers Association**
Kyle Bruetsch
The Connecticut Professional Timber Producers Association is a non-profit organization representing the forest products industry of Connecticut. Our membership works 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. www.timproct.org, info@timproct.org, 860-948-0432

62. **Connecticut Department of Energy & Environmental Protection (DEEP) Pesticide Management & Arborist Program**
Zachary Donais
The Connecticut Department of Energy & Environmental Protection (DEEP) Pesticide Management Program's main goal is to prevent adverse human health or environmental effects from the misuse of pesticides. We work with all people, products, permits, and businesses that are related to pesticides and arboriculture and make sure that they are properly certified and knowledgeable in the work they are doing. We would be happy to answer any questions about pesticides or help anyone looking to get certified! portal.ct.gov/deep-pmp, zachary.donais@ct.gov, 860-424-3326
63. **United States Department of Labor, Wage and Hour Division (WHD)**
Heather Callahan
The U.S. Department of Labor, Wage and Hour Division's (WHD) mission is to promote and achieve compliance with labor standards to protect and enhance the welfare of the nation's workforce. WHD enforces federal minimum wage, overtime pay, recordkeeping, and child labor requirements of the Fair Labor Standards Act. WHD also enforces the Migrant and Seasonal Agricultural Worker Protection Act, the Employee Polygraph Protection Act, the Family and Medical Leave Act, wage garnishment provisions of the Consumer Credit Protection Act, and a number of employment standards and worker protections as provided in several immigration-related statutes. Additionally, WHD administers and enforces the prevailing wage requirements of the Davis-Bacon and Related Acts and the Service Contract Act and other statutes applicable to federal contracts for construction and for the provision of goods and services. www.dol.gov/agencies/whd, callahan.heather@dol.gov, 860-240-4911.
64. **Connecticut Invasive Plant Working Group (CIPWG)**
Rose Hiskes
The mission of the Connecticut Invasive Plant Working Group is to gather and convey information on the presence, distribution, ecological impacts, and management of invasive species; to promote uses of native or non-invasive ornamental alternatives throughout Connecticut; and to work cooperatively with researchers, conservation organizations, government agencies, green industries, and the general public to identify and manage invasive species pro-actively and effectively. www.cipwg.uconn.edu, rose.hiskes@ct.gov, 860-683-4977
65. **Connecticut Christmas Tree Growers Association (CCTGA)**
Lisa Angevine Bergs
The Connecticut Christmas Tree Growers Association is a non-profit membership organization established in 1960. CCTGA is dedicated to the development of the Christmas tree industry in the state of Connecticut. Representing over 200 members, CCTGA focuses on the production and marketing of top-quality Christmas trees as well as providing consumers with information about local tree farms, where to purchase CT Grown Christmas trees, and how to care for them. ctchristmastree.org, Executivedirector.cctga@gmail.com, 860-601-5906
66. **Wild Ones Mountain Laurel Chapter**
Lydia Pan
Wild Ones is a national 501(c)(3) organization that promotes environmentally sound landscaping practices to preserve biodiversity through the preservation, restoration, and establishment of native plant communities. Wild Ones awards Seeds for Education grants and certifies native plant butterfly gardens. The Mountain Laurel Chapter is based in New London, CT and sponsored by the Connecticut College Arboretum. We raise awareness about the importance of landscaping with native plants in urban & suburban gardens to support pollinators and other wildlife. Our monthly programs are generally free and open to the public. Our exhibit will have literature about ecological landscaping, lists of native plant alternatives, best native plants for wildlife, instructions on how to propagate native plants from seed and where to obtain seed-grown plants and seeds for species native to our ecoregion. https://mountainlaurel.wildones.org/, wild.native.plants@gmail.com, lcpan01@gmail.com, 860-383-3580
67. **Master Gardeners**
Eric Larson
The UConn Extension Master Gardener Program trains citizens to develop skills in botany, horticulture, and gardening to assist the community in best practices for diagnosing diseases and pests by presenting the clients with scientifically based choices. https://mastergardener.uconn.edu/, Eric.larson2@uconn.edu, 203-285-4918.
68. **Connecticut Department of Labor's Division of Occupational Safety and Health (CONN-OSHA)**
Catherine Zinsser and Robert Hunts
The Connecticut Department of Labor's Division of Occupational Safety and Health is referred to as CONN-OSHA. 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. As a State Plan state, CONN-OSHA adopts and enforces standards that are

at least as effective as the federal requirements. CONN-OSHA also 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. https://portal.ct.gov/dol/divisions/conn-osha?language=en_US, catherine.zinsser@ct.gov, 860-263-6942.

69. **Hamden Land Conservation Trust**
    Gail Cameron
    The Hamden Land Trust is an all-volunteer non-profit organization that preserves and protects open space in Hamden. We also educate the public about natural resources and the environment and have established several pollinator gardens on our properties. This year's exhibit will be about the importance of pollinators and what people can do to help. www.hlct.org, hamdenlandtrust@gmail.com
70. **Connecticut Department of Agriculture**
    Rebecca Eddy
    The Connecticut Department of Agriculture 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. For more information, visit www.CTGrown.gov, rebecca.eddy@ct.gov, 860-713-2503
71. **Bonsai Society of Greater New Haven**
    Alexander J. Amendola
    The Bonsai Society of Greater New Haven (BSGNH) is a diverse group of folks who practice the art/science of Bonsai. Why art and science? That's because Bonsai is 50% horticulture/plant physiology and 50% art and creativity. A healthy, vigorous tree is prerequisite to the breathtaking, artistic masterpiece one can create in a Bonsai pot. http://www.bonsainewhaven.com, 203-824-7224
72. **Connecticut Department of Energy & Environmental Protection-Wildlife Division (DEEP-Wildlife)**
    Paul Benjunas
    The Wildlife Division is part of the Connecticut Department of Energy and Environmental Protection (DEEP) and is responsible for advancing the conservation, use, and appreciation of Connecticut's wildlife resources. This display will highlight some of the Division's ongoing research with an emphasis on black bears and bobcats. https://portal.ct.gov/DEEP/Wildlife/Wildlife-in-Connecticut, paul.benjunas@ct.gov, 860-416-8563
73. **Federated Garden Clubs of Connecticut**
    Kelle Ruden
    The Federated Garden Clubs of CT, Inc. is an educational and charitable organization made up of over 6,200 members, 118 clubs and 26 affiliated organizations. We encourage high standards in all aspects of garden work and are dedicated to protect and conserve our natural resources, preserve our heritage and promote civic beauty. We offer National Garden Club Schools to the public as well as to our members in the areas of: Environmental, Flower Show, Gardening, and Landscape Design. We welcome opportunities to assist those in search of a garden club and are always delighted to participate in Plant Science Day. https://ctgardenclubs.org/, Kelle.ruden@ctgardenclubs.org, 203-216-0884
74. **Levo International, Inc.**
    Nathaniel Heiden
    Levo International is a non-profit 501(c)3 organization dedicated to eliminating food insecurity through innovation and partnership. Levo's main focus has been delivering assistance to food insecure neighborhoods in Connecticut and in Haiti. Hydroponics is the growth of plants without soil in a water-based system. Simplified forms of hydroponics are the main mechanisms Levo uses to increase food access. Levo's research program has therefore focused on reducing the inputs required for hydroponic farming to increase its accessibility and impact. With the support of The Connecticut Agricultural Experiment Station, Levo has ongoing research efforts exploring the development and deployment of effective natural fertilizers and evaluating yield differences between hydroponic and soil-based farming. https://levointernational.org, nheiden@levointernational.org, 860-655-5228
75. **Connecticut Federation of Lakes (CFL)**
    Maryellen DiLuzio
    The Connecticut Federation of Lakes (CFL) is the Voice of Connecticut Lakes. Connecticut lakes need a voice to represent them at the local and state government levels, to educate the public, and to help create an environmental ethic for lakes so these important inland water bodies can become and/or remain the healthy, desirable natural resources our families and friends deserve. https://www.ctlakes.org/, info@ctlakes.org

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

SPEAKER BIOGRAPHIES

ANUJA BHARADWAJ, PH.D.
Anuja Bharadwaj received her Ph.D. at The Indian Institute of Technology Delhi in India. After working as a postdoctoral researcher at The Connecticut Agricultural Experiment Station (CAES), she joined the States Forensic Laboratory as Forensic Science Examiner in Toxicology Unit in the Connecticut Department of Emergency and Public Protection. Anuja came home to CAES again in November 2021 as Assistant Agricultural Scientist II in the Department of Analytical Chemistry (DAC). Her focus is to develop and validate methods for the analysis of cannabinoids in marijuana products. She analyzes cannabis products submitted by the Connecticut Department of Consumer Protection. Additionally, she assists in DAC's Hemp Regulatory Program and other research efforts.

RICHARD S. COWLES, PH.D.
Richard Cowles has worked at the Valley Laboratory of The Connecticut Agricultural Experiment Station for the past 28 years. As an entomologist, he has worked on various exotic invasive pests such as hemlock woolly adelgids, emerald ash borer, and spotted wing drosophila. Because of his expertise in the application of systemic pesticides and assessing their efficacy, his studies have broadened to include management of boxwood blight and beech leaf disease.

MARK H. CREIGHTON
Mark Creighton began his work at The Connecticut Agricultural Experiment Station in 2010 in the Department of Entomology as the State Bee Inspector working within the office of the State Entomologist. His primary responsibility is to is to inspect honeybee colonies looking for disease and parasites in order to keep Connecticut's Honeybee population healthy. Mark is also an Authorized Certification Official for the USDA and performs Nursery Stock Inspection as needed. Honeybees are important in support of Connecticut's agricultural industry. In addition, Mark is the Station's Apiculturist, keeping bees at Lockwood Farm and assisting researchers in various projects requiring bees. Mark is a frequent speaker at bee clubs, garden associations, local high schools and colleges. He graduated from the Master Beekeeper program at University of Montana in 2018.

MEGAN A. LINSKE, PH.D.
Megan Linske graduated with her BS from Nazareth College in 2012 and Master's and Ph.D. from the University of Connecticut (UConn) in 2014 and 2017. During her time at UConn, she also worked at The Connecticut Agricultural Experiment Station where she started as a seasonal employee working on Japanese barberry and tick management. Shortly thereafter, she was promoted to Technician working on integrated tick management and transitioned into a postdoctoral position upon the successful completion of her Ph.D. She was recently promoted to Assistant Scientist II and continues to work on tick ecology and management.

ROBERT E. MARRA, PH.D.
Robert Marra is an Associate Scientist in the Department of Plant Pathology and Ecology at The Connecticut Agricultural Experiment Station, serving since 2004 as the state's Forest Pathologist. His research encompasses various aspects of tree and plant diseases of urban and natural ecosystems. Current research centers on beech leaf disease, developing molecular tools for rapid diagnostics and tracking transmission and spread, using molecular fingerprinting, of the BLD nematode, *Litylenchus crenatae* subsp. *mccannii*. Robert Marra recently developed a methodology using sonic and electrical-resistance tomography to nondestructively measure the amount of carbon sequestered in forest trees, in order to investigate the role that internal decay in forest trees plays in carbon cycling and the mitigation of global warming through carbon sequestration. Additionally, Robert Marra conducts annual surveys for oak wilt and beech leaf disease.

FELICIA MILLETT
Felicia Millett received her Master's (MS) in Plant Science from the University of Connecticut in 2022. She worked as a graduate research assistant in Quan Zeng's laboratory at The Connecticut Agricultural Experiment Station, researching methods of host entry by the bacterial plant pathogen, *Erwinia amylovora*, into apple leaves causing infection by fire blight. She joined the Department of Plant Pathology and Ecology in January 2023 and now serves as a Plant Diagnostician in the Plant Disease Information Office. She also holds the Connecticut Arborist license.

GIL SIMMONS – Samuel W. Johnson Memorial Lecturer
Chief Meteorologist Gil Simmons joined WTNH Storm Team 8 in February 2003. Gil served on active duty in the United States Marine Corps as a meteorologist/oceanographer for six years forecasting weather conditions all over the world from 1990 to 1996. He then moved back to Connecticut to attend WCSU and forecast the weather locally. Gil received two Emmy nominations for his weather coverage in Connecticut and was awarded 2002 Best Weathercast in Connecticut by the Associated Press. A native of Foster, Rhode Island and Killingly, Connecticut, Simmons is a graduate of Western Connecticut State University and a member of the American Meteorological Society. He is one of a limited number of meteorologists with the prestigious Certified Broadcast Meteorologist seal of approval from the American Meteorological Society. Hobbies include studying the weather, exercising, snowmobiling, and gardening. Gil also sets time aside to participate in a variety of community fundraisers and events. He looks forward to delivering the weather every weekday morning on NEWS 8, Twitter, Facebook, and Instagram too!

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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.

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

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: http://portal.ct.gov/caes
or just scan our QR code below with your smartphone.

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