Dr. Goudarz Molaei, Dr. Philip Armstrong, Dr. Theodore Andreadis, and colleagues from New York and Vermont examined the recent emergence and expansion of eastern equine encephalitis virus (EEEV) in a new focus in Vermont. They found that the principal mosquito vector, *Culiseta melanura,* acquired blood meals primarily from birds. Findings demonstrate that this mosquito species serves as the primary vector of EEEV among wild bird species, but also is capable of occasionally contributing to epidemic/epizootic transmission of EEEV to humans/equines. (*Parasites & Vectors* 2015)

SCIENTIFIC DISCOVERIES

Dr. Richard Cowles found through extensive search of strawberry fields historically associated with high populations of black vine weevil that this major pest of berries has disappeared from commercial fields in Connecticut. Several factors may be involved, but it is likely that both cessation of soil fumigation and a possible increase in soil temperatures through the root zone have tipped the balance in favor of biological control of black vine weevil by insect pathogenic nematodes. Informal survey of extension small fruit entomology specialists suggests that this pest is now only important to strawberries being grown in higher latitudes (northern New England; Plattsburgh, NY, and Canada).

As part of a national survey focused on honey bee health, seven apiaries in CT were sampled by apiary inspector **Mark Creighton** in 2014 and tested for several virus diseases associated with colony losses. Varroa mites were found in all colonies sampled. All colonies tested were positive for Deformed Wing Virus, which is associated with Varroa mites. Other viruses detected in some colonies were Israeli Acute Paralysis Virus, Acute Bee Paralysis Virus; and Chronic Bee Paralysis Virus. Lake Sinai Virus-2 and Slow Paralysis Virus were not detected in this survey. In 2015, 24 apiaries were sampled for the national survey.

Magali Bazzano, a graduate student at the University of New Haven, and **Dr. Wade Elmer** found that dimethylsulfoniopropionate (DMSP), a metabolite in marsh grass (*Spartina alterniflora*) putatively associated with plant health, was in higher concentrations in healthy marshes than in areas where dieback occurred. Levels of DMSP were also lower in plants near creek banks where dieback is first observed than in areas away from creek banks. Understanding the role of DMSP may offer insights into the physiological etiology of marsh dieback.

In a two-year field experiment, **Dr. Chris Maier** determined that feeding by larvae of the lily leaf beetle significantly reduces the weight of native Canada lilies in wild stands.

Dr. Goudarz Molaei, Michael Thomas, John Shepard, Dr. Philip Armstrong, Dr. Theodore Andreadis, and colleagues from Oregon State University studied the vector-host interactions of *Culiseta melanura* to identify key bird species that serve as hosts for this mosquito species and for Eastern equine encephalitis (EEE) virus in four sites in Connecticut where virus activity has historically occurred. This highly pathogenic virus is responsible for outbreaks of severe disease in humans. They identified eight bird species important for maintenance of EEE virus and developed a mathematical model to describe the transmission dynamics of EEE virus.

Biochar, a product of heating biomass waste in the absence of air, has attracted interest as an adsorbent in agriculture and environmental remediation due to its porous nature. **Dr. Joseph Pignatello and Dr. Feng Xiao** discovered that subjecting biochar briefly to hot air (up to 40 minutes at 400 °C) greatly increased its ability to adsorb organic compounds, including hydrocarbons, herbicides and industrial compounds of concern as soil pollutants. Their results indicate a way in which biochar may be tailored for specific purposes, and provide insight into the effects of air oxidation on char formation.

Pumpkins and winter squash require multiple visits from bees during the short time each female flower is open (from dawn until about 11 am on a single morning) in order to set fruit. After collecting and processing stigmas from female flowers on up to 20 fields

Continued on next page

CAES Seminars

The Connecticut Agricultural Experiment Station is offering a series of talks by various scientists. All talks are free and open to the public and will be held in Jones Auditorium at the New Haven campus from 12:00 noon to 1:00 pm. A complete schedule is also at www.ct.gov/caes/.

Wednesday, January 27
Dr. Peter J. Krause, Senior Research Scientist, Dept. of Epidemiology and Public Health, Yale School of Medicine, "Emerging tick-borne infections: Babesiosis and hard tick relapsing fever."

Wednesday, February 3
Dr. Adriana Arango, Dept. of Forestry and Horticulture, CAES, "Environmental challenges and trees…who wins the battle?"

Wednesday, February 17
Dr. Jeffrey Ward, Dept. of Forestry and Horticulture, CAES, "Mixing applied and basic research — crop tree management."

Wednesday, March 9
Dr. Anthony DeNicola, White Buffalo, "Can tick-associated disease risks be mitigated through deer management?"

Wednesday, March 30
Dr. Blaire Steven, Dept. of Environmental Sciences, CAES, title TBA.

Wednesday, April 13
Dr. Sam Telford, Tufts University, "Emergence, expansion, and changes in the frequency of vector-borne diseases in the US."

Wednesday, April 27
Dr. Doug Brackney, Dept. of Environmental Sciences, CAES, "Intrahost population diversity of deer tick virus and potential genetic bottlenecks associated with transtadial transmission."

Tuesday, May 10
Dr. Richard Cowles, Valley Laboratory, CAES, "Against the wind: challenges in applying behavioral manipulation to manage spotted wing drosophila."

Wednesday, May 25
Dr. DeVei Li, Valley Laboratory, CAES, or UConn faculty member, "Indoor molds and human health."

of pumpkin or winter squash for three years, **Dr. Kimberly Stoner** found that the average level pollen deposition was generally above 2,000 pollen grains per stigma, which is enough to ensure full fruit set.

Dr. Jason White, along with colleagues at the University of Texas-El Paso showed that the impact of nanoparticle cerium oxide in soil on kidney bean productivity and seed quality was influenced by soil organic matter content. This research suggests that nanoparticle cerium oxide exposure negatively impacts the nutritional quality of kidney beans. This altered seed quality may have significant implications for food production and human health.

Experiment Station Associates Membership Application

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January 2016

Bulletin
news from the experiment station associates

The *Bulletin* is published by the Experiment Station Associates and mailed to our members. To become a member, please complete and mail the form on page 6.

The Experiment Station Associates was formed in 1990 to encourage and support the work of the scientists at The Connecticut Agricultural Experiment Station.

We welcome your comments. Please email the editor, Pamela Weil, at pamelaweil44@gmail.com.

Protecting Forests in Connecticut for the Future

by Stephen Wing, ESA Board Member

Eric Hammerling gave a spirited "good news, bad news" talk about Connecticut's forests — past, present, and future — under the big top at Plant Science Day on August 5, 2015.

Hammerling, the executive director of the Connecticut Forest and Park Association (CFPA), gave the Samuel W. Johnson Memorial Lecture to an attentive audience of several hundred. The title of his address: "Protecting Forests in Connecticut for the Future — How are we doing? What will it take?" He should know: the CT Forest and Park Association is the oldest not-for-profit conservation organization in the state, founded in 1895.

Providing some historical context, Hammerling pointed out that the CFPA answered a dire need at the end of the 19th Century: Connecticut had no state parks, no schools of forestry, no certifications for foresters and no tree wardens. It had five goals: to develop public appreciation of forests, to disseminate information relating to the proper use of forests, to secure passage of laws to protect forests, to advance the establishment of state and national parks and forests, and to encourage study in schools of forestry and kindred topics.

The CFPA has advocated and formed alliances over the last

120 years that have resulted in important accomplishments: laws providing incentives to landowners to preserve forests, the designation of the New England Scenic Trail, and funding for the management of forests parks and trails. We have also seen the establishment of numerous state parks, including Rocky Neck, Harkness, and Sleeping Giant. CFPA has conserved in its own name 1824 acres with conservation easements and 436 acres in ownership, and 7 miles of trail easements. CPFA also trains teachers and conducts

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Goodwin State Forest and Pine Lake in Hampton, CT.
Photo courtesy of Goodwin State Forest Conservation Education Center.

Experiment Station Associates
P.O. Box 6093
Wallingford, CT 06492

educational programs. Having introduced CPFA Hammerling turned to the state of Connecticut's forests today.

Pointing to map graphics shown on the large screen he pointed out that Connecticut is about 59% forested with a half-acre per person, making Connecticut the fourth densest state in the country. He pointed out that 80% of forests are privately owned, most of that by families. Surprising to some, forests contribute an estimated $3 billion annually to the CT economy, including the "leaf peeping" industry.

So much for the good news.

On the downside, Hammerling pointed out that our forests are being developed (92,000 acres between 1986 and 2006) and "core forests" (large tracts) are being reduced by 169,000 acres in the same period. Added threats come from invasive species, including the Emerald Ash Borer, Asian Long-horned Beetle, Hemlock Woolly Adelgid, and numerous plants such as Japanese Barberry, Burning Bush, and Oriental Bittersweet. Another threat comes from the aging of the forests (78% of trees are 60 plus years), and the increased likelihood of catastrophic storm damage with climate change. In the 1938 hurricane 55,000 acres of forest were flattened.

Next, Hammerling explained Wildlife Urban Interface (WUI), a measure of tree canopy in urban areas. By this index, Connecticut ranks first in the nation with a 67.4% rating. With all that said, he bore down on the reality of the "protection" of Connecticut's forest land. Of roughly one million acres "protected" about half are in tax incentives (P.A. 490 and the 10 Mill acts). These incentives can be abandoned by landowners if they choose to sell their land and 82% of these owners are over 50 years old.

Another fourth of "protected" forests are state parks and state forests, but at present, the state legislature is able to sell off state parks and state forests! The remaining fourth is owned by land trusts, water companies, and towns, but some water company lands can be sold. It takes "lots of $$ to protect forests permanently," he said.

As a result, we are losing an average of 6,000 acres of forest and 8,500 acres of core forest each year. Every three years, forest cover will drop by 1%; every two years we lose another 1% of Connecticut's core forest. Hammerling likened this to "a death by a thousand cuts."

While the Department of Energy and Environmental Protection (DEEP) Open Space Grants have helped protect 30,000 acres, they have been hard pressed to use the grant resources they have available. Why? The DEEP forestry staff has only 12 "front-line" foresters to advise 140,000 forest landowners, and 8 are eligible to retire! UConn's Extension service has only two foresters. The Connecticut Agricultural Experiment Station is also understaffed. On the municipal level, towns only focus on removals for safety issues and most towns don't involve tree warden expertise in planning and zoning.

What do we need? Hammerling advocates for an amendment to the state constitution to ban the sale of public forests and says we need more funding and staff for the institutions than assist private forest landowners and stewardship. We need to invest in our forests!.

The renovation and addition to the **Jenkins-Waggoner Laboratory** was dedicated on June 11, 2015.

The original building of 16,000 square feet was constructed in 1932. This recent renovation added another 11,00 square feet to provide state-of-the-art laboratory facilities and services to Connecticut residents and businesses.

The new lobby (left photo) features both a Plant Disease Information Office and an Insect Identification Office for public inquiries.

New Scientific Staff

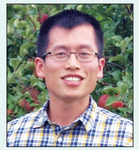
Dr. Jatinder Aulakh is a weed scientist who joined the Valley Laboratory as an Assistant Scientist II in August 2015. He holds a PhD degree in weed science from Auburn University. Dr. Aulakh will be focusing his research on management of weeds in ornamental nursery crops species using biological, chemical and non-chemical practices.

Dr. Adriana Arango-Velez is a plant physiologist and ecologist who joined the Department of Forestry & Horticulture as an Assistant Scientist II in September, 2014. She holds a PhD degree in forest biology and management from the University of Alberta. She will focus her research on plant adaptation and response mechanisms to biotic (pests and pathogens) and abiotic (drought and soil toxicity) stresses on crop plants and trees using an integrated multi-disciplinary approach combining techniques in plant ecology, molecular physiology and genomics.

Dr. Douglas Brackney is a microbiologist and immunologist who joined the Center for Vector Biology & Zoonotic Diseases and the Department of Environmental Sciences as an Assistant Scientist II in December, 2014. He hold a PhD degree in microbiology, immunology and pathology from Colorado State University. Dr. Brackney will focus his research on elucidating the cellular and molecular mechanisms that allow mosquito and tick borne viruses to develop within their hosts using state-of-the-art techniques such as next-generation sequencing, super resolution microscopy, and high-throughput RNAi screens.

Dr. Blaire Steven is an environmental microbiologist who joined the Department of Environmental Sciences as an Assistant Scientist II in July, 2014. He holds a PhD degree in microbiology from McGill University. He plans to focus his research on how microbial populations in soil and water respond and contribute to various climate change scenarios using molecular and microbial techniques to better describe complex microbial systems including; wetlands, harmful algal blooms in Connecticut lakes, and wood-degrading bacterial/fungal communities.

Dr. Lindsay Triplett is a plant microbiologist and molecular geneticist who joined the Department of Plant Pathology & Ecology as an Assistant Scientist II in October, 2014. She holds a PhD degree in plant pathology from Michigan State University. Dr. Triplett wll be working on diseases caused by plant-infecting bacteria (*Xanthomonas* species, bacterial leaf spot) to understand the mechanisms through which bacteria interact with plants with the idea of identifying new targets for resistance. She will also be developing novel diagnostic tools to identify bacterial plant pathogens.



Dr. Quan Zeng is a bacterial plant pathologist who joined the Department of Plant Pathology & Ecology as an Assistant Scientist II in November, 2014. He holds a PhD degree in biological sciences from the University of Wisconsin-Milwaukee. Dr. Zeng will be conducting research on fire blight, an important bacterial disease of pome fruit using molecular and genomic tools to understand virulence mechanisms of pathogens and to develop novel disease management options. He will also be assessing streptomycin resistance in fire blight populations in New England.

Ms. Lindsay Patrick is a plant diagnostician in the Plant Disease Information Office. She joined the Department of Plant Pathology & Ecology as a Research Technician I in November, 2014. She holds a MS degree in entomology from Purdue University and a BS degree in biology from Central Michigan University. Ms. Patrick will be assisting Dr. Yonghao Li and Dr. Sharon Douglas with diagnosis of plant health problems and conducting seed purity and germination analyses.

Recent Work by Station Scientists

ARTICLES PUBLISHED

Dr. Theodore Andreadis, Dr. Philip Armstrong, Dr. John Anderson and Dr. Andrew Main examined the spatial-temporal patterns of Cache Valley (CV) virus, a mosquito-borne *Bunyavirus* that is enzootic throughout much of North and Central America, and found in Connecticut from 1997 through 2012. Findings argue for a limited role for vertical transmission for the perpetuation of CV virus as occurs with other related *Bunyaviruses*. (*Vector-Borne and Zoonotic Diseases* 2014).

Dr. Philip Armstrong, Dr. Theodore Andreadis and Dr. John Anderson sequenced and analyzed numerous isolates of Cache Valley (CV) virus sampled in Connecticut during an 18-year period to determine how the virus population may change over time. Phylogenetic analyses showed the establishment of a new viral lineage during 2010 that became dominant by 2014 and appears to have originated from southern Mexico. Together, their data support the emergence of a new lineage of CVV in the northeastern United States and suggest extensive dispersal of viral strains in North America. (*American Journal Tropical Medicine and Hygeine* 2015).

Dr. Anuja Bharadwaj, Dr. Laura Hayes, and Dr. Kirby Stafford III demonstrated that applications of garlic could provide 1 to 3 weeks of moderate suppression of the blacklegged tick (*Ixodes scapularis*) on residential properties in Connecticut. (*Journal of Medical Entomology* 2015).

Dr. Laura Hayes, Jennifer Scott, and Dr. Kirby Stafford III found higher winter precipitation was associated with higher blacklegged tick (*Ixodes scapularis*) nymphal densities the following summer. Snow moderates temperatures and provides moisture and likely increases overwintering tick survival rates, (*Ticks and Tick-Borne Diseases* 2015).

Dr. DeWei Li, in collaboration with scientists from China, Thailand and Russia conducted morphological and molecular phylogeny studies on Wood ear fungi (*Auricularia auricula-judae*) from Asia, Europe, and North America. Phylogenetic analyses were used to delineate seven species in the complex, including three species new to science: *Auricularia angiospermarum, A. minutissima, and A. tibetica*. A synoptic table of comparison of species in the complex is provided including the most important characters of the seven species. (*Mycological Progress* 2015)

Dr. Chris Maier estimated the nymphal density of the small 17-year periodical cicada, *Magicicada septendecula*, which he discovered for the first time in Connecticut in 2013. (*The Canadian Entomologist* 2015).

Dr. Robert Marra and colleagues in Belgium and the USDA-ARS in Beltsville, MD have identified and described a new fungal species associated with boxwood blight. Though morphologically and pathologically nearly identical to the European species *Calonectria pseudonaviculata*, the new species, *C. henricotiae*, differs in tolerance to temperature, fungicide sensitivity, distribution, and lacks sexual compatibility. Because of *C. henricotiae's* reduced sensitivity to several fungicides important to the control of boxwood blight, its elevation to species status will streamline regulatory efforts to prevent the accidental introduction of *C. henricotiae* into the United States. (*Plant Pathology* 2015).

Dr. Joseph Pignatello and collaborators from Peking University in China and the University of Massachusetts at Amherst studied the biological availability of carcinogenic chemicals in in vitro ("test tube") models simulating the human digestive tract. The focus of the study was eleven polycyclic aromatic hydrocarbons (PAHs) commonly found in particles of soot or char which may be unintentionally ingested with soil particles or grilled food. (*Environmental Science & Technology* 2015).

Dr. Neil Schultes has been studying transporters of purines and pyrimidines in plants. Purines and pyrimidines are nitrogen-rich molecules called nucleobases that make up DNA and are central to plant metabolism. (*Protoplasma* 2015).

Dr. Kirby Stafford III, Howard Kilpatrick, and Andrew LaBonte found that reducing deer density to 13 animals per square mile significantly reduced tick abundance by 76% and the number of human cases of Lyme disease by 80% in a residential community in Connecticut. (*Journal of Medical Entomology* 2014).

Dr. Jason White, Dr. Roberto De la Torre Roche, Dr. Alia Servin, and Joseph Hawthorne, along with colleagues at four other universities have found that nanoparticle cerium oxide, a rare earth oxide element (REE) used in a wide range of applications, accumulates from soil and through a food chain (zucchini, crickets, spiders) to a greater extent than does the non-nanoparticle form of the element. These findings are significant because they represent the first direct investigation of nanoparticle trophic transfer in agricultural systems. (*Environmental Science and Technology* 2014).

Dr. Jason White and colleagues at the University of Massachusetts reviewed the current state of knowledge on the toxicity and detoxication mechanisms of higher plants for engineered nanoparticles. This comprehensive literature review summarizes what is currently known and highlights future areas in need of investigation. (*Environmental Science and Technology* 2015).

Dr. Jason White and colleagues at Hasselt University in Belgium found that exposure to silver nanoparticles in soil increased maize biomass, and that this effect coincides with significant structural and physiological alterations of the bacterial communities in the rhizosphere. This work is important because it is among the first studies to address the role of nanoparticle exposure on important plant-microbial interactions. (*Soil Biology and Biochemistry* 2015).

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