Station News

The Connecticut Agricultural Experiment Station
Volume 8 Issue 6 June 2018

The mission of The Connecticut Agricultural Experiment Station is to develop, advance, and disseminate scientific knowledge, improve agricultural productivity and environmental quality, protect plants, and enhance human health and well-being through research for the benefit of Connecticut residents and the nation. Seeking solutions across a variety of disciplines for the benefit of urban, suburban, and rural communities, Station scientists remain committed to "Putting Science to Work for Society", a motto as relevant today as it was at our founding in 1875.

CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

This Issue

ADMINISTRATION

DR. THEODORE ANDREADIS was interviewed about the Experiment Station's research and surveillance programs on ticks, mosquitoes and associated vector-borne diseases in the state by Aaron Kupec, WTIC Radio (May 16); participated in a "boot camp" workshop on identification of mosquitoes sponsored by the Northeast Regional Center of Excellence in Vector-Borne Diseases held at Fordham University's Calder Center in Armonk, NY (20 student attendees) (May 23); and hosted an informational meeting held at the Station between faculty from the University of Connecticut's Department of Pathobiology and scientists from CAES's Center for Vector Biology & Zoonotic Diseases to discuss potential research collaborations (15 attendees) (May 31).

ANALYTICAL CHEMISTRY

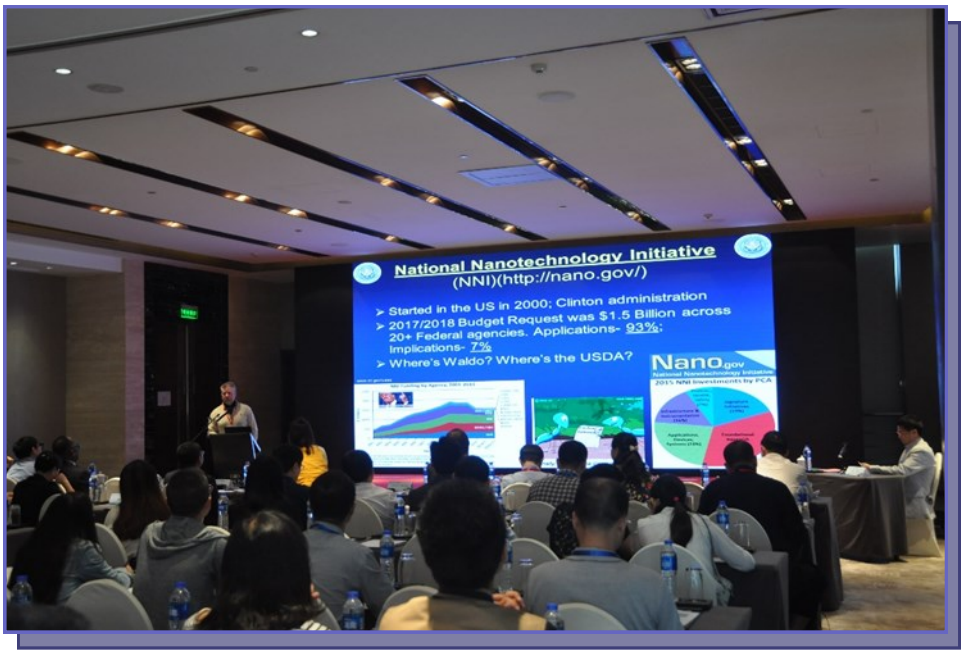
DR. JASON WHITE participated in the weekly ZOOM call for the Center for Sustainable Nanotechnology (May 2, 23, 30); participated in a teleconference with the CT Department of Consumer Protection Drug Control Division concerning our involvement in opioid and fentanyl testing (May 4); was an invited plenary speaker at the 4th International Symposium on the "Environmental Application and Implication of Engineered Nanoparticles" in Wuxi, China and gave a lecture entitled "Nanomaterials in agriculture: A current perspective on applications and implications" (120 attendees) (May 7-11); hosted a bi-weekly Center for Sustainable Nanotechnology ZOOM meeting on nano-enabled agriculture (May 14, 29); participated by ZOOM in the Thesis Background Exam (TBE) of Ms. Jaya Borgatta, who is a PhD student at the University of Wisconsin and in the Center for Sustainable Nanotechnology (May 15); spoke by phone with Prof. Philip Demokritou of the Harvard University School of Public Health regarding collaborative research and grant submissions (May 23); spoke by phone with Ms. Becky Curtis of the University of Minnesota regarding participation as a committee member in her PhD research (May 24); provided welcoming comments and a tour of the Department of Analytical Chemistry laboratory and programs to visiting students from Norwich Technical High School (9 students) (May 24); participated as a committee member in the PhD dissertation defense of Dr. Huiyuan Guo of the University of Massachusetts (May 30); and spoke by phone with Dr. Rhema Bjorkland of the National Nanotechnology Coordination Office concerning planning of the 2nd Quantifying Exposure to Engineered Nanomaterials workshop in Washington, DC this October (May 31).

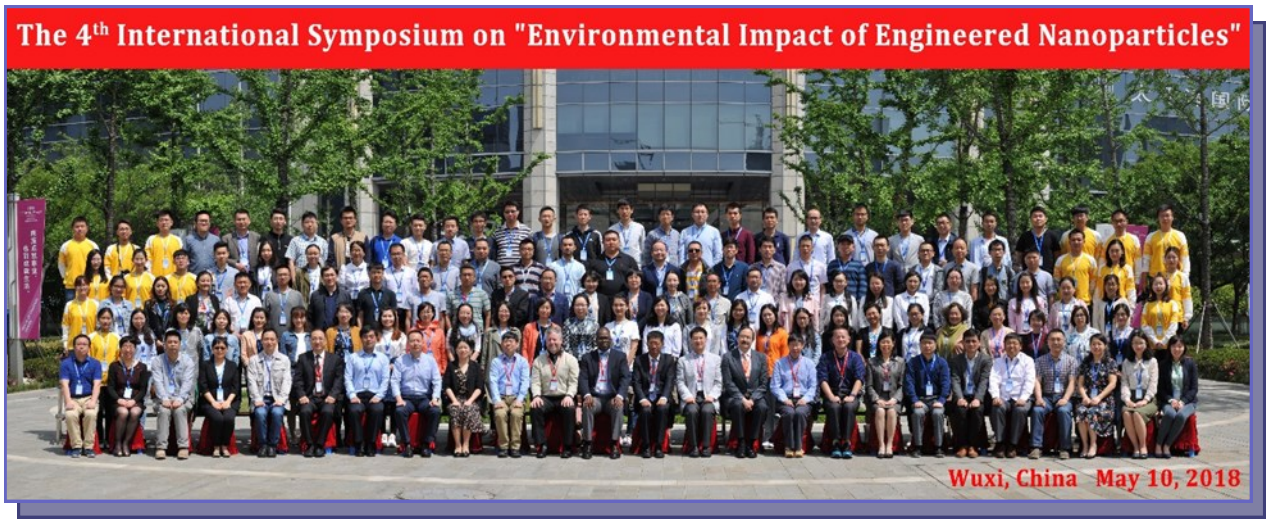
DR. CHRISTINA ROBB, DR. BRIAN EITZER, MS. TERRI ARSENAULT and MR. CRAIG MUSANTE participated in the FDA FERN cCap Chemistry monthly phone call (May 10); along with **DR. WALTER KROL,** participated in the FDA FERN cCap Chemistry Ricin proficiency test follow-up phone call (May 10); attended the Eastern Analytical Symposium May Board meeting and Program meeting in Plainsboro, NJ (May 18); and presented a seminar for the CAES Seminar Series

entitled "Select Agent Analysis at CAES" (35 attendees) (May 23).

DR. BRIAN EITZER gave a keynote talk entitled "Bees and Pesticides: Challenges in Measurement and Toxicology" at the 12th European Pesticide Residue Workshop in Munich, Germany (400 attendees) (May 22); and was a participant in the North American Chemical Residue Workshop's Organizing Committee conference (May 10).

DR. NUBIA ZUVERZA-MENA gave presentations entitled "Supplying nano-size nutrients enhance yield and suppress fungal diseases in crop plants" and "Comparative environmental fate and toxicity of copper nanomaterials" as an invited speaker during the 2018 Nanotechnology conference held in Anaheim, CA (50 attendees) (May 14-16).





Dr. Jason C. White was an invited plenary speaker at the 4th International Symposium on the "Environmental Application and Implication of Engineered Nanoparticles" in Wuxi, China.

ENTOMOLOGY

DR. KIRBY C. STAFFORD III spoke about ticks and tick-borne diseases to the Lyme Garden Club in Lyme (40 adult attendees) (May 7); was interviewed about a recent CDC report on increased tick activity and tick-borne diseases by Bob Myers, Cornwall Chronicle (May8); was interviewed about tick activity and sampling for ticks by Rebecca Schuetz, Norwalk Hour (May 15); was interviewed about gypsy moth activity by John Silva, WTIC-1080 radio (May 17); was interviewed about gypsy moth activity for 2018 by Cherie Monte, WINY radio (May 22); participated in the NEVBD "Boot Camp" for public health personnel and provided training on tick identification and tick management (May 22-24); was interviewed about ticks by Kate, New York Times (May 23); was interviewed about tick activity by Martha Shanahan, New London Day (May 29); and participated in the joint meeting between CAES and the University of Connecticut Department of Pathobiology on vector biology-related research in Jones Auditorium (15 attendees) (May 31).

MS. TIA M. BLEVINS participated in the 37th annual Horticultural Inspection Society, Eastern Chapter's meeting in Worcester, MA. As Treasurer, she presented the financial report to the members (April 11-14).

MS. KATHERINE DUGAS gave a tour of Insect Inquiry Office to visiting students from Norwich Technical High School (9 attendees) (May 24).

MR. MARK H. CREIGHTON helped the Franciscan Sisters of the Eucharist in Meriden reestablish their apiary program (May 1); at a pollinator event at the Connecticut Science Center in Hartford, staffed a CAES booth and provided an observation hive to display honey bees to the visitors (400 attendees) (May 3); spoke with 2nd and 3rd grade students at East Conn in Hampton, on honey bees and their role in pollination, the students were very excited to view the bees in an observation hive (310 students) (May 18); and assisted Dr. Alicia Bray from Central Connecticut State University in New Britain establish an apiary program on campus (May 24).

DR. MEGAN LINSKE was accepted into the National Wildlife Society's 2018 Leadership Institute (May 1); discussed wildlife biology professional opportunities and research with Connecticut FFA students (55 students) (May 3); participated in the joint meeting between the Center for Vector Biology and Zoonotic Diseases and the University of Connecticut's Department of Pathobiology and Vector Biology group (May 31).

DR. CLAIRE E. RUTLEDGE met with a Master Gardeners' class to promote citizen scientist program Wasp Watchers in Norwich (35 adult attendees) (April 24); gave a talk about emerald ash borer and *Cerceris fumipennis* to a Master Gardeners' class in New Haven (40 adult attendees) (April 26); presented a workshop "The Biological Control of Emerald Ash Borer in Connecticut" for the Connecticut Botanical Society in Middlefield, Cromwell (20 adults) (April 28); hosted an intern from New Haven Academy magnet high school, Adriana Rodriguez, who worked in the forest entomology laboratory four days a week for 3

weeks (May 7); hosted Dr. David Williams from UK Forestry, who assisted field set-up for the UK Forestry funded bronze birch borer project my lab is undertaking this summer (May 22-25); and visited Polly Wiegland, MS who is the ecologist for the Central Pine Barrens Commission in Long Island, NY to view southern pine beetle damage and management activities (May 25).

DR. VICTORIA L. SMITH was interviewed about the threat of Spotted Lantern Fly by Patricia del Rio of WFSB News (May 14).

DR. KIMBERLY A. STONER served on the master's degree committee of Ben Gluck at the University of Connecticut, along with Ana Legrand and Julia Cartabiano (May 8); was interviewed about research on pesticide residues in trapped honey bee pollen from Connecticut nurseries by Kim Trella of CT DEEP for their Pollution Prevention newsletter (May 10); visited a pollinator meadow at Twin Brooks Park in Trumbull with Dmitri Paris, Trumbull Park Superintendent; Tina Baton, Conservation Administrator for the town of Stratford; Brian Carey, Conservation Director for the town of Fairfield; and Mary Ellen Lemay, Administrator of the Housatonic to Hudson Regional Conservation Partnership to discuss the process of turning an abandoned quarry into a park with a 5-acre pollinator meadow, and continuing efforts to create pollinator habitat in neighboring towns (May 10); visited Mary Ellen Lemay and Ellen McCormick, Farm Director, at the Lachat Town Farm in Weston, which also has extensive areas set aside for pollinator habitat (May 10); and served on the doctoral committee of John Campanelli of the University of Connecticut, along with Julia Kuzovkina and Ana Legrand (May 23).

ENVIRONMENTAL SCIENCES

DR. JOSEPH PIGNATELLO presented an overview of research in the Department of Environmental Sciences to visiting students from Norwich Technical High School (8 students, 1 teacher) (May 24).

DR. PHILIP ARMSTRONG gave a lecture entitled "Regional Vector-Borne Diseases and Emerging Threats" for the Vector Biology Bootcamp Course held at the Louis Calder Center, Armonk, NY (40 attendees) (May 22); and presented his research and met with University of Connecticut faculty at a meeting on vector-borne diseases held at CAES (20 attendees) (May 31).

MR. GREGORY BUGBEE, with Abigail Wiegand, spoke on the results of the CAES 2017 Aquatic Plant Survey of Lake Forest at the annual meeting of the Lake Forest Association in Bridgeport (approx. 50 attendees) (May 2); and participated as a judge in the Future Farmers of America Science Fair held in the Jones Auditorium (May 3).

DR. GILLIAN EASTWOOD presented a summary of her research at a joint meeting with University of Connecticut faculty on vector-borne diseases held at CAES (20 attendees) (May 31).

DR. ANDREA GLORIA-SORIA, with **MS. ANGELA B. BRANSFIELD,** conducted an interactive outreach activity about mosquitoes at Tender Care Learning Center in Hamden (approximately 34 attendees, 30 children, 4 adults) (June 6).

DR. GOUDARZ MOLAEI was interviewed by Wired Magazine/Wired.com, "*Insect-borne Diseases Have Tripled. Here's Why*" https://www.wired.com/story/insect-borne-diseases-have-tripled-heres-why/ (May 2); was interviewed by Eyewitness News 3 wfsb.com, "*New kind of tick could find its way to Connecticut*" http://www.wfsb.com/story/38114627/new-kind-of-tick-could-find-its-way-to-connecticut (May 4); gave an invited talk, "*Continuous Plague of Ticks and Tick-associated Diseases in Connecticut and throughout Northeastern U.S.*" at an event organized by the Chatham Health Department and hosted by Hebron Gilead School in Hebron (9 attendees, 1 student) (May 7); was interviewed by Rivereast News Bulletin, The Glastonbury Citizen, on the "*Current Status of Tick Activity and Prevalence of Tick-borne Pathogens* in Connecticut" (May 15); was interviewed by Heathline.com on "*Here's Why Lyme Disease Keeps Spreading in the U.S.*" https://www.healthline.com/health-news/heres-why-lyme-disease-keeps-spreading-in-the-us#1 (May 21); discussed ticks and tick-associated diseases to students from Norwich Technical High School (9 attendees, 8 students) (May 24); and was interviewed by NBC Connecticut on tick abundance and infection with tick-borne pathogens, potential impact of past winter in tick activity and abundance this year, and the status of other tick-associated diseases and invasive tick species in Connecticut (May 25).

MR. JOHN SHEPARD spoke to two groups of Agri-Science students about the State Mosquito Trapping and Arbovirus Surveillance Program (55 students, 2 adults) (May 3); presented mosquito trapping information and arbovirus surveillance data at a meeting of the Stamford Health Department's Vectorborne Disease Prevention Taskforce (10 attendees) (May 16); presented a seminar entitled "Taxonomic Identification of Adult Female Mosquitoes" and was an instructor for a workshop on identification of adult mosquitoes as part of a Vector Biology Boot Camp sponsored by the Northeast Regional Center of Excellence in Vector-Borne Diseases (22 students) (May 23); and spoke to a group of visiting students from Norwich Technical High School about the State Mosquito Trapping and Arbovirus Surveillance Program (8 students, 1 adult) (May 24).

FORESTRY AND HORTICULTURE

DR. JEFFREY S. WARD spoke on "Foresters for the Birds" to the Cheshire Garden Club (16 attendees) (May 7); and presented a paper entitled "B-level and crop tree management in mature oak stands: 10-year results" at the 21st Biennial Central Hardwood Forest Conference held in Bloomington, IN (70 attendees) (May 15).

DR. ABIGAIL A. MAYNARD visited Quantum Biopower in Southington to discuss collaborative compost utilization research (May 7); assisted students at Hamden Hall Country Day School with their vegetable garden (48 students, 3 teachers) (May 4, 9, 10, 16); along with **DR. ROBERT MARRA**, judged exhibits for the CAES prize at the New Haven Science Fair (May 14, 15); reported on Station activities at a quarterly meeting of the Council on Soil and Water Conservation held in Vernon (15 adults) (May 17); participated in a meeting of the State Technical Committee in Tolland (May 24); and discussed collaborative new crops research with Don Offinger of Offinger's Farm in Wilton (May 25).

DR. SCOTT C. WILLIAMS met with professors from the Department of Pathobiology, University of Connecticut, Storrs about collaborative research prospects (May 31).

MR. JOSEPH P. BARSKY staffed a Natural Resources Career booth at the North Branford High School Environmental Science Fair (10 students, 5 teachers) (May 4); and was elected as Park Naturalist for the Sleeping Giant Park Association (May 6).

PLANT PATHOLOGY AND ECOLOGY

DR. WADE ELMER participated with **DR. JASON WHITE** in a conference call with the Center for Sustainable Nanotechnology (May 29).

DR. YONGHAO LI presented "Plant Doctor" to students and teachers in the Ecology Day at the Brown Middle School in Madison (45 youths, and 7 adults) (May 4); presented "Common Garden Diseases" to the Nichols Garden Club in Trumbull (24 adults) (May 8); presented "Spring and Summer Garden Tips" to members of the Watertown Community and Senior Center in Watertown (11 adults) (May 9); attended the Northeastern Plant Diagnostic Network Meeting and presented "CAES Plant Disease Updates" in Ithaca, NY (20 adults) (May 17); and talked about the Plant Disease Information Office to visiting students from Norwich Technical High School (8 youths, 1 adult) (May 24).

DR. ROBERT MARRA assisted in judging the Future Farmers of America (FFA) AgriScience Fair held in Jones Auditorium (37 students) (May 3); joined forest pathologists from area states, including ME, NH, and MA, at Myles Standish State Park (Carver, MA) to scout for and plan a forest pathology field trip for the upcoming International Congress of Plant Pathology (15 adults) (May 10); and along with **DR. ABIGAIL MAYNARD,** served as special-award judges for the Greater New Haven Science Fair, on behalf of the CAES Special Award "for the best project related to food, plants, insects, or the environment." This year's award was given to Matilda Pethrick, a 7th grade student at Betsy Ross Arts Magnet School, for her project "From Biomass to Biogas" (May 14-16).

DR. LINDSAY TRIPLETT presented a classroom lecture entitled "Bacterial diseases in the ancient world" to a group of 3rd and 4th graders at Spring Glen Church (8 youths, 2 adults) (May 20); and presented a lecture on careers in plant pathology to a visiting group of students from Norwich Technical High School (10 students and 1 adult) (May 24).

DR. QUAN ZENG hosted Dr. Daniel Cooley and graduate student Paul O'Connor from the University of Massachusetts and discussed research collaborations (May 8); and visited Cold Spring Orchard at UMass in Belchertown, MA and met Jon Clements, Elizabeth Garofalo, and Dan Cooley (May 17).

VALLEY LABORATORY

MS. ROSE HISKES participated in the Symposium Planning Committee meeting of the Connecticut Invasive Plant Working Group in Windsor (May 17).

DR. JAMES LAMONDIA spoke about "Hops, a new (old) crop for Connecticut" to the North Haven Garden Club in North Haven (30 attendees) (May 10); and participated in an HRI sponsored researcher conference call to develop a national boxwood blight resistance screening protocol (10 attendees) (May 17).

DEPARTMENTAL RESEARCH UPDATES MAY 2018

Albright, M. B.*, Johansen, R., Lopez, D., **Steven, B.**, Kuske, C. R., & Dunbar, J. (2018). Short-term transcriptional response of microbial communities to N-fertilization in a pine forest soil. *Applied and Environmental Microbiology*, AEM-00598.

Abstract- Numerous studies have examined the long-term effect of experimental nitrogen (N) deposition in terrestrial ecosystems, however N-specific mechanistic markers are difficult to disentangle from responses to other environmental changes. The strongest picture of N-responsive mechanistic markers is likely to arise from measurements over a short (hours to days) timescale immediately after inorganic N deposition. Therefore, we assessed the short-term (3-day) transcriptional response of microbial communities in two soil strata from a pine forest to a high dose of N fertilization (c.a. 1mg/g of soil material) in laboratory microcosms. We hypothesized that N fertilization would repress the expression of fungal and bacterial genes linked to N-mining from plant litter. However, despite N-suppression of microbial respiration, the most pronounced differences in functional gene expression were between strata rather than in response to the N addition. Overall, ~4% of metabolic genes changed in expression with N addition, while three times as many (~12%) were significantly different across the different soil strata in the microcosms. In particular, we found little evidence of N changing expression levels of metabolic genes associated with complex carbohydrate degradation (CAZymes) or inorganic N utilization. This suggests that direct N repression of microbial functional gene expression is not the principle mechanism for reduced soil respiration immediately after N deposition. Instead, changes in expression with N addition occurred primarily in general cell maintenance areas, for example in ribosome-related transcripts. Transcriptional changes in functional gene abundance in response to N-addition observed in longer-term field studies likely results from changes in microbial composition.

Elmer W. H. and **White J. C.** The Future of Nanotechnology in Plant Pathology. Annu. Rev. Phytopathol. 2018. 56:6.1–6.23 doi.org/10.1146/annurev-phyto-080417-050108

Abstract -Engineered nanoparticles are materials between 1 and 100 nm and exist as metalloids, metallic oxides, nonmetals, and carbon nanomaterials and as functionalized dendrimers, liposomes, and quantum dots. Their small size, large surface area, and high reactivity have enabled their use as bactericides/ fungicides and nanofertilizers. Nanoparticles can be designed as biosensors for plant disease diagnostics and as delivery vehicles for genetic material, probes, and agrichemicals. In the past decade, reports of nanotechnology in phytopathology have grown exponentially. Nanomaterials have been integrated into disease management strategies and diagnostics and as molecular tools. Most reports summarized herein are directed toward pathogen inhibition using metalloid/metallic oxide nanoparticles as bactericides/fungicides and as nanofertilizers to enhance health. The use of nanoparticles as biosensors in plant disease diagnostics is also reviewed. As global demand for food production escalates against a changing climate, nanotechnology could sustainably mitigate many challenges in disease management by reducing chemical inputs and promoting rapid detection of pathogens.

Molaei*, G. and Little, E., A nine-legged tick: Report of a morphological anomaly in the blackleggedtick, *Ixodes scapularis* (Acari: Ixodidae) from the northeastern United States, *Ticks and Tick-borne Diseases*, 9 (2018) 778-780

Abstract- Morphological anomalies have been reported in the blacklegged tick, *Ixodes scapularis* (Acari: Ixodidae), from the northeastern and upper Midwestern United States, complicating identification of this important vector of human pathogens. Here, we report a case of a local morphological anomaly in *I. scapularis*, parasitizing a human living in Connecticut. We used a dichotomous morphological key, high-resolution and scanning electron microscopy images, as well as DNA sequencing for identification. The specimen was identified as an adult female *I. scapularis* with the left leg II split at the trochanter, resulting in two complete legs from the femur to pretarsus giving the appearance of five legs on the left side versus four on the right side. Here we discuss recent reports of morphological anomalies in *I. scapularis*, and highlight the need for further studies of teratology in this important tick species and its potential implications.

Anderson, J. F., Armstrong, P. M., Misencik, M. J., Bransfield, A. B., Andreadis, T. G., and Molaei, G., Seasonal Distribution, Blood-Feeding Habits, and Viruses of Mosquitoes in An Open-Faced Quarry in Connecticut, 2010 and 2011, *Journal of the American Mosquito Control Association*, 34:1–10. http://mosquito-jamca.org/doi/pdf/10.2987/17-6707.1 (Published May 2018)

Abstract- Seasonal abundance of mosquitoes, their viruses, and blood-feeding habits were determined at an open-faced quarry in North Branford, CT, in 2010 and 2011. This unique habitat had not previously been sampled for mosquitoes and mosquito-borne viruses. Thirty speciesof mosquitoes were identified from 41,719 specimens collected. *Coquillettidia perturbans*, *Aedes trivittatus*, and *Ae. vexans* were the most abundant species and represented 34.5%, 17.7%, and 14.8% of the totals, respectively. Jamestown Canyon virus was isolated from 6 species of mosquitoes collected from mid-June through July: *Cq. perturbans* (3 pools), *Ae. cantator* (3), *Ae. trivittatus* (2), *Ae. aurifer* (1), *Ae. excrucians* (1), and *Culex pipiens* (1). West Nile virus was cultured from 8 pools of *Cx. pipiens* and from 1 pool of *Culiseta melanura* collected from mid-August through late September. Cache Valley virus was isolated from 4 species of mosquitoes in 3 genera from about mid-August through late September 2011: *Cq. perturbans* (5 pools), *Ae. trivittatus* (2), *Anopheles punctipennis* (1), and *An. quadrimaculatus* (1). Nine different mammalian hosts were identified as sources of blood for 13 species of mosquitoes. White-tailed deer, *Odocoileus virginianus*, were the most common mammalian hosts (90.8%), followed by raccoon, *Procyon lotor* (3.1%), coyote, *Canis latrans* (2.4%), and human, *Homo sapiens* (1.2%). Exclusive mammalian blood-feeding mosquitoes included: *Ae. canadensis*, *Ae. cantator*, *Ae. excrucians*, *Ae. japonicus*, *Ae. vexans*, *An.punctipennis*, and *Cx. salinarius*. Fourteen species of birds, mostly Passeriformes, were identified as sources of blood from 6 mosquito species. Five species that fed on mammals (*Ae. thibaulti*, *Ae. trivittatus*, *Ae. cinereus*, *Cq. perturbans*, and *Cx. pipiens*) also fed on birds.

Linske M. A., S. C. Williams, J. S. Ward, and K. C. Stafford. 2018. Indirect Effects of Japanese Barberry Infestations on White-Footed Mice Exposure to *Borrelia burgdorferi*. *Environmental Entomology*. https://doi.org/10.1093/ee/nvy079.

Abstract-Japanese barberry (*Berberis thunbergii* de Candolle; Ranunculales: Berberidaceae) is an exotic shrub that has invaded woodland understories in the northeastern United States. It forms dense thickets providing ideal structure and microclimate for questing blacklegged ticks (*Ixodes scapularis* Say; Acari: Ixodidae). While there have been studies on the favorable habitat barberry provides blacklegged ticks, little has been studied on the relationship between barberry, vectors (ticks), and reservoirs (white-footed mice; *Peromyscus leucopus* Rafinesque; Rodentia: Cricetidae); specifically, the influence Japanese barberry has on the abundance of blacklegged ticks and *Borrelia burgdorferi* infection (Johnson, Schmid, Hyde, Steigerwalt, and Brenner; Spirochaetales: Spirochaetaceae) in mice. We studied the impacts of barberry treatment over the course of 6 yr to determine influence on encounter abundance with white-footed mice, encounter abundance with *B. burgdorferi*-infected mice, and juvenile blacklegged ticks parasitizing mice. Results from our study suggest that while both white-footed mouse and *B. burgdorferi*-infected mouse encounters remained similar between barberry treatment areas, juvenile tick attachment to mice was significantly greater in intact barberry stands ($\bar{x}$ = 4.4 ticks per mouse ± 0.23 SEM) compared with managed ($\bar{x}$ = 2.8 ± 0.17; $P < 0.001$) or absent ($\bar{x}$ = 2.2 ± 0.16; $P < 0.001$) stands. Results of this study indicated that management of barberry stands reduced contact opportunities between blacklegged ticks and white-footed mice. Continued efforts to manage Japanese barberry will not only allow for reestablishment of native plant species, but will also reduce the number of *B. burgdorferi*-infected blacklegged ticks on the landscape.

Steven, B., Huntley, R. B., and **Zeng, Q.** (2018) The influence of flower anatomy and apple cultivar on the apple flower phytobiome. https://doi.org/10.1094/PBIOMES-03-18-0015-R

Abstract-The apple flower is a transient organ that can shed light on how plant-associated phytobiomes are established and structured. Stigmas, stamens, receptacles, and petals were dissected from flowers, and the microbiome of each structure was characterized. Each flower part harbored a largely overlapping set of bacterial taxa, predominantly within the groups Pseudomonas and Enterobacteriaceae. However, the structure of the communities differed. The stigmas showed a high dominance of a small number of operational taxonomic units (OTUs; 97% sequence identity) whereas OTUs on petals were more even in relative abundance. Results from the OTU analysis of phytobiomes from stigmas from three apple cultivars, Braeburn, MacIntosh, and Sunrise, indicated cultivar did not significantly influence community structure. Correlation analysis of bacterial taxa in the apple phytobiome found a negative correlation between Pseudomonas and Enterobacteriaceae, suggesting a potential niche exclusion relationship between these taxa. In this respect, the phytobiome of the apple flower is relatively simple but different flower parts, particularly the stigma, enrich the relative abundance of specific bacterial populations. Correlations in the community structure point to potential antagonistic relationships, which could be used to manipulate the structure of the microbiome for biocontrol of pathogens or other orchard management strategies.

Williams, S.C., E.A.H. Little, K.C. Stafford III, G. Molaei, and **M. . Linske**. 2018. Integrated control of juvenile *Ixodes scapularis* parasitizing *Peromyscus leucopus* in residential settings in Connecticut, United States. Ticks and Tick-borne Diseases. https://doi.org/10.1016/j.ttbdis.2018.05.014

Abstract- Lyme disease continues to be the most common vector-borne disease in the United States with an estimated 330,000 human cases annually. In the eastern United States, the blacklegged tick, *Ixodes scapularis*, is the primary vector of the Lyme disease spirochete, *Borrelia burgdorferi*, and the white-footed mouse, *Peromyscus leucopus*, is a primary reservoir host. In four residential neighborhoods in Connecticut over three years, we tested the effectiveness of different low-toxicity integrated tick management approaches to control larval and nymphal *I. scapularis* parasitizing *P. leucopus*. Combinations of white-tailed deer, *Odocoileus virginianus*, reduction, broadcast application of the entomopathogenic fungus *Metarhizium anisopliae*, and distribution of fipronil-based rodent-targeted bait boxes were evaluated against an experimental control. Deer reduction with no other intervention likely forced juvenile *I. scapularis* to obtain blood meals from available reservoir hosts, resulting in increased exposure of *P. leucopus* to *B. burgdorferi* compared to control sites. The *M. anisopliae*/bait box and the deer reduction/*M. anisopliae*/bait box treatment combinations resulted in 94% and 85% reductions in larvae parasitizing *P. leucopus* that tested positive for *B. burgdorferi*, respectively, compared to control. Deer reduction alone resulted in only a 3% reduction, likely because parasitizing juvenile *I. scapularis* were not targeted by bait box-delivered fipronil. Unless there is community support to reduce and maintain deer at very low densities (<5 deer/km2), it is clear that a combination of *M. anisopliae*/fipronil-based bait boxes offers an effective, localized, low-toxicity option for reducing *I. scapularis* parasitizing *P. leucopus* without complications from host switching.

JOURNAL ARTICLES APPROVED MAY 2018

Burcham, Daniel C., Nicholas J. Brazee, **Robert E. Marra**, and Brian Kane. Can sonic tomography predict loss in load-bearing capacity for trees with internal defects? A comparison of sonic tomograms with destructive measurements. *Trees: Structure and Function*

Dandurand, L. M., I. A. Zasada, **James A. LaMondia**, and W. S. Phillips. Effect of the trap crop, *Solanum sisymbriifolium*, on *Globodera pallida*, *Globodera tabacum*, and *Globodera ellingtonae*. *Journal of Nematology*

Guo, Huiyuan, **Jason C. White**, Zhenyu Wang, and Baoshan Xing. Nano-enabled fertilizers to control the release and use efficiency of nutrients. *Current Opinion in Environmental Science and Health*

Maier, Chris T. Range expansion of the viburnum leaf beetle, *Pyrrhalta viburni* (Paykull) (Coleoptera: Chrysomelidae), in Connecticut. *Proceedings of the Entomological Society of Washington*

Pullagurala, V. L. R., I. O. Adisa, S. Rawat, **Jason C. White**, **Nubia Zuverza-Mena**, J. A. Hernandez-Viezcas, J. R. Peralta-Videa, and J. L. Gardea-Torresdey. Fate and effects of ENMs in agroenvironments. Book chapter in N. Marmiroli, Jason C. White, and J. Song (Eds.), *Exposure to Engineered Nanomaterials: Fate and Effects on Humans and the Environment*. Elsevier

Stafford, Kirby C., III, **Goudarz Molaei**, **Eliza A. H. Little**, C. D. Paddock, S. E. Karpathy, and A. Labonte. Distribution and establishment of the lone star tick, *Amblyomma americanum* (L.), in Connecticut and implications for range expansion. *Journal of Medical Entomology*

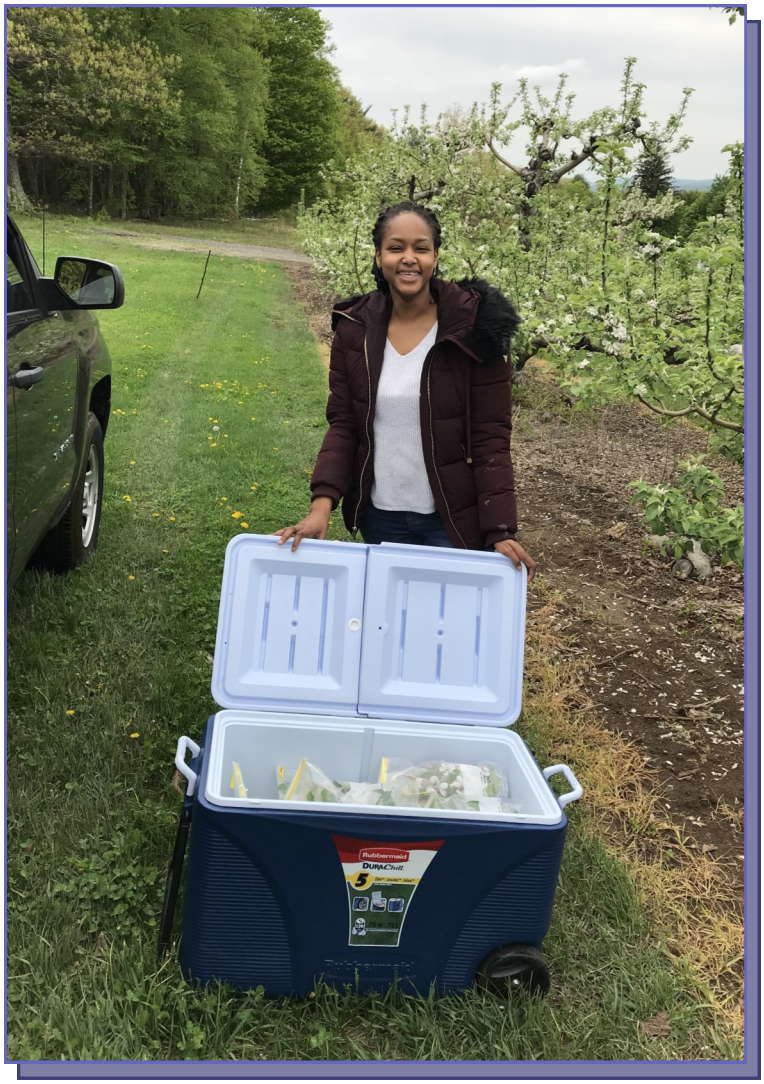
Ward, Jeffrey S. Rehabilitation of poorly stocked stands using a microstand approach. *Proceedings of the Oak Symposium: Sustaining Oak Forests in the 21st Century through Science-based Management*

Zhang, H., W. Du, J. R. Peralta-Videa, J. L. Gardea-Torresdey, **Jason C. White**, H. Guo, R. Ji, and L. Zhao. Metabolomics reveals how cucumber (*Cucumis sativus*) reprograms metabolites to cope with silver nanoparticle-induced oxidative stress. *Environmental Science & Technology*

Zhu, L-H, W. Xu, J-Y Yang, **De-Wei Li**, J-M Ge, and J-R Ye. First report of *Septotinia populiperda* causing leaf blotch of *Salix babylonica* in China. *Plant Disease*

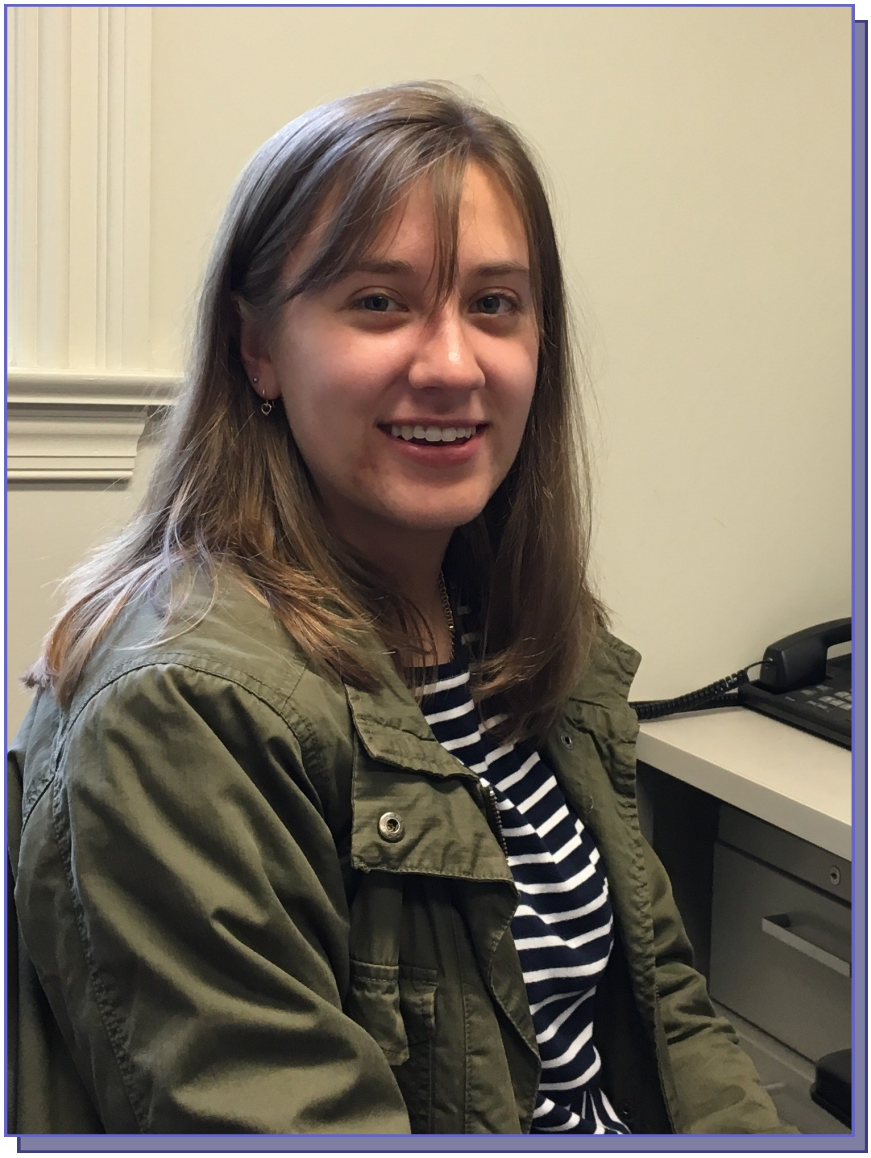
NEW STAFF, STUDENTS, AND VOLUNTEERS MAY 2018

MS. SALI DIALLO, an undergraduate student from Western Connecticut State University, started working at **Dr. QUAN ZENG**'s laboratory in the Department of Plant Pathology and Ecology as a laboratory intern on May 15th. She will work on the characterization of apple phytobiome during the infection of fire blight and other related projects during her internship.



MS. SALI DIALLO collecting apple flower samples at the UMass Cold Spring Orchard in Belchertown, MA.

MS. NOELLE STRZALKOWSKI will be performing a three week intensive internship with **DR. NEIL SCHULTES** during May. Noelle is a senior and a Biotechnology and Genetics major at the University of New Haven. A native of Connecticut, Noelle hopes to continue her passion for biology after graduation and potentially go into biopharmaceuticals.



MS. NOELLE STRAZALKOWSKI

Ms. Clarisse Linè of EcoLab in Toulouse France is visiting the Department of Analytical Chemistry. Clarisse is conducting experiments investigating the response of canola to carbon nanotube exposure.

Ms. Clarisse Linè

GRANTS RECEIVED MAY 2018

MR. GREGORY BUGBEE received a continuation grant for $87,207 from the First-Light Power Resources for invasive aquatic plant monitoring of Lakes Candlewood, Lillinonah, Zoar and Squantz Pond (May 3).

Executive Summary-
Invasive aquatic plants pose a threat to the ecological, recreational and possibly the hydrogenerating capacity of lakes Candlewood, Lillinonah, Zoar and Squantz

Pond. Eurasian watermilfoil dominates the plant communities in all lakes and is the most troublesome. The Eurasian watermilfoil (*Myriophyllum spicatum*) acreage increases and decreases in Candlewood Lake and Squantz Pond in response to deep and shallow winter drawdowns. Recent grass carp introductions may be reducing vegetation in certain coves but not in the main body of the lake. The shallow drawdown was performed in 2017 was the second in a row and Eurasian watermilfoil coverage was nearly 500 acres. This was similar to 2016 the most since our surveys began in 2007. Invasive minor naiad (*Najas minor*) and curlyleaf pondweed (*Potamogeton crispus*) are also present in Candlewood Lake but not at nuisance levels. Only five native plant species were present in Candlewood Lake in 2017 which is extremely low for such a large lake. Native plant populations are likely reduced by winter drawdowns and possibly by grass carp. Eurasian watermilfoil covered 32 acres of Squantz Pond in 2017 and was not nearly the nuisance it posed in 2016. Although the coverage was only down seven acres, it rarely reached the surface. Minor naiad coverage dropped to only six acres in 2017 and was the lowest of the three survey years. The direct connection with Candlewood Lake, under the Route 39 causeway, allows for invasive plant control via the Candlewood Lake drawdown and grass carp. We cannot rule out the possibility that some of the grass carp introduced into Candlewood Lake in 2015 have migrated into Squantz Pond and caused our observed reduction in the nuisance plants. We found seven native plant species in 2017 and this was the same as 2016. Eurasian watermilfoil showed a dramatic increase in Lake Lillinonah from our previous surveys. We found 154 acres in 2017 compared to a previous high of 90 acres in 2013. Typically the milfoil was to the surface, covered with mats of filamentous algae, and an extreme nuisance. Reasons for this large increase may be associated with low flow rates during the recent droughts. Small populations of minor naiad and curlyleaf pondweed were present in 2017 and have changed little through our surveys. We observed isolated small patches of water chestnut (*Trapa natans*) in Lake Lillinonah and their population appears under control by hand harvesting. Nine native species were present on the Lake Lillinonah transects which eclipsed the previous high of eight found in multiple years. Zebra mussels (*Dreissena polymorpha*) were attached to plants and they could begin to reduce plant growth. Our 2017 survey of Lake Zoar's transects found Eurasian watermilfoil, minor naiad and curlyleaf pondweed. European water clover was present but not on transects. Eurasian watermilfoil and minor naiad occurred on 37 and 30 percent of the points respectively and changed little from 2016. Curlyleaf pondweed was found on eight percent of the points compared to 17 percent of the points in 2016. Ten native species were found in Lake Zoar in 2017. Although a low number for such a large lake, this number represents an increase from most past years and may be the result of the herbicide applications reducing the competition from Eurasian watermilfoil. Fluctuating water levels and zebra mussels may also be factors.

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