

STATION NEWS

The Connecticut Agricultural Experiment Station
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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	2
Analytical Chemistry	5
Entomology	6
Environmental Science and Forestry	11
Plant Pathology and Ecology	21
Valley Laboratory	24
Journal Articles Approved	26

ADMINISTRATION

JASON C. WHITE, PH.D., along with **SARA NASON, PH.D.**, **NUBIA ZUVERZA-MENA, PH.D.** and **JINGYI ZHOU, PH.D.** participated in a ZOOM call with colleagues at the University of Minnesota and Yale University to discuss a collaborative NIEHS project (December 1); met by Teams with collaborators at Rutgers University to discuss a micro-nanoplastics grant submission (December 3); met by Teams with colleagues at the University of Minnesota and Convergent Bioscience to discuss collaborative projects (December 3, 4, 10, 12, 17); participated in a Teams call with colleagues from the University of Minnesota and 3M to discuss collaborative PFAS phytoremediation research (December 4, 5, 17); met by Teams with colleagues at Louisiana State University and the University of Auckland to discuss a collaborative USDA project (December 5); along with other CAES staff participated in the ZOOM interviews of several candidates for the new Assistant Scientist II Cannabis Microbiologist position (December 5); participated in the PhD proposal defense of a graduate student from the University of Texas El Paso (December 9); along with other CAES staff participated in a ZOOM call with scientists from Agricultural Research Council in South Africa to discuss the initiation of collaborative projects (December 10); participated by ZOOM in the Prospectus defense of a graduate student in the Stockbridge School of Agriculture at the University of Massachusetts (December 10); participated in a ZOOM call with faculty from the University of Massachusetts to discuss collaborative research (December 10); gave a lecture at the University of Connecticut Department of Molecular and Cell Biology entitled “Nano-enabled agriculture: A path to food security in a changing climate” (December 11); participated by Teams in the DAS Contract Bidders Scope meeting for the Valley Lab renovation and construction project (December 12); co-hosted the annual CAES Recognition Tea (December 12); met by ZOOM with a professor at Virginia Tech to discuss possible collaborative research (December 12); met with former post-doc and now Professor Chuanxin Ma of Guangdong University of Technology (December 12); spoke with Paul Johnson of FocusCuba about research projects with the CAES (December 15); along with **NUBIA ZUVERZA-MENA, PH.D.** and **MANDEEP KAUR, PH.D.** met by ZOOM with colleagues from Rutgers University and the New Jersey Institute of Technology to discuss progress on a joint USDA project on micro-nanoplastics (December 15); hosted the quarterly CAES Safety Committee meeting (December 16); spoke by Teams with scientists at BASF about funding for an upcoming Gordon Conference on nanotechnology and food (December 16); participated in the AgInnovation quarterly ZOOM call (December 18); attended the December Bond Commission meeting at the Legislative Office Building (December 18); participated in an Executive and Finance Committee meeting of the CAES Board of Control (December 19); and spoke with UConn faculty about spin-off companies (December 19).

PUBLICATIONS:

1. Ling, C.; Chen, X.; Yang, J.; Zhan, X.; White, J.C.; Xing, B.; Shen, Y. 2025. Multi-scale plant defense strategies against ciprofloxacin stress: From chloroplast-centered adaptation to microbiome coordination. *Research* <https://doi.org/10.34133/research.1082>.

Abstract- Biological stress responses operate across multiple scales, yet the coordination mechanisms remain poorly characterized. Here, we present a comprehensive systems-level characterization of coordinated plant and endophytic microbiome responses during xenobiotic stress, integrating ultrastructural analysis, proteomics, and microbiome profiling in rice seedlings exposed to ciprofloxacin (CIP). We discovered a sophisticated multi-level defense system with chloroplasts as a key hub within a highly integrated cross-organellar network, comprising 36% of all differentially expressed proteins. The system operates through three integrated mechanisms: (1) differential cellular accumulation patterns showing 14-fold tissue-specific differences, (2) ROS-associated metabolic processes with reduced toxicity of transformation products, and (3) restructuring of endophytic bacterial communities toward stress-resistant genera. This work indicates that biological systems deploy hierarchical, integrated responses spanning from organellar to ecosystem levels. The chloroplast-centered response represents a comprehensive characterization of multi-compartmental responses with implications across multiple biological fields. Our findings illustrate how multidisciplinary systems approaches can uncover emergent properties of multi-scale biological responses invisible to single-scale analyses, providing a framework for investigating multi-scale responses across diverse biological systems.

2. Tarvin-Imeokparia, J.; Abejoye, A.; Vega, I.; Mendoza, M.A.A.; Moses, C.; Durno, M.; Cahill, M.S.; Dimkpa, C.; White, J.C.; Durocher, S.; Pettit, F.; Meyering, M.; Jacobs, J.M.; Ponce, M.S.B.; Heiden, N. 2026. Application of the Shinohara Method to grow lettuce, swiss chard, and peppers in a simplified deep flow technique hydroponic system. *MethodsX* 16:107439.

Abstract- Organic fertilizers are not widely used in hydroponics due to an absence of mineralizing microbes that process organic inputs into plant available forms. The Multiple Parallel Mineralization (MPM) method enables this microbial processing to occur in hydroponic systems. The objective of this method is to provide an accessible protocol for use of the MPM method in simplified deep flow technique hydroponic systems without a need for laboratory testing of nutrient content. The method described here provides hydroponic growers with an alternative option to mineral fertilizers. We provide information about yields and the affordability of this method that growers can use to determine the economic viability of this method in their respective markets. Swiss chard, lettuce, and bell peppers were grown with this method. Aquarium nitrate test kits are used to replace lab testing typically used with the MPM method to validate the presence of nitrate as an indicator of microbial activity

3. Malik, A.; Krishna, P.M.; White, J.C. 2025. Trends in nano-sensors and analytical protocols for the starch debranching enzyme activity and resistant starch evaluation in healthy foods design. *Prepar. Biochem. Biotechnol.* Dec 13:1-17 <https://doi.org/10.1080/10826068.2025.2596899>.

Abstract- Debranching enzymes (DBEs) are responsible for cleavage of the α -1, 6, glycosidic linkage (amylopectin) of polysaccharide (starch) chains and commonly used in the starch industries. This enzymatic action generates the debranched starch, that is, short-chain glucans that are directly linked to resistant starch (RS) known to be beneficial for human gut health, glycemic index (GI) controlling, etc. In view of the demand for healthy food choices by consumers, the food industries are looking for low cost and rapid sensors for detecting the DBE activity and the RS content in their new products development. The Nelson-Somogyi (NS) and 3,5-dinitrosalicylic acid (DNS) assays are traditional methods for assessing starch DBE activity. The investigation of high-throughput nanomaterial-based biosensors have great potential as an alternate to the high-cost chromatographic techniques and useful to the industrial and laboratory-scale usage in the food processing sector. This review explores various nanomaterial-based methods for evaluating starch DBE activity and RS estimation.

4. Xu, X.; Cai, Z.; Jia, W.; Cao, Y.; Zhou, X.; Liang, A.; Lin, Z.; Zhuang, S.; Zhang, Z.; Han, L.; Zhao, J.; White, J.C.; Ma, C.; Xing, B. 2025. Multi-omics insights into nanoscale boron nitride mediated antioxidant defense and metabolic reprogramming in cucumber in response to *Fusarium* infection. *ACS Nano*. 19, 50, 42349–42364.

Abstract- *Fusarium* poses a significant threat to the global crop productivity and food security. This study evaluated the mechanisms of nanoscale boron nitride (nano-BN, 0–500 mg/kg) against *Fusarium oxysporum* in cucumber. *Fusarium* infection severely impaired plant growth with biomass declining by 60%. However, 50 mg/kg nano-BN treatment significantly increased shoot biomass by 64.9% compared to disease controls, restoring photosynthetic parameters to near-healthy levels. Nano-BN inhibited *Fusarium* proliferation by disrupting hyphal and spore structures and reduced mycotoxin production (beauvericin and enniatin) by over 63%. Metabolomic analysis demonstrates that nano-BN mitigated oxidative stress by enhancing glutathione metabolism, with significant increases in glutathione and ascorbic acid content by 166.67% and 478.78%, respectively. Importantly, the protein–protein interaction network shows that nano-BN counteracted *Fusarium*-induced suppression of ribosomal proteins and endoplasmic reticulum stress-related proteins, promoting protein synthesis and folding. The coexpression network identified sucrose and geshoidin as key metabolites linked to ribosomal and mitochondrial proteins, bridging metabolic resilience with enhanced disease resistance. Multiomics analysis suggests that nano-BN alleviated the *Fusarium* stress by regulating the phenylpropanoid biosynthesis and restoring the expression levels of key enzymes in carbohydrate metabolism. Overall, nano-BN effectively mitigates *Fusarium* stress by enhancing plant growth and modulating metabolic processes, offering a promising strategy for plant protection.

ANALYTICAL CHEMISTRY

CHRISTIAN DIMKPA, PH.D. was an invited Speaker at the 19th International Union of Materials Research Societies (IUMRS) and the African Materials Research Society (AMRS) International Conference on Advanced Materials (ICAM) in Accra, Ghana during December 9-12, 2025. He presented on the ***Role of Materials in the Management of Agro-environmental Systems*** in the Advanced Materials for Water and Environmental Remediation (Recycling and Green Technology) session. Over 500 local and international attendees participated in the plenaries.



ANUJA BHARADWAJ, PH.D. AND CRAIG MUSANTE hosted a visit by research collaborator Dr. Marisia A. Fikiet, Assistant Professor, and her master's student, Marimar Torres De Soto, from University of New Haven to discuss their collaborative work on CBD (cannabidiol) and toxic metal analysis in topical lotions (December 9).

PUBLICATIONS:

Heiden, N., Tarvin-Imeokparia, J., Abejoye, A., Vega, I., Mendoza, M.A.A., Moses, C., Durno, M., Cahill, M.S., Dimkpa, C., White, J.C., Durocher, S., Pettit, F., Meyering, M., Jacobs, J.M., Ponce, M.S.B. (2026). Application of multiple parallel mineralization method to grow lettuce, swiss chard, and peppers in a simplified deep flow technique hydroponic system. MethodX, 2026, 103749

PHILIP ARMSTRONG, SC.D. participated in the Northeast Regional Center of Excellence in Vector-Borne Diseases and Training and Evaluation Center Leadership Meeting, where he provided updates on ongoing projects and helped plan new initiatives for next year (December 17).

ANGELA BRANSFIELD participated via Zoom in Yale University's Biosafety Committee meeting (December 11); participated in a CAES Health and Safety Committee meeting (December 16); participated in a CAES DEI Disability and Accessibility subcommittee meeting (December 16); and took part in NIH's Strengthening and Modernizing Biosafety Oversight: Region 2 Listening Session (December 17).

KELSEY E. FISHER, PH.D. presented "Monarch butterfly biology, ecology, and conservation needs" for the Senior Shoreline Institute of Lifetime Learning on (December 9) for 60 attendees.

ANDREA GLORIA-SORIA, PH.D. presented the talk "Uncovering *Aedes aegypti* evolutionary history" at the Yale Against Malaria meeting (December 5; 20 attendees); her most recent work on the global history of the yellow fever mosquito, focused on populations from Argentina, was highlighted by the Universidad Nacional de La Plata Press (#Investiga) in a virtual article titled "La llegada a America del mosquito del dengue, otra consecuencia de la esclavitud" (November 27).

MEGAN LINSKE, PH.D. attended the Northeast Mosquito Control Association Conference in Hyannis, MA (December 9); attended the Northeast Regional Center of Excellence in Vector-Borne Diseases and Training and Evaluation Center Leadership Meeting to discuss project advancements and planning for the upcoming year (December 17).

GOUDARZ MOLAEI, PH.D. attended the annual meeting of the Northeastern Mosquito Control Association and, as the senior author, co-presented two oral talks: "Stick and Strike: Concanavalin A-Guided Zein-Permethrin Nanocarriers for Targeted Tick Knockdown" and "Nanopore Sequencing Enables Broad Detection and Surveillance of Tick-Borne Pathogens in *Ixodes scapularis*" (December 8); attended the Global Consortium on Climate and Health Education at the World Health Organization (WHO) EMRO region to plan a training course on climate change and public health (including vector-borne diseases) in 2026 (December 10); met and discussed with Drs. James Shepherd and Lauren Pischel of the Yale School of Medicine launching of the Alpha Gal Syndrome project (December 10); attended the NEVBD TEC leadership to discuss projects and plans for the year 2026 and provide updates (December 17); and met with

collaborators from UConn and Yale to discuss the progress on the joint project of tick bite outcome surveys (December 23).

TANYA PETRUFF presented a talk entitled “Arbovirus Activity in Connecticut, 2025” at the 71st Annual Meeting of the Northeastern Mosquito Control Association held at Margaritaville Resort Cape Code in Hyannis, MA. (December 8-10; 190 attendees) She was also inducted into the NMCA Board of Directors as a 2-year board member.

GALE. E. RIDGE, PH. D with consultation from Dr. Richard Vetter (emeritus UC-Davies, CA), a national expert on brown recluse spiders identified a population of Mediterranean Recluse spiders *Loxosceles rufescens* (Araneae: Sicariidae) discovered in an apartment building in Wallingford, CT. The male palpus is the species identifying character (Fig. 1). This is a first state record (December 11); and participated in a National Science Foundation (NSF) directorate meeting (December 18).



JOHN SHEPARD presented “The *Anopheles crucians* complex in Connecticut” at the 71st Annual Meeting of the Northeastern Mosquito Control Association held at Margaritaville Resort Cape Code in Hyannis, MA. (December 8-10; 190 attendees) and will continue to serve as 1st Vice President of NMCA for 2026.

PAULA WOLF participated in the annual Apiary Inspectors of America annual meeting in conjunction with the American Honey Producers Conference in Tampa, FL. Presented a poster about the CT State Apiary Program in 2025 and answered beekeeper questions at tabling sessions for the Apiary Inspectors of America. (December 1-5)

PUBLICATIONS:

1.Fisher, KE, B Coates, EB Dopman, D Rowland, CA Abel, JL Smith, & G Dively. (2025). Evidence of field-evolved resistance in *Ostrinia nubilalis* to *Bacillus thuringiensis* Cry1Ab and Cry1A.105 + Cry2Ab2 sweet corn in Connecticut, USA. *Journal of Economic Entomology*. <https://doi.org/10.1093/jee/toaf346>

Abstract: *Ostrinia nubilalis* is an introduced pest in North America. Populations show variation in sex pheromone communication where strains use predominately E11- or Z11-tetradecenyl acetate and seasonal timing of voltine ecotypes categorized by the duration of post-diapause development (PDD). Larval damage to corn has been effectively controlled for decades with hybrids that produce *Bacillus thuringiensis* (Bt) crystalline (Cry) insecticidal proteins. Resistance to Bt field corn hybrids occurred in Canada, but not in the United States. Here, we documented in Connecticut the first instance of *O. nubilalis* injury of Bt sweet corn with Cry1Ab and Cry1A.105 + Cry2Ab2 that are active against *O. nubilalis* during 2023 and 2024. The severity of *O. nubilalis* injury in stalks did not differ between Bt and their non-Bt isoline hybrids during 2023. After flail-mowing in 2023 in accordance with resistance management, pressure was reduced in Bt hybrids but remained consistent in non-Bt isolines during the 2024 growing season. Genotyping of *O. nubilalis* collected in this study showed that the population sample in Connecticut is mainly E-pheromone strain with a long-PDD time. Genotype results at four single nucleotide polymorphism (SNP) markers within *abcc2* that were previously reported as linked to *O. nubilalis* resistance to Cry1Fa corn, may not be linked to *O. nubilalis* resistance to Cry1Ab and Cry1A.105 + Cry2Ab2 corn. The resistance frequency, geographic distribution, and genetic basis of practical resistance to Cry1Ab and Cry1A.105 + Cry2Ab2 corn in Connecticut remain uncertain. The persistence and potential spread of Bt resistance threaten the sustainability of management practices.

2. Faw LR, Armstrong PM, Paulson SL, Eastwood G. (2025). Contrasting La Crosse virus lineage III vector competency in two geographical populations of *Aedes triseriatus* and *Aedes albopictus* mosquitoes. *Biology* 14(12):1771. doi: 10.3390/biology14121771.

Abstract: La Crosse virus (LACV) is a mosquito-borne virus (family *Peribunyaviridae*) that can result in severe human infection in children under sixteen. Historically, LACV comprised two lineages, predominantly in the Midwest and Appalachian regions of the US. In 2005, a virus of a third lineage was detected in the Northeast; however, this and subsequently isolated strains of lineage III have not, to date, been implicated in human disease. One hypothesis for this discrepancy is that vector mosquitoes have a reduced vector competency for LACV lineage III, thus preventing horizontal transmission and clinical cases. Here, we utilized two mosquito species, *Aedes triseriatus*, the native vector, and *Aedes albopictus*, an invasive potential vector,

an invasive potential vector, each from both a historic LACV range (Virginia) and from the region of lineage III (Connecticut). Utilizing oral feeding and intrathoracic inoculation methods of viral exposure, rates of LACV infection, dissemination, and transmission (proxied via salivary secretion) and capability for vertical transmission (proxied via virus-positive ovaries) were determined by harvesting mosquito bodies, legs, saliva, and ovaries, respectively. Overall, we did not detect consistent differences in transmission between any lineage, species, or state of origin, at day 14 post-infection. However, we highlight the transmission potential of LACV lineage III in all mosquito populations tested here, representing the first evidence of lineage III competency in *Aedes triseriatus* and *Aedes albopictus*, indicating the potential for human disease. We thus suggest that the absence of human cases of LACV lineage III is not modulated by a lack of vector competency in mosquitoes.

GRANT AWARDS:

A Monitoring Network to Assess the Status and Trends of Emerging European Corn Borer Resistance to *Bacillus Thuringiensis* Corn in Connecticut; USDA-AMS Specialty Crop Block Grant program FY 25; Dr. Kelsey E. Fisher; \$82,968.90; The Connecticut Agricultural Experiment Station will use several monitoring methods to map the distribution, abundance, and prevalence of Bt resistance across Connecticut. 01/01/2026 to 09/29/2028.

APIARY INSPECTORS OF AMERICA



Apiary Inspectors of America at the 2025 Annual Meeting held in conjunction with the American Honey Producers Conference, Tampa, FL.

SCOTT C. WILLIAMS, PH.D. as Northeast Section Representative, participated in a meeting to review applications for the Professional Certification Review Board of The Wildlife Society (December 1); facilitated by the Centers for Disease Control and Prevention's Midwestern Center for Excellence, participated in a meeting discussing acaricide product screening for integrated tick management efforts (December 4); participated in an evidentiary hearing and public comment session for the State of Connecticut Siting Council (December 4); chaired the evening meeting of the Town of Guilford's Land Acquisition Commission (December 4); participated in the Annual Meeting of the Northeast Mosquito Control Association in Hyannis, MA (December 9); participated in a collaborative meeting with Genesis Laboratories, Inc. and White Buffalo, Inc. (December 10); as Vice-Chair, participated in the evening meeting of the Town of Guilford's Inland Wetlands Commission (December 10); participated in the bimonthly meeting of the State of Connecticut Siting Council (December 11); participated in an evidentiary hearing of the State of Connecticut Siting Council (December 16); as Northeast Section Representative, participated in a meeting to review an appealed application for the Professional Certification Review Board of The Wildlife Society (December 17); participated in a collaborative meeting with Genesis Laboratories, Inc. and White Buffalo, Inc. (December 17); participated in the evening meeting of the Town of Guilford's Conservation Commission (December 17); participated in an evidentiary hearing and evening public comment session for the State of Connecticut Siting Council (December 18); met with collaborators from Columbia University regarding a CDC-funded integrated tick management project (December 19).

NATALIE BAILEY presented a guest lecture on tick control and prevention to undergraduates at Southern Connecticut State University alongside **JESSICA BROWN, PH.D.** (18 attendees) (December 1); participated in a Zoom call with BanfieldBio, Inc. to discuss the development of a botanical acaricide (December 2, 16); at the Northeastern Mosquito Control Association annual meeting in Hyannis, MA, presented preliminary results of pollinator trapping efforts to monitor effects of tick spray treatments as part of an integrated tick management study (190 attendees) (December 9).

JOSEPH P. BARSKY participated in the annual meeting of the Connecticut Resource Conservation and Development Area at Stone Acres Farm in Stonington (December 1); chaired the quarterly meeting of the New England Society of American Foresters Board of Directors (December 10).

JESSICA E. BROWN, PH.D. presented a guest lecture on tick surveillance, control, and disease prevention to undergraduate students at Southern Connecticut State University (18 attendees) (December 1); as an invited speaker, presented a talk titled "Prevention for Pups: Understanding ticks to better protect your pets" at the Woodbridge Dog Park Cooperative Annual Meeting in Woodbridge, CT (15 attendees) (December 8); presented an invited talk titled "Updates on rodent-targeted tick control in residential settings" at the Northeast Mosquito Control Association Annual Meeting in Hyannis, MA (190 attendees) (December 9); participated in a virtual meeting with Dr. Curt Lamberth of Oxford Environment Services to discuss collaborative plans for studying rodent-targeted tick control (December 10); as a committee member, participated in a virtual meeting of The Wildlife Society's Leadership Institute committee to discuss recruitment of the next class (December 11).

GREGORY J. BUGBEE co-chaired a meeting of the Northeast Aquatic Nuisance Species Council (December 8).

RILEY DOHERTY attended the Geospatial Professional Network membership meeting (December 4); met with CT DEEP leadership and the CT Federation of Lakes legislative subcommittee in Hartford to discuss the obstacles to rapid response of hydrilla and potential solutions (December 8); participated in the CAES website accessibility meeting (December 9); participated in the DEI disability and accessibility subcommittee meeting (December 16); participated in the Connecticut Federation of Lakes monthly board meeting (December 17); participated in the Connecticut Federation of Lakes legislative subcommittee meeting (December 22).

JEREMIAH R. FOLEY, IV, PH.D. met with Dr. Nate Harms of the United States Army Corps of Engineers and Dr. Greg Wheeler of the United States Department of Agriculture to coordinate editorial responsibilities for a manuscript evaluating the suitability of biological control agents for Connecticut River hydrilla (December 15); participated in an organizational meeting as a member of the advisory council for the Connecticut River Valley Environmental Summit to announce the all-call for the summit (December 17).

JACK HATAJIK participated in the monthly Society for Ecological Restoration – Northeast Chapter Emerging Professionals (December 9) and Communications (December 19) Subcommittee Meetings; participated in the Forest Health Quarterly Meeting between researchers at CAES and collaborators at the CT DEEP Forestry Division to discuss statewide research priorities (December 15); assisted in developing a field protocol for an American chestnut biocontrol study with **DR. ELI WARD, DR. SUSANNA KERIÖ, J.P. BARSKY**, and Casey Cordes, South Central Connecticut Regional Water Authority forester, in Guilford and Bethany (December 18).

SUSANNA KERIÖ, D.SC. attended the Connecticut Urban Forest Council meeting (December 2); met with Roz Remsen from Davey Tree Care to discuss a grant application (December 5); met with **ELISABETH WARD, PH.D., NATHANIEL WESTRICK, PH.D.**, and Dr. Elena Karlsen-Ayala from USDA Forest Service to plan research collaboration on a project focused on chestnut blight biocontrol (December 8); gave an invited talk titled "Mycorrhizal Inoculation and Tree Health" to the Town of Fairfield Forestry Committee (15 attendees) (December 9); administered the arborist exams for the Connecticut Tree Protection Examining Board (December 10); attended a call with Dr. Anna Conrad and Dr. Elena Karlsen-Ayala to plan research collaboration on butternut canker resistance breeding (December 17); attended a call to plan the annual "Branching Out Together" conference organized jointly by the CT Urban Forest Council, Tree Wardens Association of CT, and CT Tree Protective Association (December 17).

ITAMAR SHABTAI, PH.D. attended the American Geophysical Union Annual Meeting in New Orleans, LA (December 15-19) and presented a poster titled "Mineralogical Controls on Formation and Destabilization of Organo-Mineral Associations (OMAs) in the Rhizosphere" (100 attendees) (December 18).

ELISABETH WARD, PH.D. participated in the Forest Health Protection National Insect and Disease Risk Map Information Session (December 3); met with **SUSANNA KERIÖ, D.SC.**, **NATHANIEL WESTRICK, PH.D.**, and Elena Karlsen-Ayala, Ph.D., to discuss chestnut blight biocontrol project; participated in the quarterly Northeast-Midwest State Foresters Alliance Forest Health Committee meeting (December 9); met with Eric Hanson, Nate Case, and **RICHARD COWLES, PH.D.**, to discuss beech and deer exclusion treatments at Alice Newton Memorial Park in Woodbridge (December 10); participated in the monthly Forest Ecosystem Monitoring Cooperative State Coordinators meeting (December 11); met with Alison Adams, Ph.D., (Forest Ecosystem Monitoring Cooperative) and Elena Karlsen-Ayala, Ph.D., (USDA Forest Service) to develop an oak wilt risk map for Connecticut (December 12); organized and led the quarterly CAES-DEEP Division of Forestry Forest Health meeting (December 15); met with Casey Cordes (Forester, South Central CT Regional Water Authority) along with **SUSANNA KERIÖ, D.SC.**, **JACK HATAJIK**, and **J.P. BARSKY** to sample chestnuts for biocontrol treatment in Durham and Bethany (December 18).

MADELINE WATTS participated in social media subcommittee meetings with **SUMMER WEIDMAN**, **VICKIE BOMBA-LEWANDOSKI**, and **NATALIE RIVERA** focused on expanding CAES's presence across social media platforms (December 4, 18); assisted **SUMMER WEIDMAN** with an educational tour of the OAIS greenhouse for third-grade students from St. Thomas Day School, helping educate them on native and invasive aquatic plants (December 10).

SUMMER WEIDMAN participated in the CAES social media committee meeting (December 4); with **MADELINE WATTS**, gave a lesson on invasive aquatic plant management to third graders from the St. Thomas Day School in the aquatic plant greenhouse (15 people) (December 10); participated in the virtual scholarship committee meeting for the Northeast Aquatic Plant Management Society (December 15); chaired the virtual meeting of the Guilford Conservation Commission Lake Quonnipaug Subcommittee (December 16); participated in CAES accessibility committee meetings (December 9, 16).

LEIGH J. WHITTINGHILL, PH.D. met with the Website Accessibility Committee and CAES staff with web editing abilities to discuss necessary updates to CAES websites (December 9); met with the Website Accessibility Committee to discuss updates on pdf accessibility (December 16); met with the DEI Disability and Accessibility Subcommittee to discuss website, pdf, and other media accessibility updates and upcoming deadlines (December 16); attended the CT council on Soil and Water Conservation quarterly meeting and gave updates on CAES activities (December 18).

YINGXUE (CHARLIE) YU, PH.D. attended the seminar "Plastics, Agriculture, and the Environment: Environmental and Economic Perspectives on Soil-Biodegradable Mulch Films for Sustainable Agroecosystems" (December 3); attended the AGU Annual Meeting in New Orleans, LA, and chaired "Advancements in the Fate, Transport, Transformation, and Remediation of Contaminants in the Environment," and presented an oral presentation titled "Emerging Contaminants in Soil and Water Systems" (50 attendees) (December 15–19).

ALICE ZHOU, PH.D. presented the talk "Soil Properties Influence Enhanced Rock Weathering Efficacy and Carbon Accrual Dynamics" at the annual meeting of the American Geophysical Union (40 attendees) (December 15).

GRANT AWARDS:

ELISABETH WARD, PH.D., and **ITAMAR SHABTAI, PH.D.**, were awarded the 2025 Louis A. Magnarelli Post-Doctoral Award for a project titled "Leveraging experimental treatments for beech leaf disease to investigate its impacts on ectomycorrhizal communities and soil carbon dynamics."

JING YUAN, PH.D. and **BLAIRE STEVEN, PH.D.** in collaboration with colleagues from the University of Connecticut, received a United States Department of Energy, Joint Genome Institute Young Investigator award. The proposal lead by **JING YUAN, PH.D.** titled "Exploring Microbial Responses to Marsh Restoration for Coastal Wetland Health" will provide metagenomic and transcriptomic sequencing to support a project on coastal wetland restoration. The value of the award likely exceeds \$50,000 in sequencing reagents and bioinformatic support.

PUBLICATIONS:

1.Ibemgbo, S., Compton, S., Breban, M.I., Redmond, S., Grubaugh, N.D., **Linske, M., Williams, S.**, Zyskowski, K., Watkins-Colwell, G., Lewis, J., Syracuse, M., Risatti, G., Tanner, W.D., Zeiss, C. (2025) The coronaviral landscape across diverse mammalian species in the northeastern United States. *Sci Rep.* December 20. DOI: 10.1038/s41598-025-32849-3. Epub ahead of print. PMID: 41422148.

Abstract: Detection of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) across a broad mammalian host range has prompted concern that parallel evolution of SARS-CoV-2 in animals could reignite a surge in human infection. We conducted surveillance studies to describe the coronaviral landscape of wild and domestic animals (n = 889; 27 species) in the northeastern United States. We focused on the white-footed mouse (WFM) and supplemented surveillance with laboratory infection studies to assess intra- and interspecies transmission of ancestral and Omicron variants. We detected a range of coronaviruses in fecal swabs, oral swabs or stool specimens from seven species. We did not detect SARS-CoV-2 in any animal. Infection of WFM with SARS-CoV-2 confirmed their susceptibility to ancestral and Omicron variants, however viral RNA shedding declined with the latter. Intraspecies transmission was achieved only with the ancestral strain. Neither strain could be transmitted across species. Free-living WFM experienced a 4% infection rate with a recently described *Peromyscus* Betacoronavirus with high similarity to HCoV-OC43. We failed to achieve in vivo infection of WFM with HCoV-OC43 indicating that WFM are unlikely to transmit this virus. Our data support a model in which evolution of SARS-CoV-2 in humans may be accompanied by its declining foothold within the animal virome.

2.Padhye, L. P., Kah, M., Leita, E., Bowles, K., Nathanail, P., Cousins, I. T., Figuière, R., Clarke, B., Partington, J. M., Alghamdi, W. S. A., Sunderland, E., Ruyle, B. J., Endo, S., Brown, T. N., **Wang, Z.**, Zheng, S., **Pignatello, J. J.**, Smith, S. J., Riegel, M., Arp, H. P. H., Blotevogel, J., Giraud, R. J., Rappe, A. K., Sørmo, E., Cornelissen, G., Deshusses, M. A., Novosselov, I. V., Ferguson, P. L., Pinkard, B. R., Strathmann, T. J., Gobindlal, K., Sperry, J., Lumbaque, E. C., Duinslaeger, N., Radjenovic, J., Hatton, J. (2025). The PFAS roadmap – Navigating a path together to improved management. *Sustainability Science and Technology*, online December 10, 2025; DOI: 10.1088/2977-3504/ae286f

Abstract: Per- and polyfluoroalkyl substances (PFAS) represent a large - and structurally diverse - group of contaminants that have become ubiquitous in our environment. PFAS are all extremely persistent, while some are also bioaccumulative, mobile, and/or toxic, which gives rise to significant environmental and health concerns. Despite more than a decade of intensive research, the management of PFAS is still associated with considerable challenges. It is evident that a holistic approach is required to address the challenging global problem of PFAS. This roadmap features expert perspectives from world-renowned leading researchers and practitioners on how best to manage PFAS. The 15 topics cover different facets of the complex PFAS issue, providing a multidisciplinary and multisectoral overview. For each topic, we reflect on the current status of knowledge and offer recommendations on

For each topic, we reflect on the current status of knowledge and offer recommendations on science and technology advances that will help meet current and future challenges. Taken together, the 15 topics cover the entire life cycle of PFAS - from their sources to their destruction. Important themes such as monitoring and analysis, understanding and predicting fate, source controls (regulation and replacement), and existing and emerging strategies for remediation (capture and destroy) are highlighted throughout the roadmap. Overall, there are many recent scientific and technological advancements that show promise for the management of PFAS. However, it is also clear that there is no “silver bullet” and multifaceted solutions will be needed. Long-term success hinges on sustained collaboration among researchers, policymakers, industries, and communities, which we hope this roadmap will help to catalyze.

3. Poudel, P., **Whittinghill, L. J.**, Kobayashi, H., Lucas, S. (2025). Preliminary assessment of saffron production in different growing systems in Kentucky, USA. *Journal of Living Architecture*. 12(2):12-27. DOI: 10.46534/jliv.2025.12.02.012

Abstract: Saffron has the potential to become a sustainable, high-value crop for Kentucky farmers. Choosing an appropriate growing system and biofungicide treatment might increase saffron production and protect saffron from corm rot. Three growing systems (green roof modules, field conditions, and inside high tunnels) and three bio-fungicide (*Bacillus subtilis* strain QST 713) treatments (untreated control, 15.6 mL/L, and 31.2 mL/L) were used to grow saffron in 2019 and 2020 as a perennial crop. Biofungicide treatment did not affect studied variables (fresh flower weight, fresh stigma weight, dry stigma weight) in both 2019 and 2020. Higher saffron yield in 2020 might be due to the sandy coarse texture of green roof substrate which favors daughter corm production and growth. Lower yields within the high tunnels may be a result of the moisture-deficient condition induced by high temperatures during the critical growth stages. More research on soil moisture, temperature, precipitation, planting date, and bio-fungicide treatment could help optimize saffron production in Kentucky and neighboring areas in these growing systems.

4. Arhami Dolatabad, A., Blotevogel, J., Ateia, M., Mai, J., Naidu, R., Pennell, K., **Pignatello, J. J.**, Rappe, A., Altarawneh, M., Winchell, L., Zhang, X., Xiao, F. (2026) PFAS thermal treatment approaches and enhancement. *Nature Reviews Clean Technology*. DOI: 10.1038/s44359-025-00122-5.

Abstract: Thermal technologies, including incineration, pyrolysis and thermal desorption, are full-scale options for removing per- and polyfluoroalkyl substances (PFAS) from contaminated media. However, these thermal treatments generate products of incomplete destruction (PIDs), and complete PFAS mineralization is rarely achieved below 950 °C. In this Review, we examine the thermal degradation and mineralization pathways of PFAS and the PID-formation mechanisms and highlight innovative strategies to enhance PFAS mineralization at reduced temperatures. PFAS-removal efficiencies are excellent (over 90%) across thermal technologies provided that high temperatures (above 700 °C) are used;

however, mineralization efficiencies are generally less than 40% at temperatures below 700 °C and accompanied by the formation of PIDs, including perfluorocarbon greenhouse gases. Thermal phase transitions of PFAS (solid or sorbed to molten to vapour states) typically precede PFAS decomposition. Vapour containment is therefore essential to minimize fugitive emissions. The use of additives (activated carbon, alkali metals, alkaline-earth metals and platinum-group metals) can substantially minimize PID formation and improve mineralization (to more than 95%) at moderate temperatures (200–500 °C). However, additive-enhanced approaches are at varying stages of readiness, and further validation and process optimization are needed prior to large-scale implementation.



Chestnut sampling

SUSANNA KERIÖ, PH.D., JACK HATAJIK, and JOSEPH P. BARSKY sampling a wild American chestnut with South Central CT Regional Water Authority Forester Casey Cordes in Durham, CT for a new USDA Forest Service grant. This project will evaluate the effectiveness of targeted treatments of cankers with hypovirulent strains of *Cryphonectria parasitica* to help conserve and restore wild American chestnuts in Connecticut.



Retired CAES Director, **THEODORE ANDREADIS, PH.D.** takes in ESF Postdoc **DR. JESSICA BROWN'S** invited lecture on rodent-targeted integrated tick management effort at the Northeastern Mosquito Control Association Meeting in Hyannis, MA.



Retired CAES Director **DR. THEODORE ANDREADIS** ponders the finer points of ESF Technician **NATALIE BAILEY'S** invited talk on fall acaricide spraying for tick management at the Northeastern Mosquito Control Association Meeting in Hyannis, MA.

PLANT PATHOLOGY & ECOLOGY

YONGHAO LI, PH.D. discussed “Phytophthora Bleeding Canker” with students during the CTPA Arboriculture 101 Course Review Night (December 4, 30 adults); participated in the Northeast National Plant Diagnostic Network Regional Meeting via Zoom (December 11, 15 adults)

FELICIA MILLETT facilitated discussions on Horse Chestnut Leaf Blotch and Diseases of Pines during the CTPA Arboriculture 101 Course Review Night (December 4, 30 adults); was interviewed by Andrew Ung for ecoRI News on climate change and problems in landscape plants (December 5).

QUAN ZENG, PH.D. participated in the graduate committee meeting of Ajay Giri at University of Massachusetts via zoom (December 10), and graduate committee meeting of Jessica Cyr at Quinnipiac University (December 12).

PUBLICATIONS:

1. Breno de H. Almeida, Maria H.D. Costa, Luiz F.B. Evangelista, Rebeca M.S. Frutuoso, Atarissis M. Dias, Jarlan L.S. Silva, Daniel J. Silva, Jackson T. Lobo, **Washington da Silva**, Márcia M.Q. Ambrósio. Sustainable management of fusarium rots in melons: A dual strategy combining thermotherapy and 1-MCP. Crop Protection. <https://doi.org/10.1016/j.cropro.2025.107522>

Abstract: Brazil is a leading producer and exporter of Galia melon (*Cucumis melo* L.), a variety renowned for its exceptional sensory qualities. However, postharvest diseases caused by *Fusarium* spp. Lead to significant economic losses, estimated at up to US\$22 million annually. The current reliance on fungicides, such as Imazalil, is unsustainable due to regulatory restrictions and the increasing fungal resistance to current chemistry, which calls for the development of alternative control strategies. In this study, we investigated the effectiveness of thermotherapy combined with ripening phyto regulators for managing rots caused by *F. falciforme* and *F. sulawesiense* in Galia melons. Inoculated fruits underwent eight different treatments [Mock (control), HWT (hot water treatment), 1-MCP (1-methylcyclopropene), HWT + 1-MCP, GA (gibberellin), HWT + GA, GRAD (Graduate A+®), and HWT + GRAD] and were stored for 20 days at 10 ± 2 °C. We evaluated disease severity, melon fruit physicochemical parameters, and the activity of plant defense enzymes. Most treatments significantly reduced rot severity compared to the control. Notably, Graduate A+® achieved up to a 72.9 % reduction, and its efficacy was enhanced when combined with thermotherapy. Furthermore, 1- methylcyclopropene (1-MCP) treatment, alone and with thermotherapy, preserved postharvest

methylcyclopropene (1-MCP) treatment, alone and with thermotherapy, preserved postharvest quality and enhanced defense-related enzyme activity. These findings suggest that the combination of thermotherapy and 1-MCP represents a promising and sustainable approach to reducing Fusarium rot in Galia melons destined for export, with no associated regulatory risks.



The dreaded rubber chicken was foisted upon Tia Blevins during the Moose Game.



The audience applause-o-meter determined the winner of the holiday costume contest at the CAES annual Holiday Dinner at Bellini's on December 18.

JATINDER S AULAKH, PH.D., attended the northeastern invasive plant council meeting and shared results with the northeast IPC members from the winged burning-bush (*Euonymus alata*) chemical control experiment entitled “Hack and Squirt Herbicide Application Method for Euonymus Control” (December 18, 2025).

RICHARD COWLES, PH.D. was interviewed by Michael Fenster from the New Haven Register on December 8 and quoted in an article on climate change effects on Christmas tree production in Connecticut, with the article appearing on Christmas Day: https://edition.nhregister.com/infinity/article_popover_share.aspx?guid=a053e1c7-6bdc-4868-95a9-ef2d7d26b4bd&share=true.

NATHANIEL WESTRICK, PH.D., met with CAES and US Forest Service (USFS) collaborators to discuss ongoing Chestnut Blight biocontrol research funded by the USFS (Dec 8; 5 attendees); met with UConn and UMass collaborators to plan upcoming Northeast Vegetable and Fruit Conference schedule (December 12; 5 attendees); **Postdoctoral Researcher Elizabeth Indermaur** presented a research seminar entitled "A Tale of Two Pie Plants: Interdisciplinary Approaches to Advance Disease Management in Pumpkin and Rhubarb" for the CAES seminar series (December 17; 50 attendees).

ELIZABETH (LIBBY) INDERMAUR, PH.D., joined the Valley Laboratory in the lab of Dr. Nathaniel Westrick to study the role of facultative fungal pathogens in strawberry disease. Libby comes directly from her PhD at Cornell where she studied the genetics and management of fungal diseases in both canning pumpkin and rhubarb.

PUBLICATIONS:

1. Zhang, X. Y., Zhang, Q. Y., Li, D. W., Sun, J. Z. and Fan, B. (2025) Novel endophytic fungi from *Pinus*: introducing three new genera and six new species within *Capnodiales* (*Ascomycota*, *Dothideomycetes*) sensu lato. *IMA Fungus* 16: e175931. <https://doi.org/10.3897/ima fungus.16.175931>

Abstract— *Capnodiales* s. lat., the second largest order within the Dothideomycetes, comprises a highly diverse group of species exhibiting considerable morphological and phylogenetic diversity. In this study, we examined more than 800 fungal isolates from shoots of three species of healthy pine trees (*Pinus densiflora* Siebold & Zucc., *P. thunbergii* Parl., and *P. elliottii* Engelm.) in China, leading to the establishment of several novel taxa with *Capnodiales* s. lat. The species were identified through morphological characterisation and phylogenetic analyses based on concatenated sequence of seven loci: the internal transcribed spacer (ITS) regions, the large subunit nuclear ribosomal RNA gene (nLSU), the RNA polymerase II subunit B (RPB2), the actin gene (ACT), the calmodulin gene (CAL), the β -tubulin gene (TUB) and the elongation factor 1- α gene (TEF1). As a result, three novel genera—*Botryoconidia* (*Dissoconiaceae*), *Longisporomyces* (*Extremaceae*), and *Helianthoconium* (*Mycosphaerellaceae*) are proposed, along with nine novel species: *Botryoconidia globosus*, *Longisporomyces filisporum*, *Neocatenulostroma endophyticum*, *Rachicladosporium pennatum*, *Helianthoconium helianthosporum*, *Sphaerulina nanjingensis*, *Toxicocladosporium fusiforme*, *Zasmidium guttulatum*, and *Zasmidium longisporum*.



Furthermore, we employed fossil calibrations to estimate divergence times of these taxa within *Capnodiales* s. lat. The results suggest that the crown age of *Capnodiales* was around 241.9 Mya (95% HPD: 239.23–243.18 Mya), in the Middle Triassic. The major subclades such as *Capnodiales* s. str., *Cladosporiales* and *Mycosphaerellales* began diversifying during the Jurassic, with crown ages estimated at 169.56 Mya, 148.60 Mya, 187.18 Mya, respectively. This study provides comprehensive descriptions of these new endophytic taxa from pine hosts, contributing to the taxonomic and systematic understanding of the *Capnodiales* s. lat.

Adeel, M.; Nadeem, M.; Zaheer, U.; Shakoor, N.; **White, J.C.**, Rui, Y. Earthworms enhance soybean yield and quality under n-La₂O₃ nanofertilizer treatment by restructuring the rhizosphere microenvironment. *ACS Nano*.

Caleb Bryan, Brianne Symak, Sean Prager. Effects of Drought on Agricultural Bumblebee Communities in the Canadian Prairie Pothole Region. *Journal of Environmental Entomology*.

Kelsey E. Fisher, Caleb B. Bryan, Cody Acevedo, Kevin E. Anderson, Kira M. Goldman, Karena Kulakowski, Samantha N. Shimota, Steven P. Bradbury Impacts of common milkweed (*Asclepias syriaca*) leaf age on larval monarch (*Danaus plexippus*) survival, growth, development, and feeding behavior. *Insects*.

Jonathan Karisa, Amrita Ray Mohapatra, Charles Abadam, Karen Akaratovic, Jay Kiser, and **Goudarz Molaei*** The Invasive Mosquito *Aedes Albopictus*—A Vector of *Dirofilaria Immitis* In Suffolk, Virginia, United States. *Journal of Parasitology*.

Ly, Z.; Cai, Z.; Ma, C.; **White, J.C.**; Xing, B. Nano-enabled agrochemicals for sustainable agriculture: Bridging gaps for food security in the 21st century. *Science*.

Munawar, A.; Abou El-Ela, A.; Zhang, X.; Qingcheng, L.; Mao, Z.; Shamsi, I.H.; Shi, X.-X.; **White, J.C.**; Zhou, W.; Zhu, Z. Nanoscale silica primes rice resistance to insect pests through coordinated activation of physical, chemical and volatiles-mediated defense responses. *ACS Nano*.

Sarabandi, M.; Zargard, M.; Ghorbani, A.; **White, J.C.**; Chen, M. Harnessing multi-omics to engineer in planta toxic element tolerance. *Nano Today*.

Sun, D.; Yan, Y.; Du, P.; Chen, Y.; Wei, J.; Deng, S.; Kong, D.; **White, J.C.**; Li, C. Iron-containing layered minerals suppress photochemical attenuation of imidacloprid by modulating reactive oxygen species content. *Journal of Hazardous Materials*.



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