Connecticut Institute of Water Resources
The University of Connecticut

Annual Technical Report
2019

Products

Presentations

- Noons, B. and K. Guillard. 2019. Nitrogen and Phosphorus Leaching from Compost-Amended Lawns. 2019 Connecticut Conference for Natural Resources, March 2019, Univ. of Connecticut
- Noons, B. and K. Guillard. 2020 Nitrogen and Phosphorus Leaching from Compost-Amended Lawns. Dept. of Plant Science and Landscape Architecture Spring Seminar Serices. March 2020, Univ. of Connecticut.

Publications

- Noons, B. and K. Guillard. 2021. Nitrogen and Phosphorus Leaching from Compost-Amended Lawns. 2020 Annual Turfgrass Research Reports. J.C. Inguagiato (ed). College Agric. Natural Resources, Univ. of Connectictut.
- Noons, B., K. Guillard, A. Helton, and T. Morris. Nitrogen and Phosphorus Leaching from Compost-Amended Lawns. In preparation for *Crop Science* or *Journal of Environmental Quality*
- Urban, M. C. in preparation. An eco-hydrological model of climate disruptions to temporary ponds. Prepared for submission to *Ecology*.
- Urban, M. C., C. Nadeau, & S. Giery. In preparation. Climate change kills winterkill and facilitates expansion of keystone predators. Prepared for submission to *Global Change Biology*.

Information Transfer Program

Seminar Series

The CTIWR helps support a weekly seminar series held during the Fall semester by the Department of Natural Resources and the Environment. This series includes the CTIWR sponsored "William C. Kennard Water Resources Lecture" during which a respected water resources professional, normally from outside the state, is invited to speak on an issue of interest to researchers, students, and other interested individuals in our state. This past fall (November 1, 2019) CTIWR hosted Dr. Sujay Kaushal, Professor, Department of Geology, University of Maryland. Dr. Kaushal provided an hour long presentation titled, ***"****The Unhappy Hour Has Arrived: Chemical Cocktails As a Consequence of the Freshwater Salinization Syndrome",* to approximately 80 attendees. In addition to the presentation, Dr. Kaushal met with Department Graduate Students for an informal discussion to share research ideas and experiences, and met with select Department faculty

Conference Support

The Institute is proud to be among several sponsors that support the annual Connecticut Conference on Natural Resources (CCNR) held each March during spring break recess at the University of Connecticut. The CCNR attracts over 300 individuals from throughout Connecticut who are involved in the conduct of environmental research, involved in developing policy, or otherwise interested in the natural resources

of Connecticut. This conference serves as a venue for networking and sharing ideas regarding the varied environmental resources in Connecticut. CTIWR contributes $500 to support the conference. Additionally, this year the Institute had an informational table that allowed us to hand out CTIWR stickers and water bottles to improve CTIWR visibility in the state, and provide general information about the Institute to the attending public.

Outreach: Website, Social Media, Newsletter

Our Institute maintains the CTIWR web site (http://ctiwr.uconn.ed), which we continually update. Due to the decommissioning of web servers at the University of Connecticut, the CTIWR website was transferred to a new web server and redeveloped under UConn's Aurora Wordpress. The CTIWR continues to provide information about the WRRI program, our Institute and its Advisory Board members, a listing of the current year's seminars, a list of sponsored projects, reports and publications, and access to electronic copies of our "Special Reports" series. The website is also used to announce special events and release of the 104B and 104G Program RFPs, in addition to secure access to grant proposals, technical reviews and information for the CTIWR Advisory Board's review. Additionally we have added links to federal sites that provide information regarding water resources for Connecticut. New this year we have added a "For Residents" page that provides links to information useful by residents of Connecticut pertaining to water resources and ways residents can protect water resources. We continue to explore ways to provide useful information through our website.

We hired an undergraduate student to develop social media content on CTIWR Twitter and Instagram accounts, with the intent on increasing the visibility of CTIWR in Connecticut, and also to provide an additional platform to share pertinent information with the general public.

CTIWR published it's second annual Newsletter in April of 2020. The eight page newsletter provided information about CTIWR in addition to articles that discussed the importance of drinking water well testing, information about PFAS, and a researcher highlight that featured a previously 104B funded project on vernal pools. The Newsletter can be downloaded from the CTIWR website (https://ctiwr.uconn.edu/residents/)

Student Photo Contest

To help improve visibility of the Institute, particularly among the student population, CTIWR hosted an undergraduate student photo contest. Students were encouraged to submit self photographed images of water related features, particularly in Connecticut into a Google Document folder. The Institute received 71 submissions. The CTIWR Director and Associate Director judged submissions. The photographs from the first place winner and six honorable mentions were posted for viewing on the CTIWR website. The first place winner also received a $150 gift card.

Liaison Activities

CTIWR Director Dr. Michael Dietz:

- Presented at State Water Planning Council meeting. He was selected to participate in the Implementation Work Group, chairing sub-workgroup on private wells in the State.
- Attended quarterly CT Source Water Protection and CT Council on Soil and Water Conservation meetings.

- Participated in a regional IWR/Sea Grant retreat.

Student Support

104B Base Grant:

- Undergraduate – 12 (includes 4 AS Degree students at a Community College)
- Graduate – 8
- Post Doc – 0

Notable Achievements and Awards

None to report.

Nitrogen And Phosphorus Leaching From Compost-Amended Lawns

Project Type: Annual Base Grant
Project ID: 2019CT041B

Project Impact:

Concentrations of the N and P constituents suggest some concern for water quality associated with a cool-season turfgrass lawn amended with compost. Mean NH3-N concentrations were near or above 1.0 mg/L, causing concern for drinking water contamination. Similarly, several (NO2+NO3)-N concentrations approached or exceeded the drinking water standards of 10 mg/L, but only during the early establishment phase of the study. Once the turfgrass became established, NOx-N concentrations were well below the maximum contaminant level for drinking water. Concentrations of PO4-P and TP were also cause for concern. Concentrations PO4-P were observed between 0.5 and 1 mg/L and TP concentrations at all compost rates would be categorized as contributing to highly eutrophic conditions in lakes in streams under Connecticut water quality standards for lakes.

Soil testing data suggests a moderate to strong correlation between the FWC of leachate N and P fractions and soil test values. Modified Morgan extractable P showed strong correlations with FWC of PO4-P and TP constituents for both spring and fall 2020. Concentrations of NOx-N were moderately correlated with soil labile N concentrations for spring and fall 2020. Spring soil test values tended to have better correlation with FWC, suggesting that spring testing may be a better predictor of leaching of N and P constituents and allow for corrective measures during the growing season. Concentrations of NOx-N did not exceed 1 mg/L when soil labile N concentrations were less than or equal to170 mg/kg. Whereas PO4-P and TP concentrations did not exceed 0.05 and 1 mg/L, respectively, when modified-Morgan extractable soil P2O5 concentrations were less than or equal to 120 lbs/ac.

The results of the study suggest that low rates of compost frequently applied to turfgrass lawns have a low risk of contributing to water quality impairment. Whereas commonly-recommended higher rates of compost to lawns may contribute to water quality impairment from leaching losses of NH3-N, PO4-P and Total P across long-term applications. Concentrations of these constituents often exceeded limits associated with water quality impairment for freshwater resources. A routine soil test for extractable P or labile amino-nitrogen show promise in guiding compost or organic fertilizer recommendations for lawns to minimize leaching losses of P to shallow groundwater.

Forecasting The Resilience Of Vernal Pool Exosystems To Climate-Mediated Hydrological Disruptions

Project Type: Annual Base Grant
Project ID: 2019CT042B

Project Impact:

Small temporary ponds provide habitat for a disproportionate number of unique and endangered aquatic species. Understanding the hydrology of these ponds is important because their biological diversity is strongly tied to pond hydroperiod, the length of time that ponds are inundated. Precipitation, evapotranspiration, and groundwater are expected to determine the hydroperiod. As climate change progresses, it is unclear if ponds will dry earlier or later given future projections for both increased rainfall and increased evapotranspiration. To date, few models exist that can accurately predict pond hydroperiod. Here, we collected fine-scaled data on temporary pond hydrology and ecology from 24 ponds at two sites in Connecticut to inform a joint hydro-ecological model. We found strong effects of precipitation events and groundwater flow in determining drying times in preliminary analyses. Evapotranspiration had smaller, but more constant, effects throughout the season. We also detected differences in sites in leaf area index, a measure of vegetation related to potential evapotranspiration. We developed simple statistical models that can predict pond levels with moderate accuracy, but we now need to develop more complicated, iterative simulation models that can better represent seasonal variation in hydrological drivers. These developing models will inform questions about the effects of future climates on temporary pond hydrology and the organisms that inhabit these important habitats. Such projections will be important to conserve temporary ponds, given their ubiquity and disproportionate contributions to biodiversity and ecosystem services.

Paleolimnology And Molecular Investigation To Understand Blooms Of Didymosphenia Hullii, Didymosphenia Geminata, And Cymbella Janischii; Nuisance Stalk-forming Diatoms In The West Branch Of The Farmington River, Connecticut, USA

Project Type: Annual Base Grant
Project ID: 2019CT043B

Project Impact:

During preliminary core sampling, we found Didymosphenia taxa as well as Cymbella janischii, however the frustules were not found in the deep sediment of the core but in the upper core sediments, at about 5 cm. This was not unexpected since rocks and sediments in rivers continuously are eroded and pushed downstream at a much faster rate than lake sediments. Further analyses indicate that of the three sampling sites the deeper core sediment samples revealed no Didymosphenia taxa or C. janischii frustules thus far.

Further microscopy work on our core samples and coring in the West Branch of the Farmington River will need to be explored when weather permits. The cores taken to the UConn Sediment Coring Facility will be studied further and dated. The sediment from the cores alone can inform us if these diatom taxa have been in this river for a significant time or if they are newly brought here by fisherman's boots, tackle and other means. DNA analysis will continue once the snow and ice have melted and warmer weather permits the taking of samples. Samples will be split between Dr. Khan-Bureau, TRCC/UConn, and Dr. Paul Hamilton of the Canadian Museum of Nature in Canada. SEM and LM will commence once the core sediments have been dated and split for further microscopy work. Dr. Peter Siver and Dr. Khan-Bureau will perform the SEM work at UConn.

Unfortunately, COVID-19 stopped much of the work. In addition, one of the Co-PIs had medical issues impacting work on the project. Fortunately Dr. William Ouimet agreed to assist in conducting the core sampling during July 2020. Dr. Ouimet, brought with him a wealth of knowledge in river geomorphology, GIS, and expertise drill exploration in rivers. He also operates the UConn Sediment Coring Facility at UConn. His coring methodology, commonly referred to as vibracoring, incorporates the use of a vibratory machine, that is operated with a generator, which vibrates the 3"x 8' pipe as deep as allowable into the river. This technology is more conducive to river coring than the gravity or piston corer. We didn't realize the importance of this method and the equipment necessary until we tried using the gravity corer. We are very grateful for Dr. Ouimet's and his graduate students help. We will continue to work on this project with Dr. Ouimet.