Soil Health Assessment of Sugarcane and Flooded Rice Crop Rotation Within the Everglades Agriculture Area, Florida.

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Over half of the country's sugarcane production comes from the Everglades Agricultural Area (EAA) in Florida (USA). Still, soil loss is a significant concern for the future of agriculture throughout the EAA. Keeping the soils hydrated during the fallow period by cultivating flooded rice in rotation with sugarcane could potentially reduce oxidation compared to a well-drained soil. In this study, the effect of sugarcane and flooded rice crop rotation on soil health in the EAA was evaluated by conducting experiments on 35-acre plots with different rotation systems, including sugarcane-rice-sugarcane-sugarcane (SRSS), sugarcane-sugarcane-rice-sugarcane (SSRS), continuous sugarcane (SSSS) and virgin land (control). Soil health indicators, such as pH, total phosphorus (TP), mehlich3 phosphorus (M3P), total kjeldahl nitrogen (TKN), nitrate (NO_3^-) and ammonium (NH_4^+) were monitored before and after planting of each field. The changes in soil health were compared between pre-plant and post-harvest cultivation, as well as across different rotation systems. This study also integrated soil depth surveys with remotely sensed vegetation growth data to identify the relationship between soil depth and crop production in the EAA. We calculated the Normalized Difference Vegetation Index (NDVI) from remotely sensed imagery analyzed four times per year from 2014 to 2021. The regression relationships between soil depth and vegetation growth established based on the remotely sensed and survey data helped quantify impacts of soil depth on crop production. We are further connecting these results to conservation practices implemented in the EAA. Results from this study hold practical implications for soil and water management and contribute to a larger effort quantifying conservation effect within the EAA.

Estimating cover crop quantity and quality through the use of optical sensors

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Nitrogen (N) fertilizer that is not entirely recovered during a summer cash crop season is prone to losses during the winter fallow period, especially in Florida's edaphoclimatic conditions. Replacing fallows with a winter cover crop (WCC) could reduce N losses while favoring soil health, but CC benefits depend largely on residue quantity and quality. Therefore, predicting WCC biomass production could be valuable to predict potential CC benefits. Optical sensors can be used to estimate biomass and crop N concentration through their capacity to capture differences in the spectral properties of canopies. We evaluated the effects of one WCC (Sorghum-sudangrass) planted after corn on soil health, and the performance of optical sensors in estimating WCC biomass and N uptake. Aboveground biomass, plant C and N, and soil were sampled at termination of both crops. Leaf greenness of WCC was measured monthly with a handheld active optical sensor (Crop circle) and through satellite imagery (Planet). Regression models were fitted to assess the relationship between sensor readings and WCC development. Crop biomass was positively correlated with mineralizable N ($r = 0.72$) and active carbon ($r = 0.60$). Sensors could predict biomass and N uptake, but their efficiency was variable across months (R^2 from 0.01 to 0.65). The best predictions were obtained 37 days after planting using satellite imagery. Nonetheless, handheld and satellite were correlated ($r = 0.83$), indicating that both sensors estimate WCC responses similarly. Our results suggest that sensors can help estimate biomass and potential soil health benefits of WCC in Florida.

The Catawampus Theory

Shelby M. Beck, Jeremy A. Rapp, and Samuel J. Smidt

Abstract

The topic of environmental sustainability continues to lack in its interdisciplinary approach despite its multidisciplinary nature and well-documented call for ongoing discipline integration. Most dialog in environmental sustainability assumes concepts are integrated, but integration has yet to be realized in the topic. Here, we develop three unique examples that demonstrate an imbalanced and often disconnected (i.e. not integrated), history of the topic. This study demonstrates: (1) the topic has failed to become more integrated through time, (2) sustainability efforts have been cyclical, and (3) historical advancements in the field can be grouped into singular categories connecting with the social-interests of the time period. By demonstrating the lack of integration in environmental sustainability, this paper hopes to direct future sustainability efforts towards a truly integrated path.

Characterization Of Fecal Indicator Bacteria, Microbial Sources, Water Quality, And Nutrients Dynamics Seasonally For Mixed-Use Watersheds And Land Uses In NW Florida

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Abstract:

Water quality decline in aquatic systems is mostly caused by land use and land cover changes. There is, however, limited knowledge of the geographical and temporal variability of land use change features and their relationship to watershed water quality metrics. This study evaluates the relationships between bio-physicochemical water quality metrics and land use and land cover (LULC) classes as a contribution to addressing this constraint. Fecal and nutrient pollution is a main source of water quality impairment globally. Contamination of the various types of the once pristine aquatic systems in NW Florida has become very alarming over the decade. Water quality have been come significantly impaired by numerous types of contaminants especially fecal inputs, Nitrogen, Phosphorous and agrochemicals. NW Florida especially Pensacola depends on its thriving coastal tourism because of its renowned recreational beaches, activities and, seafood industry. This study area is prone to frequent and severe storm/ rainfall events, and natural disasters. Increased rainfall and resultant runoff coupled with poor and or outdated sewage / septic systems leads to high runoff of these pollutants and subsequent impairment of the Perdido and Pensacola bay and estuaries. Fecal Indicator bacteria,(*Escherichia coli, Enterococci)* were enumerated utilizing IDEXX colilert -18 and enterolert-18 and nutrients via Ion chromatography . Microbial source tacking was done using PCR, high levels of human, canine and bird fecal input was found. Results Indicated that significant amount (64%) of our 50 sites were impaired by fecal bacteria. The land use and land characterizations open water, urban land uses were consistently polluted by FIB and nutrient contamination. Spatial and temporal variation, LULC, and seasonal change all affected fate, transport and delivery of these pollutants into these aquatic systems. NW Florida watersheds and aquatic systems are severely contaminated by fecal inputs from both human and animals inputs and nutrients, immediate bioremediation, best management practices are imperative to mitigate these issues. As a result of the elevated quantity of illness, and deaths and the devastating nature of infections caused by the use of fecal impaired water it is crucial that are able to properly comprehend the cause and effect that control the dispersal of FIB pathogens and nutrients.

Keywords: Fecal indicator bacteria, *Escherichia coli, Enterococci,* water quality, Florida, Nutrients

SWES Research Forum

Title: *Innovative Learning for NASA Earth Science Applications: A Pilot Study for Game-Based Learning Using a Design Thinking Approach*

Authors: Trista Brophy, Margaux Reynolds, Shobhana Gupta

Abstract:

Earth observation (EO) data has broad applications in driving decision making for a variety of societal and environmental issues. To expand the use of EO data use across communities, the NASA Prizes and Challenges program is executing a prize competition to solicit designs for an interactive training product. This product will provide end users hands-on experience in integrating EO data into community resilience decisions. This competition seeks to complement traditional training activities with innovations in education practices by bridging technology and applied science. Specifically, the competition is being designed to leverage the creativity of serious game and immersive experience developers with a design thinking approach.

In our pilot case, our initial research includes interviews to gain insights from different perspectives from the three key stakeholders (end users, data products and services providers, serious game developers). These insights include key priorities in the region, opportunities where EO data can support decisions, and resource limits for training product creation. This information will help us define the scope and criteria of the training product competition.

End-users of the training product will be engaged throughout the lifecycle of this project, collaborating with competition participants during product testing and refinement. At the end of the competition, the training product will be available for use to the end users and lessons learned from the project will be shared broadly to allow development of trainings for other communities.

This project leverages the benefits of game-based learning, which offers rich, interactive experiences that mimic real world situations and invites collaborative problem solving from participants. Because the project sits at the nexus of Earth science and human behavior, we can harness human centered design concepts, interdisciplinary knowledge, and innovative solutions through a prize competition as opposed to a traditional grant. This format also allows us to manage risk and reduce resource use by only paying a prize for solutions that met a specific set of requirements. The next steps are to adapt the training product to accommodate varying data products, local maps, user roles, impacted communities/groups, and specific sectors.

Characterization of deep podzolized carbon with infrared spectroscopy

Bella Brush and Dr. Yang Lin

Abstract

Unlike surface podzolized horizons, DPC resides below two meters with C concentration increasing with depth. Little is known about DPC's chemical composition, hindering our ability to predict its fate under environmental changes. We characterized DPC chemistry using diffuse reflectance infrared Fourier transform spectroscopy (DRIFTS) in three profiles from Suwannee County, FL. To assess differences between surface A horizons, subsurface horizons (E, Bw, and E') and DPC horizons, we calculated the ratios of representative DRIFTS absorbance peaks, including aliphatic C-H (centered at 2853 and 2927 cm-1), aromatic C=C (centered as 1529 cm-1), amide I (centered as 1688 cm-1), and C-O (centered at 1159 cm-1). We found that the ratio of C-H to C-O greatly declined from A horizons to subsurface and DPC horizons, suggesting that plant-derived labile C was depleted in subsoils. The ratio of C=C to C-O increased from A to subsurface horizons, indicative of the preferential preservation of aromatic C=C during decomposition. However, this ratio was significantly lower in DPC than in subsurface horizons. Similarly, the ratio of amide I to C-O first increased from A to subsurface horizons and then declined at DPC horizons, mirroring the vertical trends of bulk carbon to nitrogen ratios. These results suggest that aromatic and N-containing compounds are less abundant in DPC than subsurface soils. Overall, our results revealed a unique chemical composition of DPC than surface or subsurface soils. DPC is potentially more labile than subsurface soils, which have implications for predicting its stability under global change.

Enhancing nutrient uptake and grapefruit (*Citrus paradisi*) growth through soil application of beneficial bacteria species (*Bacillus* spp.)

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Bacillus species can be considered among the most investigated biocontrol agents because this species of bacteria are classified within the plant growth-promoting rhizobacteria (PGPR), that refers to bacteria that reside in soil, colonizing and protecting the ecosystem from infection, with a wide variety of antibacterial and antifungal antibiotics, promoting plant growth by nitrogen fixation, siderophore production, solubilization of minerals containing phosphorus (P), phytohormone production and synthesis of some compounds and enzymes.

The experiment was conducted in a greenhouse located at the Citrus Research and Education Center, Lake Alfred, Fl. to screen bacterial species that perform best in improving plant root and shoot growth, active new flush, and mineral nutrition. In this experiment, plants were arranged by a complete randomized block design with seven treatments and five repetitions, each plot composed of 4 plants. The treatments correspond to fertilization, *Bacillus velezensis* (LALRISE VITA®), fresh brew from commercial product Double Nickel®, three isolates of *Bacillus subtilis*, a combination of *Bacillus amyloliquefaciens* (fresh brew of Double Nickel) and the three *Bacillus* isolates. The sixth treatment was LALRISE VITA with the addition of fertilization and the last treatment only water (control) with no additional application. The results showed that treatment six (LALRISE VITA®, *Bacillus velezensis*), effectively improved nutrient availability for uptake and benefited plant growth (p = 0.001), outperforming the negative and positive controls. Shoot (p = < 0.001) and root system developed good biomass (p = 0.001) compared with the other treatments.

Assessing Soil Health Indicators Across Various Cropping Systems in Florida

Franky Celestin, Rao Mylavarapu, Yang Lin

Abstract. Perceptions on soil health are numerous; however, a deeper understanding of this concept depends on the soil's inherent properties, the intended land use, and the management objectives. Assessing soil health indicators is critical in understanding and improving management practices to enhance soil quality. Currently, Florida does not have an established soil health baseline which has hindered the promotion and adoption of soil health in agronomic production. It is imperative to understand the contributions of individual soil parameters to overall soil health in order to develop a baseline of soil health index for various Ag-soils and ecosystems of Florida. Hence, this research provides stakeholders with a baseline survey of physical, chemical, and biological properties that are potential indicators of soil health in Florida. Given the profound impacts of cropping systems and management practices on soil health, selected soil health indicators were compared across three cropping systems in Florida - vegetables, row crops, and pastures. Approximately, 200 samples were collected across 32 counties in Florida and analyzed to determine the availability of the major nutrients, Soil Organic Matter (SOM), Permanganate-Oxidizable Carbon (POXC), Soil Respiration, Soil Protein Index (SPI), and Water-Extractable Carbon and Nitrogen. The preliminary result show that cropping system is a critical driver of soil health indicators in Florida. Furthermore, soil taxonomy and climate also influenced the values of soil health indicators.

Title: Energy and Nutrient Limitations to Degradation of Deep Podzolized Carbon

Authors: Ryan E. Champiny, Yang Lin

Abstract:

Microbial energy and nutrient limitations are two primary mechanisms responsible for the long-term persistence of soil carbon. Their importance stems from the control on the growth of microbial biomass, production of enzymes used to break down complex compounds, and as energy to initiate chemical reactions. The Carbon:Nitrogen values reported for DPC would indicate that the microbial decomposition is nitrogen limited, whereas chemical composition and molecular weight distribution indicate energetic limitation due to the low availability of small mass compounds. To test limits to microbial degradation of DPC an incubation experiment was carried out in which ^{13}C-labeled alanine and glucose were added to DPC and surface soils. At the conclusion of the 90-day incubation soils were extracted via fumigation to measure microbial biomass. The results were used to infer the susceptibility of DPC to priming compared to surface soils, and the extent to which this C pool is constrained by microbial energetic or nutrient limitation. Relative glucose priming in both DPC horizons was order of magnitude larger than in surface horizon soils and increased in magnitude with depth. Alanine treatments triggered similar priming patterns; however, they were weaker relative to glucose treatments. Respiration in alanine treatments occurred primarily within the first 40 days, while glucose treatments showed sustained respiration. Energy and nutrient limitation both increase with depth and constrain the microbial biomass, preventing it from degrading DPC. Land management practices which alter the flow of elements into the deep soil could reduce the stabilizing pressure from limitation, triggering microbial decomposition.

Title: Analyzing heavy metal removal in Point-Of-Use water filter systems: GOW & Biosand water filtration

Authors: Jeantel Cheramy, Andrew L. Rainey, Samuel Smidt, Joseph H. Bisesi, Jr and Anthony T. Maurelli

Abstract

Having access to clean drinking water is a fundamental human need. Yet, for over 2 billion people in impoverished or rural regions of the world, this access remains limited. Many efforts exist to improve access, but fundamental limitations still exist like overall cost, on-site repairs, user operating knowledge, and understanding of local contaminants. Here, we constructed two popular water filter designs to analyze the removal of the common contaminants Fe, Cu, As, Pb, and F. Specifically, we analyze the performance of a modified biosand water filter and the Gift of Water filter, each which have their own unique benefits for resolving cost, repair, and operating needs. We analyze 47 samples using an Inductively Coupled Plasma – Mass Spectrometer (ICP-MS), and we found that the concentration levels of these contaminants were within the permissible limits of US EPA and WHO guidelines after being passed through the filters. This work can be used to further support the efforts to reduce illness, disability, or even death from diseases that are linked to drinking contaminated water.

Abbreviations

BSF: Biosand Filter

CAWST: Centre for Affordable Water and Sanitation Technology

CESCR: Committee on Economic, Social, and Cultural Rights

GOW: Gift-Of-Water

HDI: Human Development Index

ICP-MS: Inductively Coupled Plasma – Mass Spectrometer

LDC: Less developed country

MCL: Maximum Contamination Level

POU: Point-Of-Use

UN: United Nation

US EPA: United States Environmental Protection Agency

WASH: Water, Sanitation and Hygiene

WHO: World Health Organization

Biogas Energy for Remote Villages in Zambia

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Department of Soil, Water, and Ecosystem Sciences

Access to reliable energy is a major challenge for developing countries where large rural populations rely on subsistence farming and cook their food over traditional wood-burning stoves or open fires. Women and children spend hours collecting the firewood needed for cooking, limiting time available for school/education or engaging in productive economic activities. Cooking with wood-burning stoves is also a significant health hazard, causing illness and death due to continuous smoke and particulate inhalation. Biogas energy from the decomposition of organic matter in an oxygen-free environment (anaerobic digestion) offers a clean-burning alternative that can be used much like propane or natural gas. Common feedstocks for anaerobic digestion include livestock manure, food waste and crop residues. The objective of this study was to assess the current and future potential for biogas energy in Zambia, where the electric-power grid serves only four percent of the 10.4 million mostly rural population. The impact of biogas technology was analyzed in the context of energy use, deforestation, social and climate change effects. The study indicates that biogas production in Zambia has the potential to provide clean energy in rural/remote areas, minimize deforestation, improve health and environmental conditions, and decrease greenhouse gas emissions. To see the fullness of these benefits, however, policies are needed to create a market for bioenergy, transfer knowledge from experts to villagers, and promote the use of local materials for digester construction.

SEDIMENT NITROGEN CYCLING AND PHYTOPLANKTON NUTRIENT LIMITATION IN AN URBANIZING ESTUARY

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University of Florida/IFAS, Gainesville, FL

Estuaries provide valuable services such as nutrient removal and primary production, but nutrient pollution and subsequent eutrophication can degrade their structure and functioning. Understanding the impacts of nutrient pollution on these ecosystem services is a necessity to protect water quality and maintain ecological integrity of coastal ecosystems. Benthic-pelagic coupling, the interactions and feedbacks between water column and sedimentary processes, is an important characteristic of estuaries. However, large gaps remain in our understanding of how nutrient loading impacts these water column-sediment biogeochemical dynamics. In this study, we examine sediment nutrient fluxes and phytoplankton responses to elevated nutrient contributions in the Guana Estuary, an urbanizing watershed draining Ponte Vedra, FL. We measured sediment denitrification (net N_2 flux), sediment oxygen demand (SOD), nutrient fluxes (NO_x, NH_4^+, PO_4^{3-}) and phytoplankton nutrient limitation seasonally at four sites along a salinity gradient. Preliminary data suggests net N_2 and dissolved inorganic nitrogen fluxes differed between sites. Sediments were a net sink for nitrogen with high N_2 production, indicating net denitrification at all sites except the freshwater site which showed fixation. Moreover, the degree of phytoplankton nutrient limitation differed between sites and seasons, with phytoplankton exhibiting particularly large responses to organic nitrogen (as urea) inputs. These sediment flux studies paired with phytoplankton nutrient limitation bioassays provide a better understanding of the coupled benthic-pelagic processes and their variability, informing nutrient budgets and water quality models that can quantify feedbacks among biogeochemical processes and ecosystem responses in an anthropizing Guana Estuary.

Words: 241

“Soil and Nutrient accretion rates in Everglades stormwater treatment area wetlands “

Ankita Datta, Praveen Subedi, Alan Wright, Patrick Inglett

Abstract

The Everglades Stormwater Treatment Areas (STAs) are a complex of large, constructed wetlands that are an integral component of the State and Federal efforts to treat runoff from surrounding agricultural areas before it reaches the Everglades. The aim of this study was to determine the accumulation rates of macro-elements including nitrogen (N), carbon (C), phosphorus (P), sulfur (S), and associated secondary elements including calcium (Ca), magnesium (Mg), aluminum (Al), and iron (Fe) in multiple Everglades STAs over their periods of operation. Soil accretion and nutrient accumulation were measured in the northern, central, and southern regions to evaluate the effects of anthropogenic nutrients and nutrient storage during the past century as it relates to STA performance. The study was conducted in two flow-ways of STA-1 East, two flow-ways of STA-2, the Western Flow-way of STA-3/4, and the Central Flow-way of STA-5/6. In general, flow ways with SAV were more efficient than EAV in accreting mineral matter, resulting in increased bulk density and higher accumulation rates of elements. Phosphorus accumulation rates were approximately 2–3 times higher in SAV than in EAV flow ways. In EAV, biomass turnover and associated biotic processes regulated organic matter accumulation rates. The spatial accumulation patterns of P, C, and N in the EAV areas of STA-2 and STA-3/4 were like those observed in the EAV areas of the natural wetlands in Water Conservation Areas, suggesting that constructed wetland systems function similarly to natural wetlands dominated by EAV areas in retaining and storing macro- and secondary elements**.**

Do cover crops alter the rhizosphere composition and predicted functionality of two sub-tropical perennial tree crops?

Emma Dawson, Antonio Castellano Hinojosa, and Sarah L. Strauss

The rhizosphere is the region of soil directly associated with plant roots. Microorganisms within this zone can be selectively recruited by the plant from the bulk soil and provide beneficial functions, including increased nutrient acquisition and resistance to stress. Comparison of microbial communities across a range of plants has shown distinct community profiles based on plant species. These differences may be related to microbial assembly processes defined by plant needs, or coadaptation between plants and microbes. Due to recent interest in enhancing soil health, cover crops have become a popular method to improve multiple soil properties. Cover crops grown in citrus orchards can alter the abundance and composition of soil bacterial communities. While cover crops may positively impact bulk soil properties, whether these benefits are imparted to trees through changes in the rhizosphere remains unclear. In this study we used 16S rRNA amplicon sequencing to compare the rhizosphere communities of citrus and guava trees grown in two soil treatments from row middles of a citrus orchard. One soil was planted with legumes and non-legume cover crops for three years and the other soil was a non-treated control. Seedlings were transplanted and grown in these treated soils for four months in the greenhouse. We hypothesize there will be compositional and predicted functional differences in the rhizosphere based on both tree and soil type. However, we anticipate a subset of shared microbes between trees due to a shared initial soil microbiome associated with each soil treatment.

Nutrient Controls on Algal Biomass in Biscayne Bay

Camila Del Sol Pina and Dr. Ashley Smyth

Biscayne Bay (BB), located in southeast Florida, has experienced substantial declines in water quality due to excess nutrients. Understanding how nutrient inputs affect algae growth in BB will help inform nutrient management decisions in the region. We conducted nutrient addition bioassays to determine which nutrient limits algal growth in the region. We hypothesized that phosphorus would cause a greater increase in chlorophyll a (a proxy for phytoplankton biomass) in BB since previous studies have found BB phosphorous limited. We collected water from the central and southern regions of BB during the wet season and added nitrogen (N), and phosphorus (P) alone and in combination (N+P). After a week, the samples were filtered and analyzed for chlorophyll a. Chlorophyll a was significantly higher in South Bay compared to Central Bay ($p<0.05$). The nitrogen and phosphorus treatment had the largest response in chlorophyll a for both regions ($p< 0.05$). In Central Bay, the nitrogen and phosphorous treatment increased chlorophyll a by about eight times compared to the control. In South Bay, N+P increased chlorophyll a by about three times compared to the control, but this increase was not different from P. Our results suggest that phytoplankton are primarily limited by P in South Bay and by both N+P in Central Bay. Although phosphorus is important, management strategies should focus on nitrogen and phosphorus to control BB eutrophication.

Abbreviations

BB	Biscayne Bay
N	Nitrogen
N+P	Nitrogen and Phosphorous
P	Phosphorous

SEASONAL AND LONG-TERM SURFACE WATER QUALITY TRENDS RELEVANT TO DRINKING WATER SUPPLY IN TAMPA, FL

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The Hillsborough River has supplied surface water for the City of Tampa's drinking water since the mid-1920s, and the Tampa Bay, FL, region has partially relied on surface water from the Hillsborough and Alafia Rivers for drinking water since 2002. These rivers also have long histories of water quality challenges driven by urban/suburban growth as well as agricultural and phosphate mining operations. To better understand water quality trends in these rivers and potential drivers of trends, we examine how several water quality characteristics have changed over time at multiple sites in the two rivers. We use weighted regression on time, discharge, and season from the USGS EGRET package in R to calculate observed and flow-normalized seasonal averages and associated uncertainties over the periods of record (10 to 29 years). We highlight estimates over the period of 2010-2019 to identify trends and drivers relevant for drinking water supply. Total organic carbon shows higher observed wet season values than dry season values, likely due to the effects of rainfall and streamflow, but the overall decreases seen between 2010 and 2019 wet season values at several sites are mostly attributable to factors other than streamflow (e.g., land use change). Fluoride, orthophosphate, and nitrate-nitrite also show decreasing trends between 2010 and 2019, especially in the Alafia River mainstem. These decreases are also mostly attributable to factors other than streamflow (e.g., source water protection efforts). Continuation of these trends could have positive implications for drinking water supply, depending on the ultimate drivers of these trends.

TITLE Advancing Applied Environmental Sustainability in Geo-, Eco-, and Agro-Sciences

AUTHORS Hayden Henke, Samuel J. Smidt, Trista Brophy, Xiang Bi, Anne Mook, Damian C. Adams, Shelby M. Beck, Zoe Spielman, Gretchen Stokes, Genaro Guerrero Espinosa

ABSTRACT

The topic of environmental sustainability lacks a generally universal model to describe sustainable vs. unsustainable actions in the geo-, eco-, and agro-sciences. This is largely because there is a growing disconnect between sustainability discussions in the sociological vs. physical sciences. As a result, sociological theories describing human activities are not integrated into physical contexts, and on-the-ground environmental data in the physical sciences is not incorporated into sociological theories. Using this systematic review of both disciplines, we constructed a model that offers an interdisciplinary framework for advancing environmental sustainability dialog. We specifically offer nine interconnected target areas that lead toward or away from sustainable systems. This new framework can be utilized for practical cross-discipline applications by aligning economic, political, and environmental sustainability goals.

Characterization of Pesticides in Urban Waterbodies of Gainesville, FL

Francisca Ordonez Hinz and P. Chris Wilson

Aquatic organisms may be exposed to many different contaminants, including pesticides. Depending on the exposure duration, concentration, and pesticide mode-of-action, critical species may be harmed resulting in the disruption of ecological systems. The presence of multiple pesticides in surface waters is well documented. These chemicals move from sites of application into aquatic waterbodies via surface runoff and/or leaching, exposing aquatic organisms to several pesticides at any given time. Samples were collected in July and December of 2022 from Hogtown Creek, Beville Heights Creek (Cofrin Nature Park), and six lakes/retention ponds in Gainesville, FL. These samples were analyzed for the presence of over 130 pesticides by LCMS/MS. Eleven herbicides (e.g., atrazine: <0.33 µg L^{-1}; simazine: <0.13 µg L^{-1}; clomazone: <0.05 µg L^{-1}; diuron: <0.02 µg L^{-1}), six insecticides (e.g., imidacloprid: <0.06 µg L^{-1}; dinotefuran: <0.02 µg L^{-1}), eight fungicides (e.g., propiconazole: <0.01µg L^{-1}), and the insect repellant DEET (<0.14 µg L^{-1}) were detected. While risks of acute toxicity appear low, knowledge is lacking regarding the input sources and maximum concentrations to which these water bodies may be exposed. Knowledge of enhanced toxic effects due to pesticide mixtures is also lacking. The identity and concentrations of pesticides in the environment should be monitored consistently to gain a better understanding of the temporal presence of pesticides. These results will be useful for identifying and assessing potential ecological risks within these local water bodies.

Soil Health and Compost Education for Elementary School Students

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Food waste deposited in landfills has negative impacts on humans and the environment. These effects include carbon emissions, in the form of methane, and landfill leachate from decomposition of food waste, which both exacerbate climate change and reduce soil and water quality. In contrast, composting provides a method to manage food waste and recycle valuable nutrients to improve soil structure and fertility. This study focused on training elementary school students on food waste reduction, recycling, and diverting food waste from the school's cafeteria through composting. The aim of the study was to apply science education to teach environmental responsibility and resource conservation. Food waste from the school lunch was recycled through composting to provide soil nutrients and improve soil health, hence creating a balance in the food ecosystem. The students sorted their food waste, plastics and paper waste into separate bins. The food, plastics and paper waste was collected and weighed daily over a six-week summer camp. The food and paper waste was composted using two tumbling compost units to produce a soil amendment for use in the school garden. A compost thermometer was used daily to monitor the compost temperature. These activities provided hands-on training and experiential learning for the students. Results of a post-training assessment revealed that the students' understanding of composting and its relevance for soil health and ecosystems balance was much improved. These results illustrate the value of science education in elementary schools to solve environmental problems and encourage pro-environmental behavior.

Predictability of Phosphorus Leaching in Biosolids-Treated Soil Columns

Yewon Lee, Allan Bacon, and Yang Lin

Abstract. Phosphorus (P) is one of the most limiting macronutrients in agriculture. As a great source of phosphorus, biosolids have been extensively applied as a fertilizer especially in pastures. Since Florida sandy soils have a low P-holding capacity, P application from biosolids could be identified as a potential cause of nonpoint source of P pollution in water bodies. This study focuses on the susceptibility of biosolids derived P-leaching in representative soils with different soil profiles in columns. This column study includes repacked soils by horizons that were leached weekly to simulate the Florida heavy rainfalls. After series of leaching events, the Soluble Reactive Phosphorus (SRP) and Total Phosphorus (TP) of the collected leachates were measured. Across all three designs, inorganic P accounts for over 80% of total phosphorus leached. From the study, we found out that the presence of Bh horizon, regardless of past biosolids application history, greatly reduced P movement by 2 orders of magnitude relative to the column with only A and E horizons. The Bh horizon is effective at intercepting the P loss from the soil profiles. Therefore, any water table that does not intersect with B horizon may be a hot moment for P leaching.

Title: Soil health stabilizes US corn yield under drought

Authors: Swarnali Mahmood, Daniel A. Kane, Márcio R. Nunes, Yang Lin

Abstract

Soil organic matter (SOM) is one of the most important soil health indicators. Soils with high SOM concentrations have been shown to stabilize crop yield under drought; however, the underlying mechanisms remain unclear. Following the Soil Health Assessment Protocol and Evaluation (SHAPE), we derived a soil health score (range: 0-1) from SOM concentration by accounting for site-specific variables, including climate, texture, and soil taxonomy. Using county-level data of rainfed corn across the United States from 2000 to 2016, we built regression models of corn yield using SOM, soil health score, and county-level Standardized Precipitation Evapotranspiration Index (SPEI) data. We found that high soil health scores were associated with high yields. During the most severe drought events, an increase of 0.5 in soil health score (range: 0-1) was associated with 1.07 ± 0.13 Mg ha^{-1} increase in corn yield. Smaller yet statistically significant effects were found during less intensive droughts. Models also showed similar effects of soil health scores on corn yield across different soil peer groups with distinct texture and soil suborders. This finding further indicates that the yield benefits of soil health were largely independent of soil texture and soil taxonomy. Overall, our results demonstrate that soil health can effectively predict corn yields under drought. It is potentially feasible to increase the resilience of corn yield against drought by adopting agronomic practices that build SOM and soil health across a wide range of geographical locations and site characteristics.

Unlocking the chemistry of legacy phosphorus to maintain sustainable agriculture and a healthy environment.

Authors: MD Anik Mahmud, Xue Bai, Caroline Buchanan, Shin-Ah Lee, Elise Morrison, Luke Gatiboni, Owen Duckworth, Jonathan Judy, and Jehangir Bhadha

Phosphorus (P) is an essential nutrient for animals, plants, and microbes; however, it could potentially harm the environment and its inhabitants when it is mined and used in unsustainable ways. It is estimated that > 40% of the world's arable land suffers from P deficiency, and finite rock phosphate sources could deplete in 50-100 years. Simultaneously, rock phosphate quality is getting lower, resulting in high fertilizer production costs with excessive harmful metal impurities (e.g., Cd and U). Thus, establishing harmony between agriculture and the environment is critical. The Science and Technologies for Phosphorus Sustainability (STEPS) is an NSF-funded convergence research community with a goal of a 25% reduction in mined phosphates and a 25% reduction in losses of point and non-point sources to soil water resources could lead us to that desired P-balance. Long-term application of animal manure and fertilizer in acidic soils (e.g., North Carolina), native P in muck soils (e.g., Histosol in South Florida), and tightly held P in alkaline calcareous Arizona soils makes the "legacy P" a promising in situ P-resource. Unfortunately, legacy P's bioavailability to plants is low, knowledge of chemical speciation and factors that control legacy P's bioavailability are also lacking. The modified version of Hedley P fractionation and ICP-OES analysis with the combination of liquid state ^{31}P NMR spectrometry for organic-P and Synchrotron-based P K-edge XANES for inorganic-P could shed light on legacy P chemistry and quantity for a better understanding of the bioavailability of P in soils, which could lead to sustainable P-balance.

Carbon Sequestration Potential of Regenerative Farming Practices on mitigating soil subsidence within the Everglades Agricultural Area, Florida

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Abstract

The Everglades Agricultural Area (EAA) is essentially a drained wetland that has exposed over 500,000 acres of organic soils (histosols) for agricultural purposes, thereby leading to soil loss via microbially mediated organic matter (OM) oxidation locally referred to as "soil subsidence". To address soil subsidence, growers are conducting regenerative farming practices that have the potential to enhance carbon sequestration. For ensuring long term soil sustainability within EAA, the study objective was to estimate carbon sequestration potential of regenerative farming practices. A field study comprising three treatments - fallow [F], flooded fallow [FF] and flooded rice [FR] was conducted. Pre- and post-soil samples were collected at 0-15 cm depth. Under FR, aboveground and belowground biomasses were collected. Soil carbon stock, OM, and active carbon were analyzed, and aboveground and belowground biomass carbon sequestration was estimated using linear sampling method. Based on research findings, FF and FR accumulate soil OM while F contribute to soil loss via OM oxidation. Active C, which is a fraction of soil OM susceptible for being microbially mineralized and lost into atmosphere as CO_2 significantly decreased only under FF. Estimated sequestered belowground biomass carbon at harvesting stage (HS) is 53 kg C/ha, corresponding to 194 kg CO_2 removal from atmosphere. Estimated sequestered aboveground biomass carbon at HS is 951 kg C/ha, equivalent to 3,486 kg CO_2 removal from atmosphere. Estimated soil carbon stock at HS is 3,864 kg C/ha, equivalent to 14,168 kg CO_2 /ha removal from atmosphere to the soil, and potentially generating 14.2 carbon credits.

APPROACHES FOR QUANTIFYING SOIL CARBON SEQUESTRATION IN SPACE AND TIME

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ABSTRACT

Soils are a potential source or sink of atmospheric CO_2 and can play an important role in climate regulation. Therefore, quantifying the amount of soil carbon is essential for monitoring the carbon cycle and for developing sustainable management practices that can minimize carbon emissions and sequester more carbon from the atmosphere.

At the point scale traditional methods of wet digestion and dry combustion are extensively used for laboratory analysis of soil organic carbon (SOC). These methodologies are based on the oxidation of SOC to CO_2 either with chemicals or using high temperatures. Although these methods yield great results, they must be performed in the laboratory, which adds additional time and cost. The evolving spectroscopic methods could be comparatively rapid for monitoring soil carbon in the laboratory or the field. Several types of spectroscopies available are Diffused Reflectance Spectroscopy (DRS), Laser-induced Breakdown Spectroscopy (LIBS), Inelastic Neutron Scattering (INS), etc. A major limitation of spectroscopy is its low precision due to indirect carbon measurement. Therefore, Eddy covariance approach is used to directly measure the ecosystem carbon exchange on a large scale. To minimize the use of resources, soil carbon modeling can also be performed using crop simulation software or empirical equations. The use of carbon isotopes and artificial intelligence-based carbon modeling to quantify soil carbon is also emerging recently. Regardless of the methodology's underlying principle, each method has its distinct advantages and limitations. Therefore, for more efficient quantification of soil carbon sequestration further research on the existing and emerging methods is required.

Kenaf (*Hibiscus cannabinus*): A Sustainable Source of Horticultural Growth Media

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Kenaf is an herbaceous annual, soft fiber crop that may have the potential for commercial success in the state of Florida due to the high yields that can be obtained in the state's warm climate. The core of the crop, usually a waste by-product created during fiber production, can be utilized as growth media for containerized plants when pulverized, exhibiting properties comparable to that of peat moss. The commercial horticulture industry is heavily reliant on peat moss as a potting medium. However, peat moss releases carbon emissions into the atmosphere during harvest and during transportation, making it a contributory factor to climate change. Kenaf core could act as a sustainable alternative to peat moss. Furthermore, every part of the kenaf plant can be utilized in various industries: the fibers for papermaking, the seeds in oil production, the core as a growth medium, and the leaves for livestock feed. The versatility of this crop could make it a valuable cash crop for the southeastern United States.

Spartina alterniflora (smooth cordgrass) in living shorelines: traits and planting design may influence sediment stabilization and sediment enhancement in the Indian River Lagoon

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Living Shore Lines (LSLs) are an increasingly implemented management tool nationally, throughout Florida, and within the IRL, and recently passed legislation (LSLs Act of 2019, 2017 Nationwide Permit issuance for LSLs) indicates both national and state promotion of this practice (Smith et al., 2020). Shoreline protection by LSLs is motivation for their adoption (Bilkovic et al., 2016; Polk et al., 2022; Stafford, 2020), yet LSLs can fail or be slow-to-establish due to uncontrollable factors (losses of sediment input, storms etc.) but also due to suboptimal planting designs and plant material, which can be manipulated. Some science-based guidelines have been developed (Gaynor et al., 2019; Manis et al., 2015), but particularly model-driven planting parameters are needed (Kazemi et al., 2021). This research fills that information gap, increasing LSL capacity to trap sediments and promote key habitat. Research focuses on *Spartina alternifora* and includes 1) development of a model-determined theoretical optimum planting design for sediment stability, 2) a survey of nurseries and LSL projects for genetics and plant traits, 3) greenhouse experiments to compare growth of different sources of *Spartina* in contrasting sediment conditions under different planting designs.

Decarbonizing the Cement Industry via Algae Cultivation

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Concrete is an essential aspect of modern infrastructure, being a much-preferred construction material because it is long lasting and low maintenance. Concrete is produced through the creation of a paste comprised of cement and water that is mixed with aggregates such as sand and gravel. However, the production of one pound of cement emits 0.93 pounds of CO_2. Thus, concrete production is a major source of CO_2 emissions and accounts for approximately 8% of global carbon emissions. As the global demand for concrete continues to increase, it is evident that efforts must be made to reduce emissions associated with its production to mitigate climate change. This research proposes that the cultivation of algae can be integrated into the process of cement production so as to reduce the emissions associated with concrete. Algae uptake CO_2 through photosynthesis, having a CO_2 bio-fixation efficiency of 10-50 times higher than terrestrial plants. Algae have the ability to capture 1.8 kg of CO_2 per kilogram of algal biomass. Therefore, we hypothesize that, through the integration of algae cultivation and cement production, CO_2 can be effectively recycled through a closed-loop system. Algal biomass can be cultivated using the CO_2 emitted from cement flue gas. The cultivated algae can be harvested and used to produce methane gas (CH_4) via anaerobic digestion, which can in turn be used to power the cement plant, which will in turn produce more CO_2 to be captured through further algal cultivation.

Water-dispersible carbon nanoparticles as a soil amendment for sandy soils: evaluation of agronomic performance and soil biochemical quality

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Carbon nanoparticles (CNPs) are emerging soil amendments for increasing soil fertility & crop growth, particularly for sandy soils with low nutrient holding capacity. However, their interactions with plant and soil remain unclear. Greenhouse and field studies were conducted to evaluate the effects of novel water-dispersible CNPs (200-1200 mg/kg, soil drench) combined with fertilizer applied at recommended rates on agronomic performance and soil biochemical properties across different soil types (Spodosol and Alfisol) and crop species (lettuce and sugar beet). Compared to fertilizer-only treatments (control), CNPs applied at low to medium rates (200-800 mg/kg) enhanced crop growth and biomass production in greenhouse (lettuce) and field (sugar beet) conditions. Similarly, elevated NPK availability in soil and accumulation in crop were found with CNPs applications across our experiments, with up to 230% K accumulation in lettuce at 800 mg/kg CNPs compared to control. Soil biological activities (soil basal respiration, microbial biomass carbon, and enzyme activities) were stimulated at lower application rates (200-400 mg/kg) while remaining similar or reduced at higher application rates. Based on our preliminary results, given that the advantages of CNPs were potentially lost at higher application rates, CNPs could be recommended as a soil amendment applied at low rates (200-400 mg/kg) to improve soil–plant interactions in sandy soils.

Effect of silicon fertilization on performance of young citrus trees

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The study was conducted to elucidate whether silicon (Si) can be beneficial for citrus nutrition as it has gained relevance as a supplement for plant nutritional needs. Citrus industry faces many challenges associated with biotic and abiotic stresses that can be ameliorated with Si and other nutrients. To determine the effect of silicon on citrus, a short-term study was conducted under greenhouse conditions. This involved 8 treatments, including varying rates of Si and calcium (Ca): 0-0, 0-22.5, 7-11.5, 7-34, 14-23, 14-45.5, 28-46, and 28-68.5 g/plant for Si and Ca respectively. The setup consisted of 40 plants, where each plant served as a replicate. Bi-weekly measurements of height and trunk diameter were taken, and soil and leaf tissue samples were analyzed. At the end of the experiment, the plants were classified and measured for fresh weight, and dried at 70 °C until constant weight. The results of the study showed that treatment with 14 g Si per plant had the most growth and contained greatest dry biomass. There were no significant differences in leaf Si content. These results imply there can be an optimum rate of Si for the plants, as growth improved with increasing application rate. It is hard to tell if the improved growth is just because of the Si or mostly because of the association with Ca, but the results are important as they provide insight into the effects of Si on citrus and may aid in the development of better strategies for citrus nutrient management.

Spatiotemporal Variability of N-cycling in the Guana Estuary

Jenna Reimer, Ashley Smyth, and A.J. Reisinger

Denitrification and nitrogen-fixation are essential yet opposing processes in the nitrogen (N) cycle. Denitrification is a microbially-mediated process that permanently removes reactive nitrate (NO_3) from the biosphere, while N-fixation converts dinitrogen (N_2) gas into bioavailable forms of N for use in biochemical processes. The combination of these processes can be thought of as a net N_2 flux for a system. The relative importance of one pathway compared to the other can be driven by factors such as salinity, temperature, organic matter, and nutrient availability. Increased anthropogenic N inputs have disrupted the balance between N-fixation and denitrification, leading to excess reactive N and coastal eutrophication. Understanding the relative importance and environmental drivers and regulators of each pathway can improve our understanding and management of N cycle in the face of these increased inputs. To elucidate the factors controlling denitrification and N-fixation and the spatiotemporal variability of these processes, we measured monthly net potential sediment N_2 rates (balance of denitrification and N-fixation) at 10 locations along the Guana estuary salinity gradient for 13 months. Using lab incubations, we quantified the production (denitrification) or consumption (N-fixation) of N_2 gas over time, with analysis of timepoint samples conducted via membrane-inlet mass spectrometry. Preliminary results suggest a shift from N-fixation to denitrification along an increasing salinity gradient. By quantifying drivers and spatiotemporal variability of net potential N_2 flux, we can develop strategies to manage N and protect water quality and ecosystem services provided by the Guana Estuary.

Pesticide Application Method and Timing Influences Contamination of Nectar in Salvia

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Abstract. Exposure to pesticides is one potential factor contributing to the loss of pollinators and pollinator diversity observed over the recent past. This project evaluated the influence of pesticide application method (drench vs. spray) and timing (relative to flowering) on contamination of nectar of *Salvia* × 'Indigo Spires' (*Salvia longispicata* × *S. farinacea*). The systemic insecticide thiamethoxam (Flagship) was used as a model pesticide, which was applied at the lowest labeled rate. Nectar samples were collected using glass microcapillaries and analyzed by LC-MS/MS. Concentrations of thiamethoxam and its metabolite clothianidin were highest with drench applications, regardless of application timing, and exceeded published toxicity thresholds for native bees and/or honeybees in the case of thiamethoxam. With concentrations of 421.6±71.6 ng/mL and 820.4±192.9 ng/mL (when Flagship was applied before and after blooming respectively), thiamethoxam residues in nectar exceeded LC_{50} values of 227 ng/mL (European honeybee, *Apis mellifera*) and 54.3 ng/mL (native bee, *Melipona scutellaris*) with drench application treatments, indicating significant risks for acute toxicity. In contrast, concentrations in nectar were below toxicity thresholds for both spray applications before and after flowering (3.5±1.3 ng/mL and 13.7±2.6 ng/mL respectively). Concentrations were lower for spray and drench applications made before

flowering relative to applications made after flowers began opening. Future research should evaluate other species, pesticides, and application parameters for develop BMPs for pollinator protection.

Comparative the effect of varying salinity of reclaimed water for blueberry production.

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Blueberry production increased to 5,200 acres in Florida in 2021. Finding an alternative irrigation water source depending on the ground water discharge is crucial for environment sustainability. Reclaimed water has the potential to be used as an alternative source for blueberry irrigation according to its characteristics of containing sufficient amount of nutrients and improving soil health. The aim of this study is to evaluate the effect of using reclaimed water as an alternative source for blueberry irrigation and soil health in Florida. In addition, the study will evaluate the effect of elevated concentration of salinity to specify the salinity threshold on selected blueberry varieties. A greenhouse experiment of two blueberry cultivars: Arcadia, and Kestrel varieties were selected. Six irrigation treatments were applied where well water has been used as a negative control, deionized water as a positive control, in addition to 25%, 50%, 75% and 100% of reclaimed water diluted with deionized water for blueberry irrigation. In the second objective, NaCl was added to the deionized water in different amounts to reach a salinity level of 0.5 - 1.5, 1.5 - 2.5, 2.5 - 3.5, 3.5 - 4.5 and 4.5 - 5.5 dS/m. Leachate, soil, root, shoot, plant tissue nutrient content and plant/root physiological responses will be examined. The treatment (s) with lower N leachate, biomass yield and less blueberry plant deterioration will be selected for further series of greenhouse and field long-term research.

Key words:
Reclaimed water, blueberry, salinity, Florida

Impacts of acidification and fertilization on soil quality and citrus tree production.

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Abstract:
Soil pH has varying effects on soil fertility and nutrient availability. In fact, soil acidity regulates the availability of macro and micronutrients. This study proposes three different experiments. The first experiment ascertains the effects of soil acidification on CLas population and root physiology under greenhouse conditions. This study hypothesizes that soil acidification will alter apoplast and phloem pH, reducing CLas population and root damage. The second experiment tests the use of organic acids for soil health improvement, nutrient uptake, and tree productivity in the field conditions. The second study hypothesizes that organic acids combined acidification and soil health enhancement will result in improved nutrient uptake, CLas suppression, and optimal tree response. The third experiment evaluates various fertilizer products for improved fruit yield, soil quality, and rehabilitation of HLB-affected trees. The third study hypothesizes that a good soil fertility program enhances the quality and production of HLB-affected trees. Two-year field and greenhouse studies will be conducted at the Citrus Research and Education Center (CREC) to evaluate acidification and fertilization impacts on soil quality and citrus tree production. Tree response, fruit yield quality, juice quality, and tissue and soil chemical characteristics will be measured. Preliminary findings from similar studies that have been done for modifying soil pH using humites; fulvic acids and humates are also known for high exchange capacity and influence nutrient availability. Besides altering soil pH, additional benefits should be expected from soil acidification using acids and the proposed fertilization program.

Abbreviations

Candidatus Liberibacter asiaticus	CLas
Huanglongbing or citrus greening disease	HLB

Coral epibionts may play an important role in the coral host microbiome and delivery of beneficial microbes for coral.

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Corals host a consortium of microbial organisms that play vital roles in coral health, growth, and development. Recent studies reveal that corals can share microbes via mobile consumers (e.g., snails and fish), which travel between coral colonies. These studies often follow specific pathogens and rarely consider the overall microbiome or investigate the transmissibility of potentially beneficial microbial taxa. Conceivably, microbial homogenization among corals, through consumer exposure, can occur, especially with multiple microbial transmissions. I proposed a novel multi-faceted comparative study to elucidate routes and transmissibility of various microbial groups through a coral-reef consumer mediated pathway. In this study, we attempted to manipulate the microbial relationship between the coral, *Acropora cervicornis,* and the reef consumer, *Domecia acanthophora,* by feeding reef consumers potentially beneficial microbes for corals (pBMCs) and allowing the them to transmit these pBMCs to corals under stress. I intend to explore the reef consumer's ability to uptake, retain, and transmit these pBMCs. I will also examine how consumers alter microbial composition and abundance of microbes for corals under stress, specifically excess nutrient stress. The coral species, *Acropora cervicornis*, was chosen due to its life history strategies as a broadcast spawner and the relative importance that horizontal (from the environment) transmission plays in determining coral microbial assemblages within the genus. The Elkhorn Coral crab, *Domecia acanthophora*, was chosen as the reef consumer as it demonstrates a symbiotic relationship with *A. cervicornis* and is ubiquitous throughout the Caribbean. Recent literature suggests that the crabs provide regular cleaning services that may be critical in removing sediments and unwanted materials from a coral's surface. Furthermore, some crab species are known to scrape mucus or coral polyps rather than create deep predation scares. This feeding style may be an effective way of reducing coral wounding and decrease entry points for potential pathogens. As corals remain threatened by disease, it is imperative to not only understand the functional role of these crabs but also to expound upon the microbial role that reef consumers play in the horizontal transmission and maintenance of the coral microbiome. Due to the nature of these consumers as generalists feeding on a variety of coral species, and their constant interaction with corals, it is likely that sharing of microbial communities across species is common and potentially influential for coral health. This work will expand on studies of host microbial interactions among invertebrate species and broaden the understanding of how host microbial interactions can influence the larger ecosystem.

Shifting Macrophytes: *Thalassia* and *Caulerpa* Support Unique Ecological Communities

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Macroalgae are replacing seagrasses in marine ecosystems across the globe. Macroalgae beds can support unique faunal assemblages compared to seagrasses and can therefore drive changes in community structure and ecological function as they increase in abundance. However, large changes in the relative abundance of marine macrophytes often occur as a result of anthropogenic impacts such as eutrophication and associated light limitation. These background environmental conditions often hamper attempts at isolating the effects of seagrass replacement by macroalgae on ecological communities. To understand how changes in macrophyte abundance may affect ecological communities, we sampled *Thalassia testudinum*, *Caulerpa prolifera*, and *Caulerpa paspaloides* monocultures as well as mixed habitats for benthic invertebrates and fishes in a low-nutrient and minimally-impacted system: Crystal Bay, Florida. Species composition and diversity differed significantly among habitats and sampling times. Temporal changes in species composition reflected seasonal shifts in macrophyte relative abundance. Differences among habitats and seasons were driven primarily by differences in the abundance of several numerically dominant species and, to a lesser extent, species turnover. The results of our sampling efforts suggest that seagrasses and macroalgae support complex, yet unique communities, in Floridian waters.

Abstract. As Florida's population continues to grow, many natural land cover types are being converted to support this growing population (e.g., forest to urban). As these natural land covers are converted, changes in surface imperviousness can lead to changes in downstream water flow. Water flow changes have direct implications on both human and environmental systems like increased flood risk. Here we work to develop a back-of-the-envelope calculation to determine how changes in land cover influence Florida streamflow. Specifically, we span 2001-2016 using precipitation, land cover, streamflow, and impervious datasets to find the watershed residence time with the greatest correlation between watershed characteristics and water transport. This model will help quickly identify hydrological changes throughout Florida watersheds that can lead to a variety of future research impacts like investigating impacts to flooding, nutrient loading, and outcomes of urban planning strategies. Ultimately, we seek to contribute to the sustainable management of Florida landscapes.

From the document "Estimating maximum streamflow impacts by land cover change in Florida Watersheds" by Zoe Spielman, Kevin Easton, John Flores, Kyle Williams, and Samuel Smidt

Variability in Seagrass Monitoring Methods: Balancing Precision and Experimenter Bias

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Seagrasses are ecologically and economically important foundation species that are declining globally. Robust monitoring programs are therefore needed to detect change. Many monitoring programs exist, but they tend to use slightly different monitoring methods. We conducted a review of the primary literature as well as reports from Florida statewide seagrass monitoring programs and identified percent cover, percent occurrence, point count, and Braun-Blanquet as common methods used to measure seagrass cover. We tested the efficacy and comparability of these methods in a field experiment in Cedar Key and Crystal River, Florida. At six sites, we established four stations that were visited by four data collectors estimating seagrass cover using each method. To compare biases by data collector, we calculated coefficient of variance within a station. Point count had a significantly higher variance indicating low comparability between collectors. We also calculated variance between stations within a site. We found that Braun-Blanquet and percent occurrence had statistically low variation indicating that these methods are less sensitive in detecting changes in seagrass cover. Overall, these preliminary results show that methods are not always comparable and indicates that choosing the appropriate method of estimating seagrass cover requires a tradeoff between comparability and sensitivity.