Intermission - 1st floor lobby, 2 pm

Our partners from The Nature Conservancy will be briefly speaking, so grab a snack and gather around!
Learn more about what TNC does in Ohio specifically here.

Poster Presentations - 1st floor main hallway, 1 - 4 pm

Undergraduate students

1 - *Redevelopment and Risk: Urban Land-Use Change in Pittsburgh's Floodplains (2000–2020)*
Allie Beniston, Department of Geography, Kent State University

Urban development along post-industrial river corridors can reshape patterns of flood risk and produce uneven exposure across neighborhoods, raising concerns about long-term resilience. This study analyzes how urban land-use change within designated floodplains has evolved along the river corridors of Pittsburgh, Pennsylvania, between 2000 and 2020. Using land cover data from the National Land Cover Database (NLCD), this research evaluates development trends across multiple time points and combines these data with Federal Emergency Management Agency (FEMA) 100-year floodplain boundaries to assess changes in floodplain exposure. The results show that development increasingly concentrates along river corridors, with a shift toward more intensive land uses over time. Much of this change reflects the redevelopment of former industrial land rather than expansion into undeveloped areas. At the same time, the extent of developed land within floodplain boundaries increases, indicating that redevelopment has continued in areas that remain vulnerable to flooding. These patterns suggest that urban redevelopment has not only reshaped the physical landscape but has also influenced the spatial distribution of environmental risk. By combining spatial analysis with an understanding of Pittsburgh's post-industrial

transformation, this study highlights how redevelopment processes intersect with floodplain dynamics. The findings provide insight for land-use planning, floodplain management, and long-term resilience strategies in Pittsburgh and other post-industrial riverine cities.

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2 - *Under the Shell: Exploring the Relationship Between Bacterial Abundance and Lysozyme in Lizard Eggs*
Allison Remick, Department of Biological Sciences, Kent State University (ESDRI Fellow)

Microbes are known to influence the growth and development of many vertebrate species. However, there is little known about how these microbes explicitly influence a host's earliest stages of life. Recent studies have demonstrated that wild vertebrate eggs contain microbial DNA, suggesting that eggs may harbor microbial communities that could have significant effects on embryo development and hatchling fitness. It is unknown whether these microbes are living given high concentrations of lysozyme that protects the embryo from bacterial colonization. To address this knowledge gap, we sought to: (1) determine whether lizard eggs contain viable microbial communities and (2) test whether total bacterial abundance is affected by lysozyme concentration. We collected eggs directly from the oviduct of adult female wall lizards (Podarcis muralis) at various stages of gravidity. Egg contents were extracted after external sterilization by lysing the egg and diluting in sterile PBS. Each sample was cultured on both brain heart infusion and trypticase soy agar. We next quantified lysozyme activity and total bacterial abundance using 16S rRNA qPCR. Preliminary qPCR results revealed a consistent presence of microbes in each egg regardless of developmental stage. Bacterial abundance was not associated with lysozyme concentration, suggesting the presence of lysozyme resistant bacteria. Culture plates showed growth of morphologically similar colonies across samples. Together, these results support the hypothesis that living microbes are present within vertebrate eggs and that lysozyme resistance is the primary mechanism by which they avoid lysis via bacteriolytic enzymes in the egg.

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3 - *From Barns to Bay: Mapping Animal Feeding Operation Manure Risks in the Chesapeake Bay Watershed Using Geospatial AI*
Andrew Shenal, HESI Lab, Department of Geography, Kent State University (ESDRI Fellows)

Agricultural manure contributes an estimated 19% of nitrogen and 26% of phosphorus loads influencing Chesapeake Bay. Existing documentation often lacks the location of the animal feeding operations [AFOs] that store and produce this manure across the region, despite their locations providing significant benefit to watershed management through nutrient planning and risk assessment. This study utilizes Meta's Segment Anything Model and high-resolution aerial imagery to identify AFOs in the Chesapeake Bay Watershed, providing a comprehensive database of their locations. Further, with high-resolution land cover data in the watershed, liquid manure storage locations can be interpolated and documented. Results reveal a significant portion of AFOs create risk of watershed contamination due to presence of manure and waterway connectedness. The resulting database provides a foundational resource for nutrient planning, regulatory prioritization, and watershed management across the region.

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4 - *The System of Provisioning : Tackling Food Insecurity through Community-Based Food Assistance in Mahoning County*
Anna Fink, Department of Geography, Kent State University (ESDRI Fellow)

Over one-eighth of American households suffer from food insecurity, a prevailing and persistent issue characterized by the lack of reliable access to sufficient, safe, and nutritious food (Coleman-Jensen, 2015). Catalyzed by sharp economic recessions and heightened levels of food insecurity in the 1970s, emergency food assistance emerged as a valuable food provisioning system. These programs include food pantries, food banks, soup kitchens, and no-cost distribution models. Previous research conducted on food assistance highlights federal assistance programs and recipient perspectives. This study explores the organizational structures and values of community-based programs in Mahoning County and how the factors listed above affect efficiency in addressing food insecurity. Conversations with directors of food distribution programs located in Mahoning County revealed two key themes which influence efficiency : partnerships and funding. Findings revealed that all locations viewed nutrition as a guiding principle of their mission, with funding acting as the leading barrier towards supporting it. Results indicate that networks of provision, composed of other food assistance programs, hospitals, schools, and businesses, allow community-based provisioners to strengthen food security within their community.

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5 - *Coal mine drainage impact on zooplankton abundance in lakes in the Ohio Muskingum Watershed Conservancy*
Anna Grace Green, Department of Biological Sciences, Kent State University (ESDRI Fellow)
Dr. Joseph Ortiz, Department of Earth Sciences

Zooplankton serve as essential bioindicators of water quality and ecosystem health. Shifts in zooplankton concentrations can reveal early signs of environmental decline within freshwater lakes. The rising prevalence of coal mine drainage (CMD) in lakes in the Muskingum Valley Watershed is leading to a decrease in zooplankton populations. This study examined Atwood, Tappan, and Piedmont lakes, which exhibit impacts of coal mine drainage (increased calcium total dissolved solids and sulfate concentrations) on their zooplankton populations. The loss of zooplankton poses a substantial ecological risk. Zooplankton are primary consumers that are critical to energy transfer, nutrient cycling, and the regulation of algal growth within these freshwater communities. Coal mine drainage is a driving force declining zooplankton community within southeastern Ohio lakes. Zooplankton taxa were characterized by utilizing taxonomic keys, and water quality tests were performed to evaluate ecosystem health within these lakes. We hypothesized a negative correlation between coal mine drainage concentrations and zooplankton abundance in freshwater communities.

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6 - *Artificial Light at Night: Site Prioritization for Ohio Bat Species Conservation*
Anna Penkalski, Department of Geography, Kent State University

Artificial light at night (ALAN) represents an increasing environmental stressor that impacts nocturnal wildlife across multiple scales, yet lacks research within Ohio's landscape. While current literature suggests that flight speed dictates whether species perceive light as a hindrance or foraging benefit, these interactions vary across taxa. The simultaneous positive and negative effects of artificial light across bat species call for a species-specific approach, with this assessment focusing on the Big Brown Bat (Eptesicus fuscus) and the Hoary Bat (Lasiurus cinereus). This research primarily develops a landscape-scale suitability model within Portage County to identify priority research sites where high-contrast light-to-canopy ratios offer ideal conditions for future bat-ALAN studies. Utilizing ArcGIS Pro, the model integrates radiance data with tree canopy density as a secondary ecosystem component to account for vegetative shielding. To evaluate the relevance of existing data, the study performs a preliminary comparison between suitability scores and bat pass frequency data. Evaluating current monitor data allows for an assessment of whether current efforts adequately capture the

range of habitat utilization. By identifying these critical monitoring gaps and providing a list of high-priority target zones for future fieldwork, this project establishes a data-backed framework for securing the resources necessary for species-specific monitoring and mitigation initiatives in Ohio.

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7 - *Characterizing Magnetotactic Bacteria from Acid Mine Drainage in Northeast Ohio*
Bryce Stoltz, Department of Earth Sciences, Kent State University
Dr. Courtney Wagner, Department of Earth Sciences, Kent State University
Dr. David Singer, Department of Earth Sciences, Kent State University
Dr. Min Gao, Advanced Materials Liquid Crystal Institute, Kent State University

Preliminary work from acid mine drainage sites in Northeast Ohio further confirm that magnetotactic bacteria (MTB) are present in these ancient Earth- and Mars-like environments. MTB are a genetically diverse group of bacteria that inhabit the oxic-anoxic transition zone (OATZ) in water columns around the globe in various environments. The OATZ is found in chemically stratified water columns and is typically located within the first centimeter or so of the water-sediment interface. MTB biomineralize magnetic crystals, which aid in navigating the water column. The crystals are characterized by different size, morphology, and composition, which can indicate different species with distinct environmental preferences. The magnetic crystals can also be preserved after cell death, recording past environmental conditions and how they have changed over time. Studying modern analog environments strengthens interpretations of past environments.
Acid mine drainage is characterized by low pH values and elevated concentrations of sulfur, iron, and other heavy metals. Studying and characterizing MTB in acid mine drainage can aid in the identification of similar ancient environments and extraterrestrial life. Here, we focus on two acid mine drainage sites in Northeast Ohio, a transect of the remediated Huff Run watershed and a transect of the non-remediated Yellow Creek. Light and transmission electron microscopy were used to confirm whether MTB are present, and if so, their cellular morphology, magnetic particle composition and magnetic particle morphology. MTB were found in a Huff Run sample, but not in any of the Yellow Creek samples. Magnetic extracts are to be performed to further confirm the absence of MTB in the Yellow Creek samples. Moving forward we also plan to investigate what specific conditions are potentially inhibiting the grow of MTB in Yellow creek and what types of potential role MTB have in toxic metal mobility in these systems.

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8 - *Craving for worms: Do House sparrows selectively forage for arthropods prior to breeding?*
Corey Alexander, College of Arts and Sciences, Kent State University
Dr. Brian Trevelline, Department of Biological Sciences, Kent State University

A bird's diet plays a large role in reproductive fitness. Most passerine birds in temperate climates adjust their diets in preparation for breeding. This change usually means consuming more invertebrates, which are rich in essential nutrients critical to reproduction. For example, granivorous House sparrows (Passer domesticus) opportunistically consume invertebrates during breeding, but it is unknown whether this diet shift is driven by a change in sparrow feeding preferences. If given the choice, will captive house sparrows willingly choose a diet with invertebrates over a regular seed diet as breeding season approaches? To answer this question, we engaged 48 KSU undergrads to conduct a controlled and observer-blinded feeding trial using behavioral observations as part of a laboratory module for two sections of Ornithology (BSCI 30582). Captive sparrows housed in the Trevelline Lab Aviary were given a free choice between hanging tube feeders filled with either the regular seed diet or a seed mix supplemented with dried mealworms. Students recorded the total number of birds feeding or perching on each feeder every 15 seconds for 3 minutes, with multiple replicates for each of 8 total animal rooms containing 5-11 adult sparrows. Overall, our data showed that birds exhibited a preference for the seed mix supplemented with mealworms, supporting our hypothesis that House sparrows preferentially select for invertebrates in preparation for breeding. Interestingly, there was variation across rooms in terms of feeding preference, suggesting host feeding preferences are also variable across individuals, possibly affected by factors such as individual age, sex, and social hierarchies within the captive colony.

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9 - *Water Intermittency in Kigali, Rwanda*
Finn Machuga, Department of Geography, Kent State University (ESDRI Fellow)
Dr. Sarah Smiley, Department of Geography, Kent State University

The UN has presented many goals to increase global water security. These have included Millenium Development Goal 7, which aimed to "Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation" and the Sustainable Development Goals which aim to "Ensure availability and sustainable management of water and sanitation for all." These goals have included indicators that are well-meaning, but fail to represent the diverse circumstances that

allow or prevent water access. Additionally, they lack metrics to measure how severe water insecurity is for households or individuals, how those affected adapt, and what resilience techniques develop over time. To expand water security knowledge, researchers have developed the HWISE (Household Water InSecurity Experiences) Scale which includes these metrics. This study aims to expand the definition of water security by utilizing HWISE Scale within a case study of water usage in Kigali, Rwanda. Kigali is an important site for this project as there is a prevalence of water intermittency issues in the area, another under researched aspect of water scholarship.
In Kigali, 110 surveys were conducted which asked community members about water sources and storage, frequency and severity of interruptions, and levels of worry. Interesting patterns emerged from these field surveys. Water security seems to vary greatly between neighbors; specifically, some of the interviewees have access to tanks that hold up to 10,000 l of water and fill up automatically while some interviewees manually fill up and store a handful of jerry cans. It does not seem that storage size directly affects the worry or severity of worry of interviewees and many people's worries are based on which activities are limited by the intermittency. Further examination is necessary to develop a deeper understanding of the qualitative and anecdotal data provided by the interviewees.

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10 - *Land Back Definitions and Typology*
Mallory Turnbull, Environmental Studies, Department of Geography, Kent State University (ESDRI Fellow)
Finn Machuga, Environmental Studies, Department of Geography, Kent State University (ESDRI Fellow)

In its most barebones form, the LandBack movement is the newfound term for the return of ancestral land to indigenous peoples. However, the call for land return to Indigenous peoples has existed since the land itself was unrightfully taken. Despite the straightforward wording LandBack encompasses much more than the physical act of land return. The LandBack movement itself is about the spiritual, personal, and physical connections to the land as well as the objectives behind the return of the land. The approach of our research took the form of Two-Eyed Seeing; this is a foundation developed by the Mi'kmaq elders that discusses the incorporation of lenses, one of western science and the other of indigenous knowledge. Through the Western lens, we analyzed how LandBack was discussed in scholarly articles, as well as the language choices that the authors used around the objectives of LandBack. This resulted in 20 "definitions" used to breakdown the typology surrounding LandBack. To incorporate the feedback of indigenous peoples into our research we presented our work at the

California Native American Tribal GIS Summit and received feedback from the participants. The results of our research can be utilized in two ways: First, as a way to determine if different objectives of the LandBack movement yield different results; and second, as a way to better streamline the understanding of LandBack and develop a common language for land return policies.

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11 - *Stewardship of Keystone Species at Frog Bay National Tribal Park*
Mallory Turnbull, Environmental Studies, Department of Geography, Kent State University (ESDRI Fellow)

Ecological keystone species (EKS), by definition, play a vital role in their respective ecosystems due to their unique ability to hold the natural environment together (NRDC). Similarly, Indigenous cultural ecological keystone species have an intrinsic role in the cultural well-being of specific peoples. Research around ecological keystone species is common in the conservation sciences. However, our understanding of cultural ecological keystone species (CKS) remains an under-developed topic despite recent interest, with literature on cultural ecological keystone species on the rise. This project proposes an analysis of the relationship between keystone and Indigenous cultural ecological keystone species through a scoping review of existing literature. I specifically propose to examine how environmental stewardship and Indigenous traditional ecological knowledge (ITEK) shapes the conservational practices of Indigenous cultural ecological keystone species within Frog Bay National Tribal Park, led by the Red Cliff Band of Lake Superior Chippewa (Ojibwe). This project seeks to find how environmental stewardship shapes the approach to the conservation of Indigenous cultural ecological keystone species over ecological keystone species. This research further develops the differentiation between the approaches of the stewardship of EKS and CKS to promote a more holistic ethnoecological lens for their conservation.

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12 - *Microplastics (MPs) in Canned Fish Samples*
Grace Dorfi, Department of Biological Sciences, Kent State University
MD Zobayer Rahman, Department of Biological Sciences, Kent State University
Dr. Xiaozhen Mou, Department of Biological Sciences, Kent State University

Microplastics (MPs) are particles of plastic that are 5 mm in diameter or less and are typically formed through the degradation of larger plastic products. MP pollution has caused growing concern because of the potential impacts of MP exposure in the tissues

of organisms, especially organisms that are to be consumed. This study aimed to determine the presence of MPs, if any, in the tissue of canned fish. Three cans of fish were purchased, with three different species being analyzed: salmon (Salmo salar), sardine (Sardina pilchardus), and tuna (Katsuwonus pelamis). Canned fish samples (20 g from each homogenized samples) were digested in 10% KOH to remove organic matter. The remaining solution containing MPs were filtered onto GFF filters, stained with Nile Red, and quantified and classified (pellets, films, fibers, filaments, and fragments) using fluorescence microscopy. All microplastics were identified in all three samples in the form of films, fibers, and filaments. To expand on this study, samples from various brands of canned fish can be tested, comparing budget brands to premium brands to determine if price point correlates with the presence of MPs.

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13 - *Surveying Bee Populations on Campus*

Gustavo de Azevedo Nantes, Department of Biological Sciences, Kent State University
Dr. Thomas Franzem, Department of Biological Sciences, Kent State University
Dr. Katie McNamara Manning, Environmental Science and Design Research Institute, Kent State University
Dr. Christie Bahlai, Department of Biological Sciences and Environmental Science and Design Research Institute, Kent State University

Native bee decline can have severe effects on the environment because they are the primary pollinators in both agricultural and wild settings. We aim to understand the bee community on campus and which plants they are visiting so we can provide supportive habitat to them all season long. With other students, I conducted surveys of 5 areas on campus - 3 ornamental gardens, a prairie, and a wildflower planting. We used modified vacuums, collecting bees within a 15 minute sampling window at each site. The bees were collected into vials and photographed individually. We recorded which plants they were on and uploaded it into iNaturalist. In total, we captured nearly 300 bees and found that higher flower diversity at sites was associated with more bees.

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14 - *Quantitative Analysis of Indigo Content in P. Tinctoria Grown Under Different Nitrogen Concentrations*

Helen McLellan, School of Fashion, Kent State University (ESDRI Fellow)
Dr. Sarah Eichler, Department of Biological Sciences, Kent State University

Almost all dyes in the modern textiles industry are synthetic including those used for denim. Local supply chains are uncommon with over 97% of textiles sold in the US being made in other countries. Together, these features lead to significant environmental and societal harms. To counteract these harms, local natural dyes may provide a more environmentally conscious method of dyeing textiles. Polygonum tinctoria, also known as Japanese Indigo, has a long history of use in blue textile dyeing. Natural dyeing and the domestic cultivation of dye goods provides an opportunity for the textile industry to reduce environmental harm. This study looked at the efficacy of indigo dye extraction techniques using the stem and leaf tissue of P. Tinctoria.

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15 - *Differential Chlorophyll Responses of Kale (Brassica oleracea) to Mechanical Damage and Light Deprivation*
Isabel Traska, Department of Biological Sciences, Kent State University (ESDRI Fellow)

Plants show diverse physiological responses to physical and environmental stressors, yet pigment responses to localized mechanical damage versus light limitation remain poorly studied in leafy crops. This study investigated chlorophyll dynamics in greenhouse-grown kale (Brassica oleracea). One group was grown under control conditions, three under mechanical damage treatments, and one under light deprivation.Chlorophyll a and b concentrations were quantified weekly over ten weeks using spectrophotometric analysis, and total chlorophyll was calculated. Linear models demonstrate significant treatment effects for chlorophyll a, chlorophyll b, and total chlorophyll. Light deprivation resulted in an evident increase in total chlorophyll over time, while mechanically damaged plants did not significantly differ from control plants. Significant treatment to time interactions show that pigment responses were dynamic, notably under reduced light. In contrast, chlorophyll ratios were not significantly affected by treatment, suggesting an increase in pigment concentration rather than structural changes in pigment composition. These findings exhibit the resilience of kale to localized mechanical damage and highlight adaptive chlorophyll accumulation under light limitation.

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16 - *Two-Eyed Seeing: A Remote Sensing Approach to Monitoring Wildfires on Indigenous-Owned Lands*

Jackson Miller, Department of Geography, Kent State University (ESDRI Fellow)
Dr. He Yin, Department of Geography, Kent State University

Wildfires across the Western United States have continuously shown their destructive capabilities, with recent examples including the Park Fire of Northern California that burned 425,000 acres of land and the smaller, but no less destructive Palisades Fire, which burned in Los Angeles County. Going forward, with the advance of Climate Change, it is expected that these wildfires will become more destructive and frequent. Previous studies have shown that Indigenous land management practices, such as cultural burns, limit wildfires' ability to spread and cause subsequent damage. These claims are widespread, but little research has been conducted to validate them through a remote sensing lens. This study's purpose is to identify areas that implement Indigenous management practices and to quantify their ability to limit wildfire destruction and spread.
To achieve this, this study looked at an Indigenous-owned area named Tásmam Koyóm in the Sierra Nevada region of California. This site was purchased by the Mountain Maidu people in 2019. The land has been managed by cultural burns, restoration of stream hydrology, and beaver reintroduction. In 2021, the Dixie Wildfire burned through this region, allowing for a comparison of this land to the nearby non-Indigenous owned parcels. A nearby timber preserve located southwest of Tásmam Koyóm was compared to the Indigenous-owned land with regard to burn area and severity using burn indices such as dNBR and land cover classifications. Calculations found that burn severity was higher on the timber preserve. The severity difference was most apparent in the forested areas of the land.

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17 - *Effects of seasonal changes on gut microbiome composition and diversity in American Goldfinches (Spinus tristis)*

Jami Greb, Department of Biological Sciences, Kent State University (ESDRI Fellow)
Dr. Sangeet Lamichhaney, Department of Biological Sciences, Kent State University
Trixie Taucher, Department of Biological Sciences, Kent State University
Aarati Basnet, Department of Biological Sciences, Kent State University

The gut microbiome is a symbiotic relationship between a host animal and the microbes residing inside its gastrointestinal tract, aiding in digestion, metabolism, and other physiological processes. The gut microbiomes in birds are largely known to be influenced by environmental factors, and shifts in the microbiome may assist them in adapting to environmental changes. Relatively few studies have examined how gut microbiomes change across seasons in wild birds. In this study, we aim to understand

how seasonal changes influence the composition and diversity of the gut microbiome in American Goldfinches. We also studied differences in the gut microbiome between sexes as they have sexual dimorphism in their carotenoid-based plumage color, and the production of this yellow pigment is known to be associated with the gut microbiome. We used intestinal content from American Goldfinches caught during all four seasons over a year and used 16S rRNA sequencing to characterize their gut microbial communities. Although we observed substantial inter-individual variation in microbiome composition and diversity, we did not detect significant seasonal or sex-based patterns. These results suggest that, in American Goldfinches, gut microbiomes may be relatively stable across seasons or sexes, indicating that host–microbe interactions are possibly buffered against seasonal changes and that other factors may play a larger role in shaping microbial communities than seasonal or sex-related differences.

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18 - *Regional Ethics in Zoo Education: A U.S. and South Korea Comparison*
Jessica Specht, Environmental Studies, Department of Geography, Kent State University

This research project focuses on the differences between zoological parks in South Korea and zoos in the United States and how they promote, deliver, and prioritize wildlife-focused education programming. By comparing the Cleveland Metroparks Zoo and the Columbus Zoo with Seoul Grand Park, this project evaluates how each zoo structures its programs, the themes they focus on, how they teach and promote these programs, and how the public engages with them. These zoos maintain similar goals, but they differ in their approaches, and what these patterns suggest about the most effective ways to support public learning about wildlife. Framing this comparison within environmental ethics, especially the difference between conservation-focused and preservation-focused approaches, helps explain why these zoos may vary in their educational goals and strategies. Through this research, the project aims to identify patterns in program design, priorities, and cultural values, showing insight into the most effective ways to support learning about wildlife across different regional and ethical contexts.

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19 - *Developing a Computer-Vision Model to Quantify Bird Behavior*
Kyle Goertler, Department of Biological Sciences, Kent State University (ESDRI Fellow)
Robert Boyd, Department of Biological Sciences, Kent State University

Behavior is a critical characteristic that shapes the ecology and evolutionary biology of birds. However, traditional methods used in quantifying behavior in both controlled and natural settings remains constrained by labor-intensive manual scoring, limited sampling frequency, and susceptibility to observer biases. Recent advances in computer-vision object detection modeling offers the potential to address these limitations. To explore this potential, a computer-vision model was designed to recognize male and female House sparrows (Passer domesticus) in a captive aviary setting, as well as the objects within their enclosures, such as feeders, perches, and nest boxes. In tandem with the model, a framework was developed to quantify the presence, activity, and interactions of avian subjects within their enclosures. Passive presence was measured through 'snapshot' counts of detected subjects predicted within a frame, while activity was monitored and quantified via tracking the displacement of detected subjects. Active engagement, or interactions, with environmental objects was defined by accounting for overlapping bounding boxes. By translating object detection outputs directly into organized behavioral metrics, the framework enabled continuous measurement of research subjects. However, the reliability of the detection output remained varied across subject prediction, constrained mostly by lighting conditions, as well as the available methods of camera positioning. The variation observed in detection highlights the importance of dataset composition, model architectural design, and the impact that lighting and camera positioning has on prediction. The results of these initial tests provides a methodological foundation for integrating computer-vision models into behavioral ecological studies of birds.

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20 - *Propagating Echinacea purpurea Near Autumn Dormancy and Assessing Its Medicinal Content: A Preliminary Study*

Lauren Alexandra DiGiacomo, Department of Biological Sciences, Kent State University
Dr. Carolina Schuchovski, Department of Biological Sciences, Kent State University
Dr. Edgar Kooijman, Department of Biological Sciences, Kent State University

Echinacea purpurea is a perennial native to Ohio. It is well-regarded for its potential medicinal value, attributed to a host of secondary metabolites including polyphenols. E. purpurea is most easily propagated by seed, but vegetative propagation is of interest because it strongly conserves useful traits. However, this species dies back during winter, leaving only dormant root crowns to work with. We are investigating the propagation of E. purpurea root crowns harvested in October.

The crowns were planted in tubes of vermiculite and perlite, situated inside a deep water culture bin built by a talented botany student. The crowns were pre-soaked in either water, a solution of BAP cytokinin, or both BAP cytokinin and IAA auxin. Auxins and cytokinins are used to promote root and shoot growth, respectively. However, their effects on growth and organ differentiation are nonlinear; they antagonize and modulate one another in such a way that calls to mind Yin and Yang (Schaller et al., 2015). Additionally, we are trying to develop a method for qualitatively measuring polyphenol content without specialized machinery. This involves conducting thin layer chromatography with glass/silica gel plates and an iodine stain. We are testing solvents of varying polarity on standards of chlorogenic acid (a polyphenol precursor to E. purpurea's most abundant medicinal compound) and vegetable extracts.
Our results to date suggest that both BAP alone and the mixed treatment yielded plants with significantly (P < 0.001) more leaves than control. For the mixed treatment, this was accompanied by a significant increase in aboveground dry mass (P < 0.05). Results from the chromatography are pending. We have found a solvent that functions, yet are searching for better separation.
We hope our results can aid growers as well as students conducting E. purpurea research with limited resources.

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21 - *Exploring AI Applications: Utilizing Artificial Intelligence to Detect and Identify Fauna Caught on Camera Traps*
Lauren Sigrist, Department of Biological Sciences, Kent State University (ESDRI Fellow)
Dr. Greg Smith, Department of Biological Sciences, Kent State University

In an ever evolving world, artificial intelligence (AI) has become a prevalent topic. AI has the potential to be utilized in most fields of study and will likely have a major influence on the future of research.What does this mean for the future of human researchers? In order to understand the reasonable uses of AI we must first understand the abilities and limitations of the AI systems in use. One prominent application of AI in the field of biological sciences is the use of AI to catalog and analyze data at a rapid rate. Utilizing the website WildlifeInsights, and the artificial intelligence system within the site, we can explore the application of AI in identification of animal species caught on camera traps. WildlifeInsights is a public domain server that serves as both a database and a program that can be used to analyze data from the uploaded images. Upon uploading images the user is prompted to enter information regarding the camera trap, including location. The location data allows the AI program to narrow down the potential species caught on the camera trap. Using this information the AI analyzes each photo for the presence of

fauna and notes the observation in a datasheet. Images with detected fauna are then cataloged by varying taxonomic level, including those with unidentifiable fauna marked for review by the user. The program could vastly decrease the amount of time and manpower needed to manually catalog camera trap images from a research project, but may be limited in its abilities. In order to determine if WildlifeInsights is an application that could be of value to biological science researchers the limitations of the site must be explored and defined. Here, we investigate those limits with data from three geographically separated locations: Ohio, Florida, and California.

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22 - *Feeding the gap: How policy shifts reshaped food access in Ohio*
Lily Stenroos, Department of Geography, Kent State University

US food policy produces social and economic structures that create barriers for many communities in accessing food. Federal and state governments have restructured social welfare and nutrition assistance programs dramatically, negatively altering eligibility and funding capacity. In response, food banks and other nutrition assistance programs have expanded exponentially, becoming increasingly relied on in the fight against hunger. The shift raises important questions about the changing role of the state in ensuring food access and growing reliance on emergency food systems to meet long-term needs. How have recent federal and Ohio state policy shifts reducing public social service and nutrition program capacity contributed to the institutionalization of emergency food systems as a primary food access mechanism in Ohio? This project examines how changes in public assistance programs reshape the state's food security landscape, using SNAP usage rates over time, federal and Ohio state policy documents, legislation, and budget reports related to state and federal funding levels for nutrition assistance programs. The findings suggest that as public assistance capacity declines, reliance on food banks and charitable food networks increases. The significance signals a structural shift in how food insecurity is addressed. Instead of serving as short-term, emergency responses, food banks and charitable food networks are becoming institutionalized as central pillars of Ohio's food access system.

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23 - *The fungal role of phosphorus storage in wetland ecosystems*
Niah Cohen, Department of Biological Sciences, Kent State University (ESDRI Fellow)

Arbuscular mycorrhizal (AM) fungi enhance the uptake of essential nutrients such as phosphorus (P) by expanding the effective root surface of plants. Excessive agricultural P runoff fuels algal blooms which deplete dissolved oxygen, block sunlight, drive

eutrophication in aquatic ecosystems, and sometimes produce toxins. This project investigates how AM fungi can facilitate P removal from the water column by promoting its incorporation into plant biomass. An inoculum containing AM fungi was sourced using trap culturing methods from a local campus wetland and used to inoculate Asclepias incarnata, an obligatory wetland plant, which was grown under controlled P-enrichment regimes. A spore viability assay confirmed the presence of AM fungi in the soil inoculum using an ultrasound–centrifuge extraction technique, yielding an estimated 400 spores per gram of soil. Additional soil characterization, including pH, electrical conductivity, and Mehlich-3 P extraction, will support analyses linking soil chemistry, AMF activity and plant nutrient uptake. We will compare plant biomass, plant tissue nutrient levels, and hyphal extensions between replicates treated with different levels of phosphorus. We hypothesized that AM-inoculated plants in the low-P treatment group will act as temporary P sinks by sequestering P in biomass. The study will illuminate the capacity of AMF-mediated wetland vegetation to mitigate P driven eutrophication, offering a scalable bioremediation strategy for nutrient-laden water caused by excessive agricultural runoff.

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24 - *Climate Change and Decomposition: How Will Temperature and Precipitation Affect Decomposition Rates in Rivers Under Future Climate Scenarios?*
Ruth Morara, Department of Biological Sciences, Kent State University
Dr. Dave Costello, Department of Biological Sciences, Kent State University

Decomposition plays a key role in carbon cycling, as it determines how long carbon remains stored in recalcitrant organic matter, before it is converted into more labile forms. Changes in temperature and precipitation due to climate change have the potential to alter ecosystem processes such as decomposition. Predicting the effects of climate change on decomposition rates in freshwater streams could be a critical step toward elucidating how organic matter availability will change under future climate scenarios. This study used the global CELLDEX decomposition data set and an existing boosted regression tree (BRT) model to predict stream decomposition rate at watershed scales under two climate scenarios: shared socioeconomic pathway 126 (SSP126) and shared socioeconomic pathway 585 (SSP585). Three climate variables extracted from Global Circulation Models (GCMs) predicting conditions in 2100 were used as inputs in the BRT model: mean annual air temperature, temperature range and precipitation. We compared predicted changes in decomposition rates across watersheds with a wide range of climates, from polar to equatorial. A sensitivity analysis was conducted to determine which climate variable(s) had the greatest impact on decomposition rate in each watershed. There was a general trend of increased decomposition rates under

both SSPs in all but one of the watersheds studied. However, the sensitivity analysis showed that the changes in decomposition rate and the degree of impact of each climate variable were regionally specific. The results of this study highlight the sensitivity of decomposition to climate change and provide region-specific guidance on important climate drivers.

Graduate students

25 - *Pollinator Body Size and Community Structure Shape Reproductive Outcomes in Rosa multiflora*
Abigail Koman, Department of Biological Sciences, Kent State University
Dr. Oscar Rocha, Department of Biological Sciences, Kent State University

Pollinator communities influence plant reproductive success and vegetation dynamics. However, few studies have investigated how pollinator body size influences pollen transfer and plant reproductive success. We examined how pollinator size influences reproductive success in the invasive shrub Rosa multiflora and its potential consequences for plant community structure. Field experiments were conducted at three sites in northeast Ohio representing open and forested habitats. Flowering branches were subjected to mesh exclusion treatments (1 mm, 3 mm, 5 mm, 10 mm, and no mesh control) to restrict pollinator access by body size. Pollinator visitation and community composition were quantified through standardized 20-minute observations conducted across 150 treatment replicates. Reproductive success was measured using hip set, seed production, seed mass, and fruit mass. A total of 248 floral visitors representing more than twenty pollinator families were recorded across sites. Syrphidae were the most frequent visitors, particularly at the two open habitats where visitation was highest and communities were dominated by Toxomerus marginatus. Pollinator abundance increased with mesh size, with the greatest visitation occurring in control and 10 mm treatments that allowed access by larger insects. In contrast, flowers accessible only to small bodied insects received few visits. The forested site supported fewer overall visitors but exhibited relatively high representation of halictid bees in control flowers. Pollen deposition and reproductive output declined with decreasing mesh size, indicating that larger pollinators contribute disproportionately to effective pollination. These results suggest that changes in pollinator community structure may influence the spread and ecological impacts of invasive flowering shrubs.

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26 - *Mapping crop field size change in conflict hotspots of Sub-Saharan Africa using very-high-resolution images and limited reference data*

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Dr. Esther Ibrahim, Leibniz Centre for Agricultural Landscape Research, Germany
Dr. Lyndon Estes, Graduate School of Geography, Clark University, USA
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Across West Africa, the presence of armed groups, and associated violence and displacements, have contributed to changes in the agricultural landscape . Farmers are forced to alter land management practices, i.e., dividing cropland into smaller and more dispersed fields (agricultural fragmentation). However, the extent of conflict-driven changes to agricultural practices is currently unknown. Satellite observations provide the only feasible means for assessing these changes, yet, remote monitoring of agricultural fragmentation in smallholder-dominated landscapes is challenging due to landscape complexity, limited ground truth data as well as the restricted access to very-high-resolution (VHR) images from the tasking-based satellites. The main aim of this study is to assess spatial-temporal patterns of agricultural fragmentation across Borno State, Nigeria (~ 72 224,55 km2) between 2018 and 2024. We approach data scarcity by integrating existing reference datasets (from Mozambique and Nigeria) and multi-sensor VHR images (GeoEye-1, WorldView-2 and -3) with transfer learning techniques. We utilize existing datasets on field boundaries and a pre-trained FracTAL ResUNet model to produce pseudo labels for our region. We fine-tuned our model using pseudo labels and additional regional set of high quality predicted field boundaries to generate wall-to-wall crop field boundaries as well as cropland extent for our region. Our preliminary results show that our multi-sensor approach can reliably capture agricultural fragmentation in smallholders-dominated regions. Our findings highlight the importance of leveraging remote sensing methods and data to large-area and multitemporal mapping of field boundaries in label-scarce regions.

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27 - *Reflooding Drained Coastal Wetlands Influence on Nitrogen and Phosphorus Flux*

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In Ohio, wetlands are being restored aiming to remove nutrients to prevent eutrophication in Lake Erie. Turtle Creek Bay is a reconnected 148-acre diked coastal wetland within the Magee Marsh Wildlife Area on the shore of Lake Erie. Turtle Creek Bay is fed by Turtle Creek, and its water level is managed by two bidirectional water control structures (WCS). In 2023, due to construction needs, the managers of Turtle Creek Bay closed the WCSs, halting all water supply except precipitation to the wetland. During 2024, the wetland was fully drained. We predicted that reflooding events would cause pulsed release of nutrients from sediments. We wanted to investigate the phosphorus and nitrogen nutrient flux, the transfer of phosphorus and nitrogen between the sediment and water, during reflooding of drained wetland sediments. Along the west perimeter of Turtle Creek Bay, we took 16 intact cores which dried for 31 days and incubated with site water for 72 hours with samples collected at hours 0, 24, 48, and 72. We sampled the inflow and outflow of the cores at each time point and measured soluble reactive phosphorus (SRP), nitrate+nitrite, and ammonium to calculate net nutrient flux in each core. Our results showed the release of nitrate+nitrite and sorption of SRP. Better understanding of reflooding dynamics within coastal wetlands will help create more accurate nutrient budgets for estimate N and P fluxes during reflooding events.

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28 - *A Wetland in Time – Comparing nutrients over different phases of construction*
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Michael Back, Department of Biological Sciences, Kent State University
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Dr. Jay Martin, Department of Food, Agricultural and Biological Engineering, Ohio State University
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Wetlands can process and store nutrients, but when restored on agricultural land, legacy phosphorus could be released to downstream ecosystems and cause harmful algal blooms (HABS). Understanding a wetland's ability to retain P is critical to wetland management and construction as this will determine if the wetland will retain nutrients effectively and prevent HABS. We examined a wetland in Northwest Ohio in the Shallow Run watershed during different construction phases. We took soil samples in the phases of preconstruction, during, and post construction to examine the soil's potential to retain nutrients. We collected the top 5 cm of soil (core diameter=19.05 mm) as they are more likely to interact with the surface water, representing nutrient retention processes. We conducted a water extraction and measured the nutrients

orthophosphate, nitrate, and nitrite. Easily mobilized phosphate (Ortho-P) ranged from 5.23 - 540.97 and nitrate/nitrite (NO2/NO3) values ranged from 48.19-1775.91. There were significant changes across construction periods for Ortho-P (p-value 0.0007). Significant changes were not seen in NO2/NO3 (p value 0.13), but visual evidence shows a slight difference between values between pre and post construction. Other metrics that were measured were pH, SPSC, organic matter, POxC, and conductivity.

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29 - *Browsing between the lines: Using giving up densities to determine habitat selection and foraging preference in white-tailed deer*
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Dr. David Ward, Department of Biological Sciences, Kent State University

Rising populations of white-tailed deer (Odocoileus virginianus) can dramatically alter plant abundance through browsing, but are some habitats affected more than others? Our research aims to determine whether plant chemical defenses differ in effectiveness across habitats. To achieve this objective, we constructed ten feeding stations: five located in prairie habitats and five in forest habitats. Each station contained three treatment totes: a control tote, a volatile organic compound (VOC) tote, and a tannic acid (tannin) tote. All totes were filled with 1 kg of alfalfa pellets and 35 unpalatable rubber tubes to prevent deer from easily obtaining a “free lunch.” To simulate natural plant defense mechanisms, the VOC treatment included a vial of β-pinene, a pre-ingestive foraging cue, while the tannin treatment incorporated a 10% tannic acid solution representing a post-ingestive foraging cue. β-pinene is a volatile compound commonly found in pine species that white-tailed deer typically avoid, whereas tannic acid was used to mimic hydrolysable tannins frequently found in tree bark. Treatment palatability was quantified using giving-up density (GUD), measured over a five-day period following a fourteen-day acclimation period. GUD represents the amount of food remaining when a forager stops feeding because the costs of continued foraging outweigh the benefits. We hypothesized that chemical defenses would be more effective in prairie sites due to reduced cover and increased perceived predation risk. However, we did not observe a significant difference in foraging behavior among the ten sites.

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30 - *Mitigating Antibiotic Resistance Genes in Wastewater Effluents Using Electron Beam Technology*
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Graduate Award Recipient)
Dr. Jean Engohang-Ndong, Department of Biological Sciences, Kent State University
Dr. Laura Leff, Department of Biological Sciences, Kent State University

Wastewater treatment plants (WWTPs) discharge more than 3 billion gallons of effluent into surface water daily, which, in turn, significantly impacts aquatic organisms. Electron beam (e-beam) irradiation is an emerging technology for degrading hazardous substances and sterilizing medical and pharmaceutical products. The purpose of this study was to examine the effects of e-beams on the removal of ARBs and ARGs from effluents of a selected WWTP that discharges effluents into the Cuyahoga River (CR). Treated wastewater was collected from the Kent Water Reclamation Facility, Kent, Ohio, for this study, and three treatments were set up as follows: 1) Treated WWTP effluent only, 2) Treated WWTP effluent with spiked ARGs (sul1, sul2, and tetW) and ARBs, and 3) Sterile water as a negative control. A Dynamitron® 5.0 MeV e-beam accelerator operated by Mercury Plastics, Middlefield, Ohio, was used to irradiate the samples at different doses, including 1, 2, 5, 10, and 25 kGy, to determine the most effective dosage for eradicating ARGs. Viable Bacterial Count was determined using antibiotic-impregnated Luria Bertani broth, while the water samples were filtered using 0.22 µM filters and stored at -80 °C. Filtrates were concentrated multiple times to a final volume of 2 mL and stored at -80 °C to determine ARG persistence after e-beam treatment. DNA from the filters was extracted according to manufacturers' protocols and analyzed for the presence of previously spiked ARGs and 16S rRNA genes by quantitative PCR. Library preparation and sequencing of the V4 region of the 16S rRNA gene were carried out at Michigan State University, Michigan. Bioinformatics and statistical analysis are currently ongoing. Preliminary results indicate that e-beams above 2kGy significantly removed ARBs from wastewater, while ARGs were still detected even at 25 kGy of e-beams. This study demonstrates the potential of irradiation technologies in advanced wastewater treatment processes.

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31 - *Divergent fates: two decades of raptor population change across Ohio's shifting landscape*

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Raptors function as apex predators and ecological indicators, yet comprehensive multi-species assessments of their population dynamics across Ohio's heterogeneous landscapes remain limited. Integrating standardized surveys with citizen science data

provides a powerful but underutilized framework for assessing population trends and spatial distributions at the state level.
We integrated the eBird Basic Dataset (2005–2024; 487,880 breeding-season checklists expanded to 10.7 million detection/non-detection records via zero-filling) and the USGS Breeding Bird Survey (BBS; 2000–2024; ~80 Ohio routes) to assess raptor populations across 1,156 grid cells (10 × 10 km). Of 23 targeted raptor species, 22 were detected in eBird; 11 met BBS thresholds for formal trend modeling, with 6 additional species assessed descriptively. Analytical approaches included hierarchical Bayesian GAM models (GAMYE), single-season and dynamic occupancy models, cross-dataset validation, effort-corrected spatial cluster analysis (Getis-Ord Gi*), and land-use change correlations using annual NLCD data.
BBS trend analysis revealed four species with significant increases—Bald Eagle (+7.04%/yr), Red-shouldered Hawk (+3.90%/yr), Black Vulture (+3.81%/yr), and Turkey Vulture (+2.88%/yr)—and one significant decline: Northern Harrier (−2.50%/yr). Cross-dataset validation showed 82% directional agreement (mean r = 0.41), with strongest concordance for Black Vulture (r = 0.91) and Bald Eagle (r = 0.85). Dynamic occupancy models estimated Bald Eagle colonization rates (γ = 0.404) far exceeding extinction (ε = 0.026), while Northern Harrier exhibited the lowest detection probability (p = 0.228), indicating that approximately 77% of occupied sites go undetected. Land-use change analysis showed a significant association between wetland loss and Northern Harrier decline (r = 0.492, p < 0.001).
Ohio’s raptor community shows divergent trajectories: recovering species contrast with declining habitat specialists. The association between wetland change and Northern Harrier trends suggests habitat loss as a contributing factor. Integrating citizen science with standardized surveys provides a robust framework for tracking these dynamics across Ohio’s changing landscape.

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32 - *Daylighting and Educational Outcomes: Evaluating Classroom Daylight Quality on Academic Performance in Ohio Elementary Schools*
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This study evaluates the relationship between LEED daylighting credit levels and aggregate Grade 3–5 Mathematics and English Language Arts (ELA) performance in Ohio elementary schools. It compares schools with varying levels of daylight exposure to identify the range most supportive of learning and to examine whether excessive daylight may reduce visual comfort and achievement.

Daylight is increasingly valued as both an energy-saving strategy and an important component of healthy learning environments. Previous research suggests that daylight can improve circadian regulation, concentration, memory, and cognitive performance. Although LEED school standards encourage greater daylight access, the amount of daylight that best supports academic performance remains uncertain.
The study analyzed 217 LEED-certified elementary schools in Ohio between 2023 and 2025. Schools were grouped by daylighting credit level from 0 to 3. Aggregate Grade 3–5 Math and ELA scores were compared using linear mixed-effects models and Tukey post hoc tests. To interpret the statistical findings, a representative classroom will be modeled in Rhinoceros 3D and simulated in ClimateStudio to assess illuminance, daylight uniformity, contrast ratio, and glare.
Preliminary analysis indicated a non-linear pattern: schools with moderate daylighting credits performed better than those with very low or very high daylight levels. However, after controlling for school-level differences, daylight credit was not statistically significant ($p = 0.66$). Most variation occurred between schools, and about 72% of the variance was explained by city-level factors.
Daylighting alone does not explain differences in academic performance. School and geographic factors appear more influential, and simulation is needed to understand why schools with high daylight may perform worse. These findings could help to develop evidence-based design and construction strategies and LEED daylighting guidelines for Ohio educational buildings.

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33 - *Microplastics (MPs) in gastrointestinal tract (GIT) of Walleye (Sander vitreus)*
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Dr. Xiaozhen Mou, Department of Biological Sciences, Kent State University

Microplastics (MPs), defined as plastic particles ≤5 mm in diameter, have become a major environmental concern due to their widespread occurrence in aquatic ecosystems and potential impacts on aquatic organisms. In Lake Erie, Walleye (Sander vitreus) is an ecologically and economically important fish species, making it relevant for investigating microplastic exposure. This study examined the occurrence and characterization of microplastics in the gut of Walleye collected from Lake Erie in summer 2025. The full gastrointestinal (GI) tract was removed from each fish sample, and gut contents were collected in sterile tubes. GI samples were then digested with 10% KOH. Afterwards, MPs were filtered onto GFF filters, stained with Nile Red, and quantified and classified into five morphological categories: pellets, films, fibers, filaments, and fragments using fluorescence microscopy. The examined fish had a mean weight of 98.21 ± 54.45 g and

a mean length of 22.11 ± 3.48 cm (mean ± SD). Recovered particles were classified into five morphological categories: pellets, films, fibers, filaments, and fragments. Microplastics were detected in 55.6% of the examined fish, with a mean abundance of 1.33 particles per fish and 2.40 particles per MPs positive fish. Among the identified particle types, filaments were the most abundant, representing 41.7% of the total recovered microplastics, followed by fibers (33.3%) and films (25.0%), while pellets and fragments were not detected. Overall, these findings confirm the presence of microplastics in Lake Erie Walleye and indicate that filamentous particles are the dominant form of MPs ingested in the studied population. Future work will utilize FTIR to identify the chemical polymer composition of MPs and employ larger sample sizes to determine if a significant correlation exist between fish length/mass and microplastic abundance, which would clarify the risk of bioaccumulation over the fish's lifespan.

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34 - *Sustainable Metal Processing through Additive Manufacturing Technologies*
Noman Alias Ghulamullah, School of Engineering, Kent State University (ESDRI Graduate Award Recipient)
Dr. Dhruba Panthi, School of Engineering, Kent State University
Dr. Yanhai Du, School of Engineering, Kent State University

Additive manufacturing (AM) has emerged as a transformative and sustainable approach to metal production. Unlike conventional manufacturing, AM enables near-net-shape fabrication through precise layer-by-layer deposition and significantly reduces material waste by up to 90%. In addition, AM processes often require lower energy consumption compared to their counterparts, contributing to reduced carbon emissions. Technology also offers unparalleled design flexibility, enabling the fabrication of complex geometries, lightweight structures, and optimized components without the need for tooling or extensive machining. This not only enhances performance but also minimizes resource utilization. Furthermore, the ability to recycle metal powders and implement on-demand production supports circular economy principles by reducing scrap, inventory requirements, and transportation-related emissions. Collectively, these advantages position additive manufacturing as a key enabler of sustainable metal production, with significant implications for industries such as aerospace, automotive, and energy systems. This work highlights the critical role of AM in reducing environmental impact while improving manufacturing efficiency and design innovation.

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35 - *The mountain is calling: how birds adapt to life at high altitude*

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Mountain systems, particularly the Tibetan Plateau and surrounding Sino-Himalayan regions, represent natural laboratories for studying adaptation, diversification, and evolution. Extreme environmental gradients, including hypoxia, low temperatures, and steep elevational variation, have repeatedly shaped the evolutionary history of montane organisms. However, the genomic mechanisms underlying adaptation across these complex landscapes remain poorly understood, particularly among species with contrasting ecological strategies. Here, we investigate high-altitude adaptation using two systems with diverse life-history traits: the Tibetan Partridge (Perdix hodgsoniae), a high-altitude resident species typically found above 3,000 m, and redstarts (genus Phoenicurus), which are elevational migrants that spend only part of their annual cycle in thin mountain air. Using population genomics and landscape genomics across multiple populations and species, we examine phylogenetic relationships and evaluate how geography and environmental gradients shape diversification and adaptation across mountain systems. Our analyses reveal pronounced genetic and morphological divergence among Tibetan Partridge populations separated by major geographic barriers such as tall mountain ranges and deep valleys, highlighting the role of topographic complexity in promoting population differentiation. We further identify contrasting signatures of local adaptation, with populations in wetter regions showing associations with precipitation-related variables, whereas populations in drier regions exhibit adaptation linked to temperature variability. These findings suggest that environmental heterogeneity drives population-specific adaptive responses. In parallel, we reconstruct phylogenetic relationships and population structure among four redstart species, revealing substantial genomic divergence across species distributed along elevational gradients. Ongoing analyses aim to identify molecular mechanisms underlying elevational migration and high-altitude adaptation in these taxa. This integrative comparative framework links macro-evolutionary processes across the Sino-Himalayas with species-level genomic insights from Tibetan Partridge and redstarts. Our work advances on how complex mountain landscapes shape biodiversity and provides foundational genomic resources for studying adaptation and predicting species responses to environmental change in high-altitude ecosystems.

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36 - *The Effects of Elevated Temperature on Ant-Aphid Populations on Common Milkweed in Northeast Ohio*

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Dr. Thomas Franzem, Department of Biological Sciences, Kent State University
Dr. Christie Bahlai, Department of Biological Sciences and Environmental Science and Design Research Institute, Kent State University

Increased temperatures due to climate change will impact not only individual organisms, but also the interactions between individuals. Interactions of particular concern are mutualisms, which play a vital role in maintaining ecosystem stability. However, like many species interactions, mutualisms are complex and may display unexpected responses to environmental change. Because behavior, physiology, and population dynamics may respond unequally to environmental variables such as temperature, it is difficult to predict how the relationship will change due to climate change. Aphid–ant mutualisms occur across diverse environments worldwide, making the environmental impacts on these interactions of broad scientific interest. We conducted a passive warming experiment using open-top chambers deployed in temperate prairie and woodland habitats in Northeast Ohio to quantify how elevated temperatures altered population dynamics of mutualistic ants and aphids on common milkweed plants (Asclepias syriaca). From July through September, we conducted weekly surveys to quantify ant and aphid abundance under ambient and elevated temperature conditions. We hypothesized that elevated temperatures would increase ant aggression toward aphids (Aphis asclepiadis), reducing aphid abundance, particularly above 28 °C, when aphid reproductive rates decline. As climate change continues to alter species interactions, understanding how this mutualism responds to warming can inform predictions of this relationship in the future. Future work will expand monitoring of ant–aphid populations and include observations of ant-tending behavior to better understand how temperature influences ant aggression within this mutualism.

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37 - *Evaluating variance-based early warning of harmful algal blooms in unmanipulated lakes*

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Dr. Darren Bade, Department of Biological Sciences, Kent State University

Inputs of excess nutrients in lakes are causing harmful algal blooms (HABs) to increase in frequency, creating a need for tools to provide early warnings of ecosystem transitions to undesirable states. The theory of alternate stable states predicts that ecosystems can exist in multiple configurations of biotic and abiotic conditions. Perturbations, such as inputs of excess nutrients, can cause ecosystems to shift from

one state to another. Prior to a shift in the ecosystem state, theory suggests that statistical properties of state variables will change, such as an increase in variance. The Quickest Detection (QD) method identifies increasing variance in time series data which may indicate an approaching shift in state. We applied the QD method to high-frequency data, indicative of algal and cyanobacterial biomass. AlgaeTracker (AquaRealTime) autonomous sensors were deployed in two lakes, Brady Lake and West Twin Lake, near Kent, Ohio. The sensors measured chlorophyll a and phycocyanin at 15-second intervals. Manual samples were collected weekly to validate the autonomous measurements. Data from Brady Lake were chosen to create the baseline distribution because chlorophyll a and phycocyanin concentrations were less variable than West Twin Lake, enabling prediction of possible bloom events in the latter. Alarms were considered 'true' if they occurred before a peak value and all other alarms were considered 'false'. The QD method generated multiple alarms associated with rising pigment concentrations in West Twin Lake.

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38 - *Grassland Griefers: Functional traits may reveal local adaptation in eastern redcedars*

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Dr. David Ward, Department of Biological Sciences, Kent State University

Juniperus virginiana, the eastern redcedar (ERC), is a woody species well known and commonly studied for its encroachment into grassland habitats. These conifers were originally confined to steep cliff faces, but have drastically expanded their range due to environmental and anthropogenic factors. The modern range of ERC is delineated into five demes. One of these demes, known as Typica, represents the native range of ERC prior to encroachment, while the other four demes, including Platte River, Northern, Ozark, and Florida, represent the expanded range of ERC due to encroachment. While there is evidence for differentiation between these demes, it is unclear whether this differentiation is due to local adaptation as the species encounters novel habitats and conditions through range expansion. This study will record functional traits across five populations of ERC within two demes (Typica and Ozark) to determine whether there is occurrence of local adaptation between native (Typica) and encroaching (Ozark) demes. Functional traits relevant to growth, survival, and reproduction will be measured to gauge relative fitness across demes. Site means of each functional trait will then be analyzed using a multivariate analysis of variance (MANOVA). We hypothesize that differences in site means will reflect environmental variation between our study sites, which would provide evidence of local adaptation. For example, in the open grasslands

of the Ozark deme, eastern redcedars may not need to compete for light as aggressively as in the forested Typica deme. Therefore, growth traits such as relative growth rate may be expected to be higher in the Typica deme than in the Ozark deme. The results of our analyses will provide insights into ERC populations and inform management practices for controlling these problematic encroachers.

Faculty/Staff & Community Members

39 - *Signatures of historical land use change affect present day mammal and reptile communities in Cleveland Metroparks*
Dr. Nathan Byer, Cleveland Metroparks
Daniel Kershner, Kent State University

Present-day biodiversity is shaped by past land use; for instance, present-day park areas may have been previously used for agriculture or logging, complicating insights into habitat conditions. Despite the importance of past land use, resource management plans may not account for land management practices prior to the 1970s, which can prevent efficient quantification of habitat intactness and quality. In this study, we aimed to determine how past land use and ownership have affected present-day small mammal and reptile diversity across a series of urban parks in Northeast Ohio. We used plat map records, deeds, and historic aerial imagery to quantify past land use and land ownership. We then related these trajectories to wildlife communities detected at 10 sites using the Adapted Hunt Drift Fence Technique (AHDriFT). While results are preliminary, we documented contrasting and differing impacts of past agricultural and logging practices across wildlife taxa, reflecting differences in habitat requirements. In addition, years of park stewardship appeared to play a role in occurrence for many taxa. Our findings could improve management and restoration efforts by providing insights into past site conditions.

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40 - *The Insect Fact of the Week: Integrating Entomology Education into Non-Entomology Courses*
Dr. Thomas Franzem, Department of Biological Sciences, Kent State University

Education about insects is crucial to addressing the insect decline crisis by improving public perceptions of insects. Indeed, it is important that more people are aware of the importance of insects. College students are an important demographic in

insect-education, but most undergraduate students will never take an entomology class. Quick snippets of insect-information may be an effective strategy to introduce students to entomology, combat entomophobia, and more broadly encourage deeper student learning. While teaching introductory biology labs as a graduate teaching assistant, I developed a crash course in entomology delivered in weekly, one-to-two-minute mini-lectures throughout the semester called ‘The Insect Fact of the Week’. The Insect Fact of the Week was designed to demonstrate to students the taxonomic and ecological diversity of insects, unique facets of insect biology, and culminated in a discussion of insect conservation in the face of recently observed insect declines. Observationally, many students were engaged with and enjoyed this course-within-a-course. Student surveys of the course at the end of the semester frequently included comments stating how they enjoyed the Insect Fact of the Week, and many students reported that it changed their perception of insects. This series of mini-lectures may be a straightforward and effective method to effectively disseminate insect science to college students without requiring them to take a specific entomology class.

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41 - *Patterns of Richness in a Long-Term Citizen Science Butterfly Dataset*
Dr. Thomas Franzem, Department of Biological Sciences, Kent State University
Leo Kuck, National Park Service
Jerome Wiedmann, Ohio Lepidopterists
Mariamar Gutierrez-Ramirez, National Park Service
Dr. Christie Bahlai, Department of Biological Sciences and Environmental Science and Design Research Institute, Kent State University

Insect populations are experiencing ongoing declines in abundance and diversity, but their dynamics are often complex and trends are difficult to identify. Butterflies are an important, convenient, and useful insect group to monitor. They are a well-recorded group of insects and play important ecological roles as both pollinators and herbivores, and there is a large community of amateur lepidopterists that contribute to citizen science butterfly monitoring programs. In the present study, we analyzed 27 years of citizen science butterfly monitoring data collected across four sites in Cuyahoga Valley National Park, Ohio. We aimed to investigate patterns of species richness and abundance across years and sites and elucidate potential climatic variables that influence the butterfly community. We found similar levels of estimated butterfly species richness at three sites, yet one site had noticeably higher estimated species richness. Abundance fluctuated annually and was relatively consistent across sites. Further, we found that the butterfly communities changed directionally over time across all sites.

Additionally, we identified degree days and average daily precipitation as drivers of butterfly community variability. Overall, this work identified patterns of richness and abundance in a unique national park and identified potential climatic drivers of butterfly community variability.