WestVirginiaUniversity.
DAVIS COLLEGE OF AGRICULTURE,
NATURAL RESOURCES AND DESIGN

Student Research and Creative Scholarship Day

April 04, 2024
8:00 a.m. – 5:30 p.m.

Davis-Michael Distinguished Lecture

April 04, 2024
11:00 a.m. – 12:00 p.m.

The Davis College of Agriculture, Natural Resources and Design

Twenty-Seventh Annual

Graduate Student Research and Creative Scholarship Conference

Thursday, April 04, 2024
8:00 a.m. – 5:30 p.m.
Agricultural Science Building

Davis College of
Agriculture, Natural Resources and Design
and
West Virginia Agriculture & Forestry Experiment Station
West Virginia University
Morgantown, WV 26506-6108

Dr. Darrell Donahue, Dean and Director
Dr. Kimberly Barnes, Associate Dean
Dr. Jason Hubbart, Associate Dean of Research
Dr. Paul Lewis, Assistant Director

School of Agriculture & Food
Division of Animal & Nutritional Sciences – Dr. Chris Ashwell, Director
Division of Plant & Soil Sciences – Dr. Sven Verlinden, Director

School of Design & Community Development
Peter Butler, Director

School of Natural Resources
Division of Forestry & Natural Resoureces - Dr. Alan Collins, Interim Director
Division of Resource Economics & Management - Dr. Alan Collins, Interim Director

8th Annual University-Wide
WVU Davis-Michael Distinguished Lecture

11:00 a.m. - 12:00 p.m.

Dr. Sina Samii

Co-founder and CTO of Oryx Agribiotech LLC

"Alternative Protein Industry, Global Trends, and Future Opportunities"

Speaker Biography:

Sina Samii is a Co-founder and CTO of Oryx Agribiotech. He holds a PhD from West Virginia University. Sina conducted series of hypotheses-driven studies and published articles in peer reviewed journals, focusing on dairy nutrition biochemistry and Metabolomics. He is passionate about agricultural entrepreneurship, innovation, and sustainability.

ORAL PRESENTATIONS

Session A – Ph.D.

8:05 am – 9:20 am

1. The Butterfly Effect in Soils: From Soil Health to Plant Diversity

Johan Cuervo, Eugenia Peña-Yewtukhiw, Domingo Mata-Padrino
Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

The connection between plant diversity and soil health (SH) is complex, with limited research providing insight into this association. Some studies suggest that diversification of agricultural systems could potentially improve SH. However, it remains uncertain whether the diversity of plants influences the SH of systems or vice versa, especially under differing land management. The Appalachian region of West Virginia contains diverse ecosystems and agricultural management practices crucial for understanding SH dynamics. This study explores plant diversity as an SH indicator in two grassland systems in WV. We hypothesize that increasing plant diversity will indicate improved SH by enhancing soil fertility, soil structure, and its associate soil aggregate stability. To test this hypothesis, soil samples were collected from managed grassland under pastures and hay. Physical-chemical SH indicators such as soil organic matter, pH, nutrient content, and soil aggregate stability were evaluated at multiple soil depths. Additionally, Shannon's Diversity Index (SDI) was calculated. Preliminary results suggest a positive relationship between SDI and SH indicators: higher diversity is associated to higher levels of soil fertility in grasslands. Pasture or hay management influenced SH levels and SDI, hay land exhibited lower SDI and diminished SH compared to pastureland. These results highlight the importance of the effect of diversity in assessing and maintaining SH in WV. Results also emphasize the potential implications for designing management strategies to achieve sustainability in the region. To fully comprehend the relationship between plant diversity and SH, additional studies are needed to explore the mechanisms and factors driving this connection.

2. Effects of Additional Attributes in Discrete Choice Experiments: A Case Study of Lionfish

Freedom Enyetornye[1], Julian J. Hwang[1], Zhifeng Gao[2]
[1]Division of Resource Economics and Management, West Virginia University, Morgantown, WV
[2]Food and Resource Economics Department, University of Florida, Gainesville, FL

Discrete choice experiments (DCEs) are widely used in the economics and marketing literature to estimate consumer willingness to pay (WTP) for product attributes. In this study, we present a framework where WTP for an attribute or product may change based on the set of attributes specified by the researcher. To empirically test effects of attributes included in DCEs on WTP estimates, we use two versions of an online survey data. In one version, respondents were presented with seafood (lionfish) dish options with different cooking method (grilled, blackened, or fried) and dish type (fillet, sandwich, or tacos) at different prices. In the other version, in addition to the attributes from the first version, respondents were presented with an additional attribute: fish species (lionfish, tilapia, or mahi-mahi). Our results indicate that WTP for lionfish decreases substantially when more desirable or familiar fish attributes are introduced.

3. Tomato Pre-Breeding for *Septoria* Leaf spot (SLS) Resistance

Inty O. Hernandez-De Lira[1], Estefania Tavares-Flores[1§], Mannon Gallegly[1], Mahfuz Rahman[1,2], Vagner A. Benedito[1]
[1]Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV
[2]Extension Service, Davis College of Agriculture, West Virginia University, Morgantown, WV
[§]Current affiliation: Horticultural Sciences Department, University of Florida, Gainesville, FL

Septoria leaf spot (SLS) is a fungal disease that poses a significant threat to tomato crops and has become a severe problem in West Virginia. The disease is characterized by dark spot lesions that rapidly appear on leaves, causing defoliation and, ultimately, plant death. Unfortunately, commercial varieties with effective SLS tolerance are not available. Our research study aims to introgress robust resistance from wild tomato species into commercial cultivars, as well as identify the genetic locus or loci responsible for SLS resistance. To achieve these goals, we used local varieties ('WV-63' and 'WV-17B') as recurrent parents to produce five F1 interspecific hybrids via *in vitro* ovule culture with *S. peruvianum* and *S. arcanum* accessions identified as sources of SLS tolerance. We demonstrated that among the hybrids produced, the SLS-resistant level of confirmed F1 plants was the highest in Hybrid-4, which resulted from a cross between 'WV-17B' and *S. arcanum*. However, due to the self-incompatibility of F1 hybrids, we performed a segregation analysis in 345 H6xH2 pseudo-F2 seedlings. Our results suggest that SLS resistance is oligogenic, potentially involving 3 loci. While we have already obtained plants highly resistant to SLS, research is ongoing to confirm the QTLs in the genome linked to this trait and provide genetic materials and molecular markers to tomato breeders. Our results provide novel insights for developing commercial varieties with effective SLS tolerance. Our research also paves the way for research into resistance mechanisms applicable to various *Septoria* diseases affecting crops, forage species, and forest trees.

4. Fish Beta Diversity Relationships with Anthropogenic Stressors in Central Appalachian Streams

Alanna Lowther[1*], Caroline C. Arantes[1], Brent Murry [1], Hannah Frye[1], Katherine Adase[1], Jarrett Landreth[1], David Wellman[2], Dustin Smith[2]
[1]Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV
[2]West Virginia Division of Natural Resources, Wildlife Resources Section, Farmington, WV

Central West Virginia watersheds have been impacted by anthropogenic stressors, including extractive mining and timber harvest industries, as well as urban development and agriculture, fracking, mining, and land cover use. This study aims to understand how these impacts affect beta diversity of fish communities in mid-order streams throughout Central Appalachia. Our study was conducted on wadable 2nd-4th order streams along gradients of anthropogenic stressors. Backpack and pram electro-shocking surveys were used to sample fish communities and environmental variables were collected at each site (pH, % dissolved oxygen, conductivity, salinity, total dissolved solids, and landcover). Preliminary results via Canonical analysis of principal coordinates (CAP) showed conductivity and temperature having greatest impact on fish community beta diversity. Results also showed blacknose dace, brook trout, river chub, white sucker, and mottled sculpin having greatest impact on Species Contribution to Beta Diversity (SCBD). Additionally, three sites (Beaver Creek up- and downstream, and Buffalo Creek upstream) showed the highest Local Contribution to Beta Diversity (LCBD). Our preliminary results identified key factors driving beta diversity patterns, indicator species, and sites that contribute most to differentiation of diversity across streams in the region. For example, most of the species referenced by the SCBD are indicator species that often are associated with higher quality streams. On the other hand, sites such as Buffalo Creek with greater influence on LCBD showed a distinct combination of species. The study will continue to investigate beta diversity associations with long term impact to inform watershed conservation strategies in the region.

*M.S. presenter

ORAL PRESENTATIONS

Session B – M.S.

9:30 am – 10:45 am

1. The Effects of Different Sources of Omega-3 Polyunsaturated Fatty Acids on Hepatic Lipogenic Gene Expression and Lipid Metabolism

Adekunle Ajiboye, Christopher Ashwell
Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV

Nonalcoholic Fatty Liver Disease and other liver diseases have become increasingly prevalent health concerns worldwide. Dysregulation of lipid metabolism, characterized by altered serum lipid profiles, is a crucial contributor to these conditions. Omega-3 fatty acids (n-3 PUFAs) have been shown to modulate lipid metabolism, but the effects of different dietary sources of n-3 PUFAs on lipogenesis and lipid metabolism remain unclear. This study aimed to determine the effect of different sources of n-3 PUFAs on gene expression and serum lipids. Female Sprague-Dawley rats (age 28d) were divided into groups and fed diets comprising either flaxseed oil (FO), krill oil (KO), or menhaden oil (MO), while the control group received corn oil (CO), which has low omega-3 fatty acids. Serum lipid levels were measured, and RNA sequencing was performed to examine gene expression in the liver, an important site of lipid metabolism. The plasma lipid analysis showed that rats fed n-3 PUFA sources decreased ($P<0.05$) high-density lipoprotein compared to CO-fed rats. Additionally, both rats fed MO and KO reduced total cholesterol, with MO having a higher reduction ($P<0.05$). RNA sequencing revealed that rats fed MO and FO exhibited down-regulated gene expression of fatty acid synthase (FAS) compared to the control. Furthermore, sterol regulatory element-binding protein 1c (SREBP-1c) and stearoyl-CoA desaturase 1 (SCD-1) were downregulated in rats fed MO compared with the control. Based on the results, menhaden oil appeared to be the most promising dietary source of n-3 PUFAs for managing dysregulated lipid metabolism.

2. Varying Branched-Chain Amino Acid Ratio in Diets Using Corn Gluten Meal, L-isoleucine, and L-valine Influences 0-21d Turkey Hen Performance and Amino Acid Digestibility

Emily Estanich[1], Kristina Bowen[1], Lucas Knarr[1], Elizabeth Lynch[1], Sally Noll[2], Arturo Garcia Morales[3], Joseph Moritz[1*]
[1] Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV
[2] Department of Animal Science, University of Minnesota, St Paul, MN
[3] Butterball, LLC, Goldsboro, NC

Providing amino acids (AA) in concentrations that optimize performance is critical to turkey production. The branched-chain amino acids (BCAA) leucine, isoleucine, and valine are essential AA needed for protein synthesis and energy production, in addition to conducting anabolic signaling functions related to muscle accretion. Imbalanced BCAA ratios can lead to antagonism and degradation of limiting BCAA, particularly in diets with excess leucine. Concentrated corn protein ingredients such as corn gluten meal contain high levels of Leu and can alter BCAA requirement; however, L-Ile and L-Val may be added to balance BCAA ratios. This study was designed to evaluate the effects of dietary BCAA ratio using corn gluten meal, L-Ile, and L-Val on performance and AA digestibility in commercial turkey hens from 0-21d of age. A 38.4% corn and 49.8% soybean meal-based diet was used as the Control. In uncorrected high Leu treatments, feed intake, bird weight, and live weight gain decreased, and feed conversion ratio (FCR) increased relative to the Control at day 14 and 21 ($P<0.0001$). Performance equivalent to the Control was produced with additions of both L-Ile and L-Val at d 14 ($P<0.0001$), and FCR decreased relative to the Control at d 21 ($P<0.0001$). These results demonstrate that diets containing high Leu from a concentrated corn protein ingredient can decrease poult performance, but may be restored with concomitant additions of both L-Ile and L-Val. In practical settings, nutritionists should assess the costs associated with BCAA supplementation versus diets with high inclusions of soybean meal.

3. Formulation, Sensory Evaluation, and Physicochemical Assessment of a Novel Energy Bar

Ian Israelsen[1], Brennah Groves[1], Jacek Jaczynski[1], Cangliang Shen[1], Ayesha Sarker[2], Kristen Matak[1]

[1] Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV

[2] Agricultural and Environmental Research Station, West Virginia State University, Institute, WV

Athletes and active individuals supplement daily macronutrient intake, specifically protein, with energy bars. These bars vary in organoleptic qualities but are often associated with neutral or negative flavors by consumers. The objective of this study was to formulate a novel energy bar containing significant macronutrients and calories per serving with favorable ratings from consumers. Thirteen iterations of an energy bar were synthesized with differing protein sources (whey, soy, pea, hemp), and characteristic variations (nougat, chocolate truffle, peanut butter, double caramel). A shortbread base, date caramel-like product, and chocolate coating were included in every bar. Preliminary sensory evaluations were conducted on the 13 iterations and proximate composition, sensory evaluation, water activity, and texture were measured on the more favorable variations. Results of the preliminary sensory evaluations showed the nougat variations of each protein source were moderately more well-liked than the other characteristic variations. They were liked for attributes such as taste, texture, and appearance. Panelists responded they were "likely to purchase" two of the four nougat variations. The research is ongoing and remaining data collection is ongoing. Energy bars containing significant macronutrients and calories per serving with favorable consumer ratings are more likely to be purchased and consumed by athletes and active individuals. Adequate fueling is vital to quality performance in sport and life.

4. LGBTQ+ Clothing Habits in Appalachia

Kirstyn Korte, Kathryn Jones

School of Design and Community Development, West Virginia University, Morgantown, WV

The LGBTQ+ population has historically used clothing to signal their sexuality due to homophobic or transphobic social attitudes and laws. This means that clothing has played a big part of the LGBTQ+ identity in times past. Signaling through dress practice still relevant to the queer Appalachian community? If so, how do they use clothing in their day to day lives as a means to communicate sexual identity? This project's goal is to explore the relationship between aesthetics, the queer identity, and clothing in the Appalachian LGBTQ+ population. This exploration is a narrative inquiry informed by Butler's theory on gender performativity and Kelly Reddy-Best and Dana Goodin's exploration on queer dress practice. I'd like to highlight the unique identity construction of queer Appalachian women. I investigate their confidence and comfort to explore how safe they feel to signal their queer identity. Local members of the LGBTQ+ community were interviewed to gather perspectives on clothing's meaning in queer life in West Virginia. This work-in-progress so far has revealed that some participants have a need to fit a desired image of how other people imagine them and their queerness. This does initially appear to be a factor that may go into how they dress at least part of the time, whether to camouflage that queerness or to flaunt it at different points in their lives. Results could lend insight into how a certain subsect of the population thinks about clothing and the cognitive processes that are a part of donning clothing.

5. Adding Value to Waste Wool Through Textile Design

Cassandra Stewart, Jordon Masters
School of Design and Community Development, West Virginia University, Morgantown, WV

The LGBTQ+ population has historically used clothing to signal their sexuality due to homophobic or transphobic social attitudes and laws. This means that clothing has played a big part of the LGBTQ+ identity in times past. Signaling through dress practice still relevant to the queer Appalachian community? If so, how do they use clothing in their day to day lives as a means to communicate sexual identity? This project's goal is to explore the relationship between aesthetics, the queer identity, and clothing in the Appalachian LGBTQ+ population. This exploration is a narrative inquiry informed by Butler's theory on gender performativity and Kelly Reddy-Best and Dana Goodin's exploration on queer dress practice. I'd like to highlight the unique identity construction of queer Appalachian women. I investigate their confidence and comfort to explore how safe they feel to signal their queer identity. Local members of the LGBTQ+ community were interviewed to gather perspectives on clothing's meaning in queer life in West Virginia. This work-in-progress so far has revealed that some participants have a need to fit a desired image of how other people imagine them and their queerness. This does initially appear to be a factor that may go into how they dress at least part of the time, whether to camouflage that queerness or to flaunt it at different points in their lives. Results could lend insight into how a certain subsect of the population thinks about clothing and the cognitive processes that are a part of donning clothing.

ORAL PRESENTATIONS

Session C – Ph.D.

1:30 pm – 2:30 pm

1. Enhancing Fish Farming in Ghana Influence of Effective Aquaculture Management on Fingerlings Survival

Munkaila Lambongang[1], Michael Ayamga[2], Isaac Gershon Kodwo Ansah[2], Catherine Ragasa[3]
[1]Division of Resource Economics and Management, West Virginia University, Morgantown, WV
[2]Department of Economics, University for Development Studies, Tamale, Ghana
[3]International Food Policy Research Institute, Washington, D.C.

This study investigates factors influencing Good Aquaculture Management Practices (GAMPs) adoption and their influence on the survival rate of fingerlings among Ghanaian fish farmers. Utilizing a unique 2019 household cross-sectional dataset from six major aquaculture regions, Poisson, multiple linear regression models, and fractional regression analyses were employed. Key findings reveal significant effects of various determinants on GAMPs utilization. Access to formal credit, technical advice, in-house training, and the frequency of extension visits displayed substantial effects. Notably, considerable effect sizes were observed, particularly with credit access (Poisson: $\beta = 0.69$; OLS: $\beta = 0.28$), technical advice (Poisson: $\beta = 1.39$; OLS: $\beta = 0.24$), and in-house training (Poisson: $\beta = 2.51$; OLS: $\beta = 0.77$). Moreover, regional disparities, gender dynamics, and the use of specific chemicals and drugs displayed varying effects on fingerlings' survival rates. The effect sizes from regression analyses further substantiated these findings, underscoring the significance of regional variables (Brong-Ahafo: $\beta = -0.31$; Volta/Eastern: $\beta = -0.10$), gender dynamics (Male owner: $\beta = -0.05$), and chemical use (Cost of chemical: $\beta = 0.21$). These results offer critical insights for policymaking and practical interventions in the aquaculture sector. We advocate for policies enhancing credit accessibility, augmenting extension services, and promoting gender inclusivity to facilitate GAMPs adoption. Leveraging these findings, policymakers and stakeholders can optimize aquaculture practices, thus advancing food security and sustainable economic growth.

3. The Detection of Tree of Heaven (*Ailanthus altissima*) Using Drones and Optical Sensor

Kushal Naharki[1], Cynthia D. Huebner[1,2], Yong-Lak Park[1]
[1]Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV
[2]Northern Research Station, USDA Forest Service, Morgantown, WV

Tree of heaven (*Ailanthus altissima*) is a highly invasive tree species in the USA and the preferred host of an invasive insect, the spotted lanternfly (*Lycorma delicatula*). Currently, pest managers rely solely on ground surveys for detecting both *A. altissima* and spotted lanternflies. This study aimed to develop efficient tools for *A. altissima* detection using drones equipped with optical sensors. Aerial surveys were conducted to determine the optimal season, sensor type, and flight altitudes for *A. altissima* detection. The results revealed that *A. altissima* can be detected during different seasons and at specific flight heights. Male inflorescences were identifiable using an RGB sensor in the spring at <40 m, seed clusters were identifiable in summer and fall at <25 m using an RGB sensor, and remnant seed clusters were identifiable in the winter at <20 m using RGB and thermal sensors. Thermal sensors detected heat signatures, as the temperature of seed clusters (0.37 ± 0.3 °C) was lower than that of branches (3.06 ± 0.5 °C) on cold sunny days. Combining all seasonal data allowed for the identification of both male and female *A. altissima*. This study suggests that employing drones with optical sensors can provide a near real-time and efficient method for *A. altissima* detection. Such a tool has the potential to aid in the development of effective strategies for monitoring spotted lanternflies and managing *A. altissima*.

4. Pasture Plant Community Composition and Structure in West Virginia

Kinsey Reed[1], Angie Macias[1], Kayla Guthrie[1], Ronald Schartiger[1], Jen Kane[1], Tom Basden[2], Jim Kotcon[1], Ember Morrissey[1]
[1]Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV
[2]West Virginia University Extension Service, Morgantown, WV

In West Virginia (WV), pastureland accounts for 46% of unwooded farmland and 68% of cropland is used for hay production. Having a productive, nutritious pasture is the basis of a successful livestock operation. Pasture productivity is mainly a function of soil health, forage species composition, and grazing management. Very few published plant community surveys have been performed on multiple WV farms, the last one being by Baker and Nestor in 1979. These surveys are necessary for producers to make sound management decisions. Knowing what species to expect also greatly improves the chances of correctly identifying plant species.We conducted a comprehensive plant diversity survey on 19 pastures across WV on different soil types and under varying management intensities from mid-September to early October 2023. At each farm, plants from five 0.25 m^2-randomized quadrats were collected along a transect, identified, dried, and weighed. The majority of West Virginia pastures had few legumes (2.19% by dry weight), but high weedy forb presence (15.98%) and poor quality weedy grass species (25.47%). Across the entire state, the most common species were *Festuca arundinacea* (28.12%), *Dactylis glomerata* (19.68%), *Panicum anceps* (12.71%), and *Plantago lanceolata* (4.62%). Species presence and distribution varied significantly by region and farm management history. It is likely that a warmer climate with longer dry spells, combined with low fertility soil, has selected for unfavorable forage species. These results suggest that many WV pastures are in critical need of renovation.

5. Modeling Factors Impacting the Recruitment Success of Invasive Bighead and Silver Carp Populations in the Ohio River

Erin Shepta[1], Brent Murry[1], Caroline C. Arantes[1], Christopher Rota[1], Craig Jansen[2], Andrew Stump[3], Katherine Zipfel[4]
[1]Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV
[2]Indian Department of Natural Resources, Winslow, IN
[3]Kentucky Department of Fish and Wildlife Resources, Frankfort, KY
[4]West Virginia Division of Natural Resources, Parkersburg, WV

Populations of invasive carp (*Hypophthalmichthys nobilis* and *H. molotrix*) have successfully colonized much of the Mississippi River and its major tributaries, however their spread has slowed and even completely stalled in portions of the Ohio River. The rate of spread of invasive species is greatly influenced by their recruitment success within an invaded system. Here, we investigated factors that may be hindering invasive carp recruitment success at different spatial and temporal scales using occurrence data of juvenile carp as an indicator of successful recruitment. Juvenile carp were collected in tributaries and backwater habitats adjacent to the mainstem of the Ohio River from 2016-2023. Detection/non-detection data of juvenile carp were used as a response variable in a dynamic multi-scale occupancy model that allows for the incorporation of yearly colonization and persistence probabilities at both large-scale (pool) and small-scale (site) sampling locations while also considering changes in site usage within a sampling year. Preliminary results revealed that occupancy probability for juvenile carp varied between sampling years at both spatial scales, suggesting that carp recruitment success tends to fluctuate greatly between years. Invasive species often exhibit repeated episodes of huge population booms followed by a rapid and often sustained declines in population size. In the future we aim to incorporate environmental data into the model to better understand potential fluctuations in carp recruitment in the Ohio River. A better understanding of factors regulating carp recruitment can help contribute to more effective management of invasive carp populations in the future.

ORAL PRESENTATIONS

Session D – M.S.

2:45 pm – 4:00 pm

1. Evaluating Genetic Differences in West Virginia's Reintroduced Elk (*Cervus canadensis*)

Adam Cook, Christopher W. Ryan, Amy B Welsh
Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Elk (*Cervus canadensis*) were extirpated from eastern North America following European colonization. In the last century, reintroductions have restored the species to a wide geographic range in eastern North America with mixed results. In this study, we examine the progress of one such reintroduction in West Virginia using genomic methods. Between 2016 and 2018, 39 elk were reintroduced from Land Between the Lakes Natural Recreation Center in Kentucky and 60 from Arizona. Since the initial reintroduction, 50 additional elk have been born in West Virginia. Reintroductions with multiple source populations have potential negative genetic consequences of reduced diversity and adaptive potential. Elk reintroductions have been susceptible to failure, so understanding the genomic differences present in West Virginia's elk is vital to their conservation. We use double digest restriction-site associated DNA sequencing (ddRAD) to compare genomic sequences of 156 elk to characterize differences between source populations and assign parentage to all elk born in West Virginia since the initial relocation. We are assessing genomic patterns using single nucleotide polymorphisms (SNPs) which allow for the differentiation between neutral and adaptive differences. Ongoing bioinformatic analyses will reveal comparative numbers of putatively adaptive loci among the source populations, measures of genetic diversity, and parentage assignment for each individual born in WV that will reveal the level of admixture in the population. These results will inform best management practices for the elk population in West Virginia to ensure the long-term stability of this resource.

2. We Reintroduced Them, Now What? Assessing The Impact of River Otter Reintroductions and Contemporary Conservation Needs Across Appalachia, USA

Eden Nitza[1], Holly Morris[1], Chris Ryan[1], Nancy D. Moncrief[2], Amy B. Welsh[1]
[1]Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV
[2]Virginia Museum of Natural History, Martinsville, VA

Appalachian freshwater ecosystems have experienced immense destruction, especially deforestation and watershed pollution, since European colonization. More recently, unprecedented conservation efforts have been applied to restore these ecosystems. The North American river otter (*Lontra canadensis*) is a semi-aquatic apex predator that functions as an indicator species, and as such, its conservation is inextricably linked with that of Appalachia. Although otters were extirpated from most of Appalachia by the mid-1900's, watershed restoration and reintroduction programs have allowed this species to return to most of its historic range. However, an understanding of the population genomic consequences of this bottleneck is necessary to inform contemporary conservation efforts. To address this, we amalgamated otter tissue samples (n=395) collected from 2008-2023 across several U.S. Appalachian states in which otters were reintroduced (Maryland, Ohio, Pennsylvania, Virginia, and West Virginia) as well as from the two states that provided most of the otters for the reintroductions (Louisiana and North Carolina). We applied a double digest restriction-site (ddRAD) method to analyze single nucleotide polymorphisms (SNPs) across the sampled individuals. Our results indicate that population structuring is present within this region (e.g., in Virginia, there are 3 genetic populations), genetic populations do not correspond to geography, and effective population sizes are low (N_e = 10 (95% CI 9.7-11.2) in Virginia). These data will be used to define conservation units across Appalachia, which will guide conservation decision-makers as to how we can best ensure the long-term persistence of this species. These results also indicate the overall progress of Appalachian ecosystem recovery.

3. Caring for Scarabs: Sustaining Dung Beetle Populations with Responsible Endectocide Choice

Haylie Brown[1], Thomas Basden[2], Teiya Kijimoto[1], Joseph Lynch[1], Kevin Shaffer[2], Elizabeth Rowen[1]
[1]Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV
[2]West Virginia University Extension, Morgantown, WV

Dung beetles provide essential services that aid animal and pasture health. Burying and feeding on feces reduces parasite survival, increases bioturbation reincorporating organic matter into the soil, and reduces greenhouse gas emissions. Endectocides used to manage livestock parasites (flies/helminths) in West Virginia have adverse effects on non-target dung beetle species. Parasitic control products used in WV include Clarifly (diflubenzuron - fly control), Cydectin (moxidectin - dewormer/fly control), Ivomec (Ivermectin - dewormer/fly control), Long-Range (eprinomectin - dewormer), and Safeguard (fenbendazole - dewormer). Assessing the exposure of dung beetles to these endectocides is necessary to understand the risks for dung beetles and the ecosystem services they provide. To determine the residual concentration of endectocides in cattle feces we treated heifers with one of the five most commonly used endectocide products and collected fecal grab samples periodically for 90 days. We quantified the active ingredients using high-performance liquid chromatography (HPLC) with fluorescent detection (FLD). We recovered each product except for Safeguard in the excreted dung collected from treated heifers in 2022. Safeguard did not pass to feces, and gives farmers a safe endocide for their livestock while maintaining dung beetle health. Our recovery of other endectocides raise concerns about the effect the presence of these pesticides could have on non-target Scarabaeidae species in WV. Continued research is vital to understand the ramifications of endectocide exposure on Scarabaeidae species and the services they provide to pasture health.

4. Iron-Coated Sand as a Sustainable Substrate Amendment for Nutrient Management of Containerized Floriculture Crops

Savannah Mead[1], Karen Buzby[2], Eugenia Pena-Yewtukhiw[1], Lian-Shin Lin[2], Nicole L. Waterland[1]
[1]Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV
[2]Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV

In a polluted world with rapidly dwindling natural resources, sustainable alternatives to current methods are essential for environmental and economic progress. Acid mine drainage (AMD) and phosphorus from fertilizer runoff are major sources of water pollution in the Appalachian region. Producers are faced with rising prices of phosphate fertilizers, putting the horticulture industry in a tenuous position: reducing these costly inputs minimizes water pollution but in turn diminishes product quality. AMD-based iron-coated sand is a novel phosphate sorbent that can potentially ameliorate AMD and prevent further phosphate pollution. This technology can cut growers' input costs and slow consumption of finite phosphate resources. This study aimed to determine the viability of iron-coated sand as a substrate amendment for reducing phosphate leaching and enhancing growth, flowering, and phosphorus uptake of floriculture crops during and after production. The ideal sand-to-potting mix ratio was determined based on the growth and leachate content of pansies, petunias, and chrysanthemums. The rate of applied phosphate and P-saturation of sand were determined from growth, flowering, and leachate data of chrysanthemum during production. Finally, the coated sand was examined on petunia and chrysanthemum growth, flowering, mineral content, and leachate composition in production and post-production environments. Twenty percent P-saturated iron-coated sand with low to moderate rates of applied phosphorus reduces leached phosphate with no deleterious, and often positive, effects on the performance of floriculture crops during and after production. Iron-coated sand as a substrate amendment in container production of ornamentals has tremendous potential for advancing environmental and economic sustainability in the horticultural industry.

5. Counting the Costs: Evaluating the Economic Impact of PFAS Contamination on Pennsylvania's Housing Market

Nabin B Khanal*, Levan Elbakidze
Division of Resource Economics and Management, West Virginia University, Morgantown, WV

Per- and Polyfluoroalkyl Substances (PFAS) are renowned for their valuable industrial properties and documented adverse human health effects. However, the economic ramifications of environmental PFAS contamination remain largely unexplored. In this study we quantify the environmental externalities of PFAS contamination by employing a hedonic price model. We achieve this by focusing on the drinking water PFAS contamination incident in one of the Public Water Systems (PWS) in Dauphin County, Pennsylvania, which occurred in 2014. Utilizing home transaction data spanning from 2010 to 2019 from Dauphin and Cumberland Counties, Pennsylvania and employing various specifications of the Difference-in-Differences method, we quantify the economic impact of PFAS contamination in housing market. Our findings reveal a five to ten percent reduction in home prices in the PFAS-contaminated location. The total depreciation in home value amounts to $279 million. Notably, newer and larger homes demonstrate heightened susceptibility to contamination, while smaller houses and those aged 75 years or more remain relatively unaffected. Furthermore, the downward trajectory of home prices due to contamination persists from the discovery of contamination in 2014 until the conclusion of our study in 2019. While numerous studies have examined the impact of contaminated drinking and recreational water on the housing industry, there remains a notable gap in peer-reviewed publications regarding the economic impact of drinking water PFAS contamination. This study makes a significant contribution to understanding the adverse economic impact of drinking water PFAS contamination and provides critical insights for instigating discussions on potential mechanisms to address this pervasive issue.

*Ph.D. presenter

ORAL PRESENTATIONS

Session E – Undergraduate

4:15 pm – 5:30 pm

1. Economic Valuation of Endangered Species – A Case Study of Candy Darter

Cameron Cade, Julian J. Hwang, Levan Elbakidze
Division of Resource Economics and Management, West Virginia University, Morgantown, WV

Candy Darter is a small and colorful freshwater fish found only in Virginia and West Virginia. Of the historical 35 populations, there remain only 8. Consequently, Candy Darter was added to the endangered species list at the end of 2018. In this study, we measure the economic value of Candy Darter conservation. More specifically, we measure the economic value of Candy Darter to 1) citizens in Virginia and West Virginia; and 2) citizens in the U.S. as a whole. An online survey was distributed to the two target populations, accordingly. We find that citizens in the U.S. are willing to pay $208 per household, and citizens in Virginia and West Virginia are willing to pay $260 per household. However, at the aggregate level, the total willingness to pay is $26 billion from the U.S. population, whereas it is only $1 billion from the Virginia and West Virginia population. Our results indicate that there may be an incentive to target a bigger population when interested in measuring the economic value of environmental goods or services with little to no use values.

2. Adhesion of THM Densified Yellow-poplar (*Liriodendron tulipifera*)

Luke Chaddock, Levente Denes, Joseph McNeel, Gloria Oporto, Balazs Bencsik
Division of Wood Science and Technology, West Virginia University, Morgantown, WV

Thermo-hydro-mechanical (THM) wood densification has demonstrated effectiveness for improving physical and mechanical properties of low/medium-density hardwood lumber, therefore upgrading its structural performance. The process of densifying wood implies the collapse of cell walls due to thermal and mechanical treatments. However, there is currently very little information available related to the adhesion of THM densified wood. Along with size constraints of densified wood due to pressing parameters, research in this area is a necessity. The primary goal of this study is to demonstrate and compare the ability of THM densified wood to be adhered with various surface treatments and the use of a primer. The adhesive used in the bonding of THM densified wood is LOCTITE HB X602 PURBOND polyurethane which previously exhibited superior effectiveness in bonding untreated yellow-poplar. Improving the adhesion options for THM densified wood will open opportunities for novel and unique products that in turn will enhance economic opportunities for the industry. The properties measured for this study include surface wettability, tensile shear bonding strength, wood/glue failure, cyclic delamination, and dimensional stability. An investigation of the correlation between experimental factors will be included as well.

3. Impacts of Hemlock Woolly Adelgid and Landscape Configuration on Eastern Hemlock Associated Bird Species

Christian Harris, Christopher Lituma, Robert Ryan
Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Bird species associated with the presence of mature stands of Eastern hemlock (*Tsuga canadensis*) have experienced ongoing population declines partially due to the spread of the invasive forest pest hemlock woolly adelgid (*Adelges tsugae*) (HWA). The spread of HWA throughout the Appalachians poses a significant threat to Eastern hemlock obligate and associated species. Research on avian species' abundance within infestation zones is needed to further understand the role of HWA in population changes and shifts in distribution patterns. My objectives are to (1) determine the effects of landscape configuration and (2) HWA infestation on abundance and distribution patterns of Black-throated green warblers (*Setophaga virens*) and Acadian flycatchers (*Empidonax virescens*). I conducted ~250 avian point count surveys in 2023 on Weyerhaeuser timber properties in Greenbrier, Nicholas, and Fayette counties and the Monongahela National Forest in West Virginia. I will use linear and logistic regression models to evaluate the effects of Eastern hemlock tree density, HWA, and distance to riparian areas on Black-throated green warbler and Acadian flycatcher abundance. I will also include vegetation structure variables collected using 100-m plots taken at each point count location at 0, 120, and 240 degrees with tree diameter at breast height (DBH) recorded at point center as well as at 70 meters along each transect. Additionally, I examined individual Eastern hemlock trees for HWA infestation. Results will provide information about how Black-throated green warbler and Acadian flycatcher are affected by HWA, and if landscape variables are affecting their distribution on a forest mosaic landscape.

4. Testing of a Metabolic Engineering Strategy to Increase Phenylalanine in Plants

Taylor Smith, Joseph H. Lynch
Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Phenylalanine, an amino acid in all living organisms, is a building block for thousands of other key molecules. Plants use these phenylalanine-derived molecules to synthesize lignin, diminish genetic damage from UV radiation, and complete several other vital processes. Some of these molecules would be useful in creating biofuels, medicines, and other products to improve quality of life. The phenylalanine metabolic pathway, however, is not fully understood due to its dual nature. In phenylalanine synthesis, there are two separate pathways that exist: the plastidial and cytosolic pathways. The purpose of this study is to determine if the cytosolic pathway could be engineered in order to manipulate the output of phenylalanine in the cytosol. A previous attempt to increase cytosolic production led to unintentional feedback inhibition of the plastid pathway, resulting in a lower net production of phenylalanine. Here we describe a modified strategy to avoid such inhibition. Plasmids carrying expression cassettes with different gene combinations were modified in E. coli bacteria. Agrobacterium-mediated transformation was used to genetically modify *Arabidopsis thaliana* plants and *Petunia hybrida* flowers. The flowers were found to contain a high expression of the gene cassette along with a significant increase in phenylalanine. Despite this, there was no significant change in net volatile production.

POSTER PRESENTATIONS

Session A – Mixed

9:15 am – 10:30 pm

1. The Effects of Varying Ambient Conditions and Conditioning Temperatures on Enzyme Activity, Moisture, and Pellet Quality

Alexis Renner, Joe Moritz

Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV

Poultry is the number one animal protein consumed in the United States. All meat type poultry are fed pelleted diets to facilitate feed flow in barns and improve feeding efficiency. The pelleting process involves steam conditioning mixed mash, extruding of the conditioned feed through a die, and cooling / drying the pellets. Steam conditioning applies heat and moisture to gelatinize starch and gel proteins. In addition, conditioned feed is exposed to frictional heat and pressure within the pellet die. These thermal processes aid in pellet formation but may also degrade exogenous feed enzymes. Enzymes are particularly sensitive to moisture in steam. Moisture added through steam varies based on conditioning temperature and ambient conditions. We hypothesize that ambient conditions will interact with varying steam conditioning temperatures to influence moisture in feed, pellet quality, and enzyme stability. The proposed experiment is a randomized complete block design with a two by three factorial arrangement of treatments. Ambient temperature will be one main effect: 30 and 60 degrees Fahrenheit. Conditioning temperature will be the other main effect: 150, 165, and 180 degrees Fahrenheit. Commercially available carbohydrase and phytase enzymes will be assayed before and after pelleting to determine enzyme recovery. Additional metrics will include pellet durability index and moisture of mash, conditioned mash, hot pellets, and cool pellets. The study will be conducted at the WVU pilot feed mill located at the WVU husbandry farm. The pilot feed mill utilizes a dedicated Colombia 25 boiler horsepower boiler and a California Pellet Mill and Conditioner.

2. The Use of Drones and Machine Learning in the Mapping and Treatment of Invasive Multiflora Rose (*Rosa multiflora*) Shrubs

Kylie Shaw

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Of the many obstacles that face current conservation and restoration efforts today, invasive species are a universal issue that limit the success of these efforts all over the world. Invasive vegetation has been known to reduce native biodiversity and alter vital habitats across our landscape, requiring land management organizations to use limited time and monetary resources to monitor and manage these invasive plants. With new technologies becoming available, the goal is to make the mapping and chemical treatment of invasive plants more efficient and cost effective. Drones with multispectral sensors will be used to take high resolution images of invaded habitats throughout the growing season to capture significant radiometric and temporal signatures of these invasive plants. These images will be used to train a machine learning program in order to create a model that can correctly identify invasive plants within a drone image. This study will focus on the identification of multiflora rose (*rosa multiflora*) in Southwestern Pennsylvania. Multiflora rose is a common invasive shrub in the region that has distinct flowering and extended leaf-on phenology that will function as the identifying radiometric and temporal signatures of the shrub. This model will be deployed on a chemical spray drone that will apply herbicide to multiflora rose shrubs as it identifies them on the landscape. With these innovative mapping and treatment techniques, the management of invasive vegetation will become more time and cost effective, allowing land managers to have a greater and more widespread effect in their work.

3. Using Humorous Threats in Safety and Rules Signage in Recreation Areas to Influence Behavioral Intentions

Jacob Vargas, David Smaldone

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Communicating the importance of rules and warnings to visitors of recreational parks through signage can be difficult. However, it is still important to visitor safety. Oftentimes, these signs use fear of punishment or injury to discourage certain behaviors. According to studies following the Extended Parallel Processing Model, using threats can backfire and cause visitors to use maladaptive fear responses to counteract a high-threat message. Humor is a versatile tool that can be used to grab attention, temper perceptions, and influence decision-making. Following the Theory of Planned Behavior, when humor is used to manipulate attitudes toward a subject, this can lead to more positive perceptions and behavioral intentions. Comedians such as Jon Stewart, for example, have leveraged their position to bring controversial issues to large audiences through the use of humorous threats. This study aims to explore the effect of humorous threats on the reception of messages that may not be palatable on their own, namely, rules and warnings. Participants were asked to complete an online survey that asked about prior attitudes towards rules in recreation areas and their past experiences. They were then randomly exposed to one informational sign out of the four combinations of humor and threat content: normal (control), humor, threat, and humorous threat. After exposure to the sign, they were asked about their emotional and cognitive responses to the content. The potential impact of this study could be the addition of a new tool for park managers to communicate more effectively with visitors and manage park resources.

4. Study of the In Planta Metabolic Role of Putative Cytosolic Enzyme ncADH in Tomato

Monika Choudhary, Joseph H Lynch

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Tyrosine (Tyr) is a vital aromatic amino acid essential for protein synthesis and serves as a precursor for numerous specialized metabolites crucial for both plants and animal health. Its synthesis from prephenate, downstream of the shikimate pathway, involves two possible alternative routes catalyzed by distinct TyrA family enzymes: Prephenate dehydrogenase (PDH/TyrAp) or Arogenate dehydrogenase (ADH/TyrAa). While plants typically possess canonical ADH specific to arogenate in plastids for tyrosine production, recent phylogenetic analysis has identified a non-canonical clade localized in the cytosol, potentially contributing to total tyrosine production in plants. The metabolic role and contribution of this cytosolic enzyme in an alternative Tyr and Tyr derived metabolites pathway remains unknown till date. Such Tyr derived metabolic enzymes are yet to be investigated at the biochemical and molecular level. This study employs reverse genetic strategies to investigate the metabolic impact of non-canonical ADH loss of function and reduction of function in tomatoes. Through CRISPR-Cas9 and RNAi techniques, three mutant micro tomato plants have been generated for each construct. These mutants will be further developed into T3 homozygous plants. Quantification of Phenylalanine (Phe), Tyrosine (Tyr), and Tryptophan (Trp), along with targeted metabolic analysis in fruits and vegetative tissues, will be conducted. This research aims to enhance our understanding of the metabolic function of the putative cytosolic non-canonical ADH enzyme in tomatoes and gain insight about the production of specialized metabolites that will be applicable to metabolic engineering and breeding strategies to improve crop species.

5. Role of minor cannabinoids as defense chemicals in response to insect herbivory in hemp (*Cannabis sativa*)

Bikash Deo, Michael Gutensohn

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Cannabis sativa is a multipurpose crop used for food, fiber, cosmetics, medicine, and psychoactive drugs. Cannabinoids are secondary metabolites that are synthesized in glandular trichomes of hemp plants. These cannabinoids are versatile chemicals with a wide array of uses. Cannabinoids are classified into four groups depending on the length of the acyl chain of the molecule: varinol, butol, olivetol, and phorol-series cannabinoids. The olivetol series cannabinoids, including the well-known THC and CBD, are considered major cannabinoids as their concentration is high while varinol, butol, and phorol-type cannabinoids, such as THCV, CBDV, THCB, CBDB, THCP, and CBDP, are considered minor cannabinoids as these are generally found in trace amounts in the available strains of *Cannabis*. It is generally believed that cannabinoids may have a role in plant defense. Some previous studies have claimed insecticidal properties for cannabinoids, however, these studies have only used THC or CBD and have not considered other minor cannabinoids. Minor cannabinoids in general are only found in trace amounts and significantly increased in hemp plants upon herbivory by beet armyworm (*Spodoptera exigua*). These results suggest that minor cannabinoids likely possess activity against insect herbivores. We have performed feeding experiments with *Spodoptera exigua* utilizing artificial diet infused with individual pure compounds and have analyzed their effect on larvae of *S. exigua*.

6. The Status of Dung Beetles in West Virginia Pastures

Sneha Haridas[1], Tom Basden[2], Joseph H Lynch[1], Teiya Kijimoto[1], Elizabeth Rowen[1]

[1]Division of Plant and Soil Science, West Virginia University, Morgantown, WV
[2]WVU Extension Services, West Virginia University, Morgantown, WV

Beetles that are directly or indirectly dependent on dung are ecologically and economically beneficial to livestock and pasture health, and pasture productivity. In West Virginia, pasture is a top agricultural commodity. However, due to limited sampling, we do not have data about dung beetle species and abundances in the state. With the help of WVU Extension and WV Conservation Agency we sampled over 30 WV farms in 2022 and 2023, and are building an updated species list for the state. We are evaluating dung beetle community patterns across these farms, and are seeing interesting species level and pasture level effects on these patterns, such as the *Onthophagus hecate* and *Onthophagus taurus* (introduced) driving variations in the communities and the effect of seasonality and use of pesticides on these community variations. By understanding assemblages of the dung beetle populations in WV and pasture management practices that affect them, we will eventually be able to provide location- and landscape-based assessments of dung beetle community health to producers.

7. Assessment of the Recycling Program in West Virginia: A Case Study of Monongalia County

Nadiatu Issaka, Julian J. Hwang, Alan Collins

Division of Resource Economics and Management, West Virginia University, Morgantown, WV

Monongalia County currently does not provide curbside recycling pick-up services to all residents. Residents who reside in the county but outside Morgantown city limits are expected to bring their recyclables to drop-off sites which discourages people from recycling in general. Consequently, those who would have recycled if curbside pick-up services were available might not recycle and increase the amount of trash going to landfills. Moreover, there exists a disparity between residents within and outside Morgantown city limits in terms of rights to have access to curbside recycling pick-up services. In this study, we measure the economic value of expanding recycling pick-up services to all residents in the County. An online survey was developed and distributed in collaboration with Republic Services, a recycling and trash service provider in the County. Our results indicate that residents are willing to pay $7.37-$19.19 a month, depending on the model specification.

8. Assessing SWAT Performance: Ksat, DEM Resolution, and Climate Change Effects in Appalachia

Lilai Jin, Jason A. Hubbart

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

The Soil and Water Assessment Tool (SWAT) model is a semi-distributed hydrological predictive management model that can be used for scenario analysis. Scenario analyses are essential to advance management decision-making in anticipation of future conditions. The current work included a comprehensive SWAT model case study on the interactive effect of saturated hydraulic conductivity (Ksat) on model simulation output under different digital elevation model (DEM) resolutions and future climate change scenarios in Appalachia. An exploratory (scenario) modeling approach using the SWAT model framework was applied to investigate the SWAT model simulation response to field-measured Ksat under three DEM resolutions (1, 10, and 30 m). The 1 m DEM demonstrated a more realistic streamflow result than the other DEM resolution scenarios, and the field-measured Ksat showed a more significant impact on model predictive output than DEM resolution. Another case study was applied using global circulation models (GCMs) to assess the effects of climate change on local water balance components under two Representative Concentration Pathways (RCP 4.5 and 8.5). The results revealed that precipitation will progressively increase from 1.27 mm (2050s) to 5.81 mm (2070s) under the RCP 8.5. The overall streamflow and water yield increased over the 21st century under both RCPs, with decreases in evapotranspiration. These studies quantitatively characterize the uncertainty in model output caused using observed Ksat and DEM resolution and provide valuable insights to assist managers in formulating precautionary mitigation strategies due to climate change. The work further enriches the SWAT case studies in the Appalachian region.

9. Growth Performance and Nutritional Quality of Yellow Mealworm (*Tenebrio molitor*) Fed Apple Pomace-Supplemented Diet

Nariman Ktil[1], Ida Holásková[1], Yong-Lak Park[2], Jacek Jaczynski[1]

[1]Division of Animal and Nutritional Sciences, Werst Virginia University, Morgantown, WV
[2]Division of Plant and Soil Sciences, Werst Virginia University, Morgantown, WV

Yellow mealworms (*Tenebrio molitor*) are highly nutritious and are explored globally as a sustainable food source. Hence, there is a need for optimizing their feed and growth for human food and animal feed. This study investigates the effects of apple pomace-supplemented diet on mealworm growth performance and nutritional quality. It is hypothesized that apple pomace would cause minimal differences in insect growth, while enhancing nutritional composition. Over four weeks, larvae were fed a standard feed *ad libitum* with either added water beads (SF) or apple pomace (APS). Weekly measurements of larval weight and semiweekly collection of dead/pupated larvae were conducted. Proximate composition analysis of larvae and pupae followed the AOAC methods. Antioxidant capacity was determined with ABTS assay for oils extracted with one-step organic solvent using five solvents. Larval body weight increased significantly ($P<0.05$) with no effect ($P>0.05$) of treatment. Survival and pupation rates were significantly higher ($P<0.05$) in SF than APS larvae, while survival rates did not ($P>0.05$) differ in pupae. Pupation rates were significantly higher ($P<0.05$) in SF than APS. Proximate composition showed no differences ($P>0.05$) for moisture or ash contents. Crude protein was generally higher in larvae than pupae, while total fat was generally higher in APS than SF. Antioxidant activity showed no differences ($P>0.05$) across all groups. Apple pomace supplementation showed an overall improvement of mealworm nutritional profile. Therefore, optimizing nutritional composition of mealworm using apple pomace as a feed supplement could allow for the utilization of food processing waste in farming an alternative food source.

10. The Potential Role of miR6024-3p as a Repressor of the Anthocyanin Biosynthesis Pathway in Tomato Plants

Gabriel Lasmar dos Reis[1,2], Larissa Almeida[2], Antonio Chalfun Junior[2], Vagner Augusto Benedito[1]

[1]Division of Plant & Soil Sciences West Virginia University, Morgantown, WV
[2]Federal University of Lavras, Department of Biology, Lavras, Brazil

Throughout their lifecycle, plants encounter a myriad of biotic and abiotic stresses, leading to increased production of reactive oxygen species (ROS), which can cause substantial damage to cellular components. In response, plants synthesize antioxidant molecules, including anthocyanins, as a protective mechanism. Among the regulatory mechanisms, microRNAs (miRNAs), a class of small non-coding RNAs, emerge as key players in post-transcriptional regulation across numerous biological pathways. This study focused on defining the role of miR6024-3p in modulating anthocyanin biosynthesis in tomato plants. Employing miRNA target prediction techniques, miR6024-3p was identified as a potential negative regulator of *SlAN1* gene expression, suggesting a critical function in limiting anthocyanin accumulation in tomato. RT-qPCR analysis of miR6024-3p expression in our miniature plant model, cv. Micro-Tom (MT-WT) revealed high expression levels in all tissues analyzed. Further, RNA ligase-mediated 5'RACE provided compelling evidence of miR6024-3p-mediated cleavage of *SlAN1* transcripts. To confirm this regulatory function, we engineered a CRISPR/Cas9 vector to disrupt the miR6024-3p locus in the MT-WT genome. The generation of transgenic tomato lines and their subsequent acclimatization have yielded candidate T0 plants, which are currently under evaluation to confirm genomic edits. These genetically modified lines will serve as a foundation for genetic analyses aimed at revealing the functional impact of miR6024-3p on the repression of the anthocyanin biosynthesis, specifically through the cleavage of *SlAN1* transcripts. This research contributes to our understanding of miRNA-mediated regulation in plants. It also opens avenues for enhancing anthocyanin production through genetic manipulation, with implications for stress resilience and nutritional enhancement in crops.

11. Proposed Experimental Design for Testing the Presence of Known Ambrosia Beetle Behaviors in West Virginia's invasive Ambrosia Beetle (*Euwallacea validus*)

McKeon Laws, Teiya Kijimoto, Matt T. Kasson

Division of Plants and Soil Sciences, West Virginia University, Morgantown, WV

Invasive ambrosia beetles cause considerable economic damage to tree crops such as avocado and the native ecosystems they invade worldwide. Ambrosia beetles are a paraphyletic group of tree dwelling weevils that form a co-obligate relationship with a single fungal partner. In most cases ambrosia beetles are attracted to the volatile organic compounds (VOCs) emitted by their fungal partner. Adults feed developing larvae either only their fungal partner or a group of fungi that are phylogenetically closely related. To shed light on these behaviors in populations of invasive ambrosia beetles we will perform two observation experiments on Euwallacea validus, a less studied ambrosia beetle invasive throughout West Virginia. The first is a two-choice behavioral assay in which adult beetles can choose between the scent, emitted VOCs, of symbiotic or non-symbiotic fungi. The second is a food swap assay, larvae will be reared on symbiotic or non-symbiotic fungi, and survivorship will be recorded. These two assays are established in literature to quantify the aforementioned behaviors in ambrosia beetles. We hypothesize that E. validus will be attracted to the VOCs of its fungal partner more than non-symbiotic fungi, and that mortality will increase when larvae are raised on a non-symbiotic. The results of these studies will elevate our understanding of the ecology of E. validus and how the ambrosia beetle symbiosis functions when in a non-native environment. This information can then be applied to protecting West Virginia's ecosystems and other regions where invasive ambrosia beetles cause die back of crops and natural habitat.

12. Economic Value of Rural State Parks using Mobile Device Data

Siddhartha Bora, Ivy Mackereth
Division of Resource Economics and Management, West Virginia University, Morgantown, WV

According to a report by the U.S. Department of Commerce, "people are getting out more and outdoor recreation continues to drive America's economy." This was made in reference to a recently released report from the Commerce Department's U.S. Bureau of Economic Analysis (BEA), which revealed that the outdoor recreation economy in the United States topped $1 trillion for the first time. According to the report, there has been significant growth in outdoor recreational activities, led primarily by the travel and tourism industry (U.S. Department of Commerce, 2017). This study estimates the economic value of state parks in the Allegheny Highlands Region of West Virginia using mobile device data. To do this, we examine device location reports of visitors to the sites between 2019-2022, and develop a random utility (RUM) frameworkbased on the number of visits made to each site (Del Rossi et al., 2023):

$$E(CV_i) = \frac{1}{\beta}\{\ln\left[\sum_{j=0}^{J-1} V(P_j, Y_i)\right] - \ln\left[\sum_{j=0}^{J} V(P_j, Y_i)\right]\}¶$$

The parameter β denotes the estimated marginal utility of income, and $E(CV_i)$ represents the value of each state park to society, given travel distance, cost, and the amenities offered by each park. Previous studies have used mobile phone signal data to estimate recreational benefits and consumer welfare of urban wetlands and parks (Dai et al., 2022; Del Rossi et al., 2023; Juang and Carrasco, 2020). This study contributes to the literature by analyzing the economic value of state parks in a rural setting and estimating the welfare loss due to the COVID-19 pandemic. This study demonstrates a faster and cost-effective way to value recreational areas, and informs policy related to the state park system.

13. Creative Integration of Artificial Intelligence and Geospatial Data for Regional Wealth Estimation

Parastou Salehipour, Hodjat Ghadimi
School of Design and Community Development, West Virginia University, Morgantown, WV

Wealth estimation plays a crucial role in assessing environmental and economic development, facilitating the creation of effective regional policies and strategies. However, measuring wealth at scales below the national level is challenging, with limited empirical research to guide comparative studies. Moreover, traditional methods of collecting wealth estimation data are often time-consuming, labor-intensive, and expensive. This research presents a framework to integrate Artificial Intelligence capabilities in identifying, organizing, and collecting the required Geospatial data for wealth estimation at the regional level. Natural, physical, and human capital forms are the main components of the knowledge base for wealth assessment. Employing neural networks to capture complex relationships within the data, alongside regression models to identify correlations between asset variables and wealth indicators, contributes to the development of a Regional Wealth Model. Model validation and sensitivity analysis are conducted using cross-validation to evaluate performance across various conditions. Central to our methodology and model is the novel concept of creating a Virtual Wealth Scanner (VWS). Coupled with AI-driven insights, this scanner provides innovative pathways for quantifying wealth by identifying patterns and correlations across diverse datasets. Through continuous updates and simultaneous spatial and temporal analyses, the wealth scanner captures evolving wealth patterns with enhanced accuracy, offering real-time insights for resource allocation and development planning. The resultant VWS, as the output, provides invaluable resources for facilitating well-informed decision-making and regional policy formation. It enables stakeholders to allocate resources with precision at the sub-national level in the US and across other regions in the world.

14. Vintage Reseller Contributions in Curbing T-shirt Disposal

Melissa Chasko Turner

School of Design and Community Development, West Virginia University, Morgantown, WV

A garment's environmental impact can be lessened by extending its life. This can be achieved by long term wear, repair, and new owners. This study discusses how the vintage T-shirt market encourages reuse and retainment to prevent disposal. This will be seen under the lens of material culture and nostalgia which are woven through their shared relationship to memory, meaning, and the emotional resonance of tangible objects such as vintage T-shirts. A gap in sustainability literature is filled by specifically exploring the secondhand T-shirt market as explained by vintage T-shirt resellers. They scour thrift stores daily, purchase bulk from textile recyclers, and believe in reuse and recycle. Qualitative interviews were conducted with 26 vendors. They recounted their enterprise beginnings, their business model, determining value, and their consumer. A large segment of the narratives gathered spoke of the opportunity that consumers and the vendors themselves have to keep T-shirts out of landfills. The predominant focus was on the importance of imagery. The graphics exhibited on T-shirts were the main driver for sales, with customers searching for specific visuals or putting in requests for the vendors to try to locate rare items. The business owners shared stories from their customers seeking designs enjoyed by their parents or grandparents, attempting to share a connection to them. The goal of the study is to (1) provide academic research on the vintage reseller markets involvement in sustainability; (2) educate on how nostalgia restrains disposal of vintage T-shirts; (3) and add to sustainability education.

15. The Impacts of Flood Hazards on Property Values: Evidence Before and After a 1000-year Flood

Matthew Walker

Division of Resource Economics and Management, West Virginia University, Morgantown, WV

On June 23rd, 2016, 8 to 10 inches of rain fell in less than 12 hours over southern West Virginia. The resulting floods, which left 23 West Virginians dead, caused over a billion dollars in damages. Additionally, the federal government remains exposed to uninsured property losses due to a lack of flood insured properties despite provisions requiring flood insurance to those in areas with high-risk of flooding. Flood events and changing risk perceptions have been shown to cause variation in the value of capital at risk. This study examines the interplay between flooding, risk perception, and housing prices in West Virginia, in an effort to highlight strategies for preparedness, resilience, and recovery. Specifically, this study asks, (1) how does location relative to floodplains impact property values in Greenbrier County, West Virginia?', and (2) 'how does a severe flooding event impact property values in the following years?'. We use a hedonic valuation difference-in-differences model to determine if properties in Greenbrier County, West Virginia facing lower risk of flooding sell at a premium and, whether properties in floodplains have greater price reductions in years directly after flooding, given ceteris paribus. We found that location in the floodplain is associated with differences in parcel sale prices, and that the time of sale, pre- or post-flood, was not associated with a difference in parcel sale prices, suggesting that the flooding did not affect the perception of flooding risks and that flooding risks are known and are accounted for in parcel sale prices.

16. Blossom

Zunaira Malik, Angela Uriyo
School of Design and Community Development, West Virginia University, Morgantown, WV

Purpose and Importance of the Project: "Blossom," was developed in response to the specific requirements to create a garment for our client, Mary Rose, a 70-year-old working woman. Background of the Problem: Through an in-depth interview and closet analysis, I discovered that Mary Rose has an affinity for clothing that enhances her body shape without overemphasizing it, prefers neutral colors and occasional vibrant hues, and has a fondness for animal prints and feathers. With her needs and preferences in mind, I set out to create a garment. Research/Design Methods: My design process included multiple steps from design ideation to the assembly of the final garment. My print inspiration came from cheetahs and the colors found in peacock feathers. I merged various features of nature such as animal colors and the vibrant colors of peacock feathers. I created pleats to give the effect of opening feathers. I created brooches to reflect the spots on a cheetah's coat. Details of Design Product: The cohesiveness of this look is achieved through the combination of complementary colors. My dress depicts various interpretations of nature by combining its elements, all to give the impression of a blooming flower. Importance of the Findings: "Blossom" seeks to merge the choice of my client's color preferences with feminine dress design. The dress gives various interpretations of nature such as the dominance of a cheetah, beauty of peacock colors and the blossoming nature of a flower.

17. What are the Costs and Benefits from Carbon Sequestration to Livestock Producers in Appalachia?

Ivan Wong[1], Ana Claudia Sant'Anna[1], and Ember Morrissey[2]
[1]Division of Resource Economics and Management, West Virginia University, Morgantown, WV
[2]Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Climate change and environmental degradation highlights the need for sustainable agricultural practices. The issue of carbon emissions from livestock production cannot be overlooked. Agriculture accounts for 10% of total US greenhouse gas emissions, and 4.5% of these stem from livestock (Powers et al., 2009). Despite the potential of carbon sequestration in agricultural practices, little is known of its economic viability and social benefits within the Appalachian region, where unique environmental and economic conditions prevail. Our objective is to assess the direct and indirect costs of adopting carbon sequestration practices, alongside evaluating their broader environmental and economic impacts. Therefore, a better understanding of available carbon sequestration programs and their potential profits and costs for livestock producers and their communities is needed. Data on livestock production costs and revenues come from estimates provided by extension agencies. Information on potential benefits from government programs for farmers and the community will be compiled from official websites and complemented by past peer-reviewed studies. We use these to estimate cost and benefit from adopting CO2 sequestration practices under different herd sizes. Depending on which method is used for carbon sequestration, livestock production can store over 1 $MTCO_2$/ac/year (Powers et al., 2009). Findings offer insights into the economic viability of carbon sequestration practices in livestock production, carbon sequestration programs available to farmers. Findings will motivate discussions around the scalability of these practices beyond Appalachia, policy implications, and the role of agriculture in carbon storage.

18. Assessment of the Relationship Between Zooplankton and Larval Fish in the Ohio River

Brandon G. Mundy, Emma Hall, Cooper Motzko, Sam Johnston, Brent A. Murry
Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

The larval stage of fish life history is widely regarded as the most critical life stage due to their vulnerability to environmental factors. During the post yolk sac stage fish must consume zooplankton or risk starvation. If they are unsuccessful this can negatively affect the recruitment of the cohort. It is hypothesized that larval fish evolved to respond to environmental cues to match zooplankton blooms. In some systems this leads to temporal linkages between their densities. Recent research has shown a large seasonal shift in zooplankton blooms. Here, we measure whether larval fish abundance is related to zooplankton abundance. Through this study we assess patterns in the phenology of both zooplankton and larval fish. We collected zooplankton and larval fish from tributaries to the Ohio River from Point Pleasant, WV to Aurora, IN which is approximately 363 river kilometers. We collected zooplankton via integrated tube sampler powered by a diaphragm pump and identified using a dissecting microscope. Fish larvae were collected via 3 minute trawls and identified using a dissecting microscope. Densities were calculated for both fish larvae (larvae/ liter) and zooplankton (count/liter). We hypothesize a positive relationship between larval fish density and zooplankton density consistent with bottom up control and fish larvae "matching" zooplankton blooms. Our findings will provide insights into how larval fish respond to changes in zooplankton phenology and potential implications to fish recruitment.

19. Post Fire Effects on the Growth and Development of California Black Oak in the Central Sierra Nevada mountains.

Riley Pierce, Sophan Chhin
Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

California black oak (*Q. kelloggii*) is an important wildlife masting and cultural species in the Sierra Nevada mountains of California. This species is widespread in California and often grows in Sierra Nevada mixed-conifer sites competing with *Abies concolor*, white fir. Both species have been heavily impacted by the frequent and severe fires affecting the region recently. Plots in this study were subjected to three wildfires since 2000, and the goal was to study the relationship between the frequency and severity of these fires and their effect on California black oak growth, survivability, competition, and establishment. What we found was that the crown class ranking of a tree before a fire occurs has an effect on the emergent height of the sprout afterwards. Additionally, there is a "Goldilocks" zone of fire severity that effectively promotes black oak sprouting, while more or less severe fires will lead to the stands languishing under early seral stages and never fully developing or falling prey to intense conifer competition. This work is significant in determining the correct mix of both fire and thinning that could be used in order to properly manage California black oak so that it can mature within its habitat.

20. Development of Community Size-Spectra-Based Indices of Biotic Integrity for West Virginia

William Thompson, Andrew Stegman, Sindupa De Silva, Brent Murry
Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Wetlands are important ecosystems for improving and determining the quality of water bodies they lead into. The presence and abundance of certain macro-invertebrates are excellent indicators of the wetlands' integrity. Here, we assessed the quality of the wetlands of West Virginia by constructing a community size-spectra-based index of biotic integrity (IBI), a way of measuring the health of ecosystems by evaluating assemblage level body-size: abundance distributions. Macro-invertebrates were collected from 85 wetland sites around the state using D-nets and were measured to evaluate food web form and functionality. Taxon-specific equations were utilized to convert total length (mm) into dry mass (mg) from literature (Benke et al., 1999) and used to construct site-specific size-spectra. We hypothesize that changes in the size-spectra slopes of wetland sites will be correlated to pollution and disturbance gradients. We expect hydrologically stable wetland systems to show strong body-size: abundance relationships, while wetlands experiencing common drying events are likely to show weak to no relationship. Thus, size-spectra may prove to be a useful non-taxa-based metric assessing food web structure that can provide added value to existing taxon-based IBIs to guide stream restoration.

21. Departure (Poison)

Gabriella Stone, Colleen Moretz
School of Design and Community Development, West Virginia University, Morgantown, WV

This look is designed for a woman between their 20s and 30s, who is in a powerful position and is very assured in her ways. She likes the darker aspect of life and is drawn to the dark and macabre side of things. And she wants a garment that reflects the innermost dark parts of herself. She is an activist for the environment and social rights. She enjoys the psychology behind people responding to death by turning away and why others find the topic permissible or enjoyable. This look and the collection with it have an overwhelming amount of hand beading and embroidery. Every butterfly has glass beads embroidered onto a similar color in organza. Each butterfly has two layers of organza with hand-sewn rhinestones to the opposite wing of the beads. In addition, there is a layer of interfacing to give the color of the organza more light before cutting it out and burning the raw edges so they wouldn't fray. I wanted this look to be an art piece, more than something that my customer would wear every day. This look is meant to move people to think about death and life and their current place in it. I wanted people to be forced to look at something beautiful and soft, the butterflies, and something morbid that they would rather look away from, death.

POSTER PRESENTATIONS

Session B – Mixed

12:00 pm – 1:15 pm

1. Evaluating the Adaptation of Taro (*Colocasia esculenta*) to West Virginia Climatic Conditions

Kayode Joseph Ajayi, Domingo Mata-Padrino, Eugenia M. Pena-Yewtukhiw, and Sven Verlinden
Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Climate change likely impacts agriculture and food security across the globe, for example in temperate latitudes higher temperatures could be expected and new crops would take advantages of increase in the length of the growing period. Research was conducted in Morgantown, WV in 2022-2023 to understand the growth pattern of Taro in West Virginia, to identify different growth stages to determine the maturity stage of a Taro plant, and to analyze the chemical composition of the Taro plant. The experimental design was direct planting - low tunnel technology (2 replications, and 10- plants/plot), two fertilization treatments (fertilized and unfertilized). Distance per plant was 1-m within and between rows. Days after planting(DAP) were used to sample. Data were analyzed as completely randomized ANOVA. Dependent variables were plant height, number of shoots, width and length of the leaves days after planting. Fresh, dry weight, and chemical analysis were also determined. In 2022, the fertilized plants showed greater weight per plant than the non-fertilized ones. In 2023, both treatments were influenced by DAP and the interaction treatment by DAP. There were no significant differences in leaf dry weight regarding DAP, treatment, and their interaction. However, leaf length was significantly affected by the DAP while leaf width was affected by both DAP and treatment. It can be concluded that Taro fertilization supports early maturity and that WV climatic conditions are suitable for its cultivation; however, extreme summer conditions may lead to reduced performance with a recommendation for irrigation in future research.

2. Influence of Soil Characteristics on Two Species of *Plethodon* Salamanders (*P. cinereus, P. glutinosus*)

Jami Baker[1], Donald Brown[1,2], Shawn Grushecky[1], Sheldon Owen[1,3], Jamie Schuler[1], John Edwards[1]

[1]Davis College Division of Forestry & Natural Resources, West Virginia University, Morgantown, WV
[2]U.S. Forest Service, Pacific Northwest Research Station, Amboy, WA
[3]Agriculture & Natural Resources Program, WVU Extension Service, Morgantown, WV

As the bioenergy industry grows, there is increased interest in extraction of forest biomass. As forest biomass is lost, there is an associated decrease of soil pH, water retention, and carbon storage; a problem which can be remedied with biochar — a charcoal-like substance rich in carbon that is commonly created from woody or herbaceous agricultural and forestry waste. Many biochar studies have focused on agricultural systems, but interest is growing in using biochar in forested systems to address several concerns regarding forest soils, including offsetting carbon lost through harvest. The possible environmental benefits are appealing, but there is a lack of research into how soil-associated organisms may interact with biochar in forested environments. While some studies exist on biochar-mediated impacts on invertebrate organisms, there is little information on how fossorial and semi-fossorial vertebrates may be impacted. Therefore, before biochar is used in forested systems, its influence on forest soils and native organisms should be assessed. Due to their status as indicator species and their sensitivity to changes in the soil pH and moisture, Plethodontid salamanders are an ideal model species to examine how biochar-mediated change in soil characteristics may influence terrestrial vertebrates. This is research in progress with complete results expected by March. In these results, I will examine the short-term influence of biochar on soil characteristics, namely soil moisture and pH, and evaluate if these characteristics influence health (i.e., body condition) and abundance of *Plethodon* salamanders in hardwood forests of West Virginia.

3. Knowledge and Perceptions of Divers and Snorkelers Regarding Coral Reef Environmental Stressors and Restoration in the Florida Keys National Marine Sanctuary

Allison Benelli, Robert Burns, Ross Andrews
Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Coral reefs face rapid decline worldwide due to environmental stressors such as pollution, disease, ocean acidification, and warming of ocean waters. The Florida Keys National Marine Sanctuary (FKNMS) provides recreational opportunities while demonstrating the importance of protecting and restoring coral reefs through management efforts. Understanding human use, knowledge, and perceptions associated with these ecosystems is valuable for managers to help prioritize conservation and restoration efforts. In 2020, a WVU Davis College research team assessed knowledge and perceptions of snorkelers and divers because of their direct interactions with the reefs. Two surveys that focused on snorkelers and divers were developed via Qualtrics and sent out with a 73.4% response rate (790 surveys). The first survey asked questions related to visitor experience, perceptions of coral reef conditions, opinions about coral restoration, the influence environmental conditions have on their experience, and their overall satisfaction (Burns et al., 2021). The second survey asked questions regarding expenditures during recent recreation in the FKNMS. Results showed that two-thirds (62.3%) of visitors reported that the health of coral reef ecosystems in the Florida Keys are declining. A majority (60.7%) of visitors strongly agreed coral restoration in the Florida Keys improves the overall health of the reef and about three-quarters agreed it improves the local economy. These results provide insight to snorkelers' and divers' knowledge and perceptions regarding the status of coral reef conditions and restoration at FKNMS. Coral reef conservation has a better chance for long-term success if people are knowledgeable and supportive of such activities.

4. Do Dung Beetles Sink or Swim? Exploring Scarabaeidae Response to Climate Change Induced Precipitation

Lauren Cheshire, Elizabeth Rowen
Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Dung beetles, particularly the Scarabaeinae, provide valuable ecosystem services such as increasing water infiltration through soil, cycling nutrients, and removing dung from cattle pastures through their feeding and burying behaviors. One of the biggest threats to these services is global climate change. In the eastern U.S, climatologists have predicted an increase in severe rainfall events between intervals of hot humid days when moisture is held in the atmosphere and the ground stays dry for extended periods of time. Extremely dry soil does not absorb water as well as moderately wetted soil: therefore, an increase in flooding events are predicted as average global temperatures increase. Because we hypothesize flooding will impact access and attractiveness of cow dung to adult Scarabaeinae, and survival of offspring within and below dung pats, we will determine how dung beetles use dung pats in a climate with more flooding. In a factorial experiment, we created mesocosms in which we manipulated the amount of water inundating a dung pat and observed colonization at varying degrees of moisture. We expect to see dung beetles' ecosystem services dropping off as precipitation becomes more severe. By combining these data with mapping possible flood impacted areas, we will be able to contribute to models of decomposition and nutrient cycling in climate models of pastures in the Eastern US.

5. Distribution of Hair Types on *Osmia cornifrons* (Hymenoptera: Megachilidae): Implications for Pollination Efficiency

Nellie Heitzman, Yong-Lak Park
Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

The Japanese horn-faced bee *Osmia cornifrons* (Hymenoptera: Megachilidae) is a solitary bee introduced to North America in 1977 for commercial pollination after showing potential as a superior pollinator for Rosacea crops. However, the role of specific hairs of *Osmia cornifrons* in pollination remains unexplored, posing a significant knowledge gap. This study investigated the morphology and potential functions of hairs of *O. cornifrons* using a scanning electron microscope (SEM). We categorized hairs of female *O. cornifrons* based on the hair's morphology and location on the body. The results of this study found two primary types of hair (i.e., branched and unbranched hairs) that could be responsible for pollination. Branched hairs were evident on the head, thorax, dorsal abdomen, and outer segments of the legs. Unbranched hairs were found on the inner sections of the legs and the metasomal sterna. When pollen adhered to the hairs, it appeared as either trapped in branched hairs or packed in unbranched hairs. To test the relationship between branched and unbranched hairs on different parts of the body as well as how the pollen is packed on different hairs, we will test for normality using the Shapiro-Wilks test. Subsequently, either a Chi-Square Analysis or a generalized linear model (GLM) with a binomial error distribution will be performed. The results of this study will inform us of certain types of bee hairs that may be responsible for pollen carriage and storage on the bee body, affecting overall pollination efficiency.

6. Employing Machine Learning and UAS for Effective Autumn Olive Treatment on Reclaimed Surface Mines

Sean Keane, Paul Kinder, Michael Strager, Walter Veselka
Division of Resource Economics and Management, West Virginia University, Morgantown, WV

This research introduces an innovative approach for managing the invasive autumn olive (*Elaeagnus umbellata*) on reclaimed surface mines. The pervasive spread of autumn olive poses a significant ecological challenge which necessitates a more effective and efficient management strategy. This study employs machine learning and unmanned aerial systems (UAS) to enhance detection and treatment. Specifically, a convolutional neural network (CNN) model will be developed to accurately identify autumn olive from UAS mounted multispectral imagery. The model's predictions will then be integrated with a UAS equipped with a precision spraying mechanism for herbicide application. The anticipated outcome is a significantly improved method of autumn olive management, offering higher accuracy, efficiency, and reduced ecological impact on desired and native species. This research holds promise for surface mine reclamation, providing a scalable and transferable solution for controlling invasive species and post-mine land management.

7. Utilizing sUAS-Based Remote Sensing for Sustainable Outdoor Recreational and Interpretive Trail Design in a Mitigation Context

Isaac Kinder[1], Michael Strager[1], Shawn Grushecky[2], Walter Veselka[1]

[1]Division of Resource Economics and Management, West Virginia University, Morgantown, WV
[2]Division of Energy Land Management, West Virginia University, Morgantown, WV

The purpose of this research is to determine the efficacy of utilizing UAS-based remote sensing tools for designing recreational trails within a mitigation context. When mitigation occurs on a stream or wetland, a conservation easement is included which protects the surrounding land. Conservation easements are intended to protect the mitigated streams and wetlands as well as to allow access for the public. Sustainable interpretive and recreational trails allow individuals to interact with and learn from mitigation efforts. Mitigated areas are sensitive to sediment influx therefor minimizing trail erosion is imperative for a trail within a conservation easement. A DJI Matrice 300 sUAS system equipped with a Redtail RTL-450 LiDAR sensor will be flown over the WVU West Run trail system. The LiDAR point cloud will be converted into a digital elevation model (DEM) with a cell size of 0.25 meters using LiDAR360 software. An airplane-based LiDAR derived DEM will be obtained for comparison at 1m and 3m spatial resolutions. DEM derivatives such as slope, flow accumulation, etc. will be generated using ArcGIS Pro and SAGA software. A Spectra Precision SP80 GPS receiver will be used to capture trail segments which have and do not have erosion issues. Statistical analysis will be performed to determine if the DEM derivatives can be used to predict areas with potential for erosion issues. The results of the statistical analysis will be compared between the 3 data resolutions to determine if the drone-based data outperforms the coarser resolution airplane datasets.

8. Evaluating Land Cover Change and Opportunities for Bioenergy Crop Development on Surface Mine Sites in West Virginia, U.S.A.

Kenzie Kohrs[1], Shawn T. Grushecky[1], Jamie Schuler[1], Michael P. Strager[2], Robert Burns[1]

[1]Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV
[2]Division of Resource Economics and Management, West Virginia University, Morgantown, WV

Surface mining leaves large impacts on the environment and land, such as disturbances to land cover, forests, and water quality. Reclamation upon completion of mining operations was only required after the enactment of the Surface Mining Control and Reclamation Act of 1977. Current reclamation include revegetation with herbaceous species instead of tree species due to their success rate. Biomass, which can be a grass or tree species, has been used in various studies to reclaim surface mines and act as an alternative to nonrenewable energy sources. The objectives of this study were to quantify the state of vegetation growth on former surface mines in West Virginia over a 9-year period and identify suitable acreage for biomass production. Data, such as land cover, elevation, and permit boundaries were obtained from public sources. Using GIS applications, it was found that over 40,000 acres had been converted to forest and 40,000 acres of low vegetation was lost during the time frame. Further, the results indicated that approximately 23,000 acres of surface mines fit the criteria for the study. Of the 23,000 acres, 45% were identified as contiguous. There are studies that separate the suitability analysis of marginal lands and the ability to grow bioenergy crops on those lands, but the combination of research can be effective in reclaiming mine lands and developing alternatives for energy sources, which can create the potential incentives for landowners to establish bioenergy development projects on their land.

9. Exploring the Biology and Host Range of *Neonectria magnoliae*

Hannah M. Petronek, Matt T. Kasson

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

The family Nectriaceae includes numerous phytopathogenic fungi that cause canker diseases on both angiosperm and conifer hosts worldwide. Numerous *Neonectria* spp. cause cankers on hardwoods and conifers in North America, but their roles in contributing to tree decline and mortality are understudied compared to *N. faginata* and *N. ditissima*, the causal agents of beech bark disease and perennial target canker (*N. ditissima* only) on numerous hosts. *Neonectria magnoliae* also causes perennial cankers, but has only been reported from two native hosts: Fraser magnolia (*Magnolia fraseri*) and tulip-poplar (*Liriodendron tulipifera*). We recently confirmed *N. magnoliae* from non-native star magnolia (*Magnolia stellata*) in WVU's Core Arboretum. Both native hosts occur in the central Appalachian Mountains, but in different forests at different elevations. *Neonectria magnoliae* was first described in 1943, and little work has been done to investigate its impact on Magnoliaceae across the forested landscape. Multi-locus phylogenetic data indicate that *N. magnoliae* may encompass either two cryptic sister species or represent a host jump from Fraser magnolia to tulip-poplar. Recent phylogenetic analysis confirmed our previous findings: isolates from each host fell within separate lineages and formed well-supported clades. Morphological studies revealed strains from Fraser magnolia produced both macroconidia and microconidia, while isolates from tulip-poplar only produced microconidia. As both strains readily produce microconidia, only microconidia measurements will be taken. Cross-pathogenicity assays have been initiated for both hosts in order to quantify the pathogenicity of each strain on each host. All of these data combined will resolve the species boundaries of *Neonectria magnoliae*.

10. Soil-Water Interactions in Riparian Wetlands: A Study of Hydraulic Conductivity and Nutrient Concentrations

Bidisha Faruque Abesh, Jason A. Hubbart

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

This presentation is based on the findings from two interconnected studies conducted in the seasonal wetlands of a mixed land-use watershed in West Virginia, USA, aimed at enhancing water resource management. The first study emphasizes the critical need for accurate predictions of saturated hydraulic conductivity (Ksat) for precise water flow estimations, utilizing pedotransfer functions (PTFs) based on soil structural and textural properties. Validation against observed Ksat values revealed a significant correlation with soil texture, particularly clay content, yet underscored the low accuracy of existing PTFs, indicating a pressing need for their calibration or the development of site-specific PTFs. The second study extends the investigation to nutrient concentrations in surface water (SW) and shallow groundwater (SGW), highlighting the spatiotemporal variability influenced by precipitation patterns, hydrology, and land-use practices. Results showed distinct nutrient profiles between SW and SGW, with higher total nitrogen concentrations compared to total phosphorus, and seasonal variations in nitrate levels linked to precipitation and water flow dynamics. Principal Component Analysis (PCA) and Spearman Correlation further elucidated the relationship between nutrient distributions, water source types, and adjacent land uses. Collectively, these studies provide invaluable insights into the complexities of water and nutrient dynamics in riparian wetlands of mixed land-use catchments, offering a solid foundation for informed management decisions to sustainably manage these critical ecosystems.

11. Microbial Response to Varied Manure Treatments for Organic Agricultural Methods

Eric Goddard, Ember Morrissey, Mellisa Musekwa, Hannah Bentley, Kinsey Reed, Damon LeMaster, Rebecca Ozbolt, Elizabeth Rowen, James Kotcon
Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Organic agriculture is growing in commercial market shares and these practices commonly use manure as a fertilizer source. Plants rely on microorganisms to breakdown organic fertilizer and aid in plant nutrient uptake. Soil fertility is typically improved in organic systems via the addition of liquid, dry stacked, or composted manure. These different types of manure have distinct chemical, biological, and physical properties that may alter microbial communities and their interactions with plants. For instance, root colonizing Arbuscular Mycorrhizal Fungi (AMF) that aid crop nutrient and water acquisition, as well as plant systemic acquired immune responses, could benefit from, or be impaired by, manure additions. Additionally, these manure types could differ in their effects on microbial decomposition processes. To address this knowledge gap, we tested the effects of manure treatments consisting of dry stacked, composted, liquid, and control (no manure) on root colonization by AMF and soil respiration (an indicator of decomposition). As the effects of manure treatment on plant-microbe interactions could be crop specific, the experiment was on fields of corn (*Zea mays* L. ssp. *mays*), wheat (*Triticum aestivum* L.), and soy (*Glycine max* (L.) Merr) at the WVU Agronomy Farm. To test this, we measured decomposition rates through CO_2 production and AMF root colonization through microscopy. We predict that there will be respiration and AMF colonization differences among treatments. These results can aid future organic farming decisions, while broadening knowledge regarding beneficial microbes in plant and soil interactions from the addition of manure.

12. The Impact of the Changes of Macro Economy on the Transport Cargo Volume in South Korea and Forecasting

Gisu Kim
Division of Resource Economics and Management, West Virgina University, Morgantown, WV

South Korean economy is significantly influenced by the various external circumstances in the world. There is surging a high exchange rate and an increase in energy prices due to the framework convention on climate change. These external factors can have a significant effect on the flow of international trade volume in South Korea. This study aims to analyze the flow of near future cargo volume through forecasting model based on the historical data and tries to understand the dynamic relations between macro-economic factors and total cargo volume in South Korea. This study performed the multiple regression analysis first and, after checking the unit root and cointegration analysis, conducted the ECM analysis using time series data from September 2009 to August 2023. As a result of ECM, findings align with the expectation that a rise in the exchange rate results in a reduction in South Korea's cargo volume. In addition, the increase in Korea's productivity might lead to increase total cargo volume. However, there is no statistically significant effects of WTI and the production index of U.S. on the Korean total cargo volume. Moreover, this study conducted SARIMA model for forecasting upcoming trend of total cargo volume. Since the flow of total cargo volume in previous period appeared decline, the total cargo volume in South Korea is expected to decrease in a short term. More specifically, it is predicted that cargo volume will decline after peaking (62,118,600 tons) in March 2024.

13. Removal and Analysis of American Chestnut Stands Infected with *Cryphonectria parasitica* and Treated with Super Donor *C. parasitica* strains

Danielle Mikolajewski

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

American chestnut (*Castanea dentata*), once a dominant and ecologically/economically important tree in the eastern U.S., has since been decimated by chestnut blight caused by fungus *Cryphonectria parasitica*. One method of control is using fitness-reducing hypoviruses. Transmission of the hypovirus is controlled by vegetative incompatibility (*vic*) genes that must be identical in both donor and recipient strains to allow transfection. In the U.S., genetic diversity in *vic* genes has limited the use of hypovirulence. Engineered super donor (SD) strains of *C. parasitica* were developed to overcome this and transmit the virus regardless of *vic* genotype. In 2016-2017, members of our lab treated naturally occurring chestnut cankers in chestnut stands in western Maryland with SD strains to see if they could provide viable control. Both experiments were successful but without additional re-treatment, a majority of infected trees ultimately succumbed to disease. In 2022, infected SD treated chestnut trees were removed, sampled, and measurements were taken and compared to previous measurements. *Vic* genotyping was performed on recovered *C. parasitica* strains to characterize the *vic* genotype diversity after 6+ years since hypovirus application. As observed previously, cankers treated with hypovirus strain CHV1/Euro7 were smaller than CHV1/EP713 treated cankers. Additionally, phenotypes were found that may be associated with hypovirulence. However, hypovirulence alone cannot explain the persistence of ten chestnut trees across the two SD sites. This research contributes to the knowledge of *C. parasitica*'s ecology and the efficacy of SD, while uncovering important considerations regarding host genetics and other biotic and abiotic factors influencing disease.

14. Assessing the Population Structure, Genetic Diversity, and Hybridization of the Appalachian Cottontail (*Sylvilagus obscurus*), in West Virginia, USA

Madison L. Miller[1], Chris Rota[1], Mack Frantz[2], Sheldon Owen[1], Amy Welsh[1]

[1]Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV
[2] West Virginia Division of Natural Resources, Elkins, WV, USA

Appalachian cottontails (*Sylvilagus obscurus*) are a species of rabbit that experienced a historical decline and currently exist in small, fragmented populations across their range. Although Appalachian cottontails are currently considered a vulnerable species (S3 state conservation status rank) in West Virginia, little is known about their genetic status. Vulnerable species often exist at small population sizes and are prone to issues that could threaten the persistence of the species such as genetic drift, inbreeding depression, and high levels of genetic structure. In other parts of their range, Appalachian cottontail populations have been shown to experience low levels of gene flow and researchers recently discovered the occurrence of hybridization events with Eastern cottontails. Hybridization is particularly concerning for a vulnerable species since it can cause genetic swamping and push a species further toward extinction. In this study, we collected 208 fecal pellets from areas of suspected Appalachian cottontail habitat across the state of West Virginia. We used DNA barcoding of mitochondrial DNA to initially screen for species identification. We then assessed levels of gene flow, heterozygosity, relatedness, and hybridization for Appalachian cottontails using a suite of ten microsatellite markers. Overall, the results of this study will elucidate the conservation status of this species from a genetic perspective. This will help determine if management actions to increase gene flow among populations such as translocations or improving habitat connectivity are needed.

15. Manure Management and Weeds: Implications for Organic Grain Production

Mellisa Musekwa[1], Elizabeth Rowen[1], James Kotcon[1], Rakesh S. Chandran[1], Ember Morrissey[1], Eugenia M. Pena-Yewtukhiw[1], Ana Claudia Sant'Anna[2]
[1]Division of Plant and Soil Science, West Virginia University, Morgantown, WV
[2]Division of Resource Economics and Management, West Virginia University, Morgantown, WV

Maintaining soil fertility in organic farming is crucial for soil health and influences plant growth and weed abundance. Manure, rich in nitrogen, phosphorus, potassium, and other vital nutrients, is a valuable resource for organic farming. However, its use may complicate weed management, potentially exacerbating weed growth or aiding in their control. Manure can introduce weed seeds to the seed bank, especially when new weed species are introduced. However, it can also aid in controlling weeds by boosting seed predation and decomposition. Our study investigates the effects of three cattle manure management methods on production of organic and organic-transition grain for livestock feed production. Liquid, composted, dry stacked manure and an unfertilized control were applied to a corn-soy-wheat rotation. We expect liquid manure, with more inorganic nitrogen and less organic matter, to mimic inorganic fertilizers and carry fewer weed seeds compared to solid manures. Solid manures, composted or not, have higher organic matter, supporting predators and pathogens that target weed seeds. Dry-stacked manure, being untreated, may introduce weed seeds. Composting, heating the manure above 55°C, likely eliminates viable weed seeds. We hypothesize that composted manure will best support biological control of weed seeds without vectoring weed seeds. To assess the impact of manure on weeds, we monitored weed biomass and measured predation using sentinel weed seeds throughout the season. Additionally, we recorded yield across all treatments. These findings will inform conclusions about better manure management methods to assist organic growers in managing weed issues and enhancing productivity.

16. A Digital Memoir of Landscape: a Multi-Layer Landscape Model for Mapping Cultural Heritage.

Hossain Mohammad Nahyan, Stefania Staniscia
School of Design and Community Development, West Virginia University, Morgantown, WV

The National Coal Heritage Area (NCHA) in southern West Virginia is a designated National Heritage Area in the USA, renowned for its rich coal mining heritage and picturesque landscapes. Many of its heritage sites are located within the rural or "ordinary landscape." However, contemporary industrial practices, notably mountain top removal, are significantly altering the current landscape. Despite its recognition, comprehensive spatial planning efforts remain inadequate, neglecting the integration of both scenic and ordinary landscapes within the broader cultural landscape. We are proposing a 'landscape approach' for the NCHA, emphasizing the multifaceted nature of landscapes and advocating for the conservation and management of significant landscape elements including their surroundings. Several frameworks, including Landscape Character Assessment, Historic Landscape Characterization, Landscape Biography, and Visual Impact Assessment, seek to characterize landscapes through this comprehensive lens. In this study, firstly, we are developing a methodological framework to integrate landscape characterization with historic information and the existing visual quality. Secondly, we propose a systematic method using geographic information to map the cultural heritage, specially designed for the context. It is a multi-layered process which includes multivariate data analysis, digitization of historic maps and cartographic analysis and viewshed analysis. With this process, we are developing a multi-layer digital model that will determine distinct landscape characters, historic morphological networks and culturally sensitive viewsheds. In conclusion, our proposed 'landscape approach' for the NCHA emphasizes a comprehensive methodology that should be implemented when planning, assessing, or designing highly transformative interventions in heritage-characterized landscapes.

17. Improving Artemisinin Biosynthesis by Leveraging Genetic and Metabolic Diversity in the WVU *Artemisia annua* Collection

Ryan Preble, Ella Moats, Michael Gutensohn, Vagner Benedito

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Malaria is a mosquito-borne illness that kills hundreds of thousands of people per year, particularly children in sub-Saharan Africa and Southeast Asia. The sweet wormwood (*Artemisia annua* L.) is a medicinal herb from temperate Asia used in the treatment of malaria. It is the dominant source of artemisinin, the primary component of artemisinin-based combination therapies that are first-choice treatments against malaria. Because of the difficulty in synthesizing artemisinin *de novo*, plant tissue extraction remains the most economical method of its production. However, global production has failed to meet demand in the most vulnerable regions. Though breeding efforts have seen some success in boosting artemisinin content, synthetic biological approaches are currently the most promising. In this study, we aim to leverage the West Virginia University collection of *A. annua* specimens to identify genetic differences underpinning its diverse metabolic profiles, with the ultimate goal of engineering elite artemisinin-producing strains. The objective of this research is to identify genetic regulators associated with carbon partitioning and terpenoid synthesis for manipulation and further study. We will generate transcriptomes and metabolomic profiles for each accession held in the collection using RNAseq and gas chromatography-mass spectrometry (GC-MS). With these data, we will generate contrastive sets with respect to both individual metabolites as well as metabolite classes to isolate gene expression differences underpinning the phenotypic diversity of the collection. We will analyze these data and identify putative genetic regulators using differential expression and gene co-expression analyses.

18. Evaluating Environmental Stewardship Short Term Service-Learning at Campus Urban Natural Greenspaces Campus to Foster Community Engagement

Richard Wolff[1], David Smaldone[2]

[1]School of Design and Community Development, West Virginia University, Morgantown, WV
[2]Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Universities across the US promote community engagement to their students. Among public land-grant institutions, especially those with properties that function as urban greenspaces, students have opportunities to participate in environmental stewardship volunteer programs that conserve, protect and restore their surroundings. In return, college-level students may develop awareness and appreciation or a sense of connectivity to nature. Here at WVU there is a 30-acre urban forest known as WVU Falling Run (aka Falling Run) and it is managed by the Davis College. Its role of engagement includes volunteering, education, research, and recreation. In the past five years, the Falling Run Coordinator has gathered favorable anecdotal feedback from students that participated in their programs. Yet only limited numbers of participants take part. The purpose of this study is to evaluate the outcomes derived from Falling Run service-learning programs to be developed, administered, and short term (less than three hours) in the field. These include appreciation and awareness, a sense of connectivity to nature, a sense of ownership, teamwork, leadership, and community engagement to determine how these could affect programs. Additionally, this study will include a retrospective pre-post design. Surveying will take place throughout the remaining of 2024 using Qualtrics online in the field. This study will use a quasi-experimental non-equivalent control group which will aim to demonstrate causality between an intervention and outcomes from the various Falling Run volunteer experiences. Falling Run's results will provide insights into levels of outcomes identified in this study among WVU students engaged in environmental stewardship volunteering.

19. Enhancing Reproducibility and Comparability: Standardizing a Rapid Soil Aggregation Method for Appalachian Region Soil Testing Laboratories.

Abigail F. Clegg, Eugenia M. Pena-Yewtukhiw, Johan Cuervo

Division of Plant & Soil Sciences, West Virginia University, Morgantown, WV

Soil aggregation is a crucial physical indicator of Soil Health (SH), influencing soil functions and subsequent usage. Despite ongoing developments in the understanding of the Soil Health paradigm, refining assessment methods for SH indicators like soil aggregate stability (SAT) remains a challenge, particularly in Soil Testing labs. The Soil Health Institute has introduced a rapid SAT assessment method based on soil slaking, a process where dry aggregates break down upon contact with water. Although this method creates an Aggregate Stability Index (ASI), facilitating use in soil testing labs, its reproducibility has been proven to be low. To address this, the WVU Soil Physics Lab aims to establish a fast, reliable, and reproducible SAT measurement method sensitive to soil management and related soil properties. An experiment has been designed to standardize the rapid SAT method's sensitivity to two Appalachian region production systems and different sample presentations in the lab, specifically focusing on sieve size. The hypothesis: rapid SAT method is responsive to soil management, predicting that high tunnels will exhibit a lower soil ASI than grasslands. Additionally, it is expected that coarser sample presentations (larger aggregates) will result in higher stability indicators. The experiment involves testing three sieve sizes and two management systems. The study's ASI will be compared with results from standardized methods and soil properties like texture and organic matter. Assessing the performance of ASI aims to improve its use at the WVU and other Soil Testing Lab settings as a robust and reliable method for soil health assessment.

20. Improved Engineered Wood I-Joists

Thomas Black, Levente Denes, Joseph McNeel

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Engineered Wood I-Joists are engineered wood products comprised of two main components: flanges at top and bottom, and webbing between. These components can be made from different wood-based structural materials including Laminated Vener Lumber (LVL) as the flange material and Oriented Strand Board (OSB) as the internal webbing bonded together using an isocyanate resin. The joists are commonly used as floor joists and based upon the span of the floor the depth of these joists' changes. This research aims to improve the load bearing capacities of the joists by substituting the internal webbing with advanced OSB panels. Adding the advanced OSB improves the achievable spans and reduces the material use, helping to move towards a more sustainable construction. The research covers also the investigation of chases placement without compromising the strength. Adding chases into the joist will allow for ease of installation during construction as well as will allow for utilities like water, electricity, sewer, and ducting pass through the joists. Preliminary research indicates that the advanced OSB being used is stronger than commodity OSB commonly used in existing joists designs. The properties that are being tested in this study are modulus of elasticity, modulus of rupture, and shear strength.

21. A New Species of Fungus Symbiotic with the Morning Glory *Ipomoea tricolor*

Corinne M. Hazel, Daniel G. Panaccione

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Ergot alkaloids are chemicals produced exclusively by fungi and are important for their use in pharmaceuticals and their toxic impacts on livestock. *Ipomoea tricolor* is a common plant species in the family *Convolvulaceae* (morning glory). Limited sequence data and HPLC analysis of ergot alkaloid presence in plant tissues show evidence of a fungal symbiont of *I. tricolor* despite no identified or externally visible fungus. Our goal is to isolate and describe this fungus, which we hypothesize represents a new species. Observation of fungal hyphae on evacuated seed coats from *I. tricolor* and subsequent transfer onto malt extract agar resulted in cultures of the symbiont isolated from the plant. The fungus grew slowly as white hyphae and sometimes aggregated into synnema-like structures, both structures lacking any spores. Sequences of PCR products from this culture were most similar to the preliminary sequence data available for the symbiont. Using PCR and enzymatic digests, the same fungus was detected in *I. tricolor* roots, hypocotyls, cotyledons, leaves and stems. Since we were able to culture the fungus, we isolated sufficient DNA to sequence the genome with Illumina technology. Phylogenetic analyses based on multiple genes indicated that the symbiont of *I. tricolor* was distinct from, but related to, the two described species of *Periglandula* previously observed in other species of morning glories. Based on these data and observations, we conclude that the symbiotic fungus of *I. tricolor* is a distinct species of *Periglandula* and propose the name *Periglandula clandestina sp. nov.*

22. Effect of Vinegar Water on Chicken Carcasses Contaminated with *Salmonella typhimurium* and WV Poultry Survey

Carly Long, Cangliang Shen

Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV

As the demand for locally grown products increases, pastured poultry production and on-farm mobile poultry harvest becomes more prevalent. The long-term goal of this proposed integrated research and extension project is to identify microbial safety risks associated with locally-produced broilers, to provide supporting documentation for implementation of a mobile poultry processing unit (MPPU), and to secure and promote small poultry meat production and marketing in West Virginia and the Appalachian region. The objective of this study is to conduct an in-depth survey of 30-50 small local broiler processors in West Virginia. Questionnaires will test their knowledge of poultry meat processing and related microbial safety concerns, including "worker health, hygiene, and training", "scalding and chilling water", "sanitizing and cleaning", "microbial contamination", and "poultry wastewater treatments". The survey will also include questions on their current post-harvest practices, concerns over the currently employed methods, major considerations and barriers when deciding whether to adopt a new procedure such as MPPU, perceptions of microbial contamination, and information to determine interest in future poultry safety workshops. 30.4% of participants measured the temperature of their scalding water with 85% of them stating that their scalding water is 140 and 150 degrees Celsius, while 48% of participants do not measure. 17.4% of participants did not answer. 65.2% of participants do not add sanitizer to their chilling water, while 13% do, 33% of which use vinegar. 60.8 % of participants do not use sanitizer during the process, while 30.5% do, 50% of which use Lysol on surfaces, and 50% use bleach and 30% vinegar. 65% of participants measure their chilling time while the other 35% do not.

23. A Foldable Modular Home Made from Forest Products

Patrick Lusk

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

This research project explores the integration of advanced engineering principles and sustainable construction materials in the design of a foldable, quick-assembly house using Cross-Laminated Timber (CLT). The primary objective is to develop an eco-friendly and affordable housing solution that combines the structural and environmental benefits of CLT with the space-saving advantages of a foldable design. The study encompasses a comprehensive investigation into the mechanical properties of CLT, considering factors such as strength, durability, and flexibility in the folding mechanism. The research involves a multi-disciplinary approach, incorporating architectural design, structural engineering, and material science. Advanced computer-aided design (CAD) tools will be used to create precise models of the foldable CLT house, enabling simulations and structural analyses to ensure compliance with safety standards and building codes. Additionally, environmental impact assessments will be conducted to evaluate the sustainability aspects of the proposed design, emphasizing reduced carbon footprint and resource efficiency. The findings of this research project aim to contribute valuable insights to the sustainable construction materials field by presenting a novel solution for sustainable, affordable, quick-construction housing. The foldable CLT house has the potential to revolutionize traditional construction methods, offering a practical and environmentally conscious alternative for future housing projects.

24. Spatial Analysis and Repurposing of Coal Refuse Sites in Appalachia: From Environmental Challenge to Economic Opportunity

Kevin McCandless[1], Michael Strager[2], Shawn Grushecky[1]

[1]Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV
[2]Division of Resource Economics and Management, West Virginia University, Morgantown, WV

The process of mineral extraction in the Appalachia region has resulted in widespread coal refuse piles dispersed throughout the landscape. This resource not only pose environmental challenges but also offer opportunities for creating new revenue streams via inventive strategies for remediation and repurposing. Locating historic refuse sites and estimating their size is one of the challenges associated with developing this resource. Using multiple publicly available data sources, we developed a database of potential refuse sites in West Virginia. Once potential sites were identified, their current terrain characteristics were mapped and compared to pre-mining terrain. A methodology was developed to then estimate coal refuse volume by comparing pre-and post-mining terrain. A sample of the 193 potential sites was developed and will be used to prioritize reclamation efforts.

25. Steam Bending Treatments on American Beech Wood

Jacob J. Tripp, Levente Denes, Joseph McNeel, Gloria Oporto, Balazs Bencsik

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

American beech, *Fagus grandifolia,* is a wood species commonly found in the north-eastern region of North America. Despite its great abundance, American beech wood has little commercial application and value. Often, it is even considered a weed among foresters due to its tendency to grow in large numbers after a clear-cut has been performed on a particular site. Its close relative European beech, *Fagus sylvatica,* has a well-developed market in furniture applications such as complex desks, cabinetry, and tables that were subject to steam-bending processes. This research will explore the effects of varying steam-bending treatments of American beech and determine the bendability and machineability of samples subject to said treatments. The effect of steaming on color change will be investigated also. In doing so, more information will be readily available about American beech steam-bending properties to expand its utilization and value over time.

26. A Method to Standardize Soil Respiration Assessment as a Soil Health Indicator for Soil Testing Labs in the Appalachian Region

Grant Bohn, Dr. Pena-Yewtukhiw, Johan Cuervo

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Soil respiration is a measure of how much carbon dioxide is emitted from the soil. It is related to soil microbial and plant activity. Soil respiration is considered an indicator of soil health (SH) and it is accepted that higher soil respiration is an indicator of good SH. Solvita® is the most recognized soil respiration assessment method used by soil testing laboratories (STL), but it has been proven to exhibit low reproducibility. This study was conducted to determine whether soil sieving size can be managed to improve reproducibility of Solvita® results in STL settings. Our hypothesis is that controlling sieve size and moisture content while running Solvita® will increase results reproducibility: smaller sieve-sized will result in higher respiration rate than larger sieved soils. Grassland and high-tunnel samples were sieved at 2mm, 4mm, and 8mm. This factorial experiment, with production system (2-levels), soil health (2-levels), and sieve size (3-levels) as factors, employed a three-way ANOVA for respiration data analysis. To ensure consistent water levels, field capacity (FC) was calculated using a rapid method. Solvita® measured soil respiration with CO2 probes in gas-tight incubation jars (475mL). Respiration levels assessed after 24 hours, were quantified using color units and mg/kg CO2. Preliminary data indicates that the moisture content required to reach field capacity (FC) was higher in the soil samples sieved through 2mm than in those sieved through 4mm and 8mm. The expectation was that smaller sieve sizes would show higher soil respiration due to their increased surface area compared to larger sizes.

POSTER PRESENTATIONS

Session C – Mixed

2:15 pm – 3:30 pm

1. Developing an Assay for Identifying Volatile Compounds in Pork

Andrea Aliamaro

Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV

Meat is a key ingredient in several diets because of its high component of protein. The flavor profile of meat, particularly pork, varies based on the cooking method and temperature applied, as these factors trigger distinct chemical reactions that create volatile organic compounds as byproducts. It is important to understand the role these compounds have on meat because of its impact on their flavor, nutritional quality, and safety. The purpose of this study is to develop an ideal assay for identifying the volatile compounds found in pork samples. Raw porcine products were ground before being cooked in a water bath maintained at a consistent temperature of 60°C for 15 minutes. Volatile compounds were extracted from the headspace of samples incubated at various temperatures for 24 hours. Simultaneously, an additional set of samples was directly transferred to the incubators post-grounding and compared to the samples from the water bath. All samples were collected in scintillation vials with a Twister apparatus, and volatile chemical profiles were measured using GCMS. We detected a greater number of peaks in pork samples incubated at higher temperatures, with 80°C detecting the most. Desorption occurred in samples reaching over 80°C. There was no significant difference in peaks between the water bath technique and direct incubator placement. Development of an assay to detect various volatile organic compounds contributes to food science because it allows for the development of better products that meet consumer preferences while adhering to strict quality and safety regulations.

2. Implementing Unmanned Aerial Vehicles to Collect Human Gait Data at Distance and Altitude for Identification and Re-identification

Donn Bartram[1], Jeremy Dawson[2], Paul Kinder[1], and Walter Veselka[1]

[1] Natural Resource Analysis Center, West Virginia University, Morgantown, WV
[2] Lane Department of Computer Science and Electrical Engineering, WVU, Morgantown, WV

Gait patterns are information pertaining to the way a person moves. Gait information is unique to each person and can be used to identify and reidentify people. Historically, this task has been achieved through the use of multiple ground-based imaging sensors, but as unmanned aerial vehicles (UAVs) advance, they present the opportunity to evolve the process of human identification and re-identification. Collecting human gait data using UAVs at distances ranging from 20m to 500m and altitudes ranging from 0m to 120m is a challenging task. The current biometric data collection methods, primarily designed for ground-level and close-range scenarios, need to be revised to address the complexities associated with UAV-based gait data collection. The challenges include the need for precision in capturing gait patterns from elevated angles, the impact of atmospheric conditions on data accuracy at altitude, and the limitations of traditional gait recognition technologies when applied in aerial settings. The absence of standardized protocols and optimized algorithms for UAV-based human gait data collection further increases the difficulty of achieving reliable human identification and re-identification outcomes. This research aims to highlight these challenges and guide future research efforts toward developing practical solutions for implementing UAVs in collecting human gait data at a distance and altitude. Additionally, this research aims to explore imaging sensor limitations through a simple research activity to display the current performance of artificial intelligence and multimodal data. By exploring the issues surrounding persons identification and re-identification, this research will serve as the basis for future research and development.

3. Synergetic Effect of Cellulose and Chitosan Polymers in Cancer Treatment

Grace Cunningham

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Cellulose and chitosan, abundant natural materials, have found widespread applications in the food industry and pharmaceuticals due to their versatility and biodegradability. These materials are commonly used in wound dressings, packaging, cosmetics, and various other applications. Chitosan has garnered attention in cancer research for its potential to inhibit cancer cell growth and induce apoptosis. In this study, we hope to explore the synergistic properties of cellulose and chitosan for potential applications in cancer research. Cellulose, known for its structural integrity and robust bonding abilities, offers a solid foundation for the development of advanced materials. The inherent properties of cellulose allow for the possibility of crosslinking with various treatments and targeting agents. The unique combination of cellulose and chitosan presents an opportunity to create a prospective drug delivery system tailored for cancer research. Chitosan's researched ability to inhibit cancer cell growth, coupled with cellulose's bonding capabilities, opens avenues for designing innovative approaches in cancer treatment. This study will lay the groundwork for further investigations into the development of advanced drug delivery systems, harnessing the structural and biocompatible properties of cellulose and chitosan. The intersection of these two natural materials holds promise for advancing cancer research and developing more effective and targeted therapeutic strategies.

4. Establishing Transient and Stable Genetic Transformation Protocols for Industrial Hemp (*Cannabis sativa*)

Natalie DiStefano, Bikash Deo, Michael Gutensohn

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

With the growing popularity of the *Cannabis sativa* plant, efficient genetic transformation systems have become increasingly important for developing new varieties with improved agronomic and medicinal properties. This research project aims to establish, test, and optimize transient and stable transformation protocols for industrial hemp including plant regeneration utilizing two types of explants, hypocotyls, and cotyledons. Previous research efforts towards hemp transformation have experienced challenges due to the need for more efficient plant regeneration. To overcome this gap, this study evaluates the application of RUBY, a new reporter construct that results in the formation of the red pigment betalain visible to the naked eye. This reporter will allow us to observe the successful regeneration of entire plants starting from transformed cells in the explants through simple visualization. A second approach that we will pursue is virus-induced gene silencing (VIGS), which allows for the transient knockdown of genes in hemp i.e. to study their functions in metabolism. The expected outcome of this project will provide significant insight into efficient plant regeneration and genetic transformation protocols that enable their widespread application for genetic hemp studies, paving the way for further studies on plant breeding and biotechnological studies on the *Cannabis sativa* plant.

5. Understanding River Otter (*Lontra canadensis*) Survival and Spatial Ecology in West Virginia

Laurel Glover[1], Holly Morris[2], Christopher Ryan[2], Laura Gigliotti[3]

[1] Division of Forestry and Natural Resources, WV Cooperative Fish & Wildlife Research Unit, West Virginia University, Morgantown, WV
[2] West Virginia Division of Natural Resources, Charleston, WV
[3] U.S. Geological Survey, WV Cooperative Fish and Wildlife Research Unit, WVU, Morgantown, WV

North American river otters (*Lontra canadensis*) are a semi-aquatic furbearer, functioning as a top predator in the aquatic environments they inhabit as well as an ecologically and economically valuable species. River otters were historically prevalent throughout the continental United States and Canada before their extirpation from 11 states throughout the 19th and 20th centuries due to the fur trade and habitat degradation. Reintroduction efforts to restore river otters have occurred in many states across the country including West Virginia conducting a reintroduction effort from 1984 to 1997 during which 245 otters from Maryland, North Carolina, South Carolina, Virginia, and Louisiana were released. Now 25 years after the reintroduction and as technology improves, long term success of the reintroduction effort can be assessed. Using VHF transmitters and novel GPS transmitters, we are investigating covariates and patterns that affect river otter mortality and space use in West Virginia. These covariates include age, sex, body mass, time of year, and proximity to environmental features. Preliminary results from 5 monitored otters indicate that otters often travel up to 13 km along river systems and have high survival. With extirpation and subsequent recovery of river otters, there is a unique opportunity to gain knowledge about factors influencing the population dynamics and spatial ecology of a recovered game species, which in turn can help inform future management decisions for river otters.

6. Assessing Ecological Impacts of Invasive Carp in the Ohio River

Luka Marques do Amaral, Erin Shepta, Brent Murry, Caroline C. Arantes

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Biological invasions are a global threat to biodiversity and are a growing problem for conservation of ecosystems. Due to their limited connectivity and high endemism, freshwater ecosystems are highly susceptible to community changes caused by anthropogenic activities. In the United States, invasive carp were introduced in the 1970's, and have since spread and impacted aquatic ecosystems across the country, causing economic losses as well as changes in ecological communities. Invasive carp have been introduced in the Mississippi River basin, and have since reached the Ohio River, a major tributary. Despite their spread, little is known about how invasive carp are impacting this particular system and its native fish. Our objective was to quantify the impacts of carp on native fish assemblages in the Ohio River. We performed multivariate analyses to evaluate spatial and temporal changes in the native fish assemblages in the Ohio River along an invasion gradient from the confluence of the Mississippi and the Ohio River to Hannibal Locks and Dam, comparing pools in the four different establishment fronts of the gradient. We explored potential shifts in the structures of native fish assemblages along the gradient and the temporal scale. Our study aims to understand invasive carp impacts on the established fish assemblages on the Ohio River and serve as a reference for biological invasion studies in similar systems.

7. Northern Red Oak Seedlings Planted in a Strip Clearcut: Nine Year Results

Jamie Schuler, Patrick Plaugher

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

It is becoming increasingly difficult to regenerate northern red oak (NRO) dominated forests in the Central Hardwoods region, especially on high quality sites. We are investigating the efficacy of the strip clearcut treatment to regenerate these forests in a productive and economic manner. We followed 360 northern red oak seedlings planted along a light gradient created by a strip clearcut to assess if there are differences in seedling growth and survival at different light levels. Seedlings were repeatedly measured across time for height (using a meter stick), and survival. After nine growing seasons, survival and heights ranged from 23–88% and 63–229 cm, respectively. Seedlings growing in the cut strips had greater heights but low survival. The seedlings growing within the leave strips had high survival but remained relatively small. Seedlings planted on the edges averaged 75% survival and were considered competitive (>100 cm tall). The remaining strips will be harvested after the 10^{th} growing season. We will follow the seedlings post-harvest to assess whether the improved light conditions in the residual strip were sufficient to increase oak seedling success in the next rotation. If this treatment is found to be effective at regenerating NRO dominated forests on high quality sites, the strip clearcut will be an important economic silvicultural tool for managing oaks in the Central Hardwoods region.

8. Preliminary Analysis of Volatile Organic Compounds in Soils as Soil Health Indicator

Eugenia M. Pena-Yewtukhiw, Thorne Taul

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

In recent years the topic of soil health has gained popularity due to the novelty of soils sustainable use related to human wellbeing. Soil health explores the overall quality of soil and its ability to function over time. Researchers are continually looking for new soil health indicators that can be used to improve knowledge on how soil health can be assessed and managed. Some indicators can assess the level of soil health directly, and some present a more indirect association, but each relates to functions occurring in the soil. Volatile Organic Compounds (VOCs) are naturally occurring compounds that play a role in multiple soil processes. They are related to soil properties such as water retention, soil porosity, organic matter, and microbial activity. It is hypothesized that the size of the soil aggregates will be related to VOC volume and number of VOC types, where larger aggregate sizes will produce more VOCs. Samples were taken in pastures and high tunnels, and farmers defined soil health levels at each sampling point. Two aggregate sizes (2mm and 8mm) were placed in glass chambers and a VOC sample was taken using a packed TDU tube and analyzed using GC-MS. The VOCs generated were compared to other soil properties that include pH, dry aggregation stability, soil texture, organic matter, nutrients, and fungi/bacteria ratio. It is expected that total VOC volume or number of VOC compounds will show a relationship to different aggregate sizes in soil, and therefore show applications as a useful soil health indicator.

9. Simulated Climate-Change-Related Environmental Stressors Can Alter the Yield and Metabolomics of Tomato

Marlo Vandiver[1], Youyoun Moon[1], Janet C. Tou[2], Nicole L. Waterland[1]

[1]Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV
[2]Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV

Climate change is a pressing concern that challenges all aspects of food production, including standard greenhouse products like tomatoes. The root cause of climate change can be directly attributed to the rise in carbon dioxide (CO2) levels, leading to increased temperatures and drought severity. Tomatoes are the most produced fruit crop globally, and in addition to their economic benefits, they contain many vitamins and minerals essential for human health. This project aims to assess the multi-variable effects of simulated climate change on tomato plants by studying the combination of elevated CO2, increased temperature, and water deficit stress across three development stages: Juvenile, anthesis, and fully mature tomato. 'Sweet 'N' Neat Scarlet' tomatoes (*Solanum lycopersicum*) were grown in four plant growth chambers in a 2 x 2 x 2 factorial design with four replications. Quality parameters included photosynthetic efficiency, growth index, dry weight, flower number, and fruit size. Several metabolomic analyses were measured at each of the three stages when applicable. Preliminary data suggests that when combined with other factors, higher temperatures increase growth at juvenile and anthesis stages but ultimately decrease yield at maturity. Understanding a more comprehensive scope of the response to climate-change-related environmental stressors in tomatoes will play a significant role in securing economic stability for producers and maintaining a cornerstone fruit for human nutrition.

10. Efficacy of the Nematode Trapping Fungus, *Arthrobotry oligospora*, Against the Root Lesion Nematodes *Pratylenchus penetrans* and *P. scribneri*

Sean Campbell, James Kotcon

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Nematodes make up approximately 80% of multicellular animals on Earth and play a crucial role within the ecosystem. Fifteen percent of known nematode species are parasites of plants, including grain, fruits and vegetables. These species include the root lesion nematodes (*Pratylenchus* spp.) as well as root knot nematode (*Meloidogyne* spp.) and the dagger nematode (*Xiphinema americanum*). Certain fungi in soil act as biocontrol agents and trap nematodes. Trapping fungi were collected from field samples and cultivated on water agar amended with 300 ppm urea. Trapping fungi recovered included *Arthrobotrys oligospora* which forms adhesive nets in soil, and *Dactylaria* spp. which form ring traps. To test the hypothesis that trapping rates differed among nematode species, we examined the rates at which nematode trapping fungi could immobilize various plant-parasitic nematodes in a laboratory experiment. Microscope slides were coated with water agar (WA+urea) to evaluate the trapping rates against *Pratylenchus penetrans* and *P. scribneri*. Slides were inoculated with *A. oligospora* and 10 nematodes were added. Slides were examined repeatedly over 15 days. More *P. scribneri* survived than *P. penetrans*. Some traps were observed, but dead nematodes degraded and were not easily counted. Results suggest that *A. oligospora* is more effective at reducing *P. penetrans* than *P. scribneri*. Future research can evaluate trapping activity against other plant parasitic nematodes such as root knot or dagger nematodes. We also need to assess other nematode trapping fungi.

11. Ergot Alkaloid Biosynthesis in *Aspergillus aspearensis*

Jessica Fuss

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Ergot alkaloids are pharmaceutically important chemicals produced by fungi and are used to treat dementia, migraines, and other conditions. *Aspergillus aspearensis* is the closest relative to *Aspergillus leporis*, a fungus recently characterized to produce abundant ergot alkaloids and to have significant pathogenic potential. Considering the relatedness of *A. aspearensis* to *A. leporis*, we tested whether it could produce ergot alkaloids and parasitize the model insect *Galleria mellonella*. High-performance liquid chromatography (HPLC) analysis demonstrated that *A. aspearensis* accumulates lysergic-derived ergot alkaloids including lysergic acid alpha-hydroxyethylamide (LAH) and lysergic acid. This alkaloid profile was similar to that of *A. leporis* but not identical. We sequenced the genome and found it contained two ergot alkaloid synthesis gene clusters both of which appeared to be functional. Accumulation of LAH by *A. aspearensis* varied when the fungus was cultured on 15 different media; malt extract supported high concentrations. When spores of *A. aspearensis* were injected into larvae of the insect model, larvae died at a significantly faster rate than control larvae injected with buffer. The fungus produced ergot alkaloids during insect pathogenesis; later it produced sclerotia and spores on corpses, indicating that it can complete its life cycle in an insect. *Aspergillus aspearensis* was not an effective pathogen when exposed to intact insects, however, suggesting the pathogenesis observed represents a pre-adaptation to animal virulence. Lysergic acid-producing *Aspergillus* species are rare and are recent discoveries; *A. aspearensis* is a new source of ergot alkaloids and may be useful for studying and producing these important chemicals.

12. New Records of Invasive Hydroid *Cordylophora caspia* in the Ohio River

Emma Hall[1], Brent Murry[2], Madison Miller[2], Adam Cook[2], Amy Welsh[2]

[1]Department of Biology, West Virginia University, Morgantown WV
[2]Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Cordylophora caspia is a hydroid species able to survive in aquatic environments with varying levels of salinity, including freshwater environments. *C. caspia* is a sessile colonial cnidarian originating in the Caspian Sea that feeds on zooplankton. This species has spread to various parts of the United States including the Great Lakes. However, to our knowledge there have been no records of *C. caspia* in the Ohio River. During larval fish trawls of the Ohio River in 2023 fragments of hydroid colonies were collected as bycatch. The species was putatively identified using morphological characteristics and later confirmed by DNA barcoding. Briefly, we performed PCR reactions at the COI, 16S, and 28S regions to amplify DNA and used Sanger sequencing to produce nucleotide sequences. Sequences were then blasted against NCBI GenBank to confirm species identification. The presence of *C. caspia* in the Ohio River could result in competition with native planktivores and sessile organisms and fouling power plant intakes. Early detection is one of the most effective forms of invasive species management. Increasing awareness of bycatch organisms could aid in early detection of invasive species so invasive species can be effectively managed before they become established.

13. Examining Methods of Establishing Running Buffalo Clover (*Trifolium stoloniferum*)

Matthew Korade, Kirsten Stephan, Janen Richea

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Running buffalo clover (*Trifolium stoloniferum* Muhl. ex A. Eaton), a threatened species once believed to be extinct and rediscovered in 1983, occurs in patches throughout West Virginia, Kentucky, and Ohio. It relies on intermittent ground disturbance, as found alongside logging roads. Managers may wish to expand populations without logging operations. This study investigated the effectiveness of single or repeated ground disturbance of differing severity on establishment success of transplanted running buffalo clover. This study was conducted near Huttonsville, West Virginia, in order to examine ground disturbance by raking, mowing, and raking-plus-mowing. Fifteen study plots were planted and treated once, and seven of these were treated once more the following year. Two years after planting, using one control and three 1-m^2 disturbance subplots per plot, we counted flowers and rooted crowns and estimated cover. In addition, the cover of nearby plant types was recorded for each plot. Preliminary findings show an increase in clover crown count and cover in all three treatments when compared to the undisturbed control. The mean rooted crown count and cover of the three disturbance treatments were twice the control's, and flower count was 7 times greater. There was no difference in clover abundance between one and two disturbance treatments. These findings suggest that a combination of raking and mowing would be most effective for promoting a clover population after transplanting, but the study was too short-term to provide information about how often the disturbance must recur in order to sustain clover established by transplanting.

14. Identifying the Purpose of the Chloroplast-Mediated CEBP Protein in *Petunia*

Colin Krisulevicz, Taylor Smith, Joseph H. Lynch

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Transcription factors are proteins that sit on DNA and can either promote or halt expression of a certain gene. Carnation ethylene-responsive element-binding protein (CEBP), a nuclear-encoded transcription factor found in plants, is one of particular interest as it is believed to be involved in the process of senescence of flowers. Previous studies have elucidated the role of this protein in the nucleus, however the purpose of CEBP in the chloroplast is what I am researching. We chose *Petunia hybrida* for this project as it is a well researched model plant for senescence-related research. To knock down this gene, I have created an RNAi construct to silence mRNA coding for CEBP under control of the flower specific promoter Lis. The construct was transformed into E. coli, and then the plasmid containing the construct was then removed and inserted into Agrobacterium. Next, Agrobacterium mediated transformation was utilized to insert the RNAi into the petunias using leaf disk infiltration. Transgenic lineages were grown from tissue culture, and are currently being confirmed using DNA extraction. After confirmation, I plan to perform QRT-PCR for analysis and to identify the purpose of the chloroplast-mediated CEBP protein. The goal is to examine any flower development and senescence effects after down regulation of the gene.

15. The Modern Doll

Gia Marshall, Colleen Mortez
School of Design and Community Development, West Virginia University, Morgantown, WV

The Modern Doll was inspired by my connection to dolls as they relate to my childhood. Dolls as artifacts illustrate the social expectations for women at particular moments in time. As products of both popular culture and mass marketing, dolls are intentionally designed to reflect society's idealized version of womanhood. The dolls' wardrobes communicate a wealth of information about the ideal woman (2016). The message that I perceived as a child about dolls was the message of to be who you want to be. My aesthetics are eclectic and I wanted to showcase feminine elements such as ribbons and pink contrasted by black latex and grommets to show edginess. I will always have the little girl inside of me, hence the name the "Modern Doll." The design is a midi length black latex dress with a side cut out laced up by pink ribbons. The garment was draped into princess panels to get the body hugging fit. The boned princess panels gave the dress a classy feel. The tight fit showcases the feminine figure. After making the muslin, I created the side cut out to make sure that it was modest and tasteful. I reworked my patterns and began the process of cutting and sewing the garment. I used single faced binding to finish off my garments. This design is a reflection of my feminine yet edgy design sensibility. It relays the message that a woman can be feminine while also being bold and on trend.

16. Jacket and Pants

Chloe McIntire
School of Design and Community Development, West Virginia University, Morgantown, WV

The purpose of this assignment was to improve our pattern making skills by making a jacket and pants for the first time. The challenge was to have a knit top, jacket, and bifurcated bottoms. The research was in relation to Hip Hop style and the mind of Karl Lagerfield, creating an interesting mix. I stuck to the Chanel side of things, because it matches the style I have established in all of my designs. This design features a luxurious black tweed with bits of metallic black weaved in for the jacket and shorts. The legs of the shorts and wrists in the jacket are garnished with a gorgeous pillowy satin in a gentle shade of pink. The knit top is a metallic pink knit that is double lined to avoid transparency. The jacket features keyholes down the center of the sleeves that are topped off with rosettes. The split of the jacket is attached by a hook and eye rosette that will create an appealing center to the look. I hand made the patterns associated with this design, which is something I have improved with greatly since transferring into FDM. I hand sewed all of the flowers and added pearls to the middle. The entire ensemble is completely lined, no seams are visible. The cohesiveness of it all comes from my own personal style of a hyper feminine look, focusing on a baby pink and black color story.

17. CRISPR-Cas9 prime editing of Long-Array Tandem Repeats of Maize Knobs: Impact on Heterochromatin Structure, Organization and Behavior.

Eduardo Velloso de Oliveira[1,2], Gabriel Lasmar dos Reis[1,3], Eloisa Vendemiatti[1], Vagner A. Benedito[1], Mateus Mondin[2]

[1] Division of Plant and Soil Sciences, West Virginia University , WV

[2] CYNGELA - Department of Genetics, "Luiz de Queiroz" College of Agriculture, University of São Paulo, Brazil

[3] Federal University of Lavras, Department of Biology, Lavras, Brazil

Knobs are regions in the maize genome characterized by constitutive heterochromatin. From the time they were discovered by Barbara McClintock when she carried out experiments more than 80 years ago, much work has been released, but the main function of these regions in the maize genome has not been fully elucidated. Our objective is to perform a CRISPR-Cas9 knockout, to delete the K180 heterochromatic family motif, present in the knobs and assess the impact on the plant's phenotypes. In addition, we also aim to carry out CRISPR-Cas9 prime editing to insert a high GC and AT motifs, to induce methylation changes in the K180 region. For that, the maize inbred line *Fast Flowering Mini Maize A Transformable 6* was chosen for the experiment due to its short development time and short size compared to other lines, in addition to its compatibility with embryogenic culture, making it amenable for *Agrobacterium tumefaciens* transformation and subsequent plant regeneration. By modifying the knob, we expect to observe changes in the heterochromatin structure, leading to different genotypic organization, chromosomal behavior, and potentially phenotypic abnormalities, making it possible to unequivocally attribute a function to the region. Moreover, our findings will potentially assign a role for what has for a long time been called "useless DNA", thus changing the way we look at and understand these structures.

18. Characterizing the Effectiveness of Monofilament Fencing in Protecting Oak Regeneration From Deer Browsing within the West Virginia University Research Forest

Janen Ritchea, Kirsten Stephan, Matthew Korade, Jamie Schuler

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Browsing by white-tailed deer (*Odocoileus virginianus* Zimmerm.) threatens the regeneration capacity and, therefore, future abundance of oak-dominated eastern hardwood forest. One under-researched solution is the use of monofilament fishing line to fence desired areas. To quantify the effects of monofilament fencing in deterring ungulate browsing, we used eight fenced plots of 36 m^2 (6x6 m) at the West Virginia University Research Forest, each with an adjacent control plot 1 m away. Each fence was established with 1.8 m t-posts at each corner of the plot and 30-lb test fishing line strands every 15 cm from the top of the t-posts. Two years after fence construction, we quantified browse impact as the percentage of above-ground meristems on woody stems defoliated/damaged and height class of seedlings/saplings under 1.5 meters tall within 5 m^2 of each fenced and unfenced plot. The understory of each plot was also characterized by the proportions of vegetation cover (ferns, forbs, woody stems, and grasses) present. Preliminary results show that oak regeneration within the fenced plots were, on average, 3.5 cm taller. Additionally, the stem count of economically desirable oaks, red maple, tulip poplar, and black cherry was 14% higher in the fenced rather than unfenced plots. Understory vegetation class varied little across treatments. These results imply that monofilament fencing may be a cost-effective solution for deterring browsing. However, deer were observed within the fenced areas by wildlife cameras, and fenced plots were only 6% less browsed than unfenced, indicating that electric/woven-wire fences are superior deer browsing deterrents.

19. The Use of Woody Components in Stereolithography Additive Manufacturing

Ethan Shovlin, Levente Denes

Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

One of the most widely used materials for mass production is petrochemical plastics, which has given rise to pollutants that won't degrade in any meaningful amount, poisoning the ecosystem. This is why alternative materials must be found to phase out these harmful materials. One candidate for this new material is products derived from wood, namely microcrystalline cellulose (MCC), to be utilized in additive manufacturing. The research done at WVU has focused on fused deposition modelling and stereolithography methods of printing. Much of the recent research has been focusing on the stereolithography approach, where MCC was mixed in with Formlabs Clear V4 resin in various concentrations. In accordance with plastic standard ASTM D638, samples were tested for tensile properties. After testing, it was found that there was a slight increase of strength when the MCC aggregate was added to resin, but there was little change between different mixture concentrations. Future experiments will focus on using a combination of wood products like MCC and lignin to create a resin that is mostly made from eco-friendly materials that can be used in conventional resin printers.

20. Drinking High Fructose Corn Syrup Solution Altered Gene Expression Indicating Hypothalamic Dysfunction in Young Adult Female Rats

Sundus Lateef, Vanessa Mueller, Eloisa Vendematti, Joseph C. Gigliotti, Vagner A. Benedito, Janet C. Tou

Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV
Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV

Background: Regular consumption of sugary beverages, even at low dosages, can significantly increase brain dysfunction and risk of neurological diseases. High-fructose corn syrup-55 (HFCS-55) has been suggested to have greater metabolic effects compared to sucrose. **Objective:** To investigate diet-gene alterations in the hypothalamus of rats drinking different caloric sweeteners from weanling to young adulthood. **Methods:** Weanling (age 21 days) female Sprague-Dawley rats were randomly assigned (n=7 rats/group) to drink water sweetened with: 1) high fructose corn syrup-55, 2) sucrose, 3) fructose, or 4) no sugar for 8 weeks. Real time qualitative reverse transcription (RT-qPCR) was used to target enzymes and transcription factors involved in energy homeostasis. RNAsequencing (RNAseq) was used to determine global differentially expressed genes related to brain networks, hypothalamus-pituitary-adrenal (HPA) and hypothalamus-pituitary-gonadal (HPG) axis. Serum metabolic and stress biomarkers and estrous cycles were also determined. **Results**: HPA dysregulated resulting greater caloric intake, down-regulated hypothalamic agouti-related protein (AgRP), and the highest adrenal weights in rats drinking HFCS-55 suggesting stress eating. RNAseq revealed 586 differentially expressed genes in rats drinking HFCS-55 versus sucrose. The top downregulation hypothalamic genes included *GABRA6* and *SKOR2* involved in the stress response. Comparing rats drinking HFCS-55 to either sucrose, fructose, or water showed up-regulation of *CDHR1* and *PDYN* associated with synapses and down-regulated of *EN2* expression which has reported in autism.

21. Evaluating State Policies and Incentives for Solar Energy Adoption: Comparing Successes, Challenges, and Global Perspectives

Brett Zepfel, Elizabeth Byrd

Division of Resource Economics and Management, West Virginia University, Morgantown, WV

In the United States, the history of solar energy laws and policies dates back to the 1970s energy crisis, which prompted initial federal initiatives such as tax credits and research funding. Over time, both federal and state governments have implemented a variety of incentives, mandates, and regulatory frameworks to promote solar adoption, driven by factors like technological advancements, environmental concerns, and economic considerations. While some states are on board with implementing solar energy into their energy usage footprint, others remain hesitant to incorporate solar into their power generation sources. The focus of my research will be to analyze the incentives, laws, and policies put in each state that encourage solar power usage. I'll be evaluating what states have had the most success with implementing solar energy, how the United States' solar energy compares to some other countries, and what types of policies are put in place, such as subsidies and consumer-based initiatives. I'll be making a table that has every state, their policies, ranking them based on success, and I'll be classifying each policy in a category as I mentioned above. I researched published articles and other useful sources that will help me develop the table in my research paper. The results will show how the United States compares to other countries with regards to solar energy usage, what states have had success and why they've had success, and a look at what states have tried to implement solar but have had a difficult time. The U.S. as a country wants to develop infrastructure for solar energy in the next decade and some states are ahead of the game, so this research will be significant in seeing what has been done that has made solar somewhat successful, and what needs to be done in the future.

Special Thanks to:

Davis-Michael Distinguished Lecture
Dr. Sina Samii
Co-founder and CTO of Oryx Agribiotech LLC

The judges from the Davis College:

Administration
Ida Holaskova
Amber McLaughlin

Animal & Nutritional Sciences
Kelli George
Gene Felton
Jacek Jaczynski
Brett Kenney
Melissa Marra
Margaret Minch
Cangliang Shen
Jianbo Yao

Design & Community Development
Jessica Blythe
Peter Butler
Haley Rosson
Stefania Staniscia

Forestry & Natural Resources
Steve Chhin
Gregory Dahl
Laura Gigliotti
Charlene Kelly
David Smaldone
Kristen Stephan
Jacquelyn Strager
Stuart Welsh

Plant & Soil Sciences
Carlos Quesada
Ember Morrissey
Dan Panaccione
Sean Collins
Joseph Lynch
Ronald Schartiger
Michael Gutensohn
Bryne-Hoffman
Angie Macias
Matthew Kasson
Roghaiyeh Karimzadeh
Nikki Byrne Hoffman
Tiffany Fess
Chansotheary Dang

Resource Economics & Management
Elizabeth Byrd
Mariwan Mutala-Mohammed
Ranjita Bhandari
Young Gawn Lee
Hélène Nguemgaing

Special Assistance from the Davis College

Leah Smith

Emily Marstiller

The organizing committee:

Ana Claudia Sant'Anna, Chair, Resource Economics & Management

Elizabeth Rowen, Plant & Soil Sciences

James Kotcon, Plant & Soil Sciences

Aaron Giorgi, Design & Community Development

Caroline Chaves Arantes, Forestry & Natural Resources

Kirsten Stephan, Forestry & Natural Resources

Jacquelyn Strager, Forestry & Natural Resources