

Graduate Student Research and Creative Scholarship Day

Tuesday, April 26, 2022
8:00 a.m. – 5:00 p.m.

Davis-Michael Distinguished Lecture

Tuesday, April 26, 2022
12:45 p.m. – 1:45 p.m.

**The Davis College of Agriculture,
Natural Resources and Design**

**Twenty-Sixth Annual
Graduate Student Research and
Creative Scholarship Conference**

Tuesday, April 26, 2022
8:00 a.m. – 5:00 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. Matthew E. Wilson, Associate Dean and Director
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 Resources – Dr. Jason Hubbart, Interim Director

Division of Resource Economics & Management – Dr. Alan Collins, Director

**6th Annual University-Wide
WVU Davis-Michael Distinguished Lecture**

**12:45 p.m. -1:45 p.m.
4004 Agricultural Sciences**

Alicia Coleman and Mario Machado
University of Connecticut and University of Vermont

Alicia Coleman and Mario Machado worked collaboratively on the Extension Foundation project "Ecosystem Services in Working Lands, Practice and Policy of the U.S. Northeast" to inventory the incentive programs available to farmers, foresters, and water-based producers and supporting organizations across the region. Mario completed a doctoral degree in the Department of Geography at Clark University in 2021 and is currently a postdoctoral researcher at the Gund Institute for the Environment at the University of Vermont. Alicia completed a doctoral degree from the Department of Landscape Architecture & Regional Planning at the University of Massachusetts Amherst in 2022 and is currently a postdoctoral researcher in the Applied Forest Ecology Lab at the University of Connecticut.

ORAL PRESENTATIONS

Ph.D.

Session A

Time: 8:05 a.m. - 9:20 a.m.

1. Dietary supplementation of *Saccharomyces cerevisiae*-based microbial additive improves the health, immune status, and performance of newly weaned beef steers during a 35-d receiving period

Modoluwamu D. Idowu¹, Godstime Taiwo¹, and Ibukun M. Ogunade^{1*}

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

Nutritional interventions, including the use of microbial additive, are employed during beef receiving period to optimize intake, immune status, and reduce morbidity of newly weaned beef cattle. In this study, we evaluated the effects of dietary supplementation of a *S. cerevisiae*-based microbial additive on growth performance, intake, whole-blood immune gene expression, and plasma metabolome of newly weaned beef steers during a 35-d receiving period. Eighty newly weaned crossbred steers (206 ± 12 kg of BW) were randomly assigned to receive a diet with no additive (CON; n = 40) or a diet supplemented with a *S. cerevisiae*-based microbial additive at 28 g/steer/d (SYNB; n = 40). Individual dry matter intake (DMI) was measured using the GrowSafe intake nodes. Weekly body weights of steers were obtained to calculate average daily weight gain (ADG). Weekly whole blood samples were taken from each steer for analysis of whole blood immune gene expression and plasma metabolome. Compared with CON, beef steers fed SYNB had greater ($P = 0.01$) DMI, ADG and had lower percentage (35 vs. 50%) of animals treated for bovine respiratory disease. Feeding SYNB reduced whole blood mRNA expression of inflammatory genes including interleukin 8. Results of the plasma metabolome revealed enrichment of pathways associated with metabolism of nitrogen, glutamate, pyruvate, and sucrose/starch in beef steers fed SYNB. In conclusion, feeding supplemental SYNB to newly weaned beef steers improved intake and growth performance, led to a reduction in inflammatory stress response, and improved whole-body nutrient metabolism of newly weaned beef steers.

2. Sex ratios of lake sturgeon spawning populations in Lake Superior

Lauren Schumacher¹, Erin Driehaus¹, Henry Quinlan², and Amy Welsh^{1*}

¹School of Natural Resources, West Virginia University, Morgantown, West Virginia

²U.S. Fish and Wildlife Service, Ashland Fish and Wildlife Conservation Office, Ashland, Wisconsin

Managers rely on sex ratios and population size to evaluate the success of lake sturgeon restoration efforts. However, it can be challenging to distinguish between the sexes in the field as lake sturgeon lack external features to differentiate the sexes. Several methods are used to determine the sex of a sturgeon in the field, but these methods are dependent on the age and reproductive state of the fish and may result in “unknown-sex” individuals. This study used a newly developed genetic protocol to perform sex assignment on Lake Superior spawning lake sturgeon, calculate the sex ratios for the Lake Superior spawning populations, compare the sex ratios of the Bad River spawning population over time, and compare the sex assignment results to those obtained using field techniques. The *AllWSex2* marker was used to perform sex assignment on spawning lake sturgeon collected from the Bad River (n=194), White River (n=45), Black Sturgeon River

(n=57), Pic River (n=34), and Goulais River (n=30) from 2000 to 2010. Genetic sex determination produced similar results to field sex determination and was able to assign the sex of individuals previously labeled “unknown sex” in the field. Results suggest some variance in ratios between spawning sites and across years in the Bad River population. This may be due to lake sturgeon spawning behavior or differences in agency survey efforts. This study provides insight into the breeding ecology of lake sturgeon and will allow managers to better evaluate the population status of Lake Superior lake sturgeon.

3. Does Environmental Quality Affect Education? Evidence from Air Pollution and School Attendance in the United States

Mustahsin-Ul Aziz¹, Levan Elbakidze^{1*}

¹Division of Resource Economics and Management, Davis College of Agriculture, Natural Resources, and Design, West Virginia University, Morgantown, WV

In this study, we examine the effects of air quality on school attendance in the U.S. Existing literature shows that attendance can decrease during highly hazardous air quality conditions and during less dangerous but still unhealthy conditions, especially for sensitive groups. This paper builds on previous work and contributes with an expanded data and a nationally representative result. The paper also examines the impact of air quality on the attendance across different sociodemographic groups based on race and income. The paper uses the chronic absenteeism data (school absences for more than 15 days in an academic year) from the Civil Rights Data Collection for years 2013-14, 2015-16 and 2017-18. The air quality data is obtained from the Environment Protection Agency. Different air quality measures are used including carbon monoxide, lead, Sulphur dioxide, Ozone, Nitrogen dioxide, PM2.5 and PM10. The results are obtained using a) the data for only the locations with available air quality indicators and b) the interpolated data for locations where air quality measures are not available. The preliminary results show a significant association of school absenteeism with Carbon monoxide and PM2.5. Current results show no significant effects for other pollutants. However, ongoing analysis address several nuances, including panel data specifications, that may uncover different results.

4. Analyzing the interactions among multiple ecosystem services in a rural mining region in Central Appalachians

Vincenzo Cribari¹, Michael P. Strager², Davide Geneletti³ and Charles Yuill¹

¹School of Design and Community Development, Davis College of Agriculture, Natural Resources and Design, West Virginia University, Morgantown, WV, USA

²Division of Resource Economics and Management, Davis College of Agriculture, Natural Resources and Design, West Virginia University, Morgantown, WV, USA

³Department of Civil, Environmental and Mechanical Engineering, University of Trento, Trento, Italy

This study analyzed the interactions among a set of ecosystem services (ES) and derived ES bundles in the Headwaters of Coal River West Virginia (WV), in the Central Appalachians, an area historically characterized by surface mining and coal extraction. ES were modeled using the InVEST system, while a custom model was used to link water quality to freshwater ES, deriving information at two different spatial scales based on hydrologic units. High-resolution remote sensing data (1-2 m resolution) were used to incorporate historical information from land-cover

(LC) transitions since 1976 to differentiate reclamation processes and characterize the forest class. Consistent ES tradeoffs were confirmed in areas characterized by surface mining processes that reported significant losses of carbon sequestration, habitat quality, and freshwater ES. The interaction of complex anthropogenic processes within the specific landscape led to the definition of different ES bundles, characterized not only by coal mining processes but also by the distribution of settlements and developed areas. The utilization of relatively small hydrologic catchments (1-25 km²), the comparison with a more extensive set of spatial units, and the inclusion of high-resolution data with multiple LC classes that included historical information, allowed the authors to infer knowledge about the interactions between ES changes and their drivers in the study area. The results can be used to implement conservation, as well as development-restoration strategies, by including ES assessments to promote a more sustainable land management approach in the rural-mining region of Central Appalachians and support future alternatives to extractive economies.

The abstract is part of the article published in:

Vincenzo Cribari, Michael P. Strager, Davide Geneletti & Charles Yuill (2022) Analyzing the interactions among multiple ecosystem services in a rural mining region in Central Appalachians, *Ecosystems and People*, 18:1, 189-211, DOI: 10.1080/26395916.2022.2043445

5. The effect of a *dacitic tuff breccia* (Azomite®) in corn, soybean, and DDGS based diets that vary in inorganic phosphate source on pellet mill production rate and pellet quality

T. P. Boltz¹, J. Ferrel², K. M. Bowen¹, K. L. Harding³, V. E. Ayres⁴, and J. S. Moritz^{1*}

¹ Division of Animal and Nutritional Science, West Virginia University, Morgantown, West Virginia, 26506

² Azomite Mineral Products, Nephi, Utah, 84648

³ Prestage Department of Poultry Science, North Carolina State University, Raleigh, North Carolina, 27695

⁴ School of Agriculture, Tennessee Tech University, Cookeville, Tennessee, 38505

Feed mill pellet production rate is of great importance to integrated meat bird production. Ingredients such as dried distillers grains with solubles (DDGS), inorganic phosphate source (IPS), and fat influence production rate and feed quality due to their composition. The naturally abrasive properties of an IPS may scour the pellet die and affect feed production rate. The objective of the study was to evaluate the effect of a dacitic tuff breccia (Azomite®) inclusion in a corn, soybean meal, DDGS based diet with either dicalcium (DCP) or tricalcium (TCP) on pellet mill production rate, hot pellet temperature, and pellet quality. The assessment included four experimental treatments in a two (DCP or TCP) x two (Azomite (AZM) or no AZM) factorial Latin Square Design across four manufacturing days with complete blocks in each day. Average temperature and humidity were 16°C and 67%, respectively. There was a six percent increase in production rate when AZM was added to DCP diets (0.99 versus 1.05 MT/hr; P<0.001) and an eight percent increase in production rate when AZM was added to TCP diets (1.10 versus 1.19 MT/hr; P<0.001). The increased production rate that favored AZM and TCP diets may be associated with an additive effect of pellet die scouring. IPS and AZM interacted to affect pellet quality (P<0.021) demonstrating that increased production rate decreased pellet quality; however, the greatest amount of the observed change (three percent), would likely have little effect on bird performance. This study was successfully designed to remove confounding treatment effects of day-of-manufacture and run-order.

Session B
Time: 9:25 a.m. - 10:55 a.m.

**1. A Novel Lysergyl Peptide Synthetase Assembles Lysergic Acid Amides
In *Aspergillus* Species**

Samantha Fabian, Abby Jones, Dr. Daniel Panaccione*

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

Ergot alkaloids are pharmaceutically relevant specialized fungal metabolites structurally similar to neurotransmitters. Within the family Clavicipitaceae, the lysergic acid amide ergonovine is assembled from lysergic acid and alanine through the activity of two monomolecular nonribosomal peptide synthetases, Lps2 and Lps3. Other lysergic acid amides are synthesized from the same lysergyl-alanine precursor assembled by via the activity of additional enzymes. A novel two-module Lps gene (*lpsD*) was uncovered via genome mining in three species of *Aspergillus* that produce lysergic acid amides. The first module encoded by the novel gene shares sequence identity with Lps2 of the Clavicipitaceae; the second module of LpsD ends with sequences encoding a reductase domain, similar to Lps3, but otherwise lacks strong sequence identity with Lps3. We hypothesized the product of *lpsD* was the functional equivalent of the two separately encoded monomolecular peptide synthetases of the Clavicipitaceae (Lps2 and Lps3). We tested this hypothesis by expressing *lpsD* of *A. leporis* under the control of an *Aspergillus fumigatus* promoter in a previously engineered lysergic acid accumulating strain of *A. fumigatus* that lacks the capacity to make additional lysergic acid derivatives. Transformants were screened for accumulation of ergot alkaloids by HPLC and mass spectrometry. Results revealed strains expressing *lpsD* accumulated the lysergic acid amide ergonovine and its immediate precursor lysergyl-alanine. These data indicate the product of *lpsD* is the functional equivalent of the two monomolecular peptide synthetases of the Clavicipitaceae and that evolutionary differences for converting lysergic acid into amides occurred between the *Aspergillus* species and the Clavicipitaceous fungi.

2. Does road network structure affect air pollution stocks and flows? Evidence from road closures in Virginia

Michael Cary¹

¹ Division of Resource Economics and Management, West Virginia University, Morgantown, WV

Pollution emitted from transportation is one of the primary contributors to local pollution stocks and flows. This paper considers how the structure of local road networks might affect pollution stocks and flows through vehicular emissions. A pollution stock and flow model based upon the Fundamental Law of Road Congestion which also considers the impact of road network structure is presented and used to generate hypotheses for how the structure of road networks should affect pollution stocks and flows. These hypotheses are tested using a Hausman-Taylor approach and rely on the use of relevant topological indices to describe the structure of road networks with data on road closures serving as an instrument. Evidence is found supporting the hypotheses that better connected road networks with fewer bottlenecks and which allow for more efficient traversal lead to

lower levels of pollution stocks and flows. Evidence is also provided showing that the correct choice of topological index is critical to effectively studying the effects of road network structure on pollution outcomes.

3. **Genotype-by-Sequencing Approach to Compare Walleye (*Sander vitreus*) Populations in the Appalachian Region**

Andrew Johnson^A, Katherine Zipfel^B, Eric Hallerman^C, Wade Massure^D, Peter Euclide^E, and Amy Welsh^A

A: Division of Forestry and Natural Resources, West Virginia University, Morgantown, West Virginia 26506, USA

B: West Virginia Division of Natural Resources, 2311 Ohio Avenue, Parkersburg, West Virginia 26101, USA

C: Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061, USA

D: Kentucky Department of Fish and Wildlife Resources, Lexington Kentucky

E: Wisconsin Cooperative Fishery Research Unit, University of Wisconsin-Stevens Point, 800 Reserve St., Stevens Point, WI 54481, USA.

Walleye (*Sander vitreus*) have been stocked throughout the Appalachian region to aid in restoring populations of this important economic and ecological species. Prior to the genetic identification of a native walleye strain, walleye from the Great Lakes were used to supplement populations and create new populations. To identify the effect stocking of Great Lakes strain walleye, three Appalachian populations were sampled; two native populations (Rockcastle River and New River) and one population founded from the Great Lakes strain (Tygart Lake). Walleye from Lake Erie were also used as a reference of the Great Lakes strain. Utilization of a genotype-by-sequencing approach allowed for whole genome estimates of genetic diversity, population structure, and the creation of two SNP assays that can be utilized to identify Great Lakes strain, native Eastern Highland strain, and their F₁ hybrid. Results showed that the four populations were genetically distinct from one another and showed varying degrees of genetic diversity. The Tygart Lake showed lower genetic diversity, likely indicative of genetic drift from a founder effect. The two native populations showed varying levels of genetic diversity, potentially due to isolation of the New River population from historical panmixia populations. The New River population was found to have a higher influence of the Great Lakes strain in their genome than the Rockcastle River, indicative that the Rockcastle River may have a purer Eastern Highland strain population. Our results show the need for further sampling across the region to identify Great Lakes strain influence on local native walleye populations.

4. The Development and Evaluation of the Implementation for a Nutrition-Specific D&I Training in Appalachia

Ayron E Walker¹, Melissa D Olfert^{1*}

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

Nutrition practitioners lack self-efficacy in Dissemination and Implementation (D&I) science due to insufficient training in the field. The objective of this study was to identify the need and pilot-test the training to evaluate outcomes.

Scoping review methodology involved the search of six academic databases and included articles were analyzed for qualitative themes. An online survey assessed intentions to use D&I science and analyzed using nonparametric measurements. Then, training learning objectives were mapped to validated D&I competencies by a collaborative dialogic process. Next, experts were recruited to rank the training objectives on a 7-point Likert scale. Lastly, students were enrolled in the 8-week training and evaluated student learning outcomes through 10-point Likert scale.

Results from the scoping review (n=34) suggest a strong need for a D&I training to increase capacity among nutrition practitioners. The perceptions survey (n=70) highlighted that intention to use D&I science was positively influenced by self-efficacy (p=0.0119). Results from the content mapping exercise (n=5) discovered that the training covers 22/43 of the validated core competencies. Experts (n=31) categorized the learning strategies and syllabus positively with scores between 4-7. Students (n=8) moderately ranked self-efficacy after the intervention as positive with qualitative data suggesting that the course learning strategies (application-based learning and scenario-based learning) were essential.

This study suggests that self-efficacy influences behavioral intention. Fortunately, a competency-driven, application-based approach is advantageous in strengthening D&I science self-efficacy, which provides a potential solution for increasing capacity in practice.

5. Plasma metabolomics and hepatic mRNA expression of nutrient metabolism genes in beef steers selected for low or high residual feed intake

Godstime Taiwo¹, Modoluwamu D. Idowu¹, Sidney Taylor, and Ibukun M. Ogunade^{1*}

¹Division of Animal and Nutritional Sciences, West Virginia University, Morgantown WV 26506, USA.

To understand the physiological basis of residual feed intake (RFI) as a measure of feed efficiency in beef cattle, we analyzed the mRNA expression of hepatic genes and plasma metabolome of beef steers selected for low or high RFI. Low-RFI steers (n = 8; RFI = - 1.93 kg/d) and high-RFI steers (n = 8; RFI = + 2.01 kg/d) were selected from a group of 56 growing crossbred steers (average BW = 261 ± 18.5 kg) after a 49-d performance testing period. Liver biopsies were collected from the steers for mRNA expression analysis of 84 genes each related to metabolism of fatty acid, amino acid, and mitochondrial energy. Genes having absolute fold change ≥ 2 and false discovery rate (FDR) ≤ 0.05 were differentially expressed. Blood samples were also collected for plasma metabolome analysis using a chemical isotope labeling (CIL)/liquid chromatography–mass spectrometry-based technique. Biomarker analysis (FDR ≤ 0.05 ; Area Under the Curve (AUC) > 0.90) of the plasma metabolome was performed to identify candidate biomarkers associated with RFI. Expression of genes involved in fatty acid transport, lipid β -oxidation, and mitochondrial ATP

synthesis were upregulated in low-RFI, compared to high-RFI steers. Results of the plasma metabolome analysis showed that relative concentrations of several metabolites mostly associated with amino acid metabolism were altered ($FDR \leq 0.05$) and four amino acid metabolites were identified as candidate plasma biomarkers associated with RFI. These results demonstrated that low-RFI beef steers exhibit upregulation of molecular mechanisms associated with lipid and amino acid metabolism.

6. Performance, Carcass Quality, Tibia ash, and Mineral Digestibility Responses of Ross 708 Broilers to Increasing Dose of Two Commercially Available Mixer-added Phytases.
Kristina Bowen¹, Mark Jackson², Victoria Ayres¹, Tim Boltz¹, Elizabeth Lynch¹, and Joe Moritz^{1*}

¹Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, West Virginia, 26506

²Huvepharma, Peachtree City, GA 30269, USA

Mixer added phytases must retain efficacy post conditioning and pelleting. Heat from saturated steam and friction upon pellet die extrusion may deactivate phytases. The objective of this study was to assess the thermostability of two commercially available phytases concentrated at 500, 1,000, or 2,000 FTU/kg in mixed mash post steam conditioning at 82°C for 30 sec and extrusion through a 4.8 x 38mm pellet die and the subsequent effect on 0 to 44-day Ross 708 male broiler performance, mineral digestibility, and tibia ash responses. A 3 (Phytase level) × 2 (Phytase source) factorial arrangement of treatments within a randomized complete block design was utilized. A positive control and negative control diet based on available phosphorus and total calcium were also manufactured and analyzed within a multiple comparison. Diets were fed to 8 replicate pens of 30 chicks in three phases. Live performance, day 20 and day 44 tibia ash, day 44 hot boneless, skinless breast weight, and mineral digestibility were measured. Calcium digestibility was increased for birds fed Optiphos Plus (**OP**) relative to Quantum Blue (**QB**) ($P < 0.05$). Phosphorus digestibility increased as phytase level increased ($P < 0.05$). Day 20 tibia ash percentage increased for 1,000 and 2,000 FTU/kg for both phytase sources ($P < 0.05$). Day 44 percent tibia ash increased for OP at 1,000 and 2,000 FTU/kg relative to QB ($P < 0.05$). The assessed phytase sources showed similar benefit to live performance and breast yield but varied in response to tibia ash and mineral digestibility at different concentrations.

Masters Session C

Time: 11:00 p.m. - 12:30 p.m.

1. Preparing Pre-service Agricultural Education Teachers to teach Agricultural Mechanics: Are we doing enough?

Lexi Trickett¹, Preston Byrd¹, Ryan Anderson², Chris Haynes³

¹Department of Agricultural and Extension Education, West Virginia University, Morgantown, WV

²Department of Agricultural Education and Mechanics, Texas State University, San Marcos, TX

³Department of Agricultural Education and Communication, Tarleton State University, Stephenville, TX

Teacher education programs face an array of challenges when preparing secondary agricultural education teachers. One challenge is adequate preparation in technical content areas, such as agricultural mechanics. The skills required to manage a laboratory are crucial for instructors of agricultural mechanics curriculum. Agricultural mechanics is a popular course in secondary schools, but studies found that pre-service teachers were ill-equipped to teach the courses effectively. This study sought to determine the level of readiness of teacher education program graduates in agricultural mechanics. The target population for the study was certifying institutions for agricultural education teachers across the nation. Data were collected with a questionnaire, resulting in 78.4% response rate ($n = 69$). Of the nine content areas identified, more than 90% of the respondents stated that five areas were included in their respective state's secondary curriculum. Respondents identified the level of importance for each of nine competency groupings, deeming them all as "important". Hand/Power Tools ($M = 3.69$) was the only content area that institutions ranked their graduates as "prepared" to teach. The remaining content areas were ranked as "somewhat" or "poorly" prepared. Most institutions stated that they required at least one course in agricultural mechanics in their program, with the average requirement being five to eight hours. It can be concluded that agricultural mechanics course requirements have decreased since 2005, even though the content is heavily taught at the secondary level. This study has shown that we must re-evaluate how we prepare students to be competent to teach agricultural mechanics.

2. Survival of *Listeria monocytogenes* and a Comparison of Conventional or Electrostatic Spray, and Dip methods with a Mixer of Peroxyacetic Acid and Hydrogen Peroxide to protect against the pathogen on Organic Apples

Rebecca Stearns¹ and Cangliang Shen*¹

¹Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV 26506, USA

Introduction: *Listeria monocytogenes* has been recognized as an emerging, under researched pathogen on apples. The latest multistate apple recalls in 2019 caused 2,297 variety cases of apples were contaminated with *L. monocytogenes*. This study aimed to determine the efficacy of a

peroxyacetic-acid and H₂O₂ mixer delivered by conventional garden sprayer (GS), electrostatic sprayer (ES) and dip methods to inactivate the pathogen on apples.

Methods: Three types of apples were dip-inoculated with *L. monocytogenes* (2-strain). The inoculated apples were untreated (control), sprayed with water only, or treated with the H₂O₂-peroxyacetic-acid mixer [SaniDate-5.0 (SD), 0.0064, 0.1, 0.25 and 0.50%] for 20 s via GS, ES, or dip, followed by draining (2 min) on aluminum foil. Surviving bacteria were recovered on MOX-agar. Atomic force microscopy was used to detect the mechanism of inactivation of *L.*

monocytogenes in SD. Data (2 replicates/6 samples/replicate) were analyzed using the Mixed Model Procedure of SAS ($P=0.05$) and Gina-fit software for survival models.

Results: Survivals of *L. monocytogenes* on untreated apples decreased from 6.70-6.90 to 2.47, 3.75 and 4.5 log CFU/apple on FJ, HC and PL apples, respectively. The dip method was the most effective treatment on pathogen reductions (2.31-2.41 log CFU/apple) followed by GS (1.44-1.70 log CFU/apple) and then ES (0.84-1.20 log CFU/apple). Reductions of *L. monocytogenes* were greatest when apples were treated with SD-0.25 and -0.50%.

Significance: Results suggested, applying SD by dip or GS is better for pathogen reduction than ES on apples and filled the data gap for understanding of microbiological risks associated with tree fruits.

3. Similarities and differences in small mammal communities of mitigated and natural West Virginia wetlands

Krista Noe¹, Mack W. Frantz², Christopher T. Rota¹, and James T. Anderson^{1,3*}

¹ Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

² Wildlife Diversity/Natural Heritage Program, West Virginia Division of Natural Resources, Elkins, WV

³ James C. Kennedy Waterfowl and Wetlands Conservation Center, Belle W. Baruch Institute of Coastal Ecology and Forest Science, Clemson University, P.O. Box 596, Georgetown, SC 29442, USA

Wetland mitigation is intended to offset human-created losses to natural wetlands. Because wetlands are valuable, it is critical to determine whether mitigated wetlands provide benefits similar to natural wetlands. One function of wetlands is to provide habitat for wildlife; specifically small mammals, which are important in wetlands because they influence vegetation and are prey for higher trophic level wildlife. Therefore, we implemented capture-mark-recapture to sample small mammal communities at both mitigated and natural wetlands using baited Sherman Live traps. We sampled 14 mitigated and 12 natural West Virginia wetlands over 10,060 trap nights. We captured deer mice (*Peromyscus maniculatus*), white-footed mice (*Peromyscus leucopus*), meadow voles (*Microtus pennsylvanicus*), northern short-tailed shrews (*Blarina brevicauda*), meadow jumping mice (*Zapus hudsonius*), and eastern chipmunks (*Tamias striatus*) at both wetland types, and woodland jumping mice (*Napaeozapus insignis*), masked shrews (*Sorex cinereus*), and one southern flying squirrel (*Glaucomys volans*) at exclusively natural wetlands. We analyzed apparent abundance, occupancy, diversity, richness, evenness, and community composition of small mammal communities. We found apparent abundance of deer mice was higher in natural wetlands ($P < 0.01$); meadow voles were similar between wetland types only by a thin margin ($P = 0.06$). Occupancy of the remaining species caught in both wetland types was similar between types, as well as site diversity, richness, evenness, and community composition. Therefore, most aspects of small

mammal communities are similar between mitigated and natural wetlands, suggesting that mitigated wetlands may fulfill their intended role for small mammal communities, but abundance between wetland types may be species-specific.

4. Longitudinal Description of FFA Competitions and Enrollment

Kayla Giorgi¹, Adrienne McPhillips¹, and Dr. Aaron Giorgi¹

¹College of Design and Community Development/AGEE

The three intra-curricular model of agriculture education includes classroom laboratory instruction, supervised agricultural experience, personal leadership development through the FFA. The FFA provides its members the ability to explore careers through competition. The purpose of this project was to describe the relationship between the participation in state FFA Career Development Events (CDEs) facilitated by West Virginia University and enrollment in West Virginia University. Participation in CDEs and related long-term impacts on student participants have not been studied. An ex post facto study described the percentage of students that enrolled in WVU after participating in a state level CDEs facilitated by WVU faculty. A preliminary study limited to CDEs hosted in 2017 found that 4.35% of WV FFA members participate in state level CDEs and 7.13% of those participating attend WVU after. This study includes a sample from CDEs hosted from 2009 through 2019. Results consistently document low utilization of state CDEs, and low subsequent enrollment in WVU. CDEs hosted by West Virginia University have been previously thought to be recruitment events for the Davis College of Ag but findings do not support this. These events could be utilized more to encourage students to enroll at WVU and pursue careers in agriculture.

5. Sustainable Raw Materials Usage in Luxury Brands and Its Effects on Consumer Preference

Md. Rokibul Hasan and Sunidhi Mehta*

Department of Fashion, Dress and Merchandising, West Virginia University, Morgantown, WV-26506

Sustainability is a frequently used term in almost every sector. Every industry shows their deep concerns about environmental safety and proclaims their sustainable initiatives in order to maintain a healthy environment. However, their actual business operations contain little sustainable practices. Specifically, luxury fashion brands have rarely considered environment friendly measures in their business activities. But things have started to change as increasing number of consumers are becoming environmentally conscious. As a result, luxury fashion brands are updating their actions accordingly to fulfill their customer requirements. But it is not clear whether the customers are really appreciating those measures taken by the brands. Very few studies were conducted to measure the consumer's feelings, attitudes, or preferences towards these sustainable attributes of luxury fashion brands. Therefore, the present research has attempted to find out consumer's emotions and their preference of luxury products based on their raw materials usage. Facial expression analysis software was used to determine the emotions and Qualtrics software was used for the open-ended questionnaire. Findings of this research indicate that majority of the consumers have chosen products which were produced using environment friendly raw materials. They also revealed that they would not buy any product which were made of such raw materials that would negatively impact the environment.

6. The Effects of Hygienic Pelleting in Diets that Differ in Amino Acid Density on Ross 708 Broiler Performance, Amino Acid Digestibility, and Requirement

Elizabeth Lynch¹, Kristina Bowen¹, Victoria Ayres¹, Timothy Boltz¹, and Joseph Moritz*¹

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

To reduce pathogenic bacteria such as *Salmonella* in feed manufacture and ensure a high-quality pellet, pelleted feed for broiler breeders may be exposed to greater conditioning temperatures and times. However, increased conditioning temperature and time may alter amino acid confirmation, decrease digestibility, and subsequent bird performance. Increasing formulation density of amino acids may be necessary to maintain performance. The objective of this study was to evaluate high conditioning temperature and exposure time within the pelleting process (hygienic pelleting) in diets that vary in digestible lysine and corresponding amino acid ratio on Ross 708 starter broiler performance, amino acid digestibility, and requirement. A 5 x 2 factorial arrangement of treatments with 5 levels of digestible lysine (-20%, -10%, 2019 Ross Broiler Starter Nutrition recommendation, +10%, and +20%) and 2 degrees of pelleting (Standard and Hygienic) was utilized in a randomized complete block design. Each treatment was fed to 12 replicate pens of 10 male broiler Hubbard x Ross 708 chicks for a 21-day period. On the morning following day 7, 14 and 21, birds and feed were weighed by pen for performance calculations. A 10% increase in formulated Lys was necessary for Hygienic Pelleting to achieve a LWG like the Ross Level Standard Pellets. Similarly, the use of a broken-line regression model determined that to obtain optimal broiler LWG, Hygienic pellets should be formulated 9% above 2019 Ross Broiler Starter Nutrient Specification. Hygienic Pelleting decreased amino acid digestibility and increased subsequent FCR when diets were formulated to decreased amino acid density.

Keywords: Lys, Amino Acid Digestibility, Hygieniser, Thermal Processing, Feed Efficiency

Ph. D.
Session D
Time: 2:00 p.m. - 3:30 p.m.

1. Characterization of Three Novel Oocyte-Specific Long Non-coding RNAs in Cattle

Jaelyn Current, Heather Chaney, Mingxiang Zhang and Jianbo Yao*

Davis College of Agriculture, Natural Resources and Design, Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV

In mammals, proper development during early embryogenesis relies heavily on the regulation of maternal transcripts. Transcripts must undergo a gradual degradation accompanied by a concomitant activation of the embryonic genome. Recently, long non-coding RNAs (lncRNAs) have been functionally characterized as key regulators of embryonic genome activation in humans and mice. Using RNA-sequencing, our laboratory identified 1,535 lncRNAs in bovine oocytes. To date, this project has selected three novel lncRNAs (*OOSNCR1*, *OOSNCR2* and *OOSNCR3*) for further characterization. Tissue, cell, and embryonic expression profiles were generated using samples harvested from cattle. An RNA polymerase inhibitor, α -amanitin, was used to evaluate lncRNAs as maternal effect genes. The association between oocyte quality and lncRNA expression level was investigated regarding follicle size, maturation stage, and brilliant cresyl blue (BCB) staining. RT-qPCR analysis, using RPL19 or GFP as a housekeeping gene, was performed using the standard curve method. Effect of follicle size, maturation stage, and their interaction was examined using a two-factorial ANOVA. All other comparisons were performed using a student's t-test. Expression profiles revealed oocyte-specificity, a potential bidirectional communication between oocyte and cumulus cells, and consistent expression patterns during early embryonic development. In all three lncRNAs, α -amanitin treatment revealed all lncRNAs are maternally derived. Follicle size and its interaction with maturity stage was significant in *OOSNCR2*. BCB staining revealed significantly higher expression of *OOSNCR1* and *OOSNCR3* in mature oocytes. These data suggest a complex relationship between lncRNAs and their roles in oocyte maturation and early embryonic development.

2. Impact of state policies on renewable energy: A county-level spatial panel analysis

Pinky Thomas¹, Ritika Khurana², Xiaoli Etienne^{2*}

¹ Division of Resource Economics and Management, West Virginia University

² Division of Resource Economics and Management, West Virginia University

² Department of Agricultural Economics and Rural Sociology, University of Idaho, Moscow, ID

In 2020, the power sector contributed 32% of all US emissions of CO₂. However, the lack of federal regulations to contain these emissions led some states and local governments to fill this void with a variety of policy approaches. Various form of incentives for renewable energy has been employed by states, including taxes, credits etc. Meanwhile, considerable variation is observed for the amount of renewable energy (RE) generated and consumed across the states and counties. This paper evaluates how different government policies affect the RE generation capacity in the US, including wind, solar, hydro, and geothermal power development. The policies we include in the study are RPS (renewable

portfolio standard), energy efficiency resource standards (EERS), mandatory utility green power option (MUGPO), state-level sales tax credit and production incentives. We use fixed-effects, random-effects and spatial econometric panel models to analyze the time-varying covariates, time-invariant policy variables and spatial spillovers affecting the renewable power generation at the county-level respectively. Preliminary results show that EERS policy and economic policy uncertainty index are not significant. Whereas the RPS and MUGPO show a positive and significant impact. Further, GDP and unemployment rates may significantly impact RE generation capacity growth. Natural gas prices are insignificant to RE generation. In comparison, energy intensity defined as total primary energy divided by the GDP per county shows a significant positive impact on the generation capacity of RE. The examination of the relationship between policy drivers and economic drivers and renewable energy capacity generation is crucial because renewable energy allows to decouple the correlation between economic development and GHG emission growth. Since economic growth is highly correlated with energy use, it is imperative to study the energy affordability based on energy burden to assess the socio-economic impact on the RE.

3. Quantifying avian community composition and individual species associations with the red spruce ecosystem in West Virginia

Hannah Clipp^{1,2}, Donald Brown^{1,3}, Christopher Rota^{1,*}, and Petra Wood^{1,2*}

¹Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

²West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, Morgantown, WV

³USDA Forest Service, Northern Research Station, Parsons, WV

*Faculty co-advisors

Degraded red spruce ecosystems are the focus of restoration efforts in the high-elevation landscapes of West Virginia. To promote ecosystem function and long-term sustainability of restored forests, it is important to understand the associated biota, but there is a lack of contemporary quantitative studies of avian communities in red spruce forests in this region. Therefore, the purpose of this study was to use indicator species analyses to quantify bird community composition and identify individual bird species that are primarily associated with West Virginia red spruce forests. Community-wide avian point count survey data were collected from May–July in 2010–2019 at 645 study sites located in forest stands throughout the Monongahela National Forest in West Virginia. We used two sets of multivariate regression trees to group sites into clusters and explore relationships between species counts across years and GIS-derived classifications of forest types and red spruce cover classes. We then ran indicator species analyses for both set of clusters. Eleven species were associated with red spruce forests, with 8 and 3 of those species also associated with >50% and 10–50% red spruce cover, respectively. This study has implications for future qualitative and quantitative measures of success for restoration of red spruce forests in West Virginia. Moreover, the distinctiveness of the bird community in red spruce forests and strength of individual bird species associations highlight the importance of these restoration efforts to ensure long-term maintenance of regional avian diversity.

4. Characterization of agouti-signaling protein expression within the bovine ovary and early embryo

Heather Chaney*, Mingxiang Zhang, Jaelynn Current, and Jianbo Yao

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

Oocyte competence, determined by the mRNA and protein present, regulates the ability of the oocyte to resume meiosis, cleave when fertilized, promote embryonic development, and result in a full-term pregnancy. Further, paracrine signaling between the oocyte, cumulus, granulosa, and theca cells is vital for successful oocyte maturation. RNA Sequencing data revealed agouti-signaling protein (*ASIP*) mRNA is highly abundant in the bovine oocyte. However, the function and expression profile of *ASIP* within the bovine ovary has not been previously reported. Therefore, RT-qPCR was conducted to analyze *ASIP* expression within the cell types present in the ovarian follicle. Overall, *ASIP* is highly abundant in the bovine oocyte and was also detected at lower levels in theca, granulosa, and cumulus cells. Further, the expression of known *ASIP* receptors, including melanocortin receptor 1-5 (*MC1R-5*) and attractin (*ATRN*), were examined. Data revealed *MC3R*, *MC4R*, and *ATRN* are expressed in the oocyte and cumulus cells. *ATRN* expression was also detected in granulosa and theca cells. The expression profile of *ASIP* throughout early embryonic development was examined using pools of 20 oocytes/embryos per stage. Data revealed *ASIP* expression is high in the immature GV oocyte and decreases upon oocyte maturation. *ASIP* was steadily expressed from the 2-cell to the 16-cell stage of early embryonic development. Following completion of embryonic genome activation, *ASIP* expression greatly increases at the morula and blastocyst stage. Together, these data suggest a vital function for *ASIP* during oocyte maturation and early embryonic development which future studies will aim to elucidate.

5. Physical protection of organic matter in soil aggregates under differing forest management

Gregory Martin¹, Zachary Freedman², Walter Carson³, Ember Morrissey^{1*}

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

²Department of Soil Science, University of Wisconsin-Madison, Madison, WI

³Department of Biological Sciences, University of Pittsburg, Pittsburg, PA

Soil aggregates exert significant control over soil carbon dynamics and may be considered the functional unit of the soil ecosystem. Aggregates are composed of self-organizing collections of mineral particles and soil organic matter (SOM). Microaggregates assemble into progressively larger macroaggregates, which are all held together by associations with roots, fungal hyphae and SOM. A significant portion of SOM is protected from decomposition by occlusion within aggregates and by the limited diffusion of water and oxygen within and among aggregates. However, the importance of physical protection afforded to SOM by aggregates under different forest management practices is unknown. To address this question, we collected soil samples from a long-term experiment implementing surface fire, herbivore exclusion and canopy gaps in the Monongahela National Forest, WV. We subset and sieved the soil samples into four size classes: unsieved, 2 mm, 0.85 mm and 0.425 mm. We measured total carbon, SOM, active carbon, and respiration. We found size selective aggregate destruction had no effect on total carbon or SOM. Destruction significantly increased active carbon ($F = 16.54, p < 0.01$), and respiration ($F = 26.87, p < 0.01$), with unsieved soil having the lowest and the 0.85 mm and 0.425 mm sizes having the

highest ($p < 0.01$). Additionally, the effects of aggregate destruction on respiration were most pronounced in burned soils in the 0.425 mm size ($F = 4.95$, $p = 0.04$). Our findings suggest aggregate protection of SOM is significant and may be more important in soils with a history of fire.

6. Evaluating lipopolysaccharide-induced behavioral and immune response differences in sheep divergently bred for parasite resistance

K.L. Bentley¹, D.L. Wright², S.P. Greiner³, S.A. Bowdridge^{1*}

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

² Southwest Virginia Agricultural Research and Extension Center, Virginia Tech, Glade Spring VA

³ Department of Animal and Poultry Sciences, Virginia Tech, Blacksburg VA

Katahdin lambs with lower post weaning fecal egg count estimated breeding values (PWEC EBV) generate greater antibody in response to vaccination and survive better to weaning. Thus, lambs with lower PWEC values are more disease resistant and immunocompetent. To test this hypothesis, parasite-resistant St. Croix sheep, (STC, $n=10$), and parasite-susceptible Suffolk sheep (SUF, $n=10$) were compared to divergent PWEC Katahdin sheep (HiKAT, $n=10$) (LoKAT, $n=10$) and challenged with lipopolysaccharide (LPS). Sheep were intravenously administered LPS at a dose of 2.5 ug/kg. Blood samples and temperature data were collected hourly. Behavioral observations were recorded during sampling and videos within pens were obtained 30 min after blood collection. An increase of temperature by 1°C was observed in all groups. Interestingly, STC and SUF temperature peaked at 4 hrs whereas LoKAT and HiKAT both peaked at 6hrs. One metric of behavior recorded from video was sheep grimace score (SGS) (1=normal; 7=extremely abnormal). There was a stepwise increase in SGS with STC having the lowest score and SUF highest. When evaluated by time, at hour 4, STC and LoKAT returned to normal SGS whereas HiKAT and SUF remained high. Analysis of circulating tumor necrosis factor alpha (TNF α) revealed a group by time interaction where STC and LoKAT have early TNF- α peak at hour 4 and then gradually decline. HiKAT and SUF lambs had a delayed and more sustained TNF- α response peaking at hour 8. These data indicate that PFEC breeding values in Katahdin sheep may predict immunological fitness outside the context of parasitic infections.

Masters
Session E
Time: 3:35 p.m. – 4:50 p.m.

1. Dandelion Biodesign

Jordon G. Masters

Design and Community Development, West Virginia University

To study the intersection between soil science, horticulture, and fashion design, a 100% silk organza dress embellished with viable seeds has been biodesigned to be fashionable, biodegradable, and regenerative. Two aspects of biodesign were chosen for this project: biomimicry and biodegradability.¹ The senesced dandelion plant served as inspiration for the aesthetic design of the garment due to its relationship with youth, curiosity, and connection to nature.² The dandelion plant (*Taraxacum officinale*) is often given little thought except when viewed as a pest in lawns or when children elate in blowing the seed heads in the wind, however, the plant is an important part of the ecosystem. *T. officinale* can be consumed as food, incorporated in medication, and used to improve soil health.^{3,4,5}

Garment construction research included studying the morphological characteristics of the dandelion seed head and individual seeds. Textile manipulation techniques were studied to replicate the individual seed pappus and the seed heads.⁶ Edges were zigzag stitched, and hand frayed to simulate a seed pappus. Approximately 40,000 dandelion seeds were foraged to recreate seed heads. A deadstock leather tie belt was added to give more contrast and shape to the wearer's body. Throughout every aspect of creating the garment, the question of how it will be disposed of was considered. Nature is a finite resource that cannot be taken without giving back. Therefore, at the end of this biodesigned garment's life, the owner can choose to compost the 100% biodegradable garment or utilize it by harnessing the embellished viable seed.

¹Williams, N., & Collet, C. (2021). Biodesign and the allure of “grow-made” textiles: an interview with carole collet. *Geohumanities*, 7(1), 345–357. <https://doi.org/10.1080/2373566X.2020.1816141>

²Maggioni, S. (2021, February 16). *Womenswear Forecast A/W 22/23: Rerooted Nature*. WGSN login. Retrieved October 4, 2021, from <https://www.wgsn.com/fashion/article/89994>.

³Peterson, L., & Peterson, R. T. (1978). *A field guide to edible wild plants of eastern and central north america* (Ser. The peterson field guide series, no. 23). Houghton Mifflin.

⁴Ding, A., & Wen, X. (2018). Dandelion root extract protects ncm460 colonic cells and relieves experimental mouse colitis. *Journal of Natural Medicines*, 72(4), 857–866. <https://doi.org/10.1007/s11418-018-1217-7>

⁵Kabir, Z., & Koide, R. T. (2000). The effect of dandelion or a cover crop on mycorrhiza inoculum potential, soil aggregation and yield of maize. *Agriculture, Ecosystems and Environment*, 78(2), 167–174. [https://doi.org/10.1016/S0167-8809\(99\)00121-8](https://doi.org/10.1016/S0167-8809(99)00121-8)

⁶Wolff, C. (1996). *The art of manipulating fabric*. Krause Publications.



Image 1: Finished garment front. To create a biomimicry design of the senesced dandelion plant, approximately 18 yards of silk organza was used for this garment. A deadstock leather belt was added to give contrast and cut to a length that simulates the flower stem.

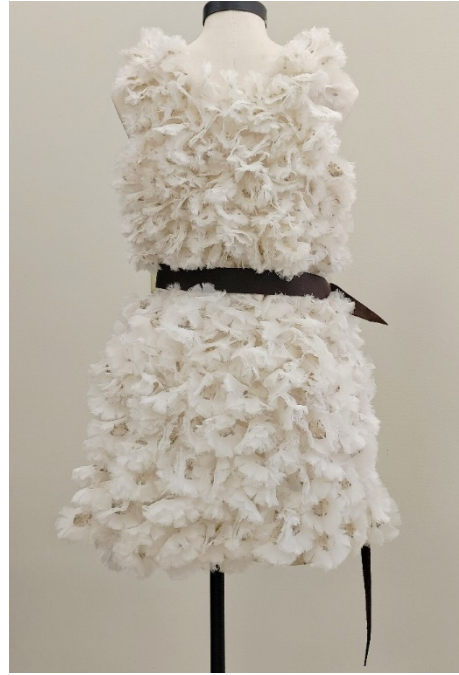


Image 2: Finished garment back. Each “seed head” was strategically hand tacked to the dress in a dense pattern. To add more contrast, larger “seed heads” (approx. 4.5” diameter) were attached from the waist to hem while smaller “seed heads” (approx. 3” diameter) were attached from the waist to neckline.



Image 3: Close-up of recreated seed heads. Each “seed head” was constructed by layering a clump of dandelion seeds between two layers of silk organza and topstitched together to create a seed pouch. Two to four seed pouches were sewn together through their centers. Edges were hand frayed to simulate the seed pappus.

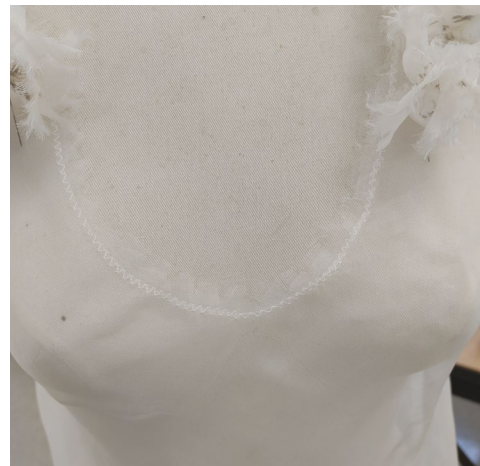


Image 4: Raw edges. Raw edges were zigzag stitched, and hand frayed to simulate seed pappus.

2. Technical Feasibility and Capital Costs of NY’s Carbon-Free Electricity Mandate

Michael E. Reed¹

¹ Division of Resource Economics and Management, West Virginia University, Morgantown, WV

In 2019, New York implemented the Climate Leadership and Community Protection Act (CLCPA). Among the provisions are requirements that electricity generation must be carbon free by 2040. This research uses an optimization under constraints economic and technical model of the New York Independent System Operator generation and transmission system to forecast the changes required to meet the CLCPA mandate. The results show that the NYISO system will need to add approximately 25,000 MW of name plate wind generation, 433,000 acres of solar panels, and 54 100 MW/10hr utility storage units at a capital cost of \$70 billion to reach the CLCPA mandate. In addition, several transmission corridors will need to have added capacity and two way flexibility to carry power from the wind, solar, and storage units to parts of the NYISO system that need power. This information informs New York’s policy makers, NYISO’s long term planners, and the citizens of New York State of the scale and potential cost of needed additions to the generation and transmission systems to meet the CLCPA requirements.

3. Investigating Glossy Buckthorn in its Invasive Range: Aerial Detection and Insect Associations

Jennifer Greenleaf and Dr. Yong-Lak Park*

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

Glossy Buckthorn (*Frangula alnus*) is an invasive shrub native primarily to Europe. It was first reported in Canada in 1989 and has since spread throughout the northeastern United States. Research regarding glossy buckthorn in North America is currently limited and will be necessary to develop methods to control or potentially eradicate it. The objectives of this study were to determine the capability of drone surveys for the detection of glossy buckthorn, and to survey insects associated with glossy buckthorn. Both objectives were conducted in the Allegheny National Forest, Pennsylvania. We have tested three sensors (i.e., normalized difference vegetation index [NDVI], natural color, and thermal) on drones to detect glossy buckthorn and at two different periods: summer with full canopy and late fall when glossy buckthorn still had leaves, but other deciduous trees did not. We have found that glossy buckthorn was most effectively detected with NDVI and natural-color sensors, and that the best time was late fall when only glossy buckthorn had foliage. Of 1,475 insects collected in the insect survey, Diptera (flies) and Hemiptera (true bugs) were the most abundant (24 and 35% of insects collected, respectively) followed by Arachnids (spiders, 17%), Hymenoptera (wasps, 13%), and Coleoptera (beetles, 7%). The results of this study will assist in the management of glossy buckthorn in North America by improving detection and documenting local insect relationships.

4. **Bridal Businesses in West Virginia: Analysis of the Firm Resources**

Ishtehar Sharif Swazan¹, Debanjan Das^{1*}

¹ Fashion Dress and Merchandising Department, West Virginia University, Morgantown, WV

In widely dispersed small communities, local and regional businesses dominate West Virginia, an eastern state of the United States in the Appalachian Mountains where the retail trade sector mostly consists of small and micro fashion businesses and contributed 37% towards the employment in 2017. These businesses create jobs, help build a strong financial position for the state, and promote community-building and social activities. These businesses are unique as they sustain themselves while competing with national and regional retail chains and carving out a customer for themselves. However, the damage caused by the spread of Covid-19 is having a devastating effect on the small and micro businesses in the United States and the impact is much more severe in rural regions of the country. As small and micro fashion businesses have a significant contribution towards the economic infrastructure of the rural state of West Virginia, it is necessary to identify the firm resources or strengths possessed by these businesses in the post-pandemic period. To achieve this objective, a content analysis of web-based self-description of the small and micro bridal businesses in West Virginia was conducted. The resource-based theory of the firm was used as the study's framework. The findings of this study revealed several significant firm resources that are helping the bridal business to grow namely: quality product, competitive price, customer satisfaction, business experience, flexible payment policy, product variety, and private appointments. The findings might inform the federal and state decision-makers to make productive and worthwhile decisions to support these businesses.

5. **Woody Vegetation Development and Restoration Trajectory in Mitigated Wetlands in West Virginia**

Jessica Bryzek¹, Christopher Rota¹, Walter Veselka¹, Elizabeth Byers², James T. Anderson*³

¹ Division of Forestry and Natural Resources, West Virginia University

² West Virginia Department of Environment Protection

³ James C. Kennedy Waterfowl and Wetlands Conservation Center, Belle W. Baruch Institute of Coastal Ecology and Forest Science, Clemson University

Woody vegetation is a long-term inhabitant of restored ecosystems and has potential to be useful for assessing restoration trajectory in mitigated wetlands. Developing data driven performance standards is needed to cumulatively evaluate restored wetland characteristics. Previous research suggests Stem-Area-at-Groundline (SAG), defined as the cross-sectional area where the stem enters the ground, to be indicative of restored woody vegetation functions such as biomass accumulation. This study assesses the feasibility of SAG to track restoration trajectory over time and the potential to be useful as a performance standard. We apply existing woody vegetation protocols adopted in Virginia, USA to mitigated wetlands in West Virginia, USA. Using a chronosequence approach, 40 mitigated wetland sites ranging from 1 to 29 years (mean = 10.2; SE = 1.3) following restoration were assessed. A stratified random sample approach was implemented to randomly generate circular plots (diameter = 5.6 m) within each national wetland inventory habitat type. All woody vegetation within each plot were identified to the species level and SAG measured. Preliminary results suggest SAG responds to site age, following an increasing trend as time since restoration

increases, but the rate of increase is greater for restoration and establishment wetlands relative to enhancement wetlands. In addition, woody vegetation development and community composition is dependent upon site specific characteristics and restoration implementation techniques. Results of this study will be useful for converting woody vegetation attributes into effective, science-driven performance standards.

POSTER PRESENTATIONS

Mixed

Session A

Time: 11:00 a.m. – 12:30 p.m.

Poster presenter should be with their poster.

1. Locating Historic Coal Mine Refuse Piles Using Remote Sensing and Machine Learning

Isaac Kinder¹, Dr. Michael Strager¹, Dr. Samuel Taylor², and Dr. Paul Kinder¹

¹ Division of Resource Economics and Management, West Virginia University, Morgantown, WV

² Energy Institute, West Virginia University, Morgantown, WV

The purpose of this research is to locate pre-SMCRA (Surface Mining Control and Reclamation Act) coal refuse piles. These historic coal refuse piles often cause negative environmental impacts such as reductions in water quality, fire hazards, and wildlife habitat loss. The first step in the reclamation process is to identify and geo-locate these historic refuse piles. Geospatial data is abundant for post-SMCRA refuse piles, but nearly non-existent for pre-SMCRA refuse piles in West Virginia. To locate refuse piles, geospatial analyses will be used to interrogate statewide one-meter LiDAR DEM (digital elevation model) and NAIP (National Agriculture Imagery Program) data. Furthermore, remotely sensed imagery and publicly available geographic information system data will be utilized to calculate potential refuse pile location distances from preparation plants, major roads, and railroads. Analytical terrain models such as slope, aspect, curvature, topographic wetness, and channel networks will be derived from the DEM. Moreover, a NDVI (normalized differential vegetation index) model will be generated from the NAIP data to investigate potential vegetation indicators of refuse pile presence. ESDA (exploratory spatial data analysis) methods will then be used to statistically determine useful explanatory training variables based on correlation of the analytical terrain models, NDVI model, and the distance models between each of the training refuse piles. Finally, useful explanatory training variables will be verified and then be used to train machine learning models such as maximum entropy or forest-based classification and regression to automate pre-SMCRA refuse pile geographic locations across West Virginia.

2. Analysis of Cost Affective Approaches for Monitoring Water and Erosion Control Features on Pipeline Corridors using sUAS-based Remotely Sensed Data

Lucas Kinder¹, Dr. Mike Strager¹, Dr. Shawn Grushecky², Dr. Paul Kinder¹

¹Division of Resource Economics and Management, West Virginia University, Morgantown, WV

²Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Monitoring of water and erosion control features is essential for protecting watersheds surrounding pipeline corridors from excess sedimentation. These features, mainly water bars, are also used to protect the underground pipelines and surface corridors from slips or landslides caused by instabilities in sloping sections. As a slope saturates with water, the bonds between dirt and rocks in the ground

weakens and can allow gravity to pull areas of ground downhill. These situations can cause substantial sediment loads to enter nearby streams and can expose or damage sections of pipelines. Current monitoring of water and erosion control features requires an inspector to walk sections of pipeline, visually inspecting water and erosion control features. This can be a difficult task depending on the topography of the area. With safety and cost effectiveness in mind, sUAS or small Unmanned Aerial Systems equipped with a variety of remote sensors may be the solution to monitoring water and erosion control features. Red, Green, Blue imagery collected using a DJI Phantom 4 Pro sUAS can model topography at high resolution using a method called Structure-from-Motion (SfM) where individual images are stitched together to create a 3D model using computer software. Another method of modeling topographical features is the use of a LiDAR (Light Detection and Ranging) sensor. This sensor, carried by a DJI Matrice 600 Pro sUAS, also allows for the creation of high-resolution 3D models that are more effective in vegetation penetration than SfM derived outputs. Modeling of water bars hold promise for permit compliance and associated feature measurements. In addition, water flow direction and accumulation analyses in ArcGIS will highlight water bars that are properly diverting water and those that are not. Both remote sensors can capture water and erosion control topographical features such as water bars at high spatial and temporal resolutions while removing the costs and hazards associated with an inspector physically walking a pipeline corridor.

3. Impact of Temperature and Salt Concentrations for Thermal Inactivation of *Salmonella* in Moisture Enhanced Reconstructed Chicken Patties

Alik Browning, Rebecca Stearns, Corey Coe, Tim Bolts, Peighton Foster, Jesica Temple and Cangliang Shen
West Virginia University, Morgantown, WV

Introduction: Chicken products moisture enhanced (MH) with salt and tripolyphosphate can be contaminated with *Salmonella*, which is responsible for approximately 35% of the foodborne illnesses associated with poultry products.

Purpose: To determine the thermal kinetic parameters of *Salmonella* in MH-reconstructed ground chicken patties as affected by temperatures and salt concentrations.

Methods: Fresh 500 chicken breast was grounded, inoculated with Nalidixic-acid (NaL-200 ppm) resistant *Salmonella* Typhimurium followed by adding NaCl (1.0 and 3.0%) + Na-tripolyphosphate (0.5%) solutions to achieve pump rates of 8%. Samples were then weighted for 10-gram and added into filtered food sample bags vacuum packaged and followed by storing at 4°C for 42-h before heating in a circulated water bath set at 62, 66, 70, and 74°C for 0, 15, 25, 30, to 180 s, respectively. Counts of the pathogen cells were analyzed on tryptic soy agars plus NaL-200 ppm. Microbial survival populations and thermal inactivation kinetics (USDA-Global-Fit software) were analyzed by the Mixed Model Procedure (SAS, n=8, 2-repeats, $P=0.05$).

Results: Initial *Salmonella* counts were 5.4 to 6.0 log₁₀CFU/g. Heating at 62-74°C for 100-180 s reduced ($P<0.05$) the pathogen populations by 2.8-5.5 log₁₀CFU/g and 2.4-4.8 log₁₀CFU/g for chicken samples containing 1% and 3% salt, respectively. Thermal dynamic data fit Weibull Model (RMSE=0.5163 to 0.7381 and AIC values=-44.026 to -8.868), but not the linear model (RMSE >1.000). Calculated D-values of chickens with 1.0% and 3% salt decreased ($P<0.05$) from 126.4±14.2, 44.6±6.9, 32.3±3.6, to 30.4±4.9 sec, and decreased ($P<0.05$) from 171.0±15.2, 56.4±5.7, 29.3±6.5, and to 24.8±4.9 sec, when heating temperatures increased from 62, 66, 70, to

74°C, respectively. D_{62} and D_{66} values of 3% salt samples were greater ($P < 0.05$) than 1% salt samples, whereas their D_{70} and D_{74} values are similar ($P > 0.05$).

Significance: Results indicate that thermal resistance of *Salmonella* was significantly affected by temperature, and salt concentrations, which will be useful by the poultry meat industry to develop proper thermal processes to eliminate Salmonella in MH chicken products.

4. Do Fashion Consumers Care about Sustainability? A comparison of consumers' conscious and subconscious responses.

Md. Shakirul Islam¹ and, Dr. Sunidhi Mehta^{1*}

Department of Fashion, Dress, and Merchandising, School of Design and Community Development, Morgantown, WV

Luxury brands are known to produce “less” to maintain their exclusivity. Could this strategy be a solution to our overconsumption of fashion goods? Consumers have reported concern on sustainability, however, their purchase behavior tend to differ. This incongruence could be a result of vague understanding and lack of knowledge of the term “sustainability”. Annual ratings of the brands published by sustainability indices may help consumers to perceive overall sustainability performances. In this project, we studied consumers' conscious (survey) and subconscious (psychophysiological) responses to the luxury products and their purchase intention of the same. We recruited 9 participants and showed them 25 visual stimuli (5 products x 5 brands) on a computer monitor. The ratings of brands were taken from Good on You-2021 and Fashion Transparency Index-2021 reports. Their subconscious data were collected using Facial Expression Analysis tool that mimics the human brain function in decoding the emotional responses of human subjects towards emotionally engaging content by gauging their facial muscles' movement. Through the post-experimental survey, we collected the conscious responses of the subjects related to their purchase intention of stimuli that they saw in the experiment. The survey data revealed a positive correlation between sustainability index values and purchase intention. Consumers expressed positive purchase intention for the brands with higher index values. However, the FEA tool did not support this finding. In other words, the conscious responses of human subjects related to purchase intention of sustainable brands differ from their subconscious responses.

5. Do the Consumers Really Care About Sustainable Packaging Materials of Luxury Brands?

Md Hadisur Rahman¹ Dr. Sunidhi Mehta^{2*}

¹ Graduate Student, Division of Design and Community Development, West Virginia University.

² Assistant Professor, Division of Design and Community Development, West Virginia University.

The current study analyzed and interpreted consumers' perceptions regarding luxury brands packaging sustainability. Luxury brands use exclusive packaging materials; some of them are sustainable, and some of them are not. Regarding using unsustainable packaging materials (ribbon, plastic tape, excessive paper, bubble wrap), luxury brand managers and marketing teams may not think about environmental impacts. Should luxury brands managers remain unconscious about using these unsustainable packaging materials? Probably not. Therefore, it's worth investigating how consumers perceive them, although these packaging materials are sometimes small portions of whole packages. Recent studies show that now-a-days consumers really care about the environment,

but little is known about how consumers perceive luxury brands' unsustainable packages. Hence, the study used a Facial Expression Analysis (FEA) and a survey to measure consumers' perceptions regarding five selected luxury brands' packaging materials. Using FEA (Affectiva Affdex iMotions 9.1) the respondents were shown five unboxing videos (Five videos from five luxury brands) focusing on packages, and five relevant facial expressions (Joy, disgust, attention, brow furrow and engagement) were considered, analyzed, and interpreted. Following that, an open-ended questionnaire survey was conducted to measure consumers' thoughts and perceptions towards those luxury brands' packaging materials. A convenience sampling method was used to collect respondents (4 females, 4 males and 1 third gender). The results showed that more than 70% of consumers perceive those packaging materials to be excessive, extravagant, unnecessary, environmentally unfriendly, and wasteful. Luxury fashion businesses should consider sustainable packaging materials to be more consumer-centered.

Keywords: Luxury brands; Packaging materials; Unsustainable; FEA; Perception

6. A Wetland Mitigation Program to Improve Aquatic and Riparian Ecology in Preston County, WV

Andrew MacKenzie¹, Darien N. Becker², Walter E. Veselka¹, Christopher M. Lituma¹, Carol C. Arantes¹, Jason A. Hubbart¹, and *James T. Anderson³

¹West Virginia University, School of Natural Resources

²Welty Environmental Center

³James C. Kennedy Waterfowl and Wetlands Conservation Center, Clemson University

Wetland mitigation practices are used to decrease the loss of wetlands due to anthropogenic impacts. We are evaluating wetland and stream mitigation techniques at Ruby Run and Stoney Run in Preston County, WV, USA. The mitigation reconnected the streams with the floodplain, added in-stream rock structures to reduce bank erosion, expanded the extent of wetlands along the stream, and revegetated the site with woody vegetation. In summer 2021, the streams were graded to add a bankfull bench, and native herbaceous vegetation was planted in the exposed soil. Woody vegetation and biochar were later added in March 2022. At Ruby Run, we are evaluating community composition and abundance of anurans, birds, fish, macroinvertebrates, small mammals, turtles, and vegetation prior to, during, and after riparian wetland mitigation. At both study sites, we are evaluating the effectiveness of added stream structures on macroinvertebrate community composition and abundance with Hester-Dendy samplers and by hand-scrubbing the structures. At both study sites, we also are comparing the growth characteristics (height and diameter) and survival of woody vegetation with and without biochar. Red-winged blackbirds (*Agelaius phoeniceus*), song sparrows (*Melospiza melodia*), meadow voles (*Microtus pennsylvanicus*) and short-tail shrews (*Blarina brevicauda*) were the most abundant species in pre-restoration and active-restoration periods. However, the abundances of short-tailed shrews apparently declined, while of meadow jumping mice (*Zapus hudsonius*) increased during restoration. These preliminary results indicate differential responses of communities to restoration practices. Further data collection will improve assessments and inform future wetland mitigation efforts.

7. **Effects of Arbuscular Mycorrhizal Fungi on the Performance of Maize under Rainfed Condition**

Md Shafiul Islam Rion¹, Md Harun Rashid², Quazi Forhad Quadir³, Imrul Mosaddek Ahmed⁴

¹Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV 26506, USA.

²Department of Agronomy, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh.

³Department of Agricultural Chemistry, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh.

⁴Plant Physiology Division, Bangladesh Agricultural Research Institute, Gazipur 1701, Bangladesh.

Arbuscular mycorrhizal fungi (AMF) are ecologically important microorganisms playing pivotal roles in different ecosystems globally. The present study aimed to investigate the potential of AMF symbiosis to mitigate soil moisture stress in maize and estimate the phosphorus (P) use efficiency under rainfed condition. The experiment had a split plot (each plot 10 m²) design with three factors (water management: rainfed and three times irrigation; AMF inoculation: inoculated and native AMF; P fertilizer: no P, 50% of the recommended dose (260 kg/ha) of P, and full recommended dose), and a control (no P, non-inoculated, and rainfed) with three replications for each treatment combinations. The grain and straw yield were significantly higher in irrigated-AMF inoculated plots, but relative leaf greenness did not differ substantially despite AMF inoculation. Reactive oxygen species analyses indicated that control plots had significantly higher water stress (Malondialdehyde: 106±11.23 nmol/g FW, and Catalase activity: 44.23±4.78 U/g FW/min) compared to other plots. Though rainfed-AMF treated plots had higher MDA than irrigated-AMF treated plots, in case of CAT activity, they were statistically similar. Root Zn, Fe, Mn, and P concentrations had varying levels of statistically significant difference between AMF-inoculated and non-inoculated plots irrespective of P fertilizer doses. Root Fe and Mn concentration were highest in plots with AMF and full P fertilizer application under rainfed condition (17354±3544, and 274±89 ppm, respectively). The relative leaf greenness, ROS, and antioxidant parameters of maize leaves suggested that AMF inoculation reduced moisture stress without compromising grain yield under rainfed condition with full dose of P.

8. **Regional sociodemographics of wastewater disposal in unconventional oil and gas production**

Young Gwan Lee¹, Levan Elbakidze^{1*}, and Suhyun Jung¹

¹ Division of Resource Economics and Management, West Virginia University, Morgantown, WV

As unconventional oil and gas (UOG) development has surged in the U.S., the volume of wastewater from UOG production has also increased dramatically. The wastewater from hydraulic fracturing (a.k.a. produced water or backflow water) amounts to 10%–30% of the fluids used during well stimulation that initiates oil and gas flow from shale plays. The produced water contains numerous toxic elements and requires careful management, including recycling, treatment and disposal, which involves injecting wastewater in designated injection wells. Ohio is the most active state in operating disposal (Class II) wells in the Marcellus shale region. Prior literature documents negative externalities associated with the disposal wells, including road accidents, underground

water contamination, and earthquakes. There are also many studies examining the environmental justice elements of landfills, industrial pollution, and power plants. However, the nexus between UOG wastewater disposal and the local communities has not been studied. We investigate the impact of UOG disposal wells on demographic and socioeconomic outcomes in the state of Ohio. We hypothesize a negative impact of the number and the size of the disposal wells on local per capita income according to avoidance behavior. We use the data from Ohio department of natural resources (ODNR) for disposal wells and ACS 5-year estimates published by U.S. Census Bureau for demographic and socioeconomic indicators and the difference-in-differences approach for the empirical analysis.

9. The Spatial Distribution of Skills, Paycheck Protection Program Loan Disbursements, and the Initial Local Labor Market Impacts from the COVID-19 Shock

David Nason¹, Heather Stephens¹

¹ Division of Resource Economics and Management, West Virginia University, Morgantown, WV

The COVID-19 pandemic led to immediate and significant negative impacts on the US labor market. This is evident through the increase in unemployment and the decrease in labor force participation that occurred in April 2020. While the whole nation felt the impacts of this shock, there was significant heterogeneity across space in the magnitude of the initial shock on local labor markets. Despite the growing literature on the economic consequences of the COVID-19 pandemic, little is known about why these disparities across space occurred. This paper seeks to explain the sources of this heterogeneity by focusing on how the spatial distribution of occupational skills effected the distribution of Paycheck Protection Program (PPP) loan disbursements and the initial local employment shocks brought on by the COVID-19 pandemic. Using multivariate and spatial regression analyses, pre-pandemic county-level skill endowments of digital, cognitive, motor, and people skills will be used to explain differences in county-level PPP loan disbursements. The spatial distribution of these skill endowments will also be used to explain differences in the magnitude of the initial COVID shock to local labor markets in the US. This paper adds to the literature that links the variation in economic outcomes across space to locational differences in occupational skills. Additionally, it provides further evidence on the impact of these skills during times of economic crisis.

10. A gene cluster for an alternate branch of the ergot alkaloid pathway in *Aspergillus leporis*

Kyle A. Davis & Daniel G. Panaccione*

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

Ergot alkaloids are a diverse group of fungal specialized metabolites with distinct biological activities. They are traditionally associated with contaminated crops and illness but have more recently been manipulated to make medicines for various neurological diseases and disorders. Different lineages of fungi contain alternate branches of the ergot alkaloid pathway, with several in the family Clavicipitaceae and a few *Aspergillus* species possessing branches leading to lysergic acid derivatives, while other *Aspergillus* and *Penicillium* species possess branches leading to the lesser studied cycloclavine and rugulovasines. Through genome mining, we have detected the

presence of adjacent *easQ* and *easH* alleles in *Aspergillus leporis*, which has previously been shown to produce lysergic acid amides. These alleles clustered equidistant in phylogenetic analyses from the alleles found in rugulovasine and cycloclavine producers. *Aspergillus leporis* is thus unusual in having gene clusters for two potentially competing branches of the ergot alkaloid pathway. We hypothesized that heterologous expression of the *A. leporis* alleles of *easQ/easH* or *easH* alone in strains of other species engineered to terminate production at chanoclavine-I aldehyde or fumigaclavine, respectively, would allow for detection of these products and demonstrate possible functionality of the two genes. Constructs for expressing the *A. leporis easQ* and *easH* alleles were generated by placing them under the control of native ergot alkaloid promoters. Biochemical characterization of transformants by high performance liquid chromatography-mass spectrometry will reveal whether the *easH* and *easQ* genes of *A. leporis* are functional and if the fungus possesses two alternate branches of the ergot alkaloid pathway.

11. SUSTAINABILITY MEETS CULTURE: THE INFLUENCE OF CULTURE ON CLOTHING PREFERENCES OF AFRICAN IMMIGRANT WOMEN IN THE UNITED STATES

Damilola Fasinu¹ and Colleen Moretz^{1*}

¹Department of Design & Merchandising, West Virginia University, Morgantown, WV

Culture sustainability is one of the essential elements of sustainability (Lin et al., 2016). Sustainable fashion describes clothing designed for longer use, manufactured ethically, and uses materials safe for consumption (Saricam & Okur, 2019). The rapid development of domestic cultural and creative market brought problems such as the severe homogenization of cultural and creative product design, the limitations of product categories, and the low age of cultural orientation (Hou, 2020). The *Fawohodie*, a cultural symbol in this design combines the elements of cultural sustainability and sustainable fashion.

Fawohodie, meaning Freedom, design combined the influence of culture on the clothing preferences of African immigrant women in the United States using the three-level theory of emotional design by Norman (2004), as a framework. The three-level theory establishes the emotional design criteria for cultural and creative products. These three levels include: instinct level (user's most intuitive feeling towards the product), behavior level (user's experience of the product) and reflection level (user's thought) centered on user experience. *Fawohodie* was designed for African immigrant women who value historical and cultural norms and want these elements to be considered and reflected in their clothing choices. *Fawohodie* was digitally printed on organic cotton sateen instead of the normative indigo dyeing processes. The symbol expresses the wearer's feelings and thoughts of *freedom*, thereby reflecting cultural identity for the wearer. The details enhance a subject-object attachment between the garment and the wearer, thus, potentially increasing the lifespan of the garment. The hemline of the *Fawohodie* garment is designed asymmetrically, strategically placed to showcase current western design trends.

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12. Mountain Biking in the Mountain State

Connor Mullin

Division of Forestry and Natural Resources, West Virginia University
Davis College of Agriculture, Natural Resources, and Design

The number of people using and owning both mountain bikes and electric bikes are on the rise. These two technologies are merging and becoming more mainstream which leads to new potential management issues. Electric bikes have been shown to increase accessibility to cycling, ride length, and riding frequency, though most research has focused on electric *bicycles*. If these qualities are shown to carry over to electric *mountain bikes*; land managers, policy makers and trail designers will need to account for them. Additionally, there is a general lack of research specifically looking at how electric mountain bikes fit into the broader cycling community. Research is needed to describe the demographics, behaviors and motivations of the users of this emerging technology. We believe that there will be differences in the above mentioned characteristics when examining those using electric mountain bikes versus traditional mountain bikes.

This will be a mixed-method study with recreational specialization as the theoretical framework. The qualitative data will be collected through a focus group involving members of local riding groups, with the goal of informing the quantitative portion of the study. This will include both in-person and online surveys which will be administered through snowball sampling and at riding events this summer. The poster session will describe my thesis proposal because the majority of the research will be conducted after April 26th.

13. Confluence: Evaluating the Individual Learning Outcomes of a Combined Citizen Science and Environmental Education Project

Evan Harms¹, Dr. Dave Smaldone^{1*}

¹Department of Recreation, Parks, and Tourism Resources, West Virginia University, Morgantown, WV

Citizen science (CS) is the participation of nonprofessionals in scientific research, and the level of “citizen” participation can vary widely. While citizen science is being used as a new platform for informal education, there is a lack of research about learning outcomes for participants, especially youth. Environmental education, like citizen science, can take place across a diversity of settings and cover a diversity of topics. Both are powerful tools for education and inquiry independently. Literature also reveals CS and EE have overlapping learning and outcome frameworks. We propose that environmental education activities delivered in conjunction with citizen science data collection methods may promote science content knowledge, science inquiry

skill learning, and stewardship in participants. Specifically, this research will examine the impact participation in a water quality monitoring citizen science project has on individual learning outcomes, including interest in science and the environment, knowledge related to water, and stewardship behaviors.

The project evaluation will use pre and post CS project engagement surveys to measure changes in individual learning outcomes. Our sample will be about 150-200 middle-school-aged youth participating in West Virginia's statewide 4-H summer camp at Jackson's Mill in 2022. After taking the pre-survey, campers will participate in a series of five citizen science activities over five days. The activities are designed to build on one another from awareness to stewardship, and link learning frameworks from both EE and CS. Afterwards, they will complete the survey again and we will be able to evaluate changes in the variables noted above.

14. Compare the efficacy of a peroxyacetic acid and H₂O₂ mix to mitigate cross-contamination of *Salmonella* Typhimurium and *Enterococcus faecium* on tomatoes during triple-wash

Corey Coe¹, Rebecca Stearns¹, Lisa Jones², and Cangliang Shen¹

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

² WV Small Farm Center Project Coordinator, West Virginia University, Morgantown, WV

West Virginia Small Farm Center suggested applying triple-wash to improve microbial safety of locally grown produce. Applying antimicrobials in produce wash water is a critical step in preventing cross-contamination instead of reducing pathogen cells. Purpose of this experiment was to compare the efficacy of triple-wash with a peroxyacetic acid/H₂O₂ mix (SaniDate-5.0) for mitigating cross-contamination of *Salmonella* and the surrogate *Enterococcus faecium* on tomatoes. Nalidixic-acid (NaL-200 ppm) resistant *S. Typhimurium* or *E. faecium* was dip-inoculated onto 2-tomatoes followed by triple-washing with 4-un-inoculated-tomatoes by water+water+SaniDate-5.0 process. *S. Typhimurium* or *E. faecium* on tomatoes or in wash-waters were enumerated using a modified MPN-method. The turbidity of each well after incubation (35°C, 24-h) was confirmed on tryptic soy agar and bile esculin agars plus NaL-200 ppm. MPN values of each treatment were determined by an MPN-calculator followed by analyzed using mixed model procedure of SAS (n=16, 4 repeats, P=0.05). Cross-contamination of *E. faecium* was prevented when 0.50% of SaniDate-5.0 was applied, whereas applying 0.70% of SaniDate-5.0 still resulted very minimal cross-contamination (0-log₁₀MPN/g). At least 0.50% of SaniDate will be effective to mitigate *Salmonella* and *E. faecium* cross-contamination on tomatoes. More researches still needed to verify that *E. faecium* is a good *Salmonella* surrogate used for validating antimicrobial washing systems on produce.

15. Detecting tree of heaven using drones for the management of spotted lanternflies, a new invasive insect in West Virginia

Kushal Naharki and Yong-Lak Park*

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

The spotted lanternfly, *Lycorma delicatula* (Hemiptera: Fulgoridae) is a new invasive pest to West Virginia, causing serious economic damages to forestry and agriculture. The most preferred host plant of the spotted lanternfly is the tree of heaven (*Ailanthus altissima*) which is a rampant invasive tree

species throughout the United States. Currently, no effective trapping methods for spotted lanternflies are available, and pest managers are solely relying on the detection of trees of heaven to locate spotted lanternfly populations. This study was conducted to develop an aerial survey method for detecting and mapping the tree of heaven using drones and optical sensors. The objective of this study was to determine the optimal flight altitude for the detection of the tree of heaven with three different optical sensors (i.e., natural color, thermal, and infrared). A series of aerial surveys at various flight altitudes (50–100 m above the ground) were conducted using rotary-wing drones equipped with three different sensors. The results of this study showed that female trees of heaven with seed clusters were detectable during the winter season. It was found that the tree of heaven can be detected at < 70 m above the ground. In addition, thermal sensors detected the heat signatures of seed clusters of the tree of heaven. This study demonstrated that detection of the tree of heaven would be possible with aerial surveys with drones equipped with optical sensors, which can help in the early response and prioritize the efforts on spotted lanternfly management.

16. “I Didn’t Know Extension Did This!” A Focus Group Analysis of a First-Year Extension Internship Program

Mikayla Hargis¹, Dr. Haley Rosson^{1*}

¹ Department of Agricultural and Extension Education, West Virginia University, Morgantown, WV

Cooperative Extension employees have served as change agents within their local communities, disseminating research-based information from the land-grant universities to the people. As the Extension Service has evolved and expanded over the last century, so have the roles and responsibilities of Extension agents. The Personnel and Organizational Development Committee identified 11 areas of core competencies that all Extension professionals should possess (Maddy et al., 2002). Out of those 11 areas, educational programming, information and education delivery, and knowledge of the Cooperative Extension organization, are competencies addressed during the program. The purpose of this project aimed to provide the interns with the opportunity to gain first-hand expertise in the Extension profession through an experiential, supervised internship experience. Interns worked directly with the supervising agent to learn about and experience educational efforts for the three programmatic areas in the Cooperative Extension Service: 1) Agriculture and Natural Resources; 2) 4-H and Youth Development; and 3) Family and Community Development. For this qualitative analysis, a focus group methodology was employed using a semi-structured interview protocol. Three overarching themes were identified in the data collected from both the intern and supervisor focus groups: 1) Motivation to participate; 2) The big picture of Extension; and 3) Next steps moving forward. Additional experiences will be included in the next iteration of the program, such as the development of a student-led educational project and preparation of a final portfolio and presentation, showcasing key activities that the intern has led or developed.

17. Extension Exchange Experience: A Transformative Learning Experience Through Domestic Travel

Mikayla Hargis¹, Dr. Haley Rosson^{1*}, Dr. Aaron Giorgi¹, Dr. Rebecca Mott², Seth Plaughter², Dr. Adam Cletzer²

¹ Department of Agricultural and Extension Education, West Virginia University, Morgantown, WV

² Division of Applied Social Sciences, University of Missouri, Columbia, MO

Extension professionals are tasked with the challenge of having a diverse educational background and technical expertise. Professional development and training programming provided by the land-grant institutions allow agents to develop and strengthen competencies that Extension professionals should possess. The Extension Exchange Experience will highlight Extension programming across West Virginia and Missouri on a biennial rotation through a domestic study abroad. Through transformative learning and immersive experiences, participants will experience Extension programmatic areas of: 1) Agriculture and Natural Resources; 2) 4-H and Youth Development, 3) Family and Consumer Sciences; and 4) Rural/Community Economic Development. Travel can be a potential source of transformative learning and can also be transformative to those traveling and the host. Through Kolb's (1984) Experiential Learning model, students will gain knowledge through experience, observation, and reflection. The concrete experience of travel combined with the pre- and post-travel reflections, will allow the participants to apply their knowledge and further develop those specific competencies and skill sets needed as Extension professionals. A qualitative analysis will be employed utilizing pre- and post-travel written and/or verbal reflections. The reflections will be analyzed through thematic analysis to identify themes generated in the reflections. Through this experience, it is anticipated that participants will be able to apply the knowledge gained to future programming within the four programmatic areas of the Cooperative Extension Service and professional development efforts to meet the competencies that Extension professionals should possess.

**Mixed
Session B
Time: 2:00 p.m. – 3:30 p.m.**

1. Comparative genomics, pathogenicity, and persistence of *Verticillium nonalfalfae* strains from *Ailanthus altissima* and alternate hosts of ecological and economic importance

Kristen H. Pierce, Brian R. Lovett, Matthew T. Kasson

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

Verticillium nonalfalfae, the causal agent of Verticillium wilt in *Ailanthus altissima*, has been proposed as a biocontrol agent to help combat the spread of the invasive tree. Strains of this naturally occurring fungus have been isolated from multiple hosts, including *Ailanthus* and many economically significant crops, and from multiple geographical origins. Identification of a strain for registration for commercial use is unresolved, as genomic comparisons are yet to be completed. We aim to compare the efficacy and host specificity of *V. nonalfalfae* isolates, use comparative genomics to investigate genetic variation among strains, and assess persistence of the fungus in soil without a host present. Inoculation of the invasive plants *Ailanthus* and glossy buckthorn, and of economically significant crops kiwifruit and hemp, will be performed to assess host range and virulence of strains. Genomic sequencing will be performed on *V. nonalfalfae* strains being considered for registration in the U.S. and in Europe. Genome-wide sequence comparisons will resolve differences among strains from varying host plants and geographical origins. *V. nonalfalfae* will be cultured from infested soils to determine the persistence of the pathogen after having been stored in soil vials for a decade; results may inform storage methods of the commercialized product in the future. Understanding the genetic differences in these strains may contribute to the shaping of our understanding of Verticillium wilt diseases. Furthermore, this work will provide important genomic information required for the U.S. Environmental Protection Agency to register *V. nonalfalfae* as a commercial biocontrol agent.

2. Urine metabolome reveals candidate biomarkers for divergent residual feed intake in beef cattle

Taylor Sidney*, Godstime Taiwo*, Modoluwamu Idowu*, and Ibukun M. Ogunade*¹

¹Division of Animal and Nutritional Science, West Virginia University, Morgantown, WV 26505, USA

Residual feed intake defines the difference between the predicted and actual feed intake, adjusted for the body size and growth performance of individual animal. We analyzed amine/phenol-metabolome of urine samples to identify urinary metabolic biomarkers associated with residual feed intake in beef cattle. A group of 56 crossbred growing beef steers (average BW = 261 ± 18.5 kg) were adapted to a high-forage total mixed ration in a confinement dry lot equipped with GrowSafe intake nodes for period of 49 d to determine their residual feed intake classification (RFI). After RFI determination, weekly urine samples were collected three times from beef steers with negative RFI (most efficient (HFE); RFI = - 1.93 kg/d, n = 8) and positive RFI (least efficient (LFE); RFI = + 2.01 kg/d, n = 8). Urine samples collected were then composited for each steer. Metabolome

analysis was conducted using a chemical isotope labeling/liquid chromatography–mass spectrometry, specifically for the analysis of metabolites containing amine/phenol-chemical groups, which are metabolites associated with metabolisms of amino acids. A total number of 557 amine/phenol-containing metabolites were detected and identified. Biomarker analysis of the urinary amine/phenol-metabolome identified N-acetyl-L-tyrosine, O-methyl-L-threonine, uridine, and threoninyl-hydroxyproline as candidate biomarkers of RFI (false discovery rate ≤ 0.05 ; Area Under the Curve ≥ 0.85). In conclusion, the results of our study revealed that alteration in urine amine/phenol-metabolome is associated with selection for low or high RFI in beef steers and urine is a potential source of metabolite biomarkers associated with RFI in beef cattle.

3. Does certification matter? An investigation into Bangladesh Apparel Industry

Mehnaz Fatima Monamy, West Virginia University, USA

*Dr. Debanjan Das, Fashion Dress and Merchandising, West Virginia University, USA

Nine years ago, the world's biggest tragedy in clothing history happened in Bangladesh, the Rana Plaza building collapse, which took more than 1,100 workers' life and more than 2,600 were injured. After this catastrophic incident, Accord, a five-year agreement, was formed with the purpose of creating a safe working environment and a better life for the Bangladeshi workers (Accord, 2013). Although the Accord agreement brought in improvements in the Bangladesh RMG industry, the former vice president of BGMEA said in an interview that compliance became a burden for the companies. They are only trying to meet the buyer requirements as compliance costs money (Textile Today, 2021). For this study, I investigated the websites of 427 factories to understand their pursuance of certification. I did a quantitative content analysis and I found that diversity in certification along with buyer requirements were essential factors in their quest for certification.

4. Factory Accidents in Bangladesh: A qualitative exploration

Mehnaz Fatima Monamy, West Virginia University, USA

*Dr. Debanjan Das, Fashion Dress and Merchandising, West Virginia University, USA

Throughout history, accidents in factories are not uncommon in the apparel sector around the world. After the Rana Plaza building collapse incident in 2013 in Bangladesh, Accord on Fire and Building Safety in Bangladesh, a five-year agreement, was created to ensure a safe working environment for the workers in the ready-made garment (RMG) sector (Accord, 2013). Although Accord is successful in guaranteeing building safety, the ongoing fire incidents indicate that there are some loopholes in the implementation of Accord. To understand the reasons for factory accidents in Bangladesh, I used a qualitative content analysis of newspaper articles to explore the factors behind factory accidents. Work culture, work environment, and human faults were found to be main factors behind factory accidents in Bangladesh.

5. **Women in Extension Persevering in Leadership Roles**

Lexi Trickett¹, Emily Perdue¹, Haley Rosson¹, Lisa DeFrank-Cole²

¹Department of Agricultural and Extension Education, West Virginia University, Morgantown, WV

²Leadership Studies Program, Eberly College of Arts and Sciences, West Virginia University, Morgantown, WV

Numerous studies have examined the lived experiences of women faculty members in Agricultural Education, yet less attention has been given to women faculty members in Agricultural Extension. The purpose of this study is to develop a profile of women Extension Agents and Specialists in West Virginia by describing their mentoring experiences and current organizational climate. Using DeFrank-Cole & Tan's (2022) Four Domains Framework, this study will be focusing on the Organizational and the Interpersonal Domains. The Organizational Domain encompasses barriers such as bias and discrimination, masculine organizational culture and gender wage gap, while also containing supports such as collective organizational culture, diversity and inclusion initiatives and fair organizational policies. The Interpersonal Domain's barriers include a lack of mentors and sponsors, work-family conflict and sexual harassment, while also containing supports such as mentors/sponsor, equal division of labor and men allies and advocates. This study is seeking to determine if women in the Agricultural Extension profession often experience sexism, marginalization, fewer leadership positions, and discouragement from staff members, similar to findings from other studies (Cline et al., 2019, 2020; Seevers & Fosters, 2003). If these results are congruent with previous studies, Agricultural Extension should work to promote a more positive and inclusive atmosphere for their women Agents and Specialists. More critical research related to women's experiences in Extension is encouraged to improve the inclusivity of the profession.

6. **Does a diverse leadership board at a lending institution increase credit access to minority farmers?**

Ranjita Bhandari, Dr. Ana Claudia Sant'Anna*

Davis College of Agriculture, Natural Resources and Design

Introduction and Problem Statement:

Fair lending laws forbid discrimination based on any demographic factors in any sort of a credit transaction such as consumer, commercial, or real estate loan (Evenoff & Segal, 1996). Despite this law, many statistical analyses continue to uncover loan denial inequalities between white and minority loan applicants (Tempkin et al., 1999). A string of lawsuits specially after 1990s have been reported in both farm and non-farm sectors in which different corporations were found guilty of charging higher rates of interest and fees to minority and female borrowers (Feder & Cowan, 2013; Savage, 2011; Savage, 2012; Meyers, 2015, & Dhakal et al., 2019). Different team of researchers also found that access to credit impacted the productivity, investment, yield and welfare of farmers (Feder et al. 1990; Houensou, Goudjo & Senou, 2021; Penderson, Chung and Neil, 2012). Thus, credit accessibility can be beneficial for both farmers and lenders. Harfhoff & Korting (1998) and Behr et al. 2011 addressed that lender and borrower relationships appear to be more significant in enhancing credit availability and approval. Demko and Sant'Anna (2021) also stated that positive relationship with lender made the Paycheck Protection Program application procedure easier. Hence, the lender borrower relationship plays an important role in increasing credit accessibility. So, we investigate linkages between diversified governing boards in lending institutions and their loan approval amounts controlling for demographic farmer information. We contribute to the

literature by investigating how diversity among governing boards and leadership staff impact credit access to SDFR (Socially Disadvantaged Farmers and Ranchers). SDFR is a farmer or rancher who belongs to a group of people who have been discriminated against because of their race, ethnicity, or gender. These group includes African Americans, American Indians, Alaskan Natives, Asians, Hispanics, Pacific Islanders, women farmers, and ranchers (United States Department of Agriculture Economic Research Service, 2021).

Method:

We will analyze demographic information on farm credit board members and/or senior leadership staff and loan amounts using data collected from farm credit system (FCS) websites and farm credit administration (FCA) call reports. Data on farmer characteristics and county level information comes from Agricultural Census and from the Paycheck Protection Program (PPP), available through the Small Businesses Administration website. We provide descriptive statistics such as on correlations between loan amounts and farmer demographics and FCS lending board using data collected to shed light on loans to socially disadvantaged farmers and ranchers. To quantify the levels of diversity among the senior staff of Farm Credit lending associations, we will use the Herfindahl-Hirschman Index (HHI), following Hunt, Layton, and Prince (2015). When HHI equals to 1, all members of the board are of the same race or gender. If board members are more diverse the HHI is smaller. Correlations between the presence and characteristics of SDFRs and HHI will be mapped to enable for the identification of cluster locations.

Expected results and potential discussions:

We expect to shed light on the demographic composition of governing boards and leadership staffs and their linkages to the loan amount awarded to counties with a majority of SDFR farmers. We expect that Farm Credit lenders with more diverse governing boards will be closely correlated to higher loan amount to counties with higher shares in SDFRs. As such, we expect to provide insight on the shares of loan amounts awarded by FCS lending associations in counties with majority SDFRs. Result can also guide agricultural lenders and policy makers to make new provisions to facilitate improved loan availability to SDFRs via farm credit lenders.

7. Effect of insect infestation on the THC, Cannabinoid and Terpene Profile of Industrial Hemp

Bikash Deo and Michael Gutensohn

Division of Plant and Soil Sciences, West Virginia University

Hemp (*Cannabis sativa*) cultivation is getting increasing attention in the 21st century due to its multipurpose uses. It is being used in >2500 products, mostly for pharmaceutical and cosmetic products. Although, farmers are attracted to hemp cultivation there are significant risks associated which can cause economic losses to farmers. Hemp plants having THC (Tetrahydrocannabinol) levels greater than 0.3 % (w/w) are legally considered as drug, and farmers need to destroy their crops if these exceed this threshold level. Hemp plants develop glandular trichomes around the female inflorescences which produce secondary metabolites including cannabinoids and terpenes. Many plants species show an increase in trichome density and secondary metabolites when exposed to biotic stress like pests and pathogens. Infestation by chewing insects could trigger biotic stress in hemp plants since herbivory activates the jasmonic acid signaling pathway that may lead to an increase in THC levels by upregulating THCA biosynthesis. To test this hypothesis, beet armyworm

(*Spodoptera exigua*) were allowed to feed for one week on hemp plants during the flowering stage. Plant samples were collected at 0, 7, 14, 21 and 28 days after treatment, and the cannabinoid and terpene profiles were analyzed. We found that there is a significant difference in THC levels in treated hemp plants compared to control plants. This clearly demonstrates that biotic stress caused by insect infestation contributes to increases in THC levels. Based on this finding losses of farmers can be reduced by managing such biotic stresses and thus make hemp cultivation economically less risky.

8. Super Donor Conversion Barriers in strains of *C. parasitica*

Danielle Mikolajewski

Plant and Soil Sciences

Castanea dentata was once an important tree across the eastern United States that had many uses. However, it has since been decimated by the fungus *Cryphonectria parasitica* which causes a disease known as chestnut blight. Despite over a century of research, control measures are limited to breeding American chestnut with more resistant Asian species and using hypovirulence-inducing viruses as a biocontrol of the fungus. Hypovirulence was discovered in Europe when scientists found a virus responsible for reducing the fungus's virulence, which allowed trees to fight off infection. Transmission of the hypovirulence-inducing virus is controlled by vegetative incompatibility (vic) genes that need to be the same in both virus donor and recipient strains to allow virus transmission. In the U.S., greater genetic diversity in vic genes limits utility of hypovirulence as a biocontrol. A super donor strain (SD) of *C. parasitica* was developed to combat this problem which has its vic genes modified such that it can donate virus to any strain of *C. parasitica*. Various strains of chestnut blight fungus, however, could not be infected by virus from the SD. My project will investigate barriers to virus transmission by SD strains. I hypothesize that these strains possess either a new vic gene or additional viruses that block virus transmission. I hypothesize that removal of these barriers will permit SD strains to have successful virus transmission. This research will contribute to refining tools currently being used to control chestnut blight and ultimately aid in restoration of American chestnut in the U.S.

9. Characterization of ZIM2, a KRAB-containing Zinc Finger Transcription Factor, highly abundant in bovine oocyte

Mingxiang Zhang¹, Heather Chaney¹, Jaelyn Current¹, Jianbo Yao¹

Author Affiliations

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

Oocyte quality is a determining factor for fertility since maternal factors orchestrate early developmental events before ZGA. KRAB-C2H2-ZFPs represent the largest transcription factor repertoire of mammalian genome, which interact with DNA through the zinc finger motif. Even though the entire function of KRAB-C2H2-ZFPs remain elusive, KRAB-C2H2-ZFPs have been demonstrated to be highly involved in various cellular processes, including development, differentiation, and apoptosis. Bovine ZIM2 is a KRAB-containing C2H2-zinc finger transcription factor, which is highly abundant in the testis. Analysis of RNA-seq data from a bovine cDNA library indicated that *ZIM2* transcript is highly abundant in oocytes as well. Characterization of *ZIM2* transcript expression revealed that *ZIM2* mRNA is expressed in testis, oocytes, and early embryos. In addition, western blot analysis using a customized ZIM2 antibody indicated that ZIM2

protein is present in oocytes and 2-cell, 4-cell, 8-cell, 16-cell embryos, morula, and blastocyst. To test the effect of ZIM2 in early embryonic development, zygote was generated by in vitro maturation and fertilization of oocytes, siRNA specifically targeting ZIM2 was designed and injected into the presumptive zygotes to perform a knockdown experiment. The decreased blastocyst rate was observed in the knockdown group compared to the uninjected and negative siRNA group. Furthermore, using a GAL4-luciferase reporter assay, ZIM2 was demonstrated to contain an intrinsic repressive effect. In addition, ZIM2 interacted with a highly conserved co-repressor KAP-1. Results of described studies demonstrate that ZIM2 is a maternally derived transcription factor required for early embryonic development in cattle, presumably functioning by repressing transcription.

10. Use of Drones to Assess Forestry Best Management Practices

William Smith¹, Bibek Aryal¹, Wanhe Hu¹, Xufeng Zhang¹, Jingxin Wang¹

¹Division of Forestry and Natural Resources Center for Sustainable Biomaterials & Bioenergy West Virginia University, Morgantown, WV 26506

The use of drones to monitor environmental mitigation efforts is an area where research seems to be lacking. There was a limited number of studies that investigated the applications of drones for surveying and monitoring forestry best management practices (BMPs). In this study, a drone is used to collect imagery in addition to on the ground BMP sampling to determine the suitability of using a drone for the assessments of BMPs. The results from the ground sampling are compared to the drone imagery. After the collection of the data in the field with the drone, data can be transferred to a computer for further manipulation. Attempts have been made to solely use ARCGIS Pro mapping software that has the capabilities suitable for the analysis of spatial features. However, there has been some difficulty in processing the raw imagery within ARCGIS Pro and another program Pix4Dmapper is being considered for this step of the process. Currently data collection is still ongoing for this study and the results will be helpful regarding the suitability of drone use for assessing forestry BMP's. Preliminary data seems to indicate that drones are well suited for the task.

Key Words: Drone, BMP, Forestry, Logging, Assessment, ArcGis, UAS, UAV, Mapping

11. Response of running buffalo clover (*Trifolium stoloniferum* Muhl ex. A. Eaton) to tree harvest and transplanting in Monongahela National Forest

Ruben Sabella

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

Running buffalo clover (RBC) is a rare perennial plant that grows throughout the American Midwest and the Appalachian Mountains. It was thought to naturally be maintained by disturbance from bison. This disturbance helped control competition and prevent canopy closure. Due to the extirpation of bison in much of its native range, managers have been looking for ways to create suitable habitat that could support new populations. We created experimental plots in the Cheat Wildlife Management Area within Monongahela National Forest with varying levels of ground disturbance. Treatments comprised of mowing vegetation, raking away litter, and raking and mowing together. We then transplanted individuals of running buffalo clover into these plots. We hypothesize that the areas with greater disturbance will have greater survival rates after one year. This study also seeks to measure the short-term impacts of logging activities on the abundance of existing RBC. Before and after a forest thinning, RBC abundance and distribution are measured

along with abiotic conditions (i.e., light levels). In addition, the abundance of invasive species is quantified after logging to assess the potential for competition. The results of this study will help managers create habitat for RBC with or without the use of logging disturbances.

12. Faculty Utilization of Professional Development in the College of Agriculture

Kayla Giorgi¹ and Dr. Jessica Blythe¹

¹College of Design and Community Development/AGEE

Higher Education faculty with teaching appointments are expected to teach in both graduate and undergraduate courses. It has been documented that little to no instruction for faculty related to how to teach within many agriculture disciplines occurs prior to beginning teaching. Universities and professional organization offer opportunities of professional development related to teaching practices on virtual and in person platforms. Faculty preparing a new generation of agriculturist need to be up to date on the latest teaching practices as cited in research to provide the best education experience for our students. Due to limited time and the weight placed on research, expectations for personal betterment of teaching practices may not be a priority for faculty with a teaching appointment. The purpose of this study is to describe the professional development attendance habits of faculty members at two colleges of comparable size at West Virginia University. Additionally, this study will describe faculty perceived self-efficacy utilizing eight different teaching competences identified within the literature as important to teaching success and framed by the Borich model of needs assessment as related to teaching practices. Faculty with a teaching appointment will be surveyed using a questionnaire of four parts including; background, demographic, attendance habits of professional development related to teaching practices, and comfortability of different teaching practices. Potential findings could offer insight how faculty members are using professional development available to them and what types need to be offered to increase participation in these professional developments as well as incentives for professional to attend.

13. Visitor's Perceptions of Recreation Economy in the Monongahela National Forest Area

Morgan Martin³, Jinyang Deng^{1**}, Douglas Arbogast²,

¹Professor, Ph.D., Recreation, Parks, & Tourism Resources Program, School of Natural Resources, West Virginia University, Morgantown, WV

²Ph.D., WVU Extension Specialist-Rural Tourism Development, West Virginia University Extension Service, Morgantown, WV

³Graduate Research Assistant, Recreation, Parks and Tourism Resources, Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Although outdoor recreation is a growing and diverse economic sector, many rural communities lack the capacity and resources to successfully capitalize on the recreation economy, which has been recognized by the USDA as an emerging or priority area of national need and an effective means for rural development. To this end, the Mon Forest Towns Partnership was initiated in 2017 through the support of the US Forest Service, West Virginia University, USDA Rural Development and 10 gateway communities to the Monongahela National Forest. As part of this ambitious

initiative, this project seeks to understand visitors' perceptions of recreation economy (in terms of branding, values, images, competitiveness, satisfaction, loyalty, and COVID-19 impacts) involving the 10 small towns in the forest area. A gap analysis using Importance-Performance Analysis (IPA) was conducted based on data collected from 621 visitors using Qualtrics. Results show that positive images and high levels of satisfaction are highly and positively correlated for destination attributes measuring the use/protection of resources, rural atmosphere, and security/safety. Contrarily, attributes on festivals/events, entertainment/nightlife, and shopping were perceived lower, thus needing future improvements. Findings from this project provide data to guide marketing/development strategies for the area and are critical for the development of sustainable recreation and economies in the forest and rural communities, facilitating the linkage between community development and forest management planning, elucidating how public land can impact local communities and what role recreation in public land plays in enhancing the quality of life for local residents and attracting visitors to the region.

14. Similarities and differences in small mammal communities of mitigated and natural West Virginia wetlands

Krista Noe¹, Mack W. Frantz², Christopher T. Rota¹, and James T. Anderson^{1,3*}

¹ Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

² Wildlife Diversity/Natural Heritage Program, West Virginia Division of Natural Resources, Elkins, WV

³ James C. Kennedy Waterfowl and Wetlands Conservation Center, Belle W. Baruch Institute of Coastal Ecology and Forest Science, Clemson University, P.O. Box 596, Georgetown, SC 29442, USA

Wetland mitigation is intended to offset human-created losses to natural wetlands. Because wetlands perform important functions, it is critical to determine whether mitigated wetlands provide benefits similar to natural wetlands. One function of wetlands is to provide habitat for small mammals, which are important in wetlands because they influence vegetation and are prey for higher trophic level wildlife. To determine the value of mitigated wetlands for small mammals, we implemented capture-mark-recapture to sample small mammal communities at both mitigated and natural wetlands. We sampled 14 mitigated and 12 natural wetlands throughout West Virginia over 10,060 trap nights. We captured six common species at both wetland types, with deer mice (*Peromyscus maniculatus*) being our most captured species, and three additional species at exclusively natural wetlands. We found most aspects of small mammal communities to be similar between mitigated and natural wetlands, including species occupancy, and site diversity, richness, evenness, and community composition. However, apparent abundance of deer mice was higher in natural wetlands ($P < 0.01$), and meadow voles (*Microtus pennsylvanicus*) were similar between wetland types only by a thin margin ($P = 0.06$). Therefore, our results suggest mitigated wetlands may fulfill their intended role for small mammal communities, but abundance between wetland types may be species-specific.

15. Measuring bacterial necromass carbon contributions stored on mineral surfaces in soil

Rachel Winslett, Ember Morrissey*, Md Shafiul Islam Rion

Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV 26506, USA

Understanding soil carbon storage, especially microbial carbon storage, may facilitate more carbon sequestration in soil which would help mitigate rising CO₂ levels in the atmosphere, along with potentially increasing soil fertility. Carbon inputs into the soil are partially broken down and stored for variable periods of time depending on multiple factors including adsorption to minerals, which can make the carbon less available to be fully decomposed. Up to 80% of the total carbon in soil has been estimated to be dead microbial cell fragments, referred to as microbial necromass. This observation makes microbial organic matter decomposition and carbon storage in microbial necromass a focus of new research in environmental microbiology. My research explores microbial carbon storage in soil by investigating how soil minerals impact the break-down of dead bacterial cells. By studying differences in the amount of carbon stored on sand, clay, and iron oxide-coated minerals by gram positive, gram negative, capsule-forming, and filamentous actinobacteria species, we hope to find correlations in carbon storage and the surface chemistry interactions of the bacteria and minerals. The information gathered from this experiment will allow us to have a better understanding of carbon cycling within soil, and that may help us protect and build soil carbon both to enhance soil fertility and to combat climate change.

16. Evaluating the impacts of deforestation on macrophyte-dwelling fish communities in the Lower Amazon river

Sam Grinstead¹, Caroline Arantes¹

¹Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Within the river-floodplain interface in the Amazon River basin, floating macrophyte beds hold extremely high fish diversity, as they provide critical refuge, feeding opportunity, and spawning grounds for several species including fishes of high commercial importance (Goulding 1980; Petry et al. 2003; Gomes et al. 2012). In Amazonian floodplains, agriculture, timber exploration, and cattle ranching drive large-scale deforestation which should affect these macrophytes ecosystem and in turn fish communities. However, no study to date has assessed macrophyte-dwelling fish response to deforestation, despite that studies have found that Amazonian deforestation negatively affects fish biomass and yield (Castello et al. 2018; Arantes et al 2019b). It is likely these fishes are strongly affected by deforestation, since many species rely on the floodplain forest for annual feeding and spawning opportunities. I hypothesize that a shift towards an increase in generalist feeders and early successional opportunistic species will be correlated with deforestation. My objective is to evaluate the relative effects of a gradient of 3-70% forest cover on the functional diversity of macrophytic fish communities in the Lower Amazon River floodplain. I will attempt to identify thresholds of deforestation using a Threshold Indicator Taxa Analysis (TITAN), and quantify the extent at which environmental filtering occurs, and identify important indicator species to environmental degradation. I will also investigate correlations between other biotic and abiotic qualities (macrophyte richness, macrophyte density, temperature, dissolved oxygen, conductivity, pH etc.) with fish community structure to acquire a more robust understanding of the breadth of these effects.

17. Measuring and projecting the sap yield of black walnut (*Juglans nigra*) trees

Erin Shaw¹, Dr. David McGill^{1*}, Dr. Jamie Schuler¹

¹Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

Sap from black walnut (*Juglans nigra*) trees can be used to produce a palatable syrup. In some instances, black walnut syrup has sold for ten times the average market price of maple syrup, distinguishing the product as an emerging economic opportunity for landowners. To accurately estimate the value of tapping black walnut trees, more research is needed regarding the sap yield of black walnut, which is currently an underexplored area of study. This study measured the sap yield of young, small black walnuts. The collected data was then analyzed alongside sap yield measurements previously taken from older, larger trees to determine the relationship between tree diameter, sap yield, and sap sugar content. Fifteen trees with an average diameter at breast height (dbh) of 2.89 inches were selected for tapping. For a seven-week period in February/March 2021, the sap yield of individual trees was measured biweekly, along with the sap's sugar content. Total sap yield per tree ranged from 56.60 to 3,414.80 milliliters and average sugar content ranged from 0.30 to 1.67%. Data collected in 2016 from black walnut trees with an average dbh of 16.87 inches showed total sap yield per tree ranged from 1,559.39 to 41,902.40 milliliters (or, 0.41 to 11.07 gallons) and average sugar content ranged from 0.91 to 2.44%. Using the 2016 and 2021 data, a regression analysis was performed in order to derive an estimate of how black walnut sap yield and sugar content change as trees mature, and subsequently increase in diameter.