

Jim and Katie Krause CNR Student Research Symposium Friday April 24, 2020



College of Natural Resources
University of Wisconsin - Stevens Point





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Jim and Katie Krause CNR Student Research Symposium

This booklet and event have been made possible by support from the
James and Kathleen Krause Student Research Endowment

Booklet Layout: Ian Vierck

Booklet Editing: Ian Vierck and Dan Connolly

Cover Photo: Kristen Cook

MISSION

The University of Wisconsin-Stevens Point College of Natural Resources provides education, research and outreach in integrated natural resources management, environmental education, and in paper science and engineering. The College of Natural Resources:

1. Provides undergraduate and graduate instruction that combines theoretical concepts with practical experience, such as laboratory and field oriented courses, internships and special projects;
2. Promotes scholarly activities that enhance the creation or application of knowledge or contributes to the resolution of environmental and natural resource management issues, especially through student research.
3. Shares faculty and student expertise with citizens, communities, agencies and industries through outreach, scholarship, and consulting.

PHILOSOPHY

The University of Wisconsin-Stevens Point College of Natural Resources embraces the philosophy of integrated natural resource management. All students in the college, regardless of major, need to understand and appreciate relations between natural resources and human needs. They need to understand the scientific method and its application to environmental problem solving. Critical thinking and problem solving strategies based on integrated resource management and education will be promoted through the college's teaching, scholarship, and outreach activities.

The college is composed of faculty, staff, and students, each with their own expertise, strengths, attitudes, and values. This diversity contributes to the education offered by the college because of our integrated philosophy. Responsibilities and appointments vary among college faculty and staff. Most have teaching appointments, some have extension appointments, while others serve mainly in research or administrative capacities. Faculty and administrators will capitalize on the strengths and diversity of College personnel to promote integrated resource management through teaching, scholarship, and outreach.

IMPORTANT NOTE:

Due to the March 30 suspension of on-site spring semester classes during the COVID-19 pandemic, the Jim and Katie Krause CNR Student Research Symposium has been converted to an on-line digital presentation format. Links to the presentations may be found at: <https://www.uwsp.edu/cnr/StudentSymposium>

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Acknowledgments

Special thanks to all those who helped make this year's event possible:

Dean Christine Thomas

Chancellor Bernie Patterson

Kevin Lawton - Computer Assistance

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Stacey Allan-Bannach and Univ. Comm. & Marketing Office - Publicity

CNR and Biology Faculty - Mentoring and Support

Volunteer Evaluators and Moderators

Tom Charlesworth - Photography

Symposium Support Volunteers

Dr. Andy Felt, and the Math 310 Operations Research Class - Developed Judge Sorting
Algorithm

Clive A. David Memorial Research Scholarship Award



Dr. Clive A. David was a driving force in establishing the CNR Student Research Symposium in 2000 (now called the Jim & Katie Krause CNR Student Research Symposium). Dr. David passed away in November 2004 after a lengthy illness. He taught in the CNR from 1989 – 2003 and was considered by his colleagues and students a true champion of student research and cutting edge technology. His leadership and vision were important in making the symposium a success. Throughout his years of teaching, Dr. David encouraged participation in undergraduate research. Some of his projects related to deforestation and soil erosion prevention, windbreaks, and solid waste. Dr. David's excellence in teaching was recognized several times during his career by both colleagues and students, including being named a UW- System Teaching Fellow in 2000.

This award is funded by the Clive and Beverley David Research Scholarship Endowment, made possible through generous gifts in Clive's Memory from the David family, alumni, and friends.

The 2020 recipient of the Clive A. David Memorial Research Scholarship is:

Laurel Deitch

Hometown: Highland Park, IL
Major: Soil and Waste Resources



- Completed project: The Effects of Biochar and Biosolids on Soil Quality and Tree Health of *Quercus macrocarpa*
- Participant: UWSP Soil and Water Conservation research project on Carbon Farming (see 2 presentations below):
 - 2019 Soil Science Society of America poster presentation: Analysis of Key Soil Nutrients and Physical Properties on a Managed Grazing Operation in Junction City, WI
 - 2019 Agronomy, Crop and Soil Science Societies of America poster presentation: Analysis of Key Soil Nutrients and Physical Properties on a Managed Grazing Operation in Junction City, WI
- 2019 Jim & Katie Krause CNR Student Research Symposium poster presentation - Highest Honors
- 2020 17th Annual Research in the Rotunda poster presentation (CNR representative)
- 2020 Wisconsin Agri-Business Association scholarship
- 2020 Soil Science Society of America National Student Recognition Program (UWSP recipient)

“I would rate Laurel’s research as 10 out of 10. Laurel is intelligent, inquisitive, engaged, hard-working, and an overall pleasure to be around. Laurel is a tremendous asset and future ambassador of UWSP. She is an excellent researcher and has a bright scientific career ahead of her.”

-Dr. Bryant Scharenbroch



April 24, 2020

Welcome to the 21st Annual Jim and Katie Krause CNR Student Research Symposium! You are about to participate in a rich tradition at the University of Wisconsin-Stevens Point, one that is both an educational experience and an academic celebration.

Student participants—I trust you will find the symposium to be one of your most memorable learning experiences. This year you will be making history by participating in the first *virtual* edition of this event as a means of adapting to the coronavirus pandemic we are all facing. I am so proud of your ingenuity and determination to pull this off!

There is little question your research will enhance the academic value of your overall education at UW-Stevens Point. You have gained a greater understanding of the world around you, a deeper learning of the subject matter taught in your classes and possibly the opening of new opportunities beyond college.

Virtual attendees and observers—I hope you will join me in applauding the drive and initiative of these students, especially their efforts to convert their presentations to an online format. Even during these difficult times, the students and their work represent exactly what our university means when we encourage our students to “*Discover Your Purpose.*”

Whether you are here to make a presentation or to witness them, you will be participating in the celebration of these academic achievements. This is a special opportunity for students to share the results of their hard work participating in investigations, projects and research activities. This year’s event features an outstanding turnout of participants representing projects from all the CNR majors, a fitting tribute to the level of faculty and student collaboration in and out of the classroom at UW-Stevens Point.

Welcome, and congratulations to all of you! I wish you success in presenting your work today and at future symposiums and conferences.

Sincerely,

A handwritten signature in cursive script that reads "Bernie L. Patterson".

Bernie L. Patterson
Chancellor



April 24, 2020

The UWSP College of Natural Resources is pleased to present the 21st annual Jim and Katie Krause CNR Student Research Symposium in *virtual format*, featuring and celebrating the scholarly achievement of many of UWSP's finest natural resource students.

Congratulations to our student participants for taking the time and initiative to extend their learning beyond the traditional classroom by depicting their research contributions in these excellent poster and oral presentations. Through their participation in this event, these students are building on the knowledge and skills they develop within the College's multi-discipline and integrated curriculum that emphasizes practical and in-the-field learning experiences. Participation in this event will undoubtedly help to prepare these students for rewarding careers, and ultimately may empower and inspire them to be effective leaders for solving natural resource challenges in the communities they will serve.

Special thanks and congratulations to our Symposium planning committee and their advisor, Dr. Rich Hauer, for resolving to convert this event to a virtual, on-line format in response to the COVID-19 pandemic. This event would have been cancelled without their creativity and resourcefulness. One of the few symposia of its kind that is planned and organized by students – this year's event features another large turnout of participants: over 100 students presenting 54 projects (45 poster presentations and 16 oral presentations). This continues a long tradition of success at this annual event. Since 2000, the number of CNR students who have presented research results in posters and oral presentations at this event totals nearly 1,400.

We salute participants for their excellence in critical thinking, inquiry, research and communication demonstrated in the abstracts contained in this booklet and in their virtual presentations prepared for this event. Let us also recognize the outstanding faculty members who have mentored and motivated students to do their best.

Finally, special thanks to Dr. Jim Krause (BS-Biology, '74) and his wife, Kathleen "Katie" (BS-Mathematics, '75), whose 2017 endowment gift makes this event possible. We are grateful for their belief in the value of higher education, undergraduate research, their alma mater, and the beautiful natural resources of their home state of Wisconsin.

Thank you for participating in this wonderful celebration of scholarly achievement and hands-on, experiential learning. Welcome to the College of Natural Resources!

A handwritten signature in black ink, appearing to read "Christine L. Thomas".

Christine L. Thomas
Dean and Professor of Natural Resource Management

From the Student Research Symposium Committee...

Welcome to the 21st annual University of Wisconsin-Stevens Point Jim and Katie Krause CNR Student Research Symposium. This year's program features students who have invested considerable time conducting research in areas such as fisheries and water resources, forestry, human dimensions of natural resource management, paper science and engineering, soil and waste management, and Wildlife Ecology and Management. The symposium allows students to present data they have collected, explored, and analyzed during the course of their research. Faculty mentors played an essential role in guiding students through the process in a spirited and educational fashion which expands beyond the traditional bricks and mortar of the classroom.

As we proceed with this year's poster and oral presentations, we honor the memory of Dr. Clive A. David, a true friend to students and faculty. David was extremely significant in building and strengthening the undergraduate research program. Although he passed in November 2004, Dr. David's influence remains to this day. The positive atmosphere he fostered created a venue for students to learn to conduct and present their research. The hundreds of students who have benefitted from the symposium over the past 20 years can credit Dr. David for his pioneering efforts.

This year marks one of the highest years of student participation, due largely to the students' initiative, faculty encouragement, and other sources of support including the work of the Student Research Symposium Committee. Our constant challenge is to meet the needs of the student presenters and promote and encourage participation in research and the symposium all year long.

We would like to thank our primary benefactors, Jim and Katie Krause, all of our volunteer evaluators, faculty and staff members in the CNR and Biology department, CNR student organizations, Dean Christine Thomas, Chancellor Bernie Patterson, and the UW-Stevens Point administration.

Congratulations to all our student presenters. Your work is truly outstanding! Our hope is that today can be as enjoyable as it is educational for you, and that you inspire more students to step up to the challenge of undergraduate research.

Cheers,

- Committee Chair: Conner Ties
- Vice Chair & Booklet Editor: Ian Vierck
- Secretary: Emily Colson
- Web Weaver: Jen Wiegert
- Judge Coordinator: Joe Quehl
- Committee Members: Dan Connolly, Alison Hidde, Amber Smith, Max LaBarbera, Aubree Hagen, Nora Hargett, and others
- Faculty Advisor: Dr. Richard Hauer (Faculty Chair); Staff Advisor: Steve Menzel

We hope you enjoy this year's symposium!



Connor Ties



Ian Vierck



Emily Colson



Jen Wiegert



Joe Quehl



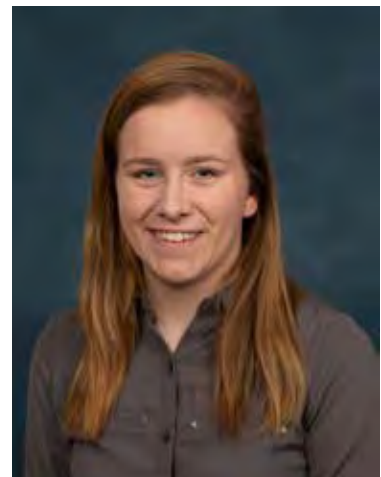
Dan Connolly



Alison Hidde



Max LaBarbera



Amber Smith

Oral Presentations

Presenters	Title
Conner Ties	Leucopus and Latitude: A Look at the White-footed Mouse's Relationship with Bergman's Rule
Ian Vierck	Longitudinal Analysis of Wisconsin Municipal Forestry Program Capacity and Effects of Assistance on Program Change
Joe Quehl, Rachel Martin, Brady Roberts, and Logan Cutler	Examining the Position of Ruffed Grouse (<i>Bonasa umbellus</i>) Drumming Logs in Relation to their Home Range and how it can affect Auditory Drumming Surveys
Kiersten Czarnecki	Unsuccessful Invasion of Zebra Mussels (<i>Dreissena polymorpha</i>) in a Riverine System
Natalie Coash	Location and Timing of Spawning Brook Trout in the Little Plover River, WI
Nathaniel Weisenbeck	Sex-Age Ratios of Savannah Elephants in Northern Botswana using Digital Photogrammetry
Nathan Jaksha	Assessment of Abiotic Factors and Synchrony in Walleye Recruitment in Wisconsin Flowages
Nora Hargett	Unique Characteristics of Greater Sandhill Crane (<i>Antigone canadensis tabida</i>) Nest Sites in Horicon Marsh, Wisconsin
Ryan Esch and Ian Vierck	Floral associations with <i>Monotropa uniflora</i>
Shannon Columb and Quentien Tyra	Exploring Diversity, Equity, and Inclusion Efforts of Wisconsin Environmental Education Centers: A Case Study
Thompson Hill	Fish Communities and Distribution Following Restoration of the Pahsimeroi Subbasin, Idaho.

Oral Presentations

Presenters	Title
Molly McGuire, Heidi Putnam, Jessycah S. Andersen	UW-Stevens Point Campuses Perspectives Towards Climate Change and Sustainability Literacy
Emily Wagner	Factors Contributing to the Distribution of Schools with Solar Capacity in Wisconsin
Adam Wysocki	Quantifying the Value of Log Merchandizing at Timber Harvest Sites Across Wisconsin
Bowen Li	Tree Canopy Analysis in Wisconsin
Madison Fell, Michaela Meehl, Amanda Lang, Cole Suckow, Carter Freymiller	Differential Timing of Migrating Northern Saw-Whet Owls Based on Age and Sex Groups

Poster Presentations

Presenters	Title
Abby Adams	Aquatic Macroinvertebrate Responses to Phosphorus Gradients on a Small Agricultural Stream in Northeast Wisconsin
Abigail G DeMeyer	Sorption of Monensin to Soil in Agricultural Runoff
Adam M Christensen	Utilization of school forests and surrounding forests' woody biomass as a heating source in Wisconsin public schools (K-12)
Aimee E Steinbrecher, Larkin R Hoepner, Kasey R Kiel, Jess W Stevens	Influence of Wetland Age on the Nitrogen Cycle
Arthur T Young, Melinda R Houtman, Madilyn M Tokarski, Madeline R Schopf, Rebecca Funk	A Comparison of Body Mass and Parasite Load in the Eastern cottontail rabbit (<i>Sylvilagus floridanus</i>)
Ashley M Skalitzky, Jacob Bergstrand, Quinn A Erd- mann, Samuel D Andres, Hayd Walkus	Orphaned Juvenile Black Bear (<i>Ursus americanus</i>) Release and Monitor
Bradley J Biegel, Nathaniel J Weisenbeck, Josh D Kivett, Ellen C Peterson, Sam Sodke	UWSP Undergraduate Fisher Research Project
Brady A Roberts, Rachel A Martin, Joe O Quehl, Logan M Cutler	Relationship between Ruffed Grouse (<i>Bonasa umbellus</i>) Seasonal Movement Patterns and Cover Type in Northern Wisconsin
Casey J Olson, Hannah N Keckeisen, Michael J Mills	Western States Land Commissioners Association Survey
Bowen Li	Tree Canopy Analysis in Wisconsin

Poster Presentations

Presenters	Title
Casey J Olson, Hannah N Keckeisen, Michael J Mills	County Government Approaches to Protecting, Restoring, and Managing Wetlands
Daniel K Martin	The Influence of a Fire Regime on Small Mammal Diversity in Oak Savannas
Daniel W Meyers, Tyler J Vinopal, Noah W Hazard, Maddie Hartlaub, Rebecca Funk	Habitat Associations and Effect of Environmental Variables on Trap Success of Gray Squirrels in Schmeckle Reserve
Elianne M Heilhecker, Casey A Kroening, Leah R Bell, Sean C Mason	Selection of nest boxes by cavity nesting waterfowl based on diameter at breast height in Mead Wildlife Area
Emily R Yulga, Robert A Doucette	Analysis of Key Soil Nutrients and Physical Properties on a Managed Grazing Operation in Junction City, WI
Ian T Corrado	Impact of thinning and burning on carabid beetle (Coleoptera: Carabidae) abundance in pine stands in Tomahawk, WI
Jaden J Kerkhoff	Occurrence of Odonates in the Upper Mississippi River Valley 2013-2018
Jaden J Kerkhoff	Efficacy of a Bioacoustics-Pyrotechnic Approach to Dispersing Canada Geese
John P Haas, Morgan P Volbrecht	Wetland seed bank comparison of cattail-dominated and noncattail areas at Lost Creek Wetland Mitigation Site
Jason J Lins	Brook Trout Culvert Passage Success Within the Little Plover River, Wisconsin
Adam D Wysocki	Quantifying the Value of Log Merchandizing at Timber Harvest Sites Across Wisconsin

Poster Presentations

Presenters	Title
Jonathon M Sicinski, Erinn E Kiesow, Hannah M Klopotek, Parker J Witt, Aubree Hagen	Community Fluctuations in Bat Species of Schmeeckle Reserve in Stevens Point, WI
Jonathon M Sicinski, Erinn E Kiesow, Hannah M Klopotek, Parker J Witt, Aubree Hagen	Using Acoustic Data to detect Fledging Little Brown Bat (<i>Myotis lucifungus</i>) Populations in Central Wisconsin
Josh Norman	Assessing the adaptive capacity to climate change of Wisconsin Great Lakes counties
Joshua J Fluor	Using Fish Communities to Assess Health of Minnesota Lakes Relative to Land Use and Geography
Kelsie B Hayes	Intensity of Liver Flukes (<i>Fascioloides magna</i>) in White-Tailed Deer During Wisconsin Hunting Season 2019
Kendra M Potter, Henry W Fielding, Kaleb L Bolder, Stephen E Van Horne, Benja Schutt	Sex bias in parasite prevalence infecting bobcats (<i>Lynx rufus</i>) harvested in Southern Wisconsin.
Kiersten H Czarnecki	Unsuccessful Invasion of Zebra Mussels (<i>Dreissena polymorpha</i>) in a Riverine System.
Krishna Parthasarathy, Kendra M Potter, Benjamin R Schutt, Stephen E Van Horne, Hen Fielding	Differentiating Bobcat (<i>Rufus Lynx</i>) from other <i>Lynx</i> species Using Hair Characteristics
Luke C Trittelwitz, Isabel R Dunn, Madilyn M Tokarski, Jessica L Bielak, Andrew Mehus	Freshwater mussel distribution and water quality relationships in Portage County

Poster Presentations

Presenters	Title
Mason T Wheeler, Kelsie B Hayes, Jeffrey W Edwards	Comparison of white-tailed deer (<i>Odocoileus virginianus</i>) Habitat use areas during the winters of 2019-2020
Maxwell S Hankard, Abby J Dremel, Dylan J Franzke	Comparison of two headwater streams of the Central Sands region of Wisconsin for neonictinoid concentrations and land use
Michaela M Meehl, Hal Edwards, Roiya Meyer	The Effects of Salt Exposure on Osmoregulation and Mass in Freshwater Snails
Miranda N Myli, Sean P Burns, Amanda C Lee-mann	Effects of the moon on detections of Eastern Whip-poor-wills at Necedah National Wildlife Refuge
Nathan J Jaksha	Diets of Larval Walleyes In Northern Wisconsin Lakes
Noah J Freuler, Zachary R Young	Adaptive Growth Project
Nora M Hargett, Amanda Lang, Mackenzie L Whitney, Megan A Seidl	A decade of winter home range size, weight, and fidelity of an individual hairy woodpecker
Quinn S Brownell	Trail Counter Research in Schmeckle Reserve and the Green Circle Trail
Reece A Mullen, Demirae E Berceau	Survey of Parasites in Waterfowl From Green Bay, WI
Ryan Esch, Ian Vierck	Floral associations with <i>Monotropa uniflora</i>
Sam LaMarche	Brook Trout Growth Potential, Size Distribution, and Diet Analysis in the Little Plover River, Wisconsin
Shannon T Columb, Lexi Smiles	What does drawing the environment tell us about environmental attitudes and awareness?
Thompson H Hill	Using Genetics to Evaluate Survival and Growth of Leech Lake strain Muskellunge Stocked in Wisconsin Lakes

Exploring Diversity, Equity, and Inclusion Efforts of Wisconsin Environmental Education Centers: A Case Study



Shannon T. Columb
Environmental Education and Interpretation

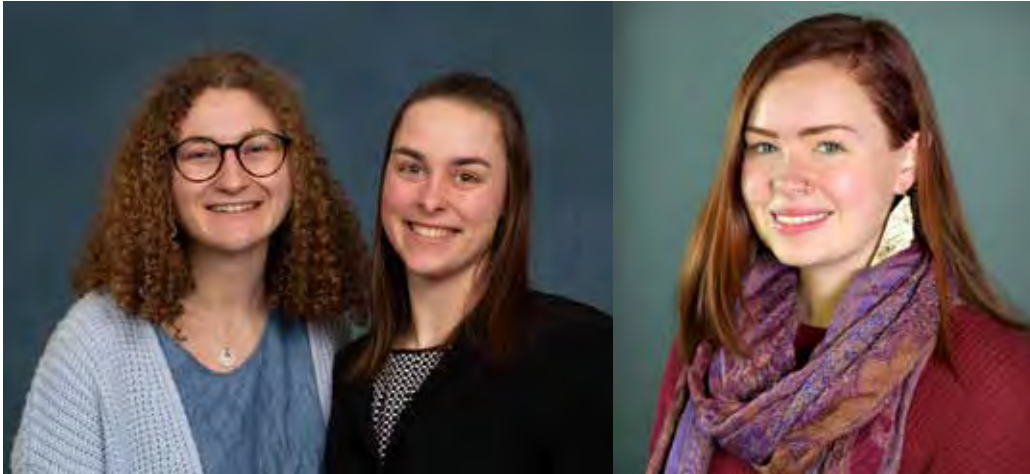


Quintien Tyra
Natural Resource Planning

Over the past four years, the Wisconsin Association for Environmental Education (WAE) has engaged in a focused effort to increase diversity, equity, and inclusion in its organization, its member organizations, and environmental education in Wisconsin. The primary goal of this research study was to take a deeper look at what Wisconsin environmental education organizations are doing and tell those stories on the WAE website and elsewhere. Five illustrative case studies were selected through a short survey sent to a list of 137 individuals who had participated in WAE professional development related to equity and inclusion or who represented organizational members of WAE. The main data source was interviews with senior staff at each study site. Interview questions focused on current efforts, the impetus behind equity and inclusion initiatives, ongoing challenges, and valued partners in this work. The interviews were digitally recorded and analyzed for emergent themes. The researchers then worked together to write case study summaries for each site to be shared on the WAE website. Similarities between sites included the importance of staff commitment in moving the organization forward, financial challenges as non-profit organizations with multiple priorities, and the importance of partner organizations that already provide services to diverse communities. The case studies are already being shared by the organizations profiled and by WAE to inspire equity and inclusion work across the state.

Advisor: Kendra Liddicoat
Oral

UW-Stevens Point Campuses Perspectives Towards Climate Change and Sustainability Literacy



Molly K. McGuire
Natural Resources Planning

Heidi A. Putnam
Natural Resources Planning

Jessycah S. Andersen
Natural Resources Planning

Climate change is a global problem that will continue to have profound impacts on Wisconsin's natural environment and human communities. Agricultural production, forest stewardship, and water resources are already being stressed by increasingly variable, unpredictable, and extreme weather events. At the same time, many of Wisconsin's vulnerable and diverse populations are increasingly burdened by environmental risks, affordability challenges, and other quality-of-life impacts. Currently, many UW System campuses, including UWSP, serve as incubators for sustainable ideas and practices that help to combat the negative effects of climate change. However, little is known about campus constituents' actual knowledge, awareness, and preferences on these issues. Where does UWSP stand on climate change today, and how does this influence the structure and success of our sustainability efforts? To answer these questions, in February of 2020, we surveyed UWSP students, faculty, and staff on the Stevens Point, Wausau, and Marshfield campuses. The results provide essential baseline data that helps to better understand our University and to guide future sustainability programming, reporting (e.g. AASHE STARS), outreach, and education.

Advisors: Robin Rothfeder and Dave Barbier
Oral and Poster
Consider for Judging

Factors Contributing to the Distribution of Schools with Solar Capacity in Wisconsin



Emily R. Wagner

Access to affordable and diverse renewable sources of energy is an integral part of creating resilient communities. Schools across Wisconsin have been finding more ways to incorporate renewable energy as a source of decreasing overhead costs. Solar panels have been adopted by schools to cut energy bills, become more sustainable, and serve as a teaching tool in school curriculums. The objective of my research is to discover what factors influence the distribution of solar-capable schools across the state. I will investigate factors such as proximity to urban or rural settings as a means to expand upon issues relating to accessibility. I will evaluate how variables such as access to contractors and installers, grants, and other financial incentives vary depending on whether schools are set in more rural or urban contexts. This research will be conducted by analyzing information gathered about Wisconsin schools by Generation 180 that detail which schools incorporate solar in their energy systems as well as other information about costs, financing, and installation. I will assess geospatial information about the location of the schools with solar and perform a statistical correlation analysis. Based on this, I anticipate to find that more urban schools contain solar capabilities due to increased access to solar panel manufacturers and installers, federal grant opportunities, and receive more financial incentives for incorporating renewable technology in their energy systems. The broader implications of this research could help rural schools identify the barriers they face in gaining access to renewable energy tech while formulating strategies to overcome this barrier.

**Oral and Poster
Consider for Judging**

Assessing the Adaptive Capacity to Climate Change of Wisconsin Great Lakes Counties

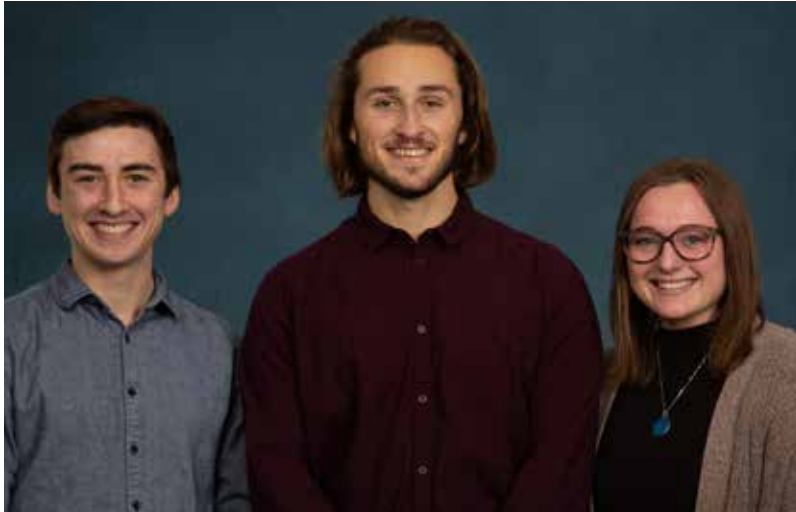


Josh Norman
Natural Resource Planning

Climate change is a phenomena that is acutely distressing communities around the world. An emerging field of planning called climate change adaptation (CCA) has brought about methods for professional planners to mitigate the risks to the changing climate by proactively planning for them. This involves understanding the communities' vulnerabilities, and resolving how to ensure that the viability and health of said communities will be protected in the long term. Effective CCA also includes the inclusion of diverse and under-represented communities so that the benefits of adaptation are spread equitably throughout a community. That being said, this study assessed the adaptive capacity of the 15 Wisconsin counties that border the Great Lakes, plus three regional planning commissions in those jurisdictions. Results show that the counties have some capacity for adapting to climate change, but there are significant barriers in the way of creating a cohesive CCA plan. Barriers included funding, lack of staff, and lack of local government prioritization. Solutions to these issues are then elaborated on and conclusions are drawn as to the future of CCA on the coasts of the Great Lakes in Wisconsin.

Advisor: Anna Haines
Poster

Western States Land Commissioners Association Survey



Casey J. Olson
Natural Resources Planning

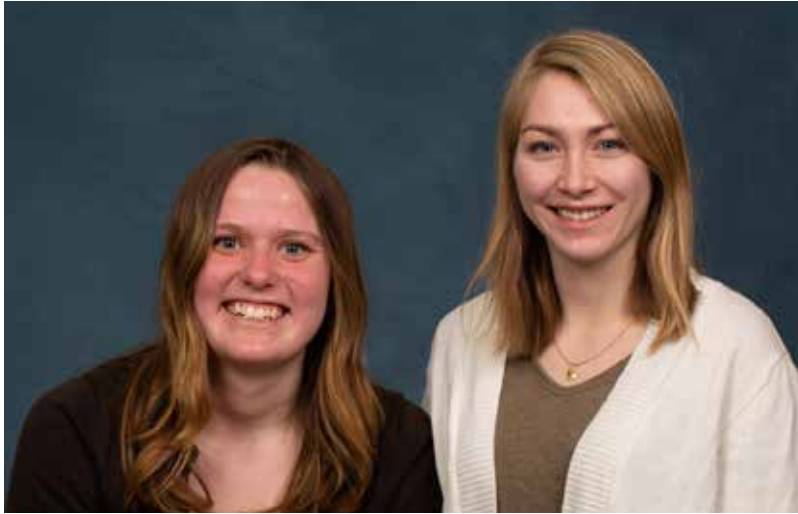
Hannah N. Keckeisen
Natural Resources Planning

Michael J. Mills
Natural Resources Planning

In the US, there are 21 states (including Wisconsin) that manage state-owned trust lands, which were granted by Congress at the time of statehood to support public education. In total, these state trust land agencies manage over 500 million acres of surface and mineral resources, making them one of the most significant (but least understood) land management entities in the country. The 21-member states are consolidated under one national organization to promote coordinated decision-making, policymaking, and management action: The Western States Land Commissioners Association (WSLCA). Their primary focus is on resource and real estate development, and there is great clarity and specificity about how each state pursues these activities. Much less clear, however, is if, and how, each state attempts to monetize public access on trust lands. Which states are doing so successfully, and through what mechanisms? What lessons might they offer to other trust lands agencies? The objective of this research is to answer these questions, generating insights for the natural resources field generally and for WSLCA member agencies specifically. These questions are important for several reasons, including: the need for states to fulfill their fiduciary responsibility in trust lands management; the potential to increase revenues that support public education; and the potential to better incentivize conservation- and recreation-oriented management by trust lands agencies. To these ends, this project will conduct a survey of the 21 WSLCA member agencies.

Advisor: Robin Rothfeder
Poster
Consider for Judging

What Does Drawing the Environment Tell Us about Environmental Attitudes and Awareness?



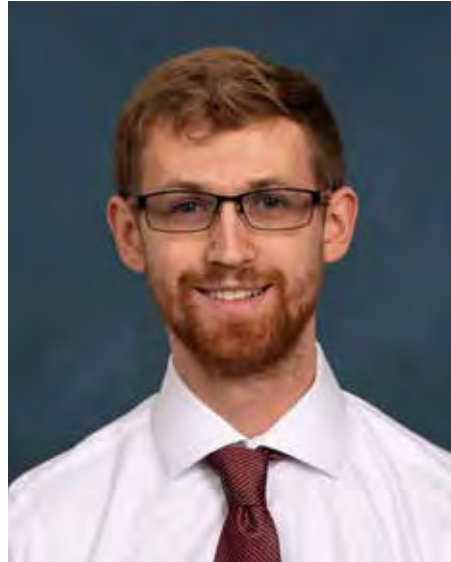
Shannon T. Columb
Environmental Education

Lexi Smiles
Environmental Education

There are a lot of environmental issues and we need promote environmental literacy, the understanding of and motivation to improve the environment. Previously, an individual's environmental literacy was measured through the use of a 90-question survey. Over the summer of 2019, we conducted research that measured environmental literacy and assessed the tool. Research was conducted at the Central Wisconsin Environmental Station (CWES) and included summer campers between the ages of 7-12. Participants drew a picture of the environment and wrote a definition of the environment. Pictures were scored using a rubric that graded the pictures and definitions on the presence and interactions of four factors found in the environment – abiotic, biotic, human, and human built. Fewer than 25% of participants included human or human built items in their drawings. As a result, environmental educators should include humans and human built structures as part of the environment during programs. Additionally, it was concluded that drawings of the environment were a better representation of an individual's idea of the environment than their written definition and that more research is needed to confirm the effectiveness of this potential environmental literacy assessment tool.

Advisor: Becca Franzen
Poster
Consider for Judging

Utilization of School Forests and Surrounding Forests' Woody Biomass as a Heating Source in Wisconsin Public Schools (K-12)



Adam M. Christensen
Natural Resources Planning

More than half of 446 Wisconsin school districts have designated school forests that can be utilized for education, timber harvesting and possibly wood energy. Natural gas, a low-priced fossil fuel, is currently used as a primary heating source in many schools in Wisconsin even though nearly half of Wisconsin is covered in forests. However, natural gas prices have the potential to fluctuate rapidly in the long-term. This study investigates the potential of four Wisconsin public schools to use woody biomass as their main heating source and examines if their school forest and the surrounding forestlands offer a long-term sustainable fuel source. We selected one school from each of four distinct regions in Wisconsin that include oak/hickory forests of the drift less area, the sparsely forested area of southeast Wisconsin, the central transition forest and the northern forests of Wisconsin. We will utilize forest/school forest maps to calculate woody biomass surrounding each school in variable radiuses. Primary data* collected through recent school district surveys in Wisconsin will be used to estimate and analyze the heating demand and potential woody biomass supply of the schools in each region. Secondary data and case studies will be used to justify the primary data and findings. Expected results would showcase if there is a significant difference between regions in the potential for woody biomass to be used as a competitive heating fuel. This study will provide the basis for further studies in the field of wood energy

Advisor: Shiba Kar
Poster

Quantifying the Value of Log Merchandizing at Timber Harvest Sites Across Wisconsin



Adam D. Wysocki
Forest Management

Forest products industries contribute significantly to the Wisconsin economy. However, the industry now faces significant challenges competing in the global marketplace due to various factors. It is generally understood that directing higher quality wood to its best use generates maximum value for all stakeholders. However, log sorting may be more critical in certain areas of the state than others depending on the geographical dispersion of forest stands and manufacturing mills. The objective of this study is to develop a method to evaluate the economic impact of sorting logs in harvesting operations based on market parameters and the spatial distribution of forest stands. An optimization model was developed to determine the best mill for each forest stand based on the products generated, stand's distance to a mill, and mills' acceptance criteria. Geospatial data for each forest stand was obtained from the Wisconsin DNR website. Pricing information was obtained using Timber Mart North Price Report. Mill information, including location, species accepted, and log types accepted was obtained from the Wisconsin DNR website. The distances between each forest stand to each mill were determined using the Origin Destination Cost Matrix tool within the ArcGIS Network Analysis extension. Several scenarios were tested, with each scenario yielding different volumes of various log grades. Each scenario was input into the optimization model to determine if the optimal solution changed based on the proportion of different log grades. Preliminary results and its implications to foresters, landowners, and mills in Wisconsin will be discussed.

Advisor: Shuva Gautam
Oral and Poster
Consider for Judging

Adaptive Growth Project



Noah J. Freuler
Forestry

Zachary R. Young
Forestry

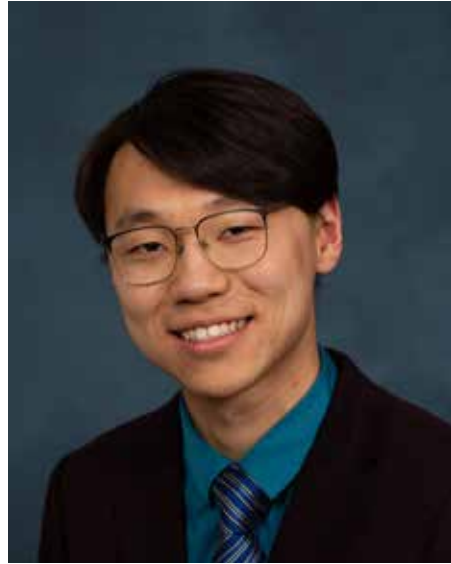
All species of trees experience dynamic loading forces and as a result reaction wood forms as eccentric growth patterns within the growth centers of wood. It is typical to see tension wood (adaptive growth). The growth closest to attachment to the trunk of the tree does not exhibit that of normal reaction wood. In ash trees (*Fraxinus* spp.) the adaptive growth results in eccentric growth like that of compression wood found in conifers, whereas in hardwoods like ash trees the type of reaction wood that should be typically found is tension wood. The further out on the branches the pattern of growth changes from eccentric to concentric growth which is more indicative of normal growth. We would suspect to exhibit undefined morphological changes at the cellular level the adaptive growth. Results are currently undefined since we are in the preliminary stages of analyzing our research.

Advisor: Les Werner

Poster

No

Tree Canopy Analysis in Wisconsin



Bowen Li
Urban Forestry

Trees are ecologically beneficial in our living environment. They provide habitat for insects and small mammals, reduce heat island effect in urban area through shading and evapotranspiration, and several other ecological services. From a landscape perspective, trees also make our cities beautiful. Therefore, it's very helpful to know the proportion/the amount of area of tree canopy in a community. This study investigated tree canopy in Wisconsin communities. We completed a tree canopy assessment to determine tree canopy changed over time between 2018 versus in 2013. We also asked if a difference exists in classifying land cover types between humans and a computer-based artificial intelligence approach. We used 1000 random points for each designated community. Each sample location was classified into seven land cover types: Herbaceous, Impervious, Bare Soil, Forest Land, Water, Wetland, and Agriculture Field. Based on preliminary findings, we found that computer-based artificial intelligence estimates of tree canopy were lower than human based estimates. Thus, we expect to find that human generated estimates will result in greater tree canopy cover. Findings from this study will be used to improve the estimation of tree canopy in Wisconsin and determine factors that explain tree canopy change over time.

Advisor: Richard Hauer
Oral and Poster
Consider for Judging

Trail Counter Research in Schmeckle Reserve and the Green Circle Trail



Quinn S. Brownell
Forest Recreation

The Green Circle Trail and Schmeckle Reserve are a key part of Stevens Point's natural and recreational areas, offering diverse opportunities for all ages and community members. It is necessary to analyze how often, when, and where the trail systems are utilized to improve our trail system knowledge and routing. Trail counter data have been collected from various areas of both Schmeckle Reserve and the Green Circle Trail for the last three to eight years depending on the specific trail counter. There are twelve counters in total: five in Schmeckle Reserve and ten on the Green Circle Trail, with three counters overlapping in both areas. Data are downloaded from the trail counters onto a portable docking system about once a month and analyzed for visitation trends. These trends include: the most frequently visited areas, most popular times and days of visitation, and differences in visitation rates depending on the season and temperature. In the year 2019, a total of 319,688 people visited the Green Circle Trail, including 69,397 users in the most popular section that crosses through Piffner Park and Bukolt Park. That same year, Schmeckle Reserve tallied a total of 253,748 visitors moving across the trail counters. These data are utilized to help Schmeckle Reserve improve visitor numbers, provide insight for potential trail rerouting, and help with securing sources of funding.

Advisor: Laura Anderson-McIntyre and Jim Buchholz

Poster

Impact of Thinning and Burning on Carabid Beetle (Coleoptera: *Carabidae*) Abundance in Pine Stands in Tomahawk, WI



Ian T. Corrado
Urban Forestry

Carabid beetles (Coleoptera: *Carabidae*) are used as indicators of forest management practices in North America because the ecological requirements of species are known, they are found across many terrestrial ecosystems, identification and sampling are simple, and they respond to changes in the environment. Carabid beetle response can be used to provide guidance for sustainable forest management. The red pine/mixed pine stand at the Treehaven Field Site in Tomahawk, WI was broken up into 24 1-1.5 acre blocks and thinning/fire treatments were applied randomly to the blocks. Stands were thinned to basal areas of 50 ft²/acre, 70 ft²/acre, 90 ft²/acre, or not thinned (6 of each). Burn treatments were applied post-thinning at 1-, 2-, 3-, 4-year spring burn intervals, 4-year fall burn interval, and no burn (4 of each). Every thinning level was paired with each burn interval totaling 24 blocks. Carabid abundance was measured with six un-baited pitfall traps in each block, which were open for seven days at a time for six weeks throughout the summer. Generally, disturbance treatments were found to increase overall carabid beetle abundance compared to the controls, with the intermediate treatments having the largest effects. Although species identification is needed for further insights on the effects of the burning and thinning, the data shows that carabid beetle abundance is significantly impacted by thinning and burning. Consistent with results from other studies, this study shows how thinning and burning intensity can have a sizeable impact on ground-dwelling invertebrates, which can significantly alter community interactions.

Advisor: Holly Petrillo
Poster

The Lucky Triple Samara



Ian E. Vierck
Urban Forestry

The Sugar Maple, *Acer saccharum*, is a deciduous, monoecious, tree with broad, palmately lobed leaves and fruit which commonly comes in pairs with long, blade-like samaras. Although these samaras most commonly come in pairs, they have been observed to come in groups of 3, 4, and 5. After finding several triple-samaras, I became interested in the probability of finding these unusual groupings. I collected 484 samaras and discovered that there is a 1 in 50 chance of finding a triple-samara on a sugar maple. To put this in perspective, you are 200x more likely to find a triple-samara than a four-leaf clover. Why is this unusual arrangement a statistically common occurrence? This is a mutation that occurs in the development of the flowers of the sugar maple. Interestingly, as of 2003, the maple family (Aceraceae) has been absorbed into Sapindaceae, or the soapberry family. This change is important to note because most species in the Sapindaceae family have 3-carpellate ovaries, unlike the common 2-carpellate ovaries of the *Acer* genus. Although it is not commonly reported, the mutation in the number of carpels seems to occur frequently. Another question that presented itself during this project is: what would the germination rates be of seeds from the triple-samaras?

Poster

Longitudinal Analysis of Wisconsin Municipal Forestry Program Capacity and Effects of Assistance on Program Change



Ian E. Vierck
Urban Forestry

The Wisconsin DNR urban and community forestry (U&CF) program offers assistance to communities in order to increase their capacity to manage their urban and community forests. Assistance is offered through funding to build capacity such as emerald ash borer management, public outreach, staff training, tree plantings, and other formats supported by the U&CF program. The Wisconsin DNR periodically assesses municipal program capacity through self-reported information. We used data from 2008 and 2018 to rank municipal program capacity using the Community Accomplishment Reporting System (CARS) method. CARS is a ranking system used by the United States Forest Service U&CF Program to rank community capacity. CARS considers whether or not the community has a management plan, the credentials of its staff, if it has tree ordinances/policies, and if it has any advocacy/advisory organizations. Each attribute was given one point with ranking score of 0-4 possible. We asked whether or not self-reported scores were different to CARS scores developed by states and reported to the USFS. We also asked if financial assistance had an effect on the CARS score. Finally, we asked if the CARS scores has changed over time.

Advisor: Richard Hauer
Oral
Consider For Judging

Floral Assosciations with *Monotropa uniflora*



Ryan L. Esch
Wildlife Ecology and Management

Ian E. Vierck
Urban Forestry

Ghost plants (*Monotropa uniflora*) are herbaceous perennials native to the temperate forests of North America. With unusual, pale white stems and flowers, these angiosperms have abandoned chlorophyll, instead parasitizing nutrients and carbon from the symbiotic relationship between ectomycorrhizal fungi and photosynthesizing plants. Ghost plants are relatively specific in forming mycorrhizae, usually partnering with members of the fungus family Russulaceae. As these fungi have integrated their hyphal networks with the roots of photosynthesizing plants, the possibility of a local, indirect relationship between ghost plants and other plants is open. Previous studies have attempted to identify such a relationship with questionable results, and none have looked for relationships with nearby understory species. We measured ten plots across the UWSP Treehaven property to explore potential associations between ghost plants and other plants.

**Oral and Poster
Consider for Judging**

Wetland Seed Bank Comparison of Cattail-Dominated and Noncattail Areas at Lost Creek Wetland Mitigation Site



John P. Haas
Ecosystem Restoration and Management

Morgan P. Volbrecht
Ecosystem Restoration and Management

The purpose of this study was to compare wetland seed bank composition and density between cattail dominated and non-cattail dominated areas at Lost Creek Wetland Mitigation Site, Portage County, Wisconsin. The site includes vegetative communities shallow marsh, deep marsh, and wet meadow; upland and open water areas of the site were excluded. Soil samples were collected in October and November, 2019. Transects were selected in cattail dominated areas and non-cattail dominated areas, and 112 samples (56 from each) were acquired using a 1.9 cm soil probe. The soil samples were placed in a greenhouse and germinated under two moisture regimes with half of the samples grown in saturated soil and half with consistently moist soil. The total number of germinated plants were documented, and each species was identified when possible. Seed bank density totals throughout the study site were: from cattail dominated areas, 396 germinated plants occurred in saturated soil conditions, and 317 occurred in moist soil conditions. In non-cattail areas, 296 germinated plants occurred in saturated soil conditions, and 228 occurred in moist soil conditions. The presence of cattails at Lost Creek indicate higher seedbank densities and saturated soil conditions promote more germination. Cattails are often controlled and this study may signal greater need for obtaining seedbank characteristics to assess the seed bank contribution to recovery.

Advisor: James Cook
Poster
Consider for Judging

The Influence of a Fire Regime on Small Mammal Diversity in Oak Savannas



Daniel K. Martin
Ecosystem Resoration and Management

Prescribed fire can be utilized as a management tool to maintain habitat for wildlife in different ecosystems. These same ecosystems may also be maintained through other means, such as mowing. This technique simulates grazing from large roaming animals on the landscape. One ecosystem in central Wisconsin that was shaped by wildfires and grazing activities is an oak savanna. This is a grassland that is sparsely dominated by an oak overstory. Historically, oak savannas provided prime habitat for important game species as well as smaller mammals. The main focus of this study was to trap small mammals in two different locations that were both oak savannas. However, they were previously maintained by two different techniques. One of the units was exposed to a seven-year burn rotation to simulate historic wildfires and the other unit was mowed to simulate grazing. Small mammals were present in both units which were dominated by the eastern chipmunk (*Tamias striatus*) and the white-footed mouse (*Peromyscus leucopus*). In the unit with prescribed burning, we saw more small mammals and a more diverse range of the small mammals that were present. Small mammal abundance and diversity was affected by the use of fire for maintaining oak savanna ecosystems.

Poster

A Decade of Winter Home Range Size, Weight, and Fidelity of an Individual Hairy Woodpecker



Nora M. Hargett
Wildlife Ecology and Management

Amanda Lang
Wildlife Ecology and Management

Mackenzie L. Whitney
Wildlife Ecology and Management

Megan A. Seidl
Wildlife Ecology and Management

Many wintering bird species occupy the Sandhill Wildlife Area (SHWA) in Babcock, Wisconsin. Hairy woodpeckers (*Picoides villosus*) are primary excavators that reside in upland woody ecosystems and can be found overwintering in the SHWA near Babcock, WI. The UWSP student chapter of The Wildlife Society has sponsored a student research project from 2007-2020 at SHWA. During this period hairy woodpeckers, among other species, have been captured to investigate home range size and fidelity during the winter months. One female hairy woodpecker has been captured continuously for 11 years. This bird (USGS aluminum band 902-63648) creates an opportunity to observe the fluctuations in individual home range size, weight, and fidelity over an extended period of time. This individual was trapped in a 31.5 hectare grid of wire tree traps and caught between January and March annually. Home ranges were determined using the Minimum Convex Polygon estimator.

Advisor: Jason Riddle
Poster
Consider for Judging

Leucopus and Latitude: A Look at the White-footed Mouse's Relationship with Bergman's Rule



Conner A. Ties
Wildlife Ecology and Management

The white-footed mouse (*Peromyscus leucopus*) is your run-of-the-mill rodent. It can be found under kitchen sinks or under logs from Quebec to the Yucatan of Mexico and everywhere in between. Including the Southwestern, Midwestern, and Eastern states. With such a large range covering multiple latitudes it could be assumed that Bergman's rule would play a factor in their body size. Bergman's rule would mean white-footed mice being larger as you near the poles and smaller as you near the equator. Currently, only body length has been looked at for the white-footed mouse, showing a positive effect with latitude. Will body mass show the same positive effect? Or is body mass determined by other factors in the white-footed mouse's environment, such as water availability? Doing so by analyzing National Ecological Observatory Network small mammal trapping data of 22 sites across the United States with varying latitudes over a three-year period.

Advisor: Christopher J. Yahnke

Oral

Consider for Judging

Survey of Parasites in Waterfowl From Green Bay, WI



Demirae E. Berceau
Biology

Reece A. Mullen
Biology

Populations of multiple waterfowl species are declining across the nation. Scaup (*Aythya marila* and *Aythya affinis*) are two species with population declines observed over the last three decades. Research is needed to better understand the declines but also provide baseline scientific information for future monitoring. The habitat and foraging behaviors of waterfowl make them highly susceptible to many parasites; however, there is a lack of waterfowl parasite surveys in Wisconsin except for directly surrounding the Mississippi river. The primary goal of our research was to investigate parasites of waterfowl and analyze trends among host species, host sex and parasites intensity. Additionally, we used morphology to identify the parasites to the lowest taxonomic level possible to accurately assess diversity and detect any undescribed species. We dissected five lesser scaup, one greater scaup, two common goldeneye, and one long-tailed duck. Ducks were donated by from hunters in the Wisconsin Waterfowl Association and all but two goldeneye were from Green Bay. These waterfowl averaged 67 parasites with the maximum from a male lesser scaup hosting 130 parasites. We identified parasites spanning several taxonomic groups including the phyla Acanthocephala and Nematoda, the class Cestoda and subclass Digenea. The differences in infection could be attributed to the various preferences in habitat and diet among the species. This study is important because a better understanding of host-parasite interaction can help manage duck populations and potential diseases by indicating the location and food sources within their habitats.

Advisor: Sarah Orlofske

Poster

Intensity of Liver Flukes (*Fascioloides magna*) in White-Tailed Deer During Wisconsin Hunting Season 2019



Kelsie B. Hayes
Wildlife Ecology and Management

The white-tailed deer (*Odocoileus virginianus*) is the most commonly hunted game animal in Wisconsin. Liver flukes often are found in deer but rarely cause clinical signs of disease. However, deer with intense infections (large numbers of flukes per host) may have fewer fawns or antler points than uninfected deer. The life cycle of liver flukes begins when eggs are passed in deer feces and land in wetland habitat. They are then ingested by snail intermediate hosts that pass the flukes into the environment where they molt into free-swimming intermediate stages and encyst on vegetation. Deer acquire the flukes while foraging on wetland vegetation, completing the life cycle. We hypothesized that deer harvested in natural forested and wetland habitats would have higher intensities of liver flukes than those harvested in farmland areas. We acquired deer livers from hunters during the fall 2019 hunting season. We counted the number of flukes in each liver and found that deer had from 0-33 flukes. A total of 61 livers were collected and 14 livers had liver flukes. Forty-seven were collected from the farmland zone and fourteen from the natural management zones. We conducted a two-sample t-test assuming unequal variances and found that intensity of liver flukes was not greater in deer harvested in natural areas ($P= 0.3547$). Results may have been statistically insignificant because only 14 deer were harvested in natural environments or because deer harvest sites are not always indicative of deer home ranges overall.

Advisors: Shelli Dubay and Ross McLean

Poster

Consider for Judging

Community Fluctuations in Bat Species of Schmeckle Reserve in Stevens Point, WI



Jonathon M. Sicinski, Wildlife Ecology and Management; Erinn E. Kiesow, Wildlife Ecology and Management; Hannah M. Klopotek, Wildlife Ecology and Management; Aubree M. Hagen, Wildlife Ecology and Management; Parker J. Witt, Soil and Land Management

Bats are a fundamental component in Wisconsin's ecosystem. All of Wisconsin's bats are insectivores, helping to keep insect populations in check. This project uses ultrasonic acoustic recording devices to remotely monitor the bat activity in Schmeckle Reserve. Remote acoustic sensors allow for observation of bat populations with no interference to their movements. Each bat species has a specific call frequency. Over the past decade, Wisconsin's bat population has been declining at an alarming rate. A likely cause of this is white-nose-syndrome. White-nose-syndrome (WNS). The pathogen is the fungus *Pseudogymnoascus destructans*. It was discovered in North America in 2006 and grows on the noses and wing membranes of cave-dwelling bats. The fungus interferes with bat hibernation cycles and causes them to become active mid-hibernation. Because of this, bats deplete their stored energy, are exposed to the elements, and cannot survive the remaining winter months. Our study will look at 1.) Identifying False positives in the calls of various bat species recorded in Schmeckle Reserve, Stevens Point WI. 2.) Using that given data to evaluate fluctuations in bat community to determine the level of influence of White Nose Syndrome. Compressed data were first processed using CFCRead and then Kaleidoscope Pro for initial species analysis. Analook was used to separate the noise files from the initial bat identified files. Both Kaleidoscope Pro and Analook were used to verify bat calls through visual sonogram interpretation. Initial results show little brown bat activity in 2019 was similar to pre-white-nose syndrome levels.

Advisor: Christopher Yahnke

Poster

Consider for Judging

Using Acoustic Data to detect Fledging Little Brown Bat (*Myotis lucifungus*) Populations in Central Wisconsin



Jonathon M. Sicinski, Wildlife Ecology and Management; Erinn E. Kiesow, Wildlife Ecology and Management; Hannah M. Klopotek, Wildlife Ecology and Management; Aubree M. Hagen, Wildlife Ecology and Management; Parker J. Witt, Soil and Land Management

Little Brown bats (*Myotis lucifungus*) mate during hibernation over the winter while in their hibernaculum. The sperm is stored within the female until the spring thaw when they awaken and begin hunting. Pregnant females create maternity or nursery colonies to maintain optimal thermoregulation which increases pup survival. Maternity colonies range in size from 20 to several hundred mothers and pups. In these colonies, the pups are born late June to early July. Once they are born, they attach themselves to their mother's teat. The mother carries the pup for three weeks at which point the pups begin to fledge or fly independently. This means that the fledglings are usually airborne by August. We are able to determine the species of bat based on their call frequency that we collect using stationary ultrasonic microphones like the Anabat acoustic device located in Schmeckle Reserve in Stevens Point, Wisconsin and the SM4Bat microphone located at Wildwood Park in Marshfield, Wisconsin. Bat calls are processed using Kaleidoscope Pro auto-identification software. During the analysis of these call frequencies, we specifically evaluate little brown bat calls and distinguish adults from fledglings based on frequency (average call frequency of 50 Kilohertz (kHz)) and pattern. Our study will evaluate the potential of fledgling detection using acoustic data. Based on the relationship of body size to pitch, we predict higher average frequencies in little brown bats during fledging.

Advisor: Christopher Yahnke

Poster

Consider for Judging

Effects of Moon Phase and Position on Eastern Whip-poor-will Detection at Necedah Wildlife Refuge.



Miranda N. Myli
Wildlife Ecology and Management

Sean P. Burns
Wildlife Ecology and Management

Amanda C. Leeman
Environmental Education

The Eastern Whip-poor-will (*Caprimulgus vociferus*) is a migratory nightjar native to eastern North America that has been decreasing in numbers in recent years. While once a commonly heard species across the eastern United States, they are not a well-researched or well-documented species. Theories on their steady disappearance from the landscape range from insecticides to loss of habitat to alteration of their overwintering grounds. Whip-poor-wills are nocturnal insectivores whose breeding ecology is strongly linked to moon phase. Their habitat range is widely varied, and Necedah National Wildlife Refuge was chosen due to its consistent records of the species on the premises. In the summer of 2019, data was collected at Necedah, and we are investigating the time of recorded entries with respect to the moon's phase and location in the sky. We propose that detections of these birds are indeed linked to the phase and location of the moon. To conduct our survey, we used a modified version of the Wisconsin Nightjar Survey protocol. We are using our time of detection data to compare detection with the moon records for that day. The resulting information may be important for future surveys and researchers to get the most accurate detection data for this declining species.

Advisor: Jason Riddle
Poster
Consider for Judging

Selection of Nest Boxes by Cavity Nesting Waterfowl Based on Diameter at Breast Height in Mead Wildlife Area



Elianne M. Heilhecker
Wildlife Ecology and Management

Casey A. Kroening
Wildlife Ecology and Management

Leah R. Bell
Wildlife Ecology and Management

Sean C. Mason
Wildlife Ecology and Management

Cavity nesting birds rely on nest boxes in areas where natural cavities are not available. In Wisconsin, specifically the Mead Wildlife Area in Marathon County, *Lophodytes cucullatus* (Hooded merganser) and *Aix sponsa* (Wood ducks) use nesting cavities or boxes for their eggs; however, the use rate and number of young produced may be declining. To help evaluate a potential factor, we are examining the selection and success of wood duck and hooded merganser nests based on the diameter at breast height (DBH) of the tree the box is affixed to. Data has been collected since the early 2000s at the Mead Wildlife Area by the UWSP Wildlife Society, but DBH was first collected this past field season. We check nearly 130 boxes in January and February by opening the boxes, removing, and examining the contents, and recording any type of use. Previous research conducted in central Minnesota concluded that wood ducks specifically did not use trees with a DBH less than 20 cm (Gilmer et al. 1978), and work done by Bellrose, Johnson and Meyers quantified natural cavity dimensions, but little is known about the relationship of selection and success of a box based on the DBH. With this research we hope to be able to add another factor to support science-based decisions on where to place nest boxes to be the most effective.

Advisor: Ben Sedinger
Poster
Consider for Judging

Differentiating Bobcat (*Rufus Lynx*) from Other Lynx Species Using Hair Characteristics



Krishna Parthasarathy
Wildlife Ecology and Management

Kaleb L. Bolder
Wildlife Ecology and Management

Stephen E. Van Horne
Wildlife Ecology and Management

Kendra M. Potter
Wildlife Ecology and Management

Henry W. Fielding
Wildlife Ecology and Management

Benjamin R. Schutt
Wildlife Ecology and Management

Bobcats (*Rufus Lynx*) are legal furbearers in Wisconsin, and 581 harvested bobcats were registered with Wisconsin DNR in 2018. Bobcat pelts bear a striking resemblance to other species in its genus Lynx. The Iberian lynx (*Lynx pardinus*), one of the four major lynx species, is endangered with a population of 400-500 in southwestern Europe. To prevent poaching and unregulated fur trade of the Iberian lynx, Bobcats are considered as “look alike” species by the Convention on International in Endangered Species (CITES appendix IIb) due to their resemblance to Iberian lynx. The CITES agreement requires tags and documentation for bobcat pelts to be exported to ensure that only all pelts originate from a legal source. We aimed to identify differences in hair structure between the bobcat and other Lynx species (*L. pardinus*, *L. canadensis*, and *L. lynx*) to inform managers of potential methods that are easier when differentiating the species for CITES compliance. Utilizing samples collected from the Smithsonian National Museum of Natural History for analysis, we will examine the color pattern and overall hair length. The color will be externally observed under a dissecting scope, and hair length will be measured using a ruler. We hope to determine if unique hair characteristics can differentiate lynx species.

Advisors: Shelli Dubay and Nathan M Roberts

Poster

Consider for Judging

Habitat Associations and Effect of Environmental Variables on Trap Success of Gray Squirrels in Schmeeckle Reserve



Daniel W. Meyers
Wildlife Ecology and Management

Tyler J. Vinopal
Wildlife Ecology and Management

Noah W. Hazard
Wildlife Ecology and Management

Maddie Hartlaub
Wildlife Ecology and Management

Rebecca Funk
Wildlife Ecology and Management

The eastern gray squirrel (*Sciurus carolinensis*) is a highly abundant game species throughout the eastern United States and extends into southern Quebec and Ontario. Previous research in Sandhill Wildlife Area near Babcock, Wisconsin has shown that eastern gray squirrels were trapped more often early in the day during periods without cloud cover and also squirrels were captured less often when the sky was overcast. We aim to investigate environmental factors that influence trap success of gray squirrels in Schmeeckle Reserve, Stevens Point, Wisconsin, a more urban setting. We anticipate that weather patterns might not influence urban squirrels as much because of increased food sources and fewer natural predators in urban environments. We will trap squirrels in two sites in Schmeeckle and record sex, age, and weight, of squirrels. Squirrels will be marked with uniquely numbered ear tags. Additionally, we will record abiotic factors such as cloud cover, precipitation, wind speed and temperature. Traps will be open when temperatures are between 0F to 35F and will be checked three times a day to reduce the risk of hypothermia due to snow melt. We will determine if squirrels are trapped more often under specific environmental conditions using multiple logistic regression. If we identify a relationship, we will compare the relationship with what was previously found to affect trap success in Sandhill. Also, squirrel hunters and wildlife viewers may be able to increase their chance of seeing or harvesting a squirrel if we identify when squirrels are more or less active.

Advisor: Shelli Dubay

Poster

Consider for Judging

A Comparison of Body Mass and Parasite Load in the Eastern Cottontail Rabbit (*Sylvilagus floridanus*)



Arthur T. Young
Wildlife Ecology and Management

Melinda R. Houtman
Wildlife Ecology and Management

Madilyn M. Tokarski
Wildlife Ecology and Management

Madeline R. Schopf
Wildlife Ecology and Management

Rebecca Funk
Wildlife Ecology and Management

The Eastern cottontail rabbit (*Sylvilagus floridanus*) is an abundant species throughout the Midwestern United States. Cottontail rabbits serve as a prey base for many of the predators and as hosts to several endo-parasites; however, parasites in cottontails are rarely observed and documented. Observations of Eastern cottontail rabbit parasites have not been published in Wisconsin since the 1950's. Since then, many areas in Wisconsin have urbanized due to an increase in population. Our objective is to live trap Eastern cottontail rabbits and collect fecal samples to determine if there is a relationship between the parasite load and body mass of rabbits in Stevens Point, Wisconsin. We hypothesize mean parasite load will increase as mean body mass decreases. We set 7 Tomahawk traps on personal property 20 min east of Stevens Point. Traps were set in the evenings from February – March and were baited with sweet feed. Captured cottontail rabbits received an ear tag, and fecal samples were collected for endo-parasites. Parasites were analyzed by conducting fecal floats and microscopic observations for identification.

Advisor: Sarah Orlofske
Poster
Consider for Judging

Examining the Position of Ruffed Grouse (*Bonasa umbellus*) Drumming Logs in Relation to their Home Range and How it can Affect Auditory Drumming Surveys



Joe O. Quehl
Wildlife Ecology and Management

Rachel A. Martin
Wildlife Ecology and Management

Brady A. Roberts
Wildlife Ecology and Management

Logan M. Cutler
Fisheries and Aquatic Sciences

Ruffed grouse (*Bonasa umbellus*) are an important game species throughout the Great Lakes region. Males perform a unique drumming display atop fallen logs to attract females and maintain their territory throughout the spring. The act of drumming usually lasts from the end of April to the beginning of June. Due to the cryptic nature of these dense woodland birds, they can be difficult to survey. One of the most common ways to do so is during this time period using auditory drumming surveys. Which is much like a typical point count survey. We have been conducting auditory drumming surveys in northern Wisconsin since 2014. Our surveys last 5 minutes and utilize a double detection framework. We also have home range estimates of collared grouse throughout the property, which were created using ArcGIS Pro. We aim to compare the location of these home ranges to the locations of known drumming logs and orientation of drumming to determine the purpose of drumming i.e to attract resident females (drumming facing into their home range) or to attract other females (drumming facing outside of their home range), or communicate with other males in the area. With this information, we can use it to reform the auditory drumming survey techniques so that we can accurately sample an entire property.

Advisor: Jason Riddle
Oral
Consider for Judging

Differential Timing of Migrating Northern Saw-Whet Owls Based on Age and Sex Groups



Madison G. Fell
Wildlife Ecology and Management

Michaela M. Meehl
Biology

Amanda Lang
Wildlife Ecology and Management

Cole J. Suckow
Wildlife Ecology and Management

Carter L. Freymiller
Wildlife Ecology and Management

The Northern saw-whet owl (*Aegolius acadicus*) (NSWO) is a mesopredator within upland ecosystems. They will live as far north as central Canada and Alaska and will migrate as far south as central Mexico. NSWOs migrate in fall from September until December, peaking around mid-October, and this species is relatively abundant in central Wisconsin during this time. Data for this project comes from the University of Wisconsin - Stevens Point student chapter of The Wildlife Society's long-term saw-whet owl undergraduate research project. Data collection takes place at Sandhill Wildlife Area, a roughly 9,000 acre Wisconsin Department of Natural Resources property near Babcock, Wisconsin. Research has been occurring each fall from 2007 through 2019. Over 1,000 NSWOs have been captured using call-playback devices and mist-nets and were banded using USGS aluminum leg bands. Wing and tail chords, weight, age, and sex of birds were recorded with each capture. Previous studies have found that juvenile diurnal birds of prey migrated significantly earlier than adults. This is due to adults attempting to remain on breeding territories for as long as possible, therefore delaying fall migration. We are interested in whether this trend also applies to nocturnal birds of prey, predicting that juvenile females will be the first to leave, while adult males will be the last. Statistical analysis will be used to analyze the age and sex distribution from the early, peak, and late migration season.

Advisor: Jason Riddle
Oral and Poster
Consider for Judging

Comparison of White-Tailed Deer (*Odocoileus virginianus*) Habitat use Areas During the Winters of 2019-2020



Kelsie B. Hayes, Jeffery W. Edwards, Mason T. Wheeler
Wildlife Ecology and Management

White-tailed deer (*Odocoileus virginianus*) in urban environments present a unique challenge to wildlife managers. Movement patterns and resource selection vary depending on habitat availability throughout specific times of the year. This study analyses the selection for vegetation dependent on habitat of white-tailed deer during the winters of 2014 through 2020 in Schmeckle Reserve, a forested habitat located adjacent to an urban interface. Deer were trapped using modified Stephenson box traps baited with corn. Selected deer were outfitted with VHF radio collars and ear tagged for identification. Currently, we are collecting data from 4 deer. We are in the process of collaring additional deer for this study. We are looking at vegetation selection dependent on winter severity. We will be using a chi squared test to determine the relationship between winter severity and habitat use. Data collection is ongoing and will continue until April 1, 2019. This analysis will provide insight to movement patterns of urban deer over the course of multiple wintering seasons.

Advisor: Scott Hygnstrom

Poster

Consider for Judging

Efficacy of a Bioacoustics-Pyrotechnic Approach to Dispersing Canada Geese



Jaden J. Kerkhoff
Hydrology

The presence of Canada geese has been increasing in Stevens Point parks, creating potentially annoying and hazardous conditions for park users. The geese foul sidewalks and lawns with their feces and nesting geese may act aggressively towards park visitors. To mitigate the problem of nuisance geese, the City of Stevens Point hired a student and consulted with a wildlife professor from the University of Wisconsin-Stevens Point to disperse geese from two city parks. Our objectives were to determine the total number of geese using the parks, the response of geese to bioacoustics and pyrotechnic frightening devices, and the attitudes of park visitors toward Canada geese. We walked the lengths of Pfiffner and Bukolt Park at sunrise and mid- afternoon from June through mid-July in 2019 and recorded the number of geese. When concentrations of at least 20 geese were observed in the park with minimal public observation, we deployed recorded alarm calls of Canada geese through a 4-speaker GooseBuster acoustic system and hand-launched BirdBangers and BirdScreamers toward the geese. We monitored the response of geese to the disturbance and the time at which it took for them to return to the park. We asked 16 park visitors about their opinions on geese and management of geese in the parks. Use of the parks by Canada geese was relatively high and typically ranged from 50 to 100 geese per day. Most of the geese immediately dispersed from the bioacoustics and pyrotechnic devices in the morning but returned within 12 to 24 hours. About 85% of the public favored the removal of Canada geese from the parks. In the future, additional methods, such as oiling of eggs, round ups, and habitat modification, should be used with frightening devices to manage nuisance Canada geese in Stevens Point parks.

Advisor: Scott Hygnstrom
Poster

Unique Characteristics of Greater Sandhill Crane (*Antigone canadensis tabida*) Nest Sites in Horicon Marsh, Wisconsin



Nora M. Hargett
Wildlife Ecology and Management

Horicon Marsh, Wisconsin is the largest fresh-water cattail marsh in the United States and is home to many migratory birds, including Greater Sandhill Cranes (*Antigone canadensis tabida*) and as of 2019, 7 non-breeding Whooping Cranes (*Grus americana*). Currently, Horicon Marsh is being considered as a primary release area for captive-reared Whooping Cranes. However, little is known about the characteristics of crane nests in this unique wetland. To further understand the potential for a successful release of Whooping Cranes, this study investigated nest locations of Greater Sandhill Cranes in Horicon Marsh (n=14). Greater Sandhill Crane nest locations were more consistently concealed than random locations. The ratio of water:cattail differed significantly between nest locations and random locations and changed significantly with an increase in distance from the nest. Examining nest site locations for Greater Sandhill Cranes can help identify the extent to which suitable nesting habitat for Whooping Cranes is available at Horicon Marsh.

Advisors: Sabine Berzins, Jason Riddle, Shelli Dubay

Oral

Consider for Judging

Orphaned Juvenile Black Bear (*Ursus americanus*) Release and Monitor



Ashley M. Skalitzky
Wildlife Ecology and Management

Jacob Bergstrand
Wildlife Ecology and Management

Quinn A. Erdmann
Wildlife Ecology and Management

Samuel D. Andres
Wildlife Ecology and Management

Hayden S. Walkush
Wildlife Ecology and Management

Dan Ruka
Wildlife Ecology and Management

Black bears (*Ursus americanus*) are one of the most charismatic species to the Northwoods of Wisconsin. Wild Instincts, a rehabilitation center located in Rhinelander, Wisconsin, cares for orphaned black bears that were rescued. Eventually, they are released back into the wild. Our goal is to evaluate and compare the movement patterns of orphaned black bears after their release, to wild black bears. In October of 2019, two female yearlings from Wild Instincts were released in the Chequamegon-Nicolet National Forest. The two bears had VHF collars placed around their neck in order to allow us to track their location conducting radio telemetry. Telemetry data points were then continuously collected after their release throughout the next five weeks, until they denned up for the winter. In addition, Wisconsin DNR bear biologists have been keeping telemetry data on three wild black bears up in the national forest area. Using ArcGIS, we created a map of all the telemetry points obtained, to illustrate the movement patterns of the two yearlings from their release to their denning period, plus the established home ranges of the wild bears. We will continue to study the movement patterns of these two orphaned bears, as well as fellow wild black bears in northern Wisconsin that have GPS collars on them. Through monitoring the movement patterns of these bears, we want to determine if there is any correlation with orphaned bears developing the tendency to spend more time in close human proximity versus non-rehabilitated bears. The data and information we gather could be applied to making management decisions if orphaned bears show a significantly higher probability in being a nuisance, as well as whether it is appropriate to release black bears into the wild after being captured.

Advisor: Cady Sartini

Poster

Consider for Judging

Sex Bias in Parasite Prevalence Infecting Bobcats (*Lynx rufus*) Harvested in Southern Wisconsin



Kendra M. Potter
Wildlife Ecology and Management

Henry W. Fielding
Wildlife Ecology and Management

Kaleb L. Bolder
Wildlife Ecology and Management

Stephen E. Van Horne
Wildlife Ecology and Management

Krishna Parthasarathy
Wildlife Ecology and Management

Benjamin R. Schutt
Wildlife Ecology and Management

Bobcat (*Lynx rufus*) populations are increasing in the Midwestern United States, and trends are apparent in Wisconsin as well. As a result, the Wisconsin Department of Natural Resources opened up the entire state to bobcat harvest in 2013 and approximately 550 bobcats were harvested in 2017-2018. Given the increase in availability of bobcat carcasses, we aimed to use these animals to test the hypothesis that male bobcats would have a higher prevalence of parasites than females because males have larger home ranges and testosterone decreases immune system capabilities. Bobcats also serve as hosts for many parasites that are pathogenic or even fatal in other felines—including domestic cats—and humans. The parasites of concern that bobcats host include *Cytauxzoon felis*, *Toxoplasma gondii*, *Giardia sp.*, *Alaria sp.*, and *Toxocara cati*. We chose the Southern zone of Wisconsin because human population density is higher, possibly increasing risk of parasite transfer from an infected bobcat to a human or a pet. The Southern zone has much more agricultural land cover, meaning more livestock and a risk for introducing parasites, and slightly warmer climate which is more hospitable for parasites who cannot survive harsh winters. We acquired the heart, lungs, stomach, and intestines of approximately 95 bobcats that were trapped and harvested in the Southern zone of Wisconsin. These organs will be dissected and the parasites present will be identified and quantified. We will calculate parasite prevalence based on this analysis and use a Fisher's exact test to determine if prevalence of parasites varies by sex.

Advisors: Shelli Dubay and Nathan Roberts

Poster

Consider for Judging

Sex-Age Ratios of Savannah Elephants in Northern Botswana using Digital Photogrammetry



Nathaniel J. Weisenbeck
Wildlife Ecology and Management

Arthur T. Young
Wildlife Ecology and Management

The biological carrying capacity of elephants in Botswana has been estimated at 50,000-55,000. The population was estimated at 131,600 in 2016. Overpopulation was in part due to a ban on hunting elephants in 2017-2019. After years of crop damage, environmental degradation, and loss of jobs, foreign currency, and a food source, the people of Botswana now look to enhance their lives because the ban on hunting has been lifted. However, Botswana currently is facing one of the worst droughts in years and people are concerned about a crash in the elephant population. We conducted research to determine the growth rate of elephants in Botswana. We observed elephants along the Khwai river, Mababe depression, and Okavango Delta. We captured 1,153 pictures of elephants using a Canon EOS Rebel T5 at 55 and 250mm. We used photogrammetry in ImageJ to measure shoulder heights. The age of each measured elephant was modeled using age, sex, and shoulder height. We compared the percentage of calves, immature (1-11 years old), and adults to a stable state distribution. The calculated sex ratio of males to females was 1.05:1. We estimate that 66% of the elephants were immature and 34% were adults. It appears that most elephants were not living long lives, possibly due to low resource availability and poaching. The population of elephants in Botswana likely will crash due to drought, starvation, and overpopulation. Hunting offers an opportunity to manage the elephant population, provide food and jobs to local villagers, and increase the economic viability of Botswana.

Advisor: Scott Hygnstrom
Oral
Consider for Judging

Using Fish Communities to Assess Health of Minnesota Lakes Relative to Land Use and Geography



Joshua J. Fluor
Fisheries

As aquatic systems diminish worldwide, it is imperative that we have the proper tools to assess lake health and identify potential stressors so that we may properly manage them. To do this we must determine which factors have the largest impact on lake health. Using watersheds in the Mississippi River Drainage Basin in Minnesota, I wanted to examine how development within northern and southern watersheds affected lake health, as well as how watershed level land use and how shoreline development relates to lake health. To examine these relationships, I compiled data using the Watershed Health Assessment Framework (WHAf), fish based IBI survey data, and shoreline development survey data from the Minnesota DNR. I found that the lakes in the northern watersheds were significantly higher ($p=0.00045$) than those in the southern watersheds. I also found multiple significant relationships between: mean fish IBI scores and the percent of land developed in the watersheds ($p<2.97E-06$), as well as between shoreline development and lake health (fish IBI scores) ($p=0.00093$), although there is much variability in this relationship ($R^2=0.0141$). My results show that there is a clear difference between the health of the lakes in the northern and southern watersheds, likely due to the abundance of agriculture and urban areas in the southern watersheds. It is also shown that shoreline development and watershed land use do have a significantly negative impact on lake health, although the data suggests that watershed land use has a more significant impact on lake health. This suggests that we should focus on land use management when managing lakes.

Advisor: Joshua Raabe
Poster

Brook Trout Growth Potential, Size Distribution, and Diet Analysis in the Little Plover River, Wisconsin



Sam LaMarche
Fisheries and Aquatic Sciences

Brook Trout (*Salvelinus fontinalis*) are a species of concern for fisheries managers in across Wisconsin. The Little Plover River is home to a self-sustaining population of Brook Trout that has been affected by heavy agriculture and ground water usage in central Wisconsin. Diminished water levels caused sections of the river to run dry between 2005 and 2009. Mandated minimum flows were implemented in early 2009 and watershed restoration efforts were completed in 2019 to increase flow rates. This focus of this study is to provide a better understanding of growth potential, size distribution, and analyze diet composition in the Little Plover River Brook Trout population. Three locations on the Little Plover River were analyzed from 2017 through 2019 using mark and recapture methods using passive integrated transponder (PIT) tags that were implemented in Fall of 2015 with continued marking through Fall 2019. Diets were collected at three locations that corresponded to three different riparian habitats (Forested, restoration, grasslands/agriculture), and were compared with driftnet invertebrate samples. Asymptotic length was found to be 285mm (CI 258-334) with an average growth rate of 0.371 (CI 0.245-0.515). Proportional size distribution (PSD – % of fish >200mm) indicated increasing size structure from 2017 (14.5%) to 2019 (28.0%). Results suggest that although size structure is increasing, current size structure indicates a small proportion of fish are of harvestable size. Building a multi-year data set on diet could provide insight into a changing size structure and could indicate why differences at locations have been observed within the stream.

Advisors: Joshua Raabe, Jered Studinski, Jeff Dimick

Poster

Consider for Judging

Assessment of Abiotic Factors and Synchrony in Walleye Recruitment in Wisconsin Flowages



Nathan J. Jaksha
Fisheries and Aquatic Sciences

Walleye *Sander vitreus* are an important sportfish in Wisconsin as they provide commercial, tribal, and recreational fishing opportunities throughout the state. While some systems have recently observed declining trends in abundance and natural recruitment of Walleye, riverine systems continue to produce high quality fisheries. Specifically, flowages within Wisconsin demonstrate considerably higher natural reproduction of Walleye and are important in providing productive fishing opportunities that may be absent or limited elsewhere. Understanding the factors that drive high natural recruitment in riverine systems is important for managers as they need to properly maintain these quality fisheries. We specifically examined the possible effects of various climatic and hydrological parameters on Walleye recruitment and age-0 growth in specific flowages. Trends in synchrony were also analyzed to further understand if Walleye recruitment variation is observed at a large geographic scale. Walleye recruitment data was collected by the Wisconsin Department of Natural Resources (WDNR) in various riverine systems (Wisconsin, Chippewa, Rock Rivers, etc.) throughout a large sampling period (1990s-present). Currently, preliminary results are being examined and will be presented within. Providing some useful insight on the factors driving Walleye recruitment in Wisconsin flowages can help guide managers in various agencies (WDNR, tribal agencies, etc.) to make informed decisions regarding riverine Walleye populations.

Advisors: Joshua Raabe; Tim Parks

Oral

Consider for Judging

Diets of Larval Walleyes In Northern Wisconsin Lakes



Nathan J. Jaksha
Fisheries and Aquatic Sciences

Walleye recruitment has declined in some northern Wisconsin lakes and previous research has indicated that a recruitment bottleneck is occurring at the larval stage in some of these lakes. Availability of prey utilized by larval walleye could affect early survival and subsequent recruitment. However, current information on diets of naturally-produced larval walleye in lakes of the upper Midwestern USA is lacking. Identifying important prey for larval walleye is the first step in determining whether availability of these prey may be a factor influencing recruitment. Consequently, we examined the diets of ~ 100 larval walleye (typically ~ 18 mm in length) collected from 13 northern Wisconsin lakes during 2016-2018. Lakes were either classified as sustained (S-NR) or declining (D-NR) natural recruitment. Larval yellow perch, *Daphnia* spp., and calanoid and cyclopoid copepods represented the majority of diet items we observed. Larval yellow perch were more prevalent in larval walleye diets than expected based on previous literature. Larval fish sampled in the S-NR lakes contained a more diverse diet, however further statistical analyses would be required to test for significant differences.

Advisors: Daniel Isermann; Daniel Dembkowski

Poster

Consider for Judging

Occurrence of Odonates in the Upper Mississippi River Valley 2013-2018



Jaden J. Kerkhoff
Hydrology

Odonates (dragonflies and damselflies) are one of the most fascinating insect groups on Earth, standing the test of time for over 300 million years. With the last survey of Odonata in the Upper Mississippi River Valley (UMRV) conducted in 1975, it was deemed important to conduct a new survey to investigate current trends. Our objectives were to inventory dragonflies of the UMRV and provide inference on species occurrence, relative abundance, and habitat associations. Citizen scientists conducted field surveys for Odonates in Navigation Pools 6 – 10 of the UMRV from April through October in 2013-2018. Annual reports contained the species, numbers, and comments about the more than 175 hours logged, and the 2943 observed Odonates. We constructed a functional data base that can be used to better record data in the future. As well as a recording of the endangered species present in the state.

Advisor: Scott Hygnstrom

Poster

Fish Communities and Distribution Following Restoration of the Pahsimeroi Subbasin, Idaho



Thompson H. Hill
Fisheries and Aquatic Sciences

The Pahsimeroi subbasin located in central Idaho is essential habitat for spawning and rearing juvenile Chinook Salmon *Oncorhynchus tshawytscha* and contains an array of native fishes. Native salmonids; Cutthroat Trout and Rainbow Trout, as well as invasive Brook Trout are the predators in the system. Forage species primarily consist of Sculpin and Redside Shiner. Idaho Fish and Game has undertaken large-scale restoration efforts in the Pahsimeroi subbasin since 2008. Bank stabilization, obstruction removal, and woody debris additions coupled with water irrigation limits have been utilized to improve stream bank structure and flows. My objectives were to determine if fish distributions and communities have changed over time following subbasin restoration efforts. Analyses focused on the Pahsimeroi River, Patterson Big Springs, and Patterson Little Springs sites that were the main areas of rehabilitation efforts. Habitat assessments measured flow and wetted width. Snorkel surveys accompanied with single and multiple pass electrofishing efforts were used to evaluate fish distribution and densities over time. The Pahsimeroi River displayed a significant increase ($p = 0.01$) in mean wetted width annually from 2015 to 2019. However, the average annual flow did not exhibit a significant increase ($p = 0.10$) from 2014 to 2019. There were no significant trends in annual density or relative abundance in salmonid and non-salmonid species from 2016 to 2019, but snorkel surveys indicated a four-year cyclical peak pattern for Chinook Salmon. Increased wetted width and flow could lead to improved access to redd and rearing habitat in tributaries. Chinook Salmon are affected by a multitude of variables that require additional research and documenting peak years may assist management with improving river conditions and regulations to protect strong year classes.

Advisor: Josh Raabe, Demitra Blythe

Oral

Consider for Judging

Using Genetics to Evaluate Survival and Growth of Leech Lake strain Muskellunge Stocked in Wisconsin Lakes



Thompson H. Hill
Fisheries and Aquatic Sciences

Stocking of muskellunge *Esox masquinongy* is common throughout Wisconsin supporting fisheries that could not be sustained through natural reproduction. Most muskellunge stocked in Wisconsin derive from native broodstock, but progeny of non-native broodstock have been stocked in some locations. Muskellunge derived from Leech Lake, Minnesota, have been stocked in at least four locations in Wisconsin: Lake Wissota, Petenwell Lake, Castle Rock Lake, and Lake Monona. Leech Lake muskellunge were stocked because they are thought to grow larger than native muskellunge from Wisconsin. However, a pilot study, which used genetics to assign muskellunge caught in Lake Wissota to their strain of origin, found that survival of Leech Lake muskellunge was poor. To determine if stocking of Leech Lake muskellunge in other Wisconsin systems resulted in similar survival rates, we genotyped muskellunge at 13 microsatellite loci and assigned fish to their strain of origin using previously collected data. Additionally, we used length and age data to explore growth rates of Leech Lake strain muskellunge stocked in Wisconsin lakes. Our research will lead to a better understanding of strain-specific survival and growth rates in muskellunge.

Advisors: Wes Larson, Kristen Gruenthal
Poster
Consdier for Judging

Location and Timing of Spawning Brook Trout in the Little Plover River, WI



Natalie S. Coash
Fisheries and Aquatic Sciences

Brook Trout *Salvenius fontinalis* are a native salmonid species within Wisconsin that require cold, high quality, flowing water. Brook Trout naturally reproduce in the Little Plover River, a groundwater dominated stream in central Wisconsin, but experienced mortalities during low flows and dry reaches from 2005-2009 caused by drought and groundwater pumping. Recent efforts to improve watershed health and river flows include groundwater pumping changes, wetland restoration, and riparian and channel modifications. Understanding Brook Trout spawning locations (i.e., redds) and timing would aid in identifying important locations and time periods for restoration and protection. Therefore, we conducted weekly redd surveys in Autumn 2017-2019 by walking the main passage of the river and GPS marking observed redd locations consisting of at least two actively staging or spawning fish over a designated redd. We mapped redds in GIS and compared locations to estimated groundwater inflow data. Brook Trout spawned throughout most of the stream but redd locations varied by week and annually. In 2017, redds were more dense in areas with higher groundwater inflows whereas in 2018 more redds were located upstream and at differing groundwater inflows. Varying redd locations could be due to differences in river flow, with much higher flows in 2018 and 2019 potentially influencing groundwater inflow or Brook Trout movement behaviors. Peak redd numbers occurred during the second and third weeks of November during all three years. This research provides valuable information on Brook Trout spawning behaviors and can be used to help ensure maximum benefits of restoration efforts and is part of an ongoing evaluation of the Brook Trout population and watershed restoration efforts of the Little Plover River.

Advisor: Joshua Raabe

Oral

Consider for Judging

Brook Trout Culvert Passage Success Within the Little Plover River, Wisconsin



Jason J. Lins
Fisheries and Aquatic Sciences

Unimpeded movement throughout streams is important for fish to complete different life stages. Road culverts can be a partial or complete barrier to fish depending on culvert dimensions, outlet drop (perching), water velocity, water depth, and other factors including species and sizes of individuals. The Little Plover River in Portage County, Wisconsin contains a naturally reproducing Brook Trout *Salvelinus fontinalis* population and flows through a single culvert at County Highway R. My objectives were to determine if Brook Trout passage success through this culvert was influenced by discharge, total length, or season. Brook Trout were tagged with 12 mm passive integrated transponder (PIT) tags and total length was recorded during various electrofishing surveys. Passage was evaluated between May 2016 and October 2019 with PIT antennas at the culvert. Fish detections were matched with total lengths and discharge at the time of detection. Passage success did not display a significant relationship with discharge in either upstream ($P = 0.078$) or downstream ($P = 0.054$) directions in logistic regression analyses but did show an overall positive relationship. The relationship between lengths of individuals and passage was also not significant ($P = 0.923$; Figure 4). Passage success was significantly different depending on season ($P < 0.001$) in a chi-square analysis, with noticeably high passage percentages in Fall and Winter. The County Highway R culvert does not appear to be a detrimental barrier to Brook Trout passage during normal discharge rates experienced during the study but could be impassable under low flows.

Advisor: Joshua Raabe
Poster
Consider for Judging

Unsuccessful Invasion of Zebra Mussels (*Dreissena polymorpha*) in a Riverine System



Kiersten H. Czarnecki
Natural Resources Management

Natural communities can be impacted by several factors, including physical and biological impacts. While using a control impact sampling design to determine the impact of a thermal effluent on the aquatic macroinvertebrate community of the AuTrain River, Alger County, Michigan, the occurrence of Zebra mussels (*Dreissena polymorpha*) was noted. The Zebra mussels presented in large quantity near the entrance of the thermal effluent, raising concerns about possible impact this invasion could have on the riverine ecosystem. Fortunately, not all introductions of an invasive species result in an established community within the ecosystem. Four sites located within a mile downstream in the mixing zone of the thermal impact were examined to determine establishment of zebra mussels. The diminished abundance and lack of adult sized living zebra mussels suggested the mussels did not establish a viable population in my study stretch of the AuTrain River.

Advisor: Jeffrey Dimick
Oral and Poster
Consider for Judging

UWSP Undergraduate Fisher Research Project



Bradley J. Biegel

Wildlife Ecology and Management

Nathanial J. Weisenbeck

Wildlife Ecology and Management

Josh D. Kivett

Ecosystem Restoration

Ellen C. Peterson

Wildlife Ecology and Management

Sam Sodke

Wildlife Ecology and Management

The fisher (*Pekania pennanti*) is native to forested landscapes within the central and northern regions of Wisconsin. It typically selects mature, contiguous, coniferous and deciduous forested habitat. This species was once extirpated from Wisconsin and is currently protected within the states of Oregon, Washington, and Wyoming. It is also listed as threatened in California. The main goal of the Undergraduate Fisher Research Project is to create a habitat selection model for fishers in central Wisconsin, specifically within the George W. Mead State Wildlife Area. We will accomplish this task by live trapping and radio collaring two fishers in the state wildlife area. Preliminary research will include camera trapping and baiting. Once collared, GPS coordinates of the fishers will be taken on a regular basis. This data will be analyzed using various geographic information systems programs. We hope to find that fishers select for an old-growth mixed deciduous and coniferous environment with a dense canopy. This habitat selection model will be used as a template for fisher management throughout the state of Wisconsin as research is lacking specifically on the habitat selection of fishers in the state. Habitat selection models can greatly benefit wildlife management decisions since they can predict the important resources that animals will utilize.

Advisor: Cady Sartini

Poster

Consider for Judging

Freshwater Mussel Species Distribution and Population Patterns in Portage County



Jessica L. Bielak, Andrew S. Mehus, Madilyn M. Tokarski, Luke C. Trittelwitz
Wildlife Ecology and Management

Isabel R. Dunn
Water Resources

Freshwater mussels are important members of riverine ecosystems and play crucial roles in improving water quality by filtering out bacteria, algae, and pollutants. Because of their relationship to water quality, they serve as valuable indicator species and suffer from environmental disturbances like pollution and impoundments. Despite their importance, large gaps remain in our knowledge of populations of freshwater mussels in Wisconsin. Previously in Portage County, freshwater mussels have been monitored by the specifications and guidelines of the Wisconsin Mussel Monitoring Project by the Wisconsin Department of Natural Resources, although some monitoring sites have not been surveyed since 1977. The data collected during these surveys are used around the country to help further knowledge and to create conservation management plans to aid the recovery of freshwater mussels. In addition to distribution and population patterns, we will determine relevant water quality parameters and their relationship to the distribution of freshwater mussels in Portage County at the four WDNR sites. We will acquire historic data from these sites and determine the relationships between water quality variables and distribution of freshwater mussels to compare to samples acquired in the future. We predict that sites of higher relative water quality will yield higher density and species richness. Analyses are ongoing, but we will compare the water quality parameters and freshwater mussel distribution by site and by year to predict the relationships we might expect to see in the future.

Advisors: Shelli Dubay, Katherine Clancy

Poster

Consider for Judging

Sorption of Monensin to Soil in Agricultural Runoff



Abigail G. DeMeyer
Water Resources Management

Monensin is an ionophore antibiotic that is widely used in livestock industries as an antiprotozoal additive and as a non-hormonal growth promoter in cattle. It does not digest well in animals and therefore, could be present in manure. As a result, monensin could be a useful indicator to help us track manure contaminations and determine the path of runoff from farm fields. The main objective of this study is to determine how much monensin stays sorbed to soil and how much goes into solution. Only several previous studies have examined monensin sorption by natural solids. We used those result to design our experimental soil to solution ratios. Mixing different masses of soil with solutions of known concentrations of monensin to determine the extent of monensin sorption to soil. Previous research suggests that the sorption reaction is rapid and after a day, the water was separated from the moist soil. Methanol, cyclohexane, and a citrate-phosphate buffer were all added to both the water and soil containing centrifuge tubes and sonicated. The cyclohexane layer was then removed, dried down, reconstituted and run on an Agilent 6430 Triple Quad LC/MS using nigericin (a similar antibiotic although not used in agriculture) as an internal standard and benzoylcegonine-D3 as a surrogate standard. The results are used to create sorption isotherms describing the relationship between monensin in solution and monensin sorbed to the solid. These isotherms can be used to identify the conditions

Advisors: Paul McGinley, William DeVita, Amy Nitka

Poster

Consider for Judging

Aquatic Macroinvertebrate Responses to Phosphorus Gradients on a Small Agricultural Stream in Northeast Wisconsin



Abby Adams
Water Resources

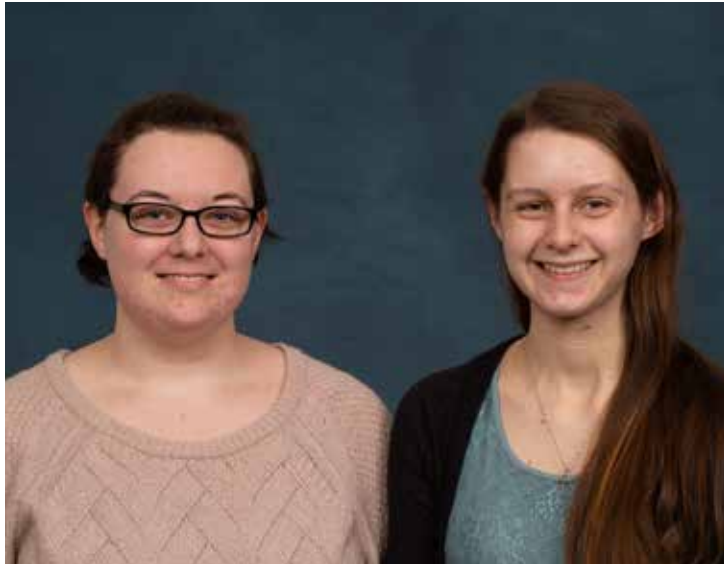
Heightened phosphorus levels are a significant problem facing Wisconsin waterways. Aquatic macroinvertebrate responses to phosphorus are known but need further investigation. Water quality monitoring data acquired from the University of Wisconsin Green Bay at Manitowoc provided the opportunity to examine aquatic macroinvertebrate responses to phosphorus levels. Phosphorus monitoring data was collected at North and South Branch of Centerville Creek in Manitowoc County, Wisconsin. Macroinvertebrates were kick-netted from three sites on each branch. Macroinvertebrate metric trends were correlated against measured phosphorus concentrations and the effectiveness of two differing family-level biotic indices were analyzed. The metrics tracked observed longitudinal phosphorus trends and Bouchard's family-level biotic index showed increased responsiveness to changes in phosphorus compared to Hilsenhoff's family-level biotic index. Ultimately, it is valuable to understand the associated macroinvertebrate response so as to better understand and mitigate these pollutants in the future.

Advisors: Jeff Dimick, Jered Studinski

Poster

Consider for Judging

The Effects of Salt Exposure on Osmoregulation and Mass in Freshwater Snails



Michaela M. Meehl and Roiya Meyer
Biology

Hal Edwards
Fisheries and Aquatic Science

The use of salt to de-ice roads in the winter is common practice in Wisconsin and many other parts of the country. One consequence of road salt application is significant run-off of the salt into freshwater wetland habitats. This runoff causes aquatic toxicity of chloride, which peaks in the months November through April. This peak in chloride toxicity may alter the ability of aquatic organisms to regulate water balance, which may alter mass and other metabolic functions. A previous study done by UWSP students on freshwater snails (*Helisoma* sp.) indicated that long-term (5 – week) exposure to sub-lethal levels of road salt caused abnormal swellings and changes in mass of the snails. We decided to extend that experiment with another genus of native freshwater snails (*Physa* sp.) to determine whether salt exposure would have a similar effect on their mass and osmoregulation. In a replicated regression design, we will expose individual snails ($n=5$ per treatment) to a range of salt levels (0.0, 1.0, 2.0, and 3.0 ppt). We predict that the high chloride concentration creates a hypotonic environment for the snails, and that the snails will retain more water than normal to counteract the osmotic changes in the environment. This study will contribute to our understanding of the impact ion concentrations have on invertebrate detritivores and their ability to regulate water balance and maintain other metabolic functions in the presence of chloride toxicity.

Advisor: Sarah Orlofske
Poster
Consider for Judging

Analysis of Key Soil Nutrients and Physical Properties on a Managed Grazing Operation in Junction City, WI



Emily R. Yulga
Soil and Land Management



Robert A. Doucette
Water Resources

Rotational grazing is an agricultural practice where livestock are moved between paddocks, and is often practiced because of its benefit to pasture quality and soil health. Our research objective is to assess the long-term soil health of a local rotational grazing operation by conducting a 20-year study on the physical and chemical properties of the soil. This study is conducted by the University of Wisconsin- Stevens Point Soil and Water Conservation Society. Soil samples are collected every four years, the most recent collection in 2019. The rotational grazing operation's 17 fields were broken up into five-acre parcels, and grid points were allotted to each parcel. Soil samples (6" depth) were collected within 10 meters of each grid point at 63 sample points. The control field, which is not rotationally grazed, and the newly converted conventionally farmed fields were also sampled. Of the samples collected in 2015, bulk density was tested in 2015-16; in fall 2017 C:N ratio, total carbon, and total nitrogen were evaluated; pH was tested in spring 2018; phosphorus, potassium, and electrical conductivity analyzed in spring 2019; biomass yield collected in fall 2018-29; organic matter is to be analyzed spring 2020. Samples from 2019 have been tested for pH in spring 2020. Testing of 2019 samples will continue and conclude in 2023, and the fields will again be sampled.

Advisors: Alyssa Gunderson, Daniel Keymer, Robert Michitsch, Jacob Prater, and Bryant Scharenbroch
Poster
Consider for Judging

Comparison of Two Headwater Streams of the Central Sands Region of Wisconsin for Neonicotinoid Concentrations and Land Use



Maxwell S. Hankard
Water Resource Management

Abby J. Dremel
Water Resource Management

Dylan J. Franzke
Hydrology

Neonicotinoids are emergent organic contaminants which are applied at rapidly increasing rates as insecticides. These compounds enter surface waters through groundwater recharge and persist due to their hydrophilicity. Recent studies have shown neonicotinoids negatively impacting aquatic macroinvertebrate communities and EPA has developed acute and chronic aquatic life benchmarks. Dinotefuran, Thiamethoxam, Clothianidin, Imidacloprid, and Acetamiprid were the five analytes of interest in this study. This study evaluated the concentration of neonicotinoids versus the percent of agricultural land use in the watershed and land use was further partitioned by crop type in two headwater streams of the Central Sands region of Wisconsin (Ten-Mile North; Ten-Mile South). An additional watershed analysis compared groundwater and surface watershed contributions to determine the best correlation of neonicotinoids. Thiamethoxam and clothianidin exceeded the chronic aquatic life benchmarks at some sites. While at most other sites, concentrations of thiamethoxam, clothianidin and imidacloprid were elevated but did not exceed aquatic life benchmarks. Dinotefuran and Acetamiprid were not detected. Land use evaluations of groundwater and surface watersheds did not conclude a definitive trend of neonicotinoid concentrations at the two study streams.

Advisors: Paul McGinley, Bill Devita

Poster

Consider for Judging

Influence of Wetland Age on the Nitrogen Cycle



Aimee E. Steinbrecher
Environmental Science and Management

Larkin R. Hoepner
Hydrology

Kasey R. Kiel
Hydrology

Jess W. Stevens
Water Resources

Wetlands are among the most biodiverse ecosystems with large benefits to the environment. They have the ability to process, cycle, and remove nutrients through soil microbial activity and can be beneficial to environmental health. Wisconsin has lost nearly half of its original wetlands, causing mitigation banks to be used to preserve the value of 'no net loss' of wetlands. This study investigates mitigated wetlands ability to cycle nitrogen (N) at various ages and natural wetlands for reference. 19 wetlands were selected and divided between four wetland age categories. Each wetland was transected four times, where a bullet corer took four soil samples along each transect, twice. Microbial biomass, mineralization, denitrification, and bulk density were used to determine the wetlands nitrogen cycling abilities. Data are currently being analyzed with results to be discussed.

Advisor: Kyle Herrman

Poster

Consider for Judging

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