

THE SUSTAINABILITY  
*of*  
SUSTAINABLE USE



2016 Winter Meeting

March 1<sup>st</sup> - 3<sup>rd</sup>, 2016

Stoney Creek Inn

Rothschild, Wisconsin

## *President's Welcome*

Members of the Wisconsin Chapter of TWS - welcome back to Stoney Creek Inn in Rothschild! We were last here two years ago, and it's good to be back in old haunts. Last year's joint meeting with Minnesota's chapter was an exciting time, but not everyone could make the long, cold drive to Duluth. I look forward to welcoming you to 2016's Winter Meeting. Each year, the Executive Board, with help from dedicated members, strives to put together a program filled with intriguing, interesting, and informative presentations. This year is no different.

We have lined up three plenary speakers who will examine this year's theme, "The Sustainability of Sustainable Use," from different perspectives. My hope is that our speakers will cause each of us to think a bit more deeply about how these concepts apply to society's views of its interaction with wildlife and wildlife habitat. The concurrent sessions will include presentations delving into policy, management, and research techniques. Additionally, you should be able to find talks involving whatever your favorite taxa may be. Student submissions comprise roughly half of all presentations.

For many "old hands," the meeting will be a time not only to learn something new, but to renew friendships and swap stories. For the students - particularly those attending their first professional meeting - it is an opportunity to gain confidence and experience. Take advantage of it. Remember, you are tomorrow's old hands.

I would be remiss not to mention the hours of work the Executive Board and others have spent putting this Winter Meeting together. I take special note of outgoing past-president Scott Craven. Scott is the only Chapter president to have served two terms. The Board is thankful for his counsel. Scott

Hygnstrom volunteered to take on the heavy lifting associated with finding and contacting potential venues, and being our on-site liaison and negotiator. Krista Pham and David Drake again saw to the design and printing of this program. Carey Strobel oversaw registration. Mandy Kamps coordinated with student chapters. Brian Heeringa took charge of sponsors and donors. Jason Riddle reviewed, sorted, and organized abstracts. Lesa Kardash kept the membership informed, and her institutional memory made the process much easier than it otherwise would have been. Many thanks to all of you.

Lastly, ATTEND this year's banquet. We have some bang-up entertainment - an experience you won't want to miss.

Mark Pfost  
*Wisconsin Chapter President*

## *Table of Contents*

Full Conference Schedule	<i>p. 4</i>
Plenary Session Speaker Line-up	<i>p. 5</i>
Plenary Session Speaker Abstracts & Bios	<i>p. 6</i>
Meeting Sponsor Recognition	<i>p. 9</i>
Weds. General Session Speaker Line-up	<i>p. 10</i>
Thurs. General Session Speaker Line-up	<i>p. 12</i>
Weds. General Session Abstracts	<i>p. 16</i>
Thurs. General Session Abstracts	<i>p. 28</i>

## *Schedule At-a-Glance*

### **Tuesday, March 1st, 2016**

6:00 - 7:00 p.m.	Registration
7:00 - 10:00 p.m.	Welcome Reception

### **Wednesday, March 2nd, 2016**

8:00 - 9:00 a.m.	Registration
9:00 a.m. - 12:00 p.m.	Plenary Session
12:00 - 1:30 p.m.	Lunch
1:30 - 3:00 p.m.	Chapter Business Meeting
3:15 - 5:15 p.m.	General Sessions A & B
6:00 - 9:00 p.m.	Evening Social & Awards Banquet Silent Action / Garage Sale

### **Thursday, March 3rd, 2016**

7:00 - 9:00 a.m.	Student Chapter Leaders' Breakfast The Green Mill
9:00 - 12:00 p.m.	General Sessions A, B, C & D
12:00 p.m.	Closing Remarks / Adjourn <i>(lunch on your own)</i>

*Wednesday, March 2nd, 2016*

**Registration**  
**8:00 - 9:00 a.m.**

*Plenary Session:*  
**“The Sustainability of Sustainable Use”**  
9:00 a.m. - 12:00 p.m.

*Moderator: Mark Pfof*

<b>TITLE</b>	<b>SPEAKER</b>
Welcome & Opening Remarks <i>9:00 - 9:15 a.m.</i>	Mark Pfof
Indigenous Perspectives on Wildlife: Past and Present <i>9:15 - 10:00 a.m.</i>	Jon Greendeer
Broadening Constituencies for Conservation Science: A Political Ecology <i>10:00 - 10:45 a.m.</i>	Paul Robbins
<i>BREAK: 10:45 - 11:15 a.m.</i>	
Hunting for Sustainability <i>11:15 a.m. - 12:00 p.m.</i>	Keith Warnke

## *Plenary Session - Speaker Abstracts/Bios*

### ***Jon Greendeer Student of Indigenous Culture***

Since the dawn of colonization, Western settlers observed a unique interdependent relationship between the Indigenous Peoples of the Americas and the surrounding wildlife. Archaeological evidence further reinforces that sustainable agricultural and wildlife management practices existed thousands of years before the 15th Century European arrival. So much has changed since then, leaving one to believe the relationship between contemporary Native Americans and the wildlife tragically disappeared as collateral damage of Western conquest. Nothing could be further from the truth. Join us in a “no boundaries” discussion about how the Indigenous relationship with wildlife has remained intact for centuries despite the social, economic, and political challenges faced by tribes of past and present.

*Jon Greendeer received an Associate Degree from UW-Marathon in 2001 and later, a Bachelors in Political Sciences from UW-Stevens Point. He spent the next 11 years working for the Ho-Chunk Nation as their Executive Officer, Grievance Review Chairperson, and Certified Mediator, having recently completed his four-year term as their President. Jon resides in Stevens Point, WI with his wife Christine Munson and daughters Brittany (22) and Rio (10). Jon is*



*an avid outdoorsman who enjoys hiking and exploring the natural world. He also spends quality time as a woodworker, musician, UAV (drone) Aerial Imagery pilot, cyclist, and laundry specialist.*

## *Plenary Session - Speaker Abstracts/Bios*

***Paul Robbins***

***Director, Nelson Institute for Environmental Studies***

Sustainable use has been suggested as a pragmatic management strategy for supporting and expanding wildlife conservation in Wisconsin and beyond. Behind this idea is a larger question: who are the constituencies for wildlife and what are their uses and views of the wild? Reviewing case research from Montana, southern Indiana, and New England, this presentation argues that sustainable use does offer a huge potential expansion of the constituency for wildlife and wild places. Only by recognizing, incorporating, and integrating the enormous and daunting diversity of users into a coherent community, however, can sustainable use make good on its promise of sustaining the wild.

*Paul Robbins is the director of the Nelson Institute for Environmental Studies at the University of Wisconsin-Madison. He is spearheading several new initiatives in educational innovation, including the establishment of a professional master's degree in Environmental Conservation. Robbins specializes in human interactions with nature and the politics of natural resource management. He has done extensive fieldwork in rural India, focusing on the politics surrounding forestry and wildlife conservation, and examining biodiversity in commercial coffee and rubber plantations. He holds a bachelor's degree in anthropology from UW-Madison and a master's degree and Ph.D. in geography, both from Clark University.*



## *Plenary Session - Speaker Abstracts/Bios*

**Keith Warnke**

**Wisconsin DNR Hunting & Shooting Sports Coordinator**

*Keith Warnke received a Bachelor's Degree in Wildlife Ecology from the UW-Madison and a Master's in Wildlife Conservation from the University of Minnesota. His first full-time job with WDNR including hunter recruitment programs during the late 1990s.*

*His past work experience includes common loon research, farmland wildlife research, legislative aide, and leading the state's upland wildlife program. He guided Wisconsin's big game program for 7 years and became the Hunting and Shooting Sports Coordinator with the Law Enforcement program in 2011.*

*His current efforts are directed toward changing the discussion surrounding hunter recruitment, retention, and reactivation (R3) to focus on outcomes rather than outputs and how the Millennial generation and growing interest in sustainable food sourcing could mitigate the impending decline in hunter numbers and extend to additional participation in outdoor recreation. The challenge will be to develop broad-scale acceptance and implementation of an approach that has shown promise for adult R3.*



## Meeting Sponsors & Exhibitors

### SILVER SPONSORSHIP LEVEL:



Tomahawk Live Trap <sup>llc.</sup>

### BRONZE SPONSORSHIP LEVEL:



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*of Wisconsin*

### Vendors / Exhibitors:

- Tomahawk Live Trap
- Natural Resources Foundation of Wisconsin
- Lake States Fire Science Consortium
- Wisconsin Wetlands Association

*Wednesday, March 2nd, 2016*  
**General Session A (Salon A):**  
**Policy, Human-Wildlife Interactions,**  
**and Research**

*Moderator: Brian Heeringa*

<b>Time</b>	<b>Title</b>	<b>Speaker</b>
3:15	Preventing Alien Invasions: Wisconsin's Invasive Species Law Updates	Amy Kretlow
3:35	Evaluating the Launch of County Deer Advisory Councils in Wisconsin	Ben Beardmore
3:55	Evaluating the Launch of the Deer Management Assistance Program in Wisconsin	Robert H. Holsman
4:15	Effects of Tourist Numbers on the Behavior of Captive Wolves	Liu Bingwan
4:35	Coyotes in Urban Areas: A Case Study	Dianne Robinson
4:55	Wildlife Conservation in the Milwaukee County Park System	Julia Robson

*Wednesday, March 2nd, 2016*  
**General Session B (Salon B):**  
**Monitoring Avian and Mammalian**  
**Populations**

*Moderator: Jason Riddle*

<b>Time</b>	<b>Title</b>	<b>Speaker</b>
3:15	Wisconsin Breeding Bird Atlas II: We Need Your Observations!	Ryan S. Brady
3:35	The Effects of Training on Inter-Observer Reliability in Camera-trap Studies of Wildlife Behavior	Jessica Jaworski
3:55	Camera and Aerial Surveys to Assess the Recovery of Semi-aquatic Mammal Populations in the St. Louis River Area of Concern	Bryn E. H. Evans
4:15	Efficacy of Combined Non-invasive Monitoring Techniques for Assessing Terrestrial Mammalian Abundance and Presence	Parker Matzinger
4:35	Two Methods of Estimating Ruffed Grouse ( <i>Bonasa umbellus</i> ) Detection Probability: PRESENCE of a	Chase Gadbois
4:55	Modeling Population Dynamics of Sandhill Cranes Using a Multi-state Open Robust Model and Simulation	Michael Wheeler

**Thursday, March 3rd, 2016**  
**General Session A (Salon A):**  
**I Just Want to Fly: Population**  
**Dynamics of Birds & Butterflies**

*Moderator: Mandy Kamps*

<b>Time</b>	<b>Title</b>	<b>Speaker</b>
9:00	Home Range and Survival of Rehabilitated Red-tailed Hawks ( <i>Buteo Jamaicensis</i> )	Jacqueline Edmunds
9:20	A Comparison of Daily Telemetry vs. Weekly Flush Count Methods for Estimating Juvenile Greater Prairie-Chicken Survival Rates	Jason Riddle
9:40	Improving Abundance Estimates and Habitat Management for Karner Blue Butterflies through Hierarchical Distance Sampling	Anna Jocham
10:00	Behavioral Determinants of Parasite Transmission in a Wild Butterfly Host	Anna Schneider

*Thursday, March 3rd, 2016*  
**General Session B (Salon B):**  
**Mammalian Population, Community,**  
**and Behavioral Ecology**

*Moderator: Carey Strobel*

<b>Time</b>	<b>Title</b>	<b>Speaker</b>
9:00	Variables Influencing Capture of Gray Squirrels in Sandhill Wildlife Area, Babcock WI	Nathan Klopmeier
9:20	Habitat Use of Snowshoe Hare ( <i>Lepus americanus</i> ) in Northern Wisconsin	Kassandra Arts
9:40	Limitations on Gray Fox ( <i>Urocyon cinereoargenteus</i> ) Scansorial Behavior	Michaela Fisher
10:00	Declining Lake Ice Predicted to Impact the Structure of Large Mammal Communities on Stockton Island in Apostle Islands National Lakeshore, USA	Emily Iehl

*Thursday, March 3rd, 2016*  
**General Session C (Salon A):**  
**Avian and Herpetofauna Nesting**  
**Ecology... Pair of Turtledoves?**

*Moderator: Mandy Kamps*

<b>Time</b>	<b>Title</b>	<b>Speaker</b>
10:40	Estimating the Time of Greater Prairie-Chicken Nest Failure	Rachel Konkle
11:00	Grazing Wisconsin's Public Lands: Opportunities, Challenges, and Research	Greta Landis
11:20	Comparing Nest-site Characteristics of Sandhill Cranes ( <i>Grus Canadensis</i> ) and a Reintroduced Population of Whooping Cranes ( <i>Grus americana</i> ) at the Necedah National Wildlife Refuge	Gina F. Giorgi
11:40	Wood Turtle Research and Conservation Strategies in Wisconsin	Carly Lapin

*Thursday, March 3rd, 2016*  
**General Session D (Salon B):**  
**Lions, Deer, and Bears, Oh My!**

*Moderator: Carey Strobel*

<b>Time</b>	<b>Title</b>	<b>Speaker</b>
10:40	Shifts in the Temporal Distribution of Prey Species and Mesopredators after the Reintroduction of Lions ( <i>Panthera leo</i> ) to Mountain Zebra National Park, South Africa	Margaret Nannenhorn
11:00	Dispersal Behavior of Yearling Male White-tailed Deer in Wisconsin	Brittany E. Peterson
11:20	Pregnancy Rates and Fat Reserves of White-tailed Deer in Wisconsin	Daniel J. Storm
11:40	Longitudinal Analysis of Reproduction and Cub Survival of Black Bears in Northern Wisconsin	Tim F. Ginnett

## *Abstracts - Wednesday General Sessions* *(alphabetical by presenter's last name)*

**Beardmore, Ben**, Robert H. Holsman, and Natalie Kaner

Wisconsin Department of Natural Resources

### **Evaluating the Launch of County Deer Advisory Councils in Wisconsin**

The process of making deer population management decisions in Wisconsin changed significantly in 2014 with the creation of County Deer Advisory Councils (CDAC). Designed to increase local input into how deer are managed, CDACs are charged with engaging stakeholders and making recommendations on 3-year population objectives and annual antlerless harvest quotas for deer management units that follow county boundaries. While it is still too early to assess what the impact of these changes will be on deer population trends, we evaluated how the new process was implemented to learn from the successes and challenges of 72 councils operating throughout the state. Overwhelmingly, CDAC members were satisfied with the way that new program was implemented, and all but a few individuals indicated that the support they received from the Department was either good or excellent. That said, many counties had difficulty recruiting qualified members to fill stakeholder seats, while representation of viewpoints other than those of deer hunters varied considerably among existing members. CDAC members also expressed their desire for greater public input and for better data concerning deer abundance, ecological and economic impacts of deer, and public opinions. Like the deer they have been established to manage, the issues affecting CDAC performance are both diverse and dynamic. We discuss ways our evaluation has implications for directing capacity-building efforts to help CDACs make sound recommendations well into the future.

**Bingwan, Liu<sup>1,2</sup>, Chen Luwen<sup>1</sup>, Li Ruonan<sup>3</sup>, and He Xiangbao<sup>3</sup>**

<sup>1</sup>College of Wildlife Resources, Northeast Forestry University, Harbin, Republic of China

<sup>2</sup>Department of Forest & Wildlife Ecology, University of Wisconsin-Madison

<sup>3</sup>Harbin Northern Forestry Zoo, Harbin, Republic of China

### **Effects of Tourist Numbers on the Behavior of Captive Wolves**

Effects of humans on the behavior of wildlife is a focal issue for ethology and tourist numbers are an important factor that affects behavior of captive wildlife in zoos. To improve welfare of captive wolves, we studied the effect of the tourist numbers on the behavior of captive wolves using group-scan-sampling before, during, and after China's National Day in Harbin's Northern Forest Zoo from September November in 2014. The proportion of active, static, conflict, and stereotyped behaviors of captive wolves differed significantly among the three periods ( $P < 0.05$ ), while the proportion of friendly and other behaviors did not ( $P > 0.05$ ). The proportion of active and friendly behaviors of captive wolves was positively associated with number of tourists significantly ( $P < 0.05$ ). The proportion of static and stereotyped behaviors was negatively associated with number of tourists significantly ( $P < 0.05$ ). Proportion of conflict and other behaviors of captive wolves was not associated with number of tourists significantly ( $P > 0.05$ ). Tourist numbers affect the behavior of the captive wolves in zoos and zoo managers could improve welfare of captive wolves by managing tourist numbers.

**Brady, Ryan**

Wisconsin Department of Natural Resources

**Wisconsin Breeding Bird Atlas II: We Need Your Observations!**

2015 marked the first year of data collection for Wisconsin Breeding Bird Atlas II – a 5-year, statewide citizen-science project that replicates the first atlas, which was conducted from 1995–2000. Atlases record bird sightings across entire states to provide key information on bird distribution and abundance to aid conservation planning. In our first year, we engaged over 700 observers, who submitted over 24,000 checklists, documenting over 1.7 million birds of 229 species. However, being a statewide project, there are still plenty of gaps to be filled. Bird observations are submitted online via an easy and intuitive custom Atlas portal to eBird. Although many observations are coming from seasoned birders, Wildlifers can make important contributions to the atlas by reporting observations of breeding birds across Wisconsin from 2015–2019. Osprey on a nest? Turkey with poults? Robin nesting in your yard? It’s easy to submit your observations and help us help Wisconsin’s birds. Visit [wsobirds.org/atlas](http://wsobirds.org/atlas) to sign up and learn more.

**Evans, Bryn E.H.**<sup>1</sup>, Shawn M. Crimmins<sup>1,2</sup>, Timothy R. Van Deelen<sup>1</sup>, and Nathan M. Roberts<sup>2</sup>

<sup>1</sup>Department of Forest & Wildlife Ecology, University of Wisconsin-Madison

<sup>2</sup>Wisconsin Department of Natural Resources

## **Camera and Aerial Surveys to Assess the Recovery of Semi-aquatic Mammal Populations in the St. Louis River Area of Concern**

The St. Louis River Estuary was designated as an Area of Concern in 1987, and loss of fish and wildlife habitat and degradation of fish and wildlife populations were highlighted as features requiring remediation. Multiple projects have been conducted since then to improve habitat quality, and our study is assessing the response of semi-aquatic mammals to restoration within the AOC.

Data collection began in November 2014, focusing on the occurrence of four species that are dependent on aquatic ecosystems: river otter (*Lontra canadensis*), beaver (*Castor canadensis*), mink (*Neovison vison*), and muskrat (*Ondatra zibethicus*). Using a combination of motion triggered cameras and aerial surveys, we are quantifying populations throughout the estuary as well as in two unimpaired reference sites: Boulder Lake Reservoir in northeastern Minnesota and the St. Croix River near Danbury in northwestern Wisconsin. The data are analyzed in an occupancy modeling framework to assess differences in abundance between the estuary and unimpaired sites and determine habitat relationships for these species.

Preliminary data analysis indicates species recovery is occurring in the AOC, and as of fall 2015 data collection is ongoing both via trail cameras and aerial surveys. We are also in the process of obtaining tissue samples to test for residual impact of heavy metal contamination. Our final synthesis will focus on any remaining barriers to full recovery, as well as provide a means of validating current aerial survey methods for semi-aquatic mammals in this region by comparing those results to the intensive field monitoring.

**Gadbois, Chase\***, Michelle Murawski\*, James Hansen\*, Bryn M. Webber\*, and Jason Riddle

University of Wisconsin-Stevens Point, College of Natural Resources

\*Undergraduate

**Two Methods of Estimating Ruffed Grouse (*Bonasa umbellus*) Detection Probability: PRESENCE of a Discrepancy**

Drumming surveys are commonly used by managers as a method of monitoring ruffed grouse (*Bonasa umbellus*) abundance, however detection probability is rarely accounted for. We conducted drumming surveys for ruffed grouse during the past two springs at the University of Wisconsin - Stevens Point's Treehaven property near Tomahawk, WI. For the first year, each point count consisted of four 2.5-minute intervals for a total of ten minutes, and each point was visited three times during the peak drumming season. To determine the probability of detection during our surveys, we compared two methods. Program MARK was used to analyze detection from individual grouse on separate survey days, and program Presence allowed us to analyze repeated visits, in which the number of grouse heard at each point is used as the frame of detection. These two methods of analysis used similar model sets, including environmental and time-based variables. In our results we found the chance of hearing the grouse if they are on their log is 98.1%, but if you include the chance they are off their logs the chance of detection goes down to 35.7%. Based off the results from our first year, we made changes to our survey methods. These changes included using three 2.5-minute intervals for a total of seven and a half minutes at each survey point, surveying a larger area, greater accuracy in environmental measurements, greater distance between points, and surveying for more days. Then we compared the results of both years with chance of detection and their top models.

**Holsman, Robert H.**, Ben Beardmore, and Robert Nack

Wisconsin Department of Natural Resources

## **Evaluating the Launch of the Deer Management Assistance Program in Wisconsin**

Wisconsin developed and implemented a Deer Management Assistance Program (DMAP) in 2014 following a recommendation in the 2012 Deer Trustee Report. DMAP was presented as way to improve habitat for deer and other wildlife and to build trust and credibility with deer hunters and landowners through increased interaction and cooperation with agency biologists and foresters. Currently, 20 state agencies utilize some type of DMAP as an outreach tool for private land conservation and deer herd control efforts. This presentation will highlight Wisconsin's experience with developing and implementing DMAP over the first two years of the program. To date, over 700 landowners and approximately 90,000 acres have been enrolled in the program. The program emphasizes forest management and harvest strategies that strike an appropriate balance between deer herd size and sustainable habitat. We developed an evaluation framework to measure the influence of program interventions on participant attitudes about habitat carrying capacity as well as on agency credibility. Baseline survey results indicate that most participants entering the program believe their properties are below carrying capacity and that local deer impacts are minor. Initial program enrollees entered with positive attitudes toward the WDNR. Enrollees in the first year of the program expressed very positive experiences. We conclude by sharing lessons learned from the initial implementation of the program.

**Jaworski, Jessica\***<sup>1</sup>, Shelli Dubay<sup>1</sup>, and Brad Strobel<sup>2</sup>

<sup>1</sup>College of Natural Resources, University of Wisconsin-Stevens Point

<sup>2</sup>Necedah National Wildlife Refuge, Wisconsin

\*Graduate student

### **The Effects of Training on Inter-Observer Reliability in Camera-trap Studies of Wildlife Behavior**

Wildlife biologists have used camera traps to study a variety of taxa including birds, ungulates, and carnivores. Data from camera traps have been used to study various aspects of wildlife ecology such as: population abundance, habitat use, activity patterns, and behavior. According to a Web of Science search, more than 650,000 studies including camera traps have been published since 1994 with a substantial increase occurring after 2006. Although camera traps easily collect photos, reviewing the photos to extract data can be time consuming and require multiple individuals. When multiple observers are used to assign animal behavior definitions to photos, observer bias and inter-observer reliability should be considered. We explored several factors that may influence the reliability of observers identifying distinct behaviors of nesting cranes, including the type of behavior, species being observed, and the training level of the observer. Our data indicate that training increases inter-observer reliability. However, the positive effects of training were only recognized when more specific behaviors were being classified. Continued research is needed to examine how training and levels of behavior may influence consistency of observer-to-observer response across multiple individuals.

**Kretlow, Amy** and Dreux J. Watermolen

Wisconsin Department of Natural Resources

### **Preventing Alien Invasions: Wisconsin's Invasive Species Law Updates**

The State of Wisconsin revised its invasive species identification, classification, and control rule (chapter NR 40, Wis. Admin. Code) in 2015, following a three-year effort that involved numerous stakeholders and affected industries. First enacted in 2009, the law seeks to prevent ecological and economic impacts associated with invasive species by prohibiting and restricting the introduction, possession, transfer, and transport of certain plants and animals. The intent is to provide a comprehensive, science-based system that prevents invasive species from becoming established in Wisconsin and prevents already-established species from spreading within the state. Significant changes to the law include: delisting two species, listing 49 new prohibited and 32 new restricted species, split-listing (prohibited/restricted) two species, changing the regulated status of five species, and creating a phase-out period for restricted plants to minimize impacts to the nursery industry and facilitate compliance. Other changes clarify rule language and streamline implementation. The Department of Natural Resources can authorize transport, possession, and transfer of regulated species through permits in certain situations. A summary of permitting activity under the law will be provided. The law also requires certain preventative measures. The wildlife management community can help implement this law in a variety of ways. What one needs to do varies depending on the type of work and activities. Resources for complying with ch. NR 40 will be provided.

**Matzinger, Parker\***<sup>1</sup>, Erik Olson<sup>1</sup>, and Guido Saborio<sup>2</sup>

<sup>1</sup>Northland College, Natural Resources Lab

<sup>2</sup>Sistema Nacional de Areas de Conservacion

\*Undergraduate

### **Efficacy of Combined Non-invasive Monitoring Techniques for Assessing Terrestrial Mammalian Abundance and Presence**

What is the most efficient and effective way to assess abundance and presence of terrestrial wildlife in the field? Non-invasive monitoring devices are crucial for assessing wildlife since they can collect valuable data while minimizing field time and human collection bias. Combining multiple non-invasive monitoring techniques may increase the accuracy and effectiveness of animal inventories compared to a single technique. We investigated the efficacy of various combinations of distance surveys and camera trap survey efforts for assessing mammal abundance and presence in Corcovado National Park, Costa Rica – arguably the most densely biodiverse place on earth. From March 1st through May 5th in 2015, twenty-one trail cameras were placed in paired or unpaired camera stations spaced between 1.6 and 3.4 kilometers apart. Camera stations were separated into two arrays with 10 or 11 camera stations each with an average of 28 days per camera. We recorded direct and indirect (track and scat) observations for roughly 470 kilometers. We summarized camera trap data into events, determined species richness per camera station, and estimated abundance per trap night. We calculated tracks per kilometer for wildlife species to allow comparison with previous observational data collected by Sistema Nacional de Areas de Conservacion and Carrillo et al. 2008. Distance software was used to estimate wildlife abundance from observational data. Initial results indicate that camera data detected 12 species while distance surveys detected 21 species (24 total species detected). Preliminary analysis suggests that both surveys combined resulted in a more complete survey though abundance varied between surveys.

**Robinson, Dianne**

Wisconsin Department of Natural Resources

**Coyotes in Urban Areas: A Case Study**

In recent years, urban wildlife managers have seen an increase in the presence of coyotes in our urban areas, resulting in an increased interest from citizens due to more common coyote sightings and coyote interactions with pets and people. Within Milwaukee County over the last year, we have seen an awareness of coyote presence and interactions between coyotes and people on the rise, with a range of management strategies developed as a result. As wildlife managers, there is a balance we hope to achieve in urban coyote management that incorporates viewpoints from all stakeholders while also integrating a balanced ecological system within our urban areas. I will briefly recount the urban history of coyotes on a national and local scale, and discuss the ongoing efforts and the variety of strategies established within Milwaukee County to manage our urban coyotes.

**Robson, Julia** and Brian Russart

Milwaukee County Department of Parks, Recreation and Culture

### **Wildlife Conservation in the Milwaukee County Park System**

The Milwaukee County Parks Natural Areas Program is a creative use of partnerships that engages Wisconsin's largest community through the science and beauty of restoration ecology. In just seven years this newly reborn Natural Areas Program has developed over 75 community partnerships and has trained 10,500 volunteers. These volunteers, who have donated nearly 92,000 hours, consist of university students, elementary school students, community groups, government agencies, NGOs, religious institutions, and private corporations. Natural resource surveys of plants and wildlife, conducted by Milwaukee County Parks Natural Areas staff and citizen scientists, within the Park System's natural areas continue to provide the Parks Department with essential information for making management decisions. To date, surveys have shown 698 species of plants, 17 species of reptiles and amphibians, 7 species of crayfish, 27 species of mammals, and 281 species of birds (migratory and breeding) using the Park System's valuable natural areas! Join us for a discussion on the methods behind implementing a successful urban wildlife monitoring program, the exciting and unique results thus far, and the implications for habitat conservation and management.

**Wheeler, Michael\***<sup>1</sup>, Tim Van Deelen<sup>2</sup>, Jeb Barzen<sup>3</sup>, and Shawn Crimmins<sup>2</sup>

<sup>1</sup>University of Wisconsin-Madison, Nelson Institute for Environmental Studies

<sup>2</sup>University of Wisconsin-Madison, Department of Forest & Wildlife Ecology

<sup>3</sup>International Crane Foundation

\*Graduate student

## **Modeling Population Dynamics of Sandhill Cranes Using a Multi-state Open Robust Model and Simulation**

Long-term trends in Midwestern sandhill crane populations indicate positive growth despite much yearly variability, and continued monitoring will be required for effective management. This study is being conducted to explore relationships between life-history stage and recruitment in sandhill crane populations. Since 1990, the International Crane Foundation (Baraboo, Wisconsin) has collected long-term re-sightings data on territorial and non-territorial sandhill cranes in southcentral Wisconsin. We used these data in a multi-state open robust model to estimate survival and state-transition probabilities of different demographic groups. Primary sessions were on an annual basis, and secondary sessions were monthly. State variables were Territorial and Non-territorial, and classifying birds in either category was based on behaviors observed during re-sightings. Preliminary results suggest that survival of territorial adults and their continued tenure on territory have appreciable effects on growth rate – hence availability of suitable territories may regulate growth rates. Consequently, management of crane populations in the Midwest may depend on creating habitats that support territory establishment.

If Wisconsin's proposed sandhill crane hunt moves forward, monitoring recruitment will be an integral part of setting sustainable harvest targets. Whether the hunt moves forward, the information from these models is still relevant and transferable. Many aspects of sandhill crane biology are shared with the other 14 crane species, many of which are threatened or endangered. The model's information regarding territoriality dynamics could also be applied to other long-lived, territorial species such as swans and geese; this last premise is even more applicable to management of game species.

## ***Abstracts - Thursday General Sessions*** ***(alphabetical by speaker's last name)***

**Arts, Cassandra\***, Matthew Kraus\*, Jamie Goethlich\*, Shaun McCabe\*, and Erik R. Olson

Northland College - Natural Resources

\*Undergraduate

### **Habitat Use of Snowshoe Hare (*Lepus americanus*) in Northern Wisconsin**

Snowshoe hare (*Lepus americanus*) abundance appears to have declined in Wisconsin over the last 2 years. Researchers have also suggested snowshoe hare distribution has contracted along the southern edge of its range. As part of a long-term mortality study we assessed snowshoe hare habitat use in northern Wisconsin to better identify habitats where snowshoe hare continue to survive and utilize. We used live-trap success and radio telemetry data to assess snowshoe hare habitat. We utilized 30 Tomahawk live-traps on Northland College's Maxwell Property. We compared habitat characteristics between successful trap sites and telemetry locations with unsuccessful trap sites using logistic regression. We present the preliminary results of this research and explore the implications our findings have for the successful conservation of the species.

Edmunds, Jacqueline\*<sub>1</sub> and Mark Berres<sub>2</sub>

<sub>1</sub>University of Wisconsin-Madison, Nelson Institute for Environmental Studies

<sub>2</sub>University of Wisconsin-Madison, Department of Animal Sciences

\*Graduate student

### **Home Range and Survival of Rehabilitated Red-tailed Hawks (*Buteo jamaicensis*)**

Wildlife rehabilitation is the practice of providing responsible care for sick, injured, or orphaned wild animals so that they may be released into the environment as healthy and successful individuals. Post-release research regarding survival rates, survivorship based on select veterinary procedures, cost-benefit analysis, and changes in migration or breeding behavior is inadequate, yet this data is crucial to assessing the utility of wildlife rehabilitation. Therefore, it is of significant interest to study the long-term effects of rehabilitative practices through mark-recapture to determine if the outcome of rehabilitation efforts is meaningful.

Red-tailed Hawks are good scientific models to assess wildlife rehabilitation efforts because of their broad-scale geographic range, large population size, and ample banding data stored by the United States Geological Service Bird Banding Laboratory (BBL). Band recoveries of deceased 6,225 wild-caught and 1,138 rehabilitated Red-tailed Hawks from BBL were used in a comprehensive mark-recapture analysis to determine if survival rates of rehabilitated Red-tailed Hawks were significantly different from those in natural populations. Deceased band recoveries were reported between 1974 – 2013, and apparent survival rates were estimated by the Seber (1970) deceased recovery model in program MARK.

Preliminary results suggest that annual survival rates of rehabilitated Red-tailed Hawks is significantly lower than those that are wild-caught and banded. Furthermore, age-related estimates suggest that juvenile rehabilitated Red-tailed Hawk survival is significantly less than those of rehabilitated adults. This information can be used as a decisive measurement of rehabilitative success and is necessary towards future management decisions in the field of wildlife rehabilitation.

Fisher, Michaela\*, Kara Winter\*, Jamie L. Goethlich\*, and Erik R. Olson

Northland College

\*Undergraduate

### **Limitations on Gray Fox (*Urocyon cinereoargenteus*) Scansorial Behavior**

Gray foxes (*Urocyon cinereoargenteus*) are one of two known canid species that possess climbing abilities. The reason as to why gray fox climb has been suggested to include prey capture, predator avoidance, and denning. However, very few studies have attempted to quantify gray fox scansorial behavior. In the fall of 2014, we initiated a study to quantify the limitations of gray fox climbing ability. Using baited trail cameras and optimal foraging theory, we documented gray fox scansorial behavior and are now attempting to describe the limitations of gray fox climbing ability. We collected data from over twenty study sites using arboreal and terrestrial camera traps in Northern Wisconsin. We compared site characteristics where gray fox climbed to sites where gray fox did not climb, using a multi-step decision tree to standardize decision-making. We assessed the effects of tree diameter, height of bait, tree species, tree limb structure, and bark texture on gray fox climbing ability. Preliminary analysis suggests that gray foxes can climb trees that are both clean bowled and densely limbed. Gray fox have climbed trees ranging from 14 to 33.5 cm in diameter, and have climbed upwards of 5 m. We plan to assess individual fox climbing abilities and to incorporate morphological measurements of individual fox to describe limitations relative to morphology (e.g., front limb length to tree diameter ratio). Understanding the parameters of gray fox scansorial behavior can help us better understand this common yet elusive species.

**Ginnett, Tim F.**<sub>1</sub>, Cheyenne J. Yates\*<sub>1</sub>, and Kate D. M. Schindler<sub>2</sub>

<sub>1</sub>University of Wisconsin-Stevens Point, College of Natural Resources

<sub>2</sub>Tetra Tech EM Inc.

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### **Longitudinal Analysis of Reproduction and Cub Survival of Black Bears in Northern Wisconsin**

Between 1989 and 2014, 116 female black bears (*Ursus americanus*) were radio-collared and monitored in the Chequamegon-Nicolet National Forest, Wisconsin. Data from this 25-year period were used to estimate reproductive parameters for female black bears in northern Wisconsin. A relatively low mean age of first reproduction (4.36 years), high mean litter size (2.51 cubs per female), and low inter-birth interval (2 years) are likely indicative of high resource availability in the study area. Mean litter size was consistent with past estimates from northern Wisconsin, increases with the age of the female, and appears to be increasing over time. The sex ratio of 238 cubs from 95 litters was 1.11M:1F and did not differ significantly from 1:1. Average cub survival rate was 0.79 and did not differ between sexes. Cub survival rates have decreased in recent years and were significantly higher for bears on private land than on public land. Reproductive parameter estimates from this study will be useful to more effectively manage the black bear population in northern Wisconsin.

**Giorgi, Gina F.** and Bradley N. Strobel

Necedah National Wildlife Refuge, Wisconsin

**Comparing Nest-site Characteristics of Sandhill Cranes (*Grus Canadensis*) and a Reintroduced Population of Whooping Cranes (*Grus americana*) at the Necedah National Wildlife Refuge**

In 2001, the U. S. Fish and Wildlife Service, along with their partners, began to establish the eastern migratory population (EMP) of whooping cranes which breed on and around the Necedah National Wildlife Refuge. Unfortunately, the EMP has been hampered by extremely low reproductive success and is not yet self-sustaining. Some hypotheses suggest the factor limiting their reproduction is EMP-centric (e.g., nesting inexperience, behavioral deficiencies) and others suggest the problem is site-centric (e.g., local abundance of predators or biting insects). If the factor limiting the reproduction of the EMP is site-centric, it may also be affecting the reproduction of sandhill cranes nesting on Necedah NWR. To determine the extent of overlap, we measured characteristics around 21 whooping crane nests, 35 sandhill crane nests and 164 associated random sites during the 2015 breeding season. We modeled the within-territory nest-site selection patterns using generalized mixed-effects logistic regression. The best-supported model suggested that water depth was important to the nest site selection of both crane species. Notably, models that included “species” as a factor had 63% lower weight of evidence than models without “species.” We did not find evidence of species-specific nest-site selection patterns. Further research will be needed to determine the specific causes of the EMP’s low reproductive success. However, if the limiting factor is only influenced by nest-site characteristics, whooping cranes and sandhill cranes should be equally affected.

**Ielh, Emily\***<sup>1</sup>, Shawn Crimmins<sup>1</sup>, Timothy Van Deelen<sup>1</sup>, Regan Dohm\*<sup>1</sup>, Bryn Evans\*<sup>1</sup>, Marcus Mueller\*<sup>1</sup>, Brittany Peterson\*<sup>1</sup>, Michael Wheeler\*<sup>1</sup>, Julie Van Stappen<sup>2</sup>, Erik Olson<sup>3</sup>, Travis Bartnick<sup>4</sup>, and Kenneth Pemble<sup>2</sup>

<sup>1</sup>University of Wisconsin-Madison

<sup>2</sup>National Park Service

<sup>3</sup>Northland College

<sup>4</sup>Great Lakes Indian Fish and Wildlife Commission

\*Graduate student

## **Declining Lake Ice Predicted to Impact the Structure of Large Mammal Communities on Stockton Island in Apostle Islands National Lakeshore, USA**

Mammals move between islands within archipelagos by swimming long distances or crossing ice bridges in winter. Declines in the formation of ice on Lake Superior foreshadow changes in the population dynamics of species inhabiting the Great Lake's island archipelagos. While Isle Royale presents a classic model of predator-prey island biogeography theory, few other studies examine the effects of climate change on communities of large mammals in the upper Great Lakes region. This study presents preliminary data on the large mammalian carnivore populations on Stockton Island in the Apostle Islands National Lakeshore. We deployed camera traps for nine months to inventory the mammal species on Stockton Island. These data shed light on the structure of communities present in the archipelago and how they may be affected by decreasing ice cover in the near future.

Jocham, Anna\*<sub>1</sub> and Bradley N. Strobel<sub>2</sub>

<sub>1</sub>Viterbo University

<sub>2</sub>Necedah National Wildlife Refuge, Wisconsin

\*Undergraduate

## **Improving Abundance Estimates and Habitat Management for Karner Blue Butterflies through Hierarchical Distance Sampling**

The Karner blue butterfly (*Lycaeides melissa samuelis*) is a Federally endangered species. The species occupies remnant savanna/barrens vegetation communities and other open landscapes, such as rights-of-ways, airports, and military bases. Wild lupine (*Lupinus perennis*) is the obligate host plant for Karner blue butterfly larvae and therefore Karner abundance appears to correlate strongly with habitat vegetation community. Understanding the relationship between Karner blue butterflies and their habitat is important to managing and monitoring them. Despite recent statistical advances, no studies have directly incorporated habitat metrics into population abundance estimates for Karner blue butterflies. We collected Karner blue butterfly abundance data during the summers of 2014 and 2015. We used hierarchical distance sampling to simultaneously identify (1) factors influencing the probability of detection and (2) those influencing the abundance of a species. We found hierarchical distance sampling and LiDAR-based habitat data improved the rigor of Karner blue butterfly population estimates and provided information valuable for habitat management and restoration decisions.

**Klopmeier, Nathan\***, Shaylee Church\*, and Shelli Dubay

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### **Variables Influencing Capture of Gray Squirrels in Sandhill Wildlife Area, Babcock WI**

The eastern gray squirrel (*Sciurus carolinensis*) is an important game species in many states. In Wisconsin, the hunting season for eastern gray squirrels is open between mid-September and late January. Since 2002, long term research in Sandhill Wildlife Area, Babcock, Wisconsin, has been focused on collecting data pertaining to the live capture of eastern gray squirrels. Data have included individual squirrel information such as sex, age, weight, trap number, and trapping instance such as open bait absent, tripped bait present, tripped bait absent, and captures of non-target species. General information such as trap times, cloud cover, precipitation events, wind speed and temperature were also recorded. We live trap squirrels during the winter months from late January through March, until the snow melts. Traps are open between the temperature ranges of 0 F and about 35 F to reduce the risk of snow melting on a squirrel, putting it at risk for hypothermia. We used logistic regression to determine if gray squirrel captures are correlated with any of our recorded environmental factors. If we identify a certain environmental factor where most squirrels are trapped, we may be able to optimize capture success by trapping during a more narrow range of conditions. Additionally, squirrel hunters might optimize success by hunting during conditions when squirrels are more active.

**Konkle, Rachel\***<sup>1</sup>, Matthew Broadway\*\*<sup>1</sup>, Jason Riddle<sup>1</sup>, Scott Hull<sup>2</sup>, Michael Hardy\*\*<sup>3</sup>, and Benjamin Zuckerberg<sup>3</sup>

<sup>1</sup>University of Wisconsin-Stevens Point, College of Natural Resources

<sup>2</sup>Wisconsin Department of Natural Resources

<sup>3</sup>University of Wisconsin-Madison, Department of Forest & Wildlife Ecology

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### **Estimating the Time of Greater Prairie-chicken Nest Failure**

Nest failure can be an important limiting factor for avian populations. As such, understanding the reasons for nest failure is critical. Predators are a common cause of nest failure, but identifying depredating species, or even taxa, may require expensive camera sets near nests to photograph or video depredation events. Recent research suggests that the timing of nest failure may be an indicator of the depredator. For example, birds often depredate nests during daylight hours, whereas mammals may depredate nests during crepuscular and nighttime hours. We used paired Thermochron iButtons® in Greater Prairie-chicken nest bowls and ambient locations to determine the time of nest failure for 32 nests in the Buena Vista and Paul Olson Wildlife Areas of Portage and Wood County, Wisconsin, in the summers of 2014 and 2015. We then used a uniform, circular statistical distribution to estimate basic descriptive statistics of the temporal ecology of these nests. Specifically, the average time of failure was 1:14 a.m. with a 95% CI of 10:54 p.m.-2:34 a.m. Indeed, 72% of failures occurred during the crepuscular and nighttime hours.

**Landis, Greta**, Sam Asper, Jacob Grace, and Courtney Robinson

Graduate students, University of Wisconsin-Madison, College of Agriculture and Life Sciences, Agroecology Program

**Grazing Wisconsin’s Public Lands: Opportunities, Challenges, and Research**

Using managed intensive rotational grazing as a management tool on Wisconsin’s public grasslands has potential for both ecological and economic opportunities, but the specific social and environmental effects are still largely unknown. Our research group at the University of Wisconsin-Madison is currently working with local land managers and cattle graziers to explore these unknowns. 2015 was the first year of a five-year project, spent “scoping” out the interest and proposed wildlife and natural areas with potential for grazing management. We would like to present our research plans for the coming season and solicit feedback as we explore both the biophysical and social characteristics of lands with potential for grazing, including vegetation and wildlife impact, infrastructure and producer costs, conservation goals and concerns, and general components of successful grazing partnerships on public land.

**Lapin, Carly**, Jim Woodford, Tiffany Bougie, and Laura Jaskiewicz

Wisconsin Department of Natural Resources

### **Wood Turtle Research and Conservation Strategies in Wisconsin**

The Wood Turtle (*Glyptemys insculpta*) is a state-listed threatened species in Wisconsin. We investigated species ecology and conservation strategies in the upper St. Croix and Wisconsin river watersheds in northern Wisconsin. In 2014 and 2015 we captured and processed 99 wood turtles, 32 of which were located 2-3 times per week using radio telemetry and 13 of which were located more frequently using GPS technology to identify nest sites, movement patterns, and road crossing locations. We identified 69 wood turtle nests, 36 of which were protected using several different methods. Of the 69 nests, 13 (19%) did not hatch (all but 1 in 2014), 21 (30%) were predated, 30 (43%) successfully hatched, and 5 (7%) had an unknown outcome. Over the course of the study, we counted over 250 hatchling wood turtles successfully leaving the nest. Between the 2 study locations, a total of 9 nest sites were created or restored above flood stage, 3 of which were protected from predation with electric fencing; in 2015, 4 of these sites were used voluntarily by nesting wood turtles. In addition, we identified 11 locations where wood turtles were frequently crossing roads and at risk for road mortality, and we installed barriers to prevent road access as well as signage to attempt to reduce the risk of road mortality at several of these sites. We will provide preliminary project results, including population estimates, survival, nest success and hatching rates, and home range analysis, as well as feedback on several different conservation strategies.

**Nannenhorn, Margaret\***, Emma Doden\*, and Eric Anderson

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**Shifts in the Temporal Distribution of Prey Species and Mesopredators after the Reintroduction of Lions (*Panthera leo*) to Mountain Zebra National Park, South Africa**

Predators often influence the behavior of their prey. In April 2013 after being absent for more than 50 years, the Mountain Zebra National Park, South Africa reintroduced two male lions (*Panthera leo*) to increase the biodiversity of the park and draw in more tourists. Previously it was determined that the reintroduction of lions did not alter the distribution of prey species throughout the park. The purpose of this study was to determine whether the reintroduction of lions resulted in a shift in the diurnal and nocturnal activity levels of both ungulate species and other predators. In January of 2013, just prior to the release of the lions, and again in January of 2015, wildlife students from the University of Wisconsin-Stevens Point conducted research in Mountain Zebra National Park using camera traps. Sixteen trail cameras were set in a 4x4 grid formation for 6 days on both trips. Each trail camera was placed near the center of its respective 4 km<sup>2</sup> grid cell in an area likely to capture animal movements, such as along game trails, dirt roads, or drainages. Species richness and the number of events per species (defined as photos of a species <30 minutes apart) were separated by diurnal and nocturnal camera detections for both sets of data. We conducted Chi-Square Tests of Independence to compare the temporal distribution of each prey species and other predators over the years. We will discuss the behavioral impacts of our results on predator-prey relationships and on tourism within the park.

**Peterson, Brittany E.\*<sub>1</sub>**, Daniel J. Storm<sub>2</sub>, and Timothy R. Van Deelen<sub>1</sub>

<sub>1</sub>University of Wisconsin-Madison, Department of Forest & Wildlife Ecology

<sub>2</sub>Wisconsin Department of Natural Resources

\*Graduate student

### **Dispersal Behavior of Yearling White-tailed Deer in Wisconsin**

Dispersal facilitates and influences many ecological processes such as disease spread, range expansion, population dynamics, and gene flow. For intensively managed wildlife populations, like Wisconsin's white-tailed deer (*Odocoileus virginianus*), understanding dispersal behavior is important for effective management. To better understand factors that influence variation in dispersal, our research occurred during 2011-2014 on 2 study areas representing the east-central (privatized farmland) and northern (forested public land) regions of Wisconsin. We evaluated weekly locations from radio-collared yearling males and found that dispersal rates for the east-central study area (n=176) consistently fell around 55%; however, dispersal rates in the northern site (n=137) revealed high annual variation (28-58%). Assessing the influence of individual quality, landscape context, winter severity, and wolf presence on dispersal probability, distance, and direction is underway. Better information regarding the factors shaping variation in dispersal would improve metapopulation maintenance and enable biologists and property managers to make informed decisions about management goals.

Riddle, Jason<sub>1</sub>, Matthew Broadway\*<sub>1</sub>, and Scott Hull<sub>2</sub>

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### **A Comparison of Daily Telemetry vs. Weekly Flush Count Methods for Estimating Juvenile Greater Prairie-chicken Survival Rates**

Wildlife populations are often limited by the survival rates of juveniles. Juvenile survival rates have been shown to be a limiting factor for Greater Prairie-chickens (GPCH) in central Wisconsin. Juvenile survival rates may be estimated by a variety of techniques. Here, we consider two techniques during a period of overlapping data collection: 1) daily encounters with radio-collared individuals (day 45-70), and 2) weekly flush counts (day 29-70). In the context of our study, individual chicks had to be captured and uniquely fitted with a mortality signal-enabled radio-collars. In contrast, weekly flush counts only required that the hen be fitted with a radio-collar to aid in brood location. Daily locations of individual radio-collared juveniles produced a daily survival estimate of 0.979 (95% CI = 0.956-0.99), which translates to a weekly survival rate of 0.860 (95% CI = 0.730-0.931). Weekly flush counts produced a weekly survival estimate of 0.851 (95% CI = 0.799-0.892). Both techniques produced similar weekly survival estimates, but weekly flush counts were more precise with less effort. We suggest that future survival studies on GPCH consider the easier, more precise method of flush counts.

**Schneider, Anna\***<sup>1</sup>, Ania Majewska<sup>2</sup>, Sonia Altizer<sup>2</sup>, and Richard Hall<sup>2</sup>

<sup>1</sup>University of Wisconsin-Stevens Point, College of Natural Resources

<sup>2</sup>University of Georgia, Odum School of Ecology

\*Undergraduate

## **Behavioral Determinants of Parasite Transmission in a Wild Butterfly Host**

Host behavior can influence infectious disease transmission by determining the frequency at which hosts encounter pathogens. Infection itself can alter host behaviors thereby influencing transmission. Monarch butterflies (*Danaus plexippus*) suffer from a debilitating protozoan parasite, *Ophryocystis elektroscirrha* (OE), which is transmitted when adults shed spores on milkweed (*Asclepias* spp.) leaves while nectaring or ovipositing; these spores are subsequently consumed by caterpillars, causing infection. Low-level spore transfer may also occur between adults through mating and other contacts. Here, we quantified monarch behavior to better estimate OE transmission rates using a combination of field observation and mathematical models. To investigate whether sex and infection status altered activity budgets of wild adult monarchs, we conducted behavioral observations and recorded their milkweed visitation rates, in the butterfly gardens at the Wormsloe Historic Site in Savannah, GA. To examine the role of spore transfer between infected and healthy adults through mating, we modified an existing differential equation model of monarch-OE dynamics to include adults contaminated with OE spores. We found that sex, but not infection status, explained variation in activity budgets. Milkweed visitation rates varied by time of day, and were higher than previously thought; these data provide the first field estimates of parasite spore deposition rates in monarchs. Depending on the duration of contamination and the probability of shedding spores onto milkweed, the model predicted late-season OE prevalence between 16.5 and 78.6%, consistent with the wide range of OE prevalence recorded in US monarchs. Thus, high milkweed visitation rates and spore transfer between adults may explain extremely high OE prevalence in some monarch populations.

**Storm, Daniel J.**

Wisconsin Department of Natural Resources

### **Pregnancy Rates and Fat Reserves of White-tailed Deer in Wisconsin**

Habitat productivity, climate, and interspecific competition influence reproduction and non-harvest survival largely through their effects on energy balance. Energy balance is reflected in body condition, including fat reserves. For this reason, monitoring fat reserves can inform managers on habitat conditions and population size relative to carrying capacity. We used a variety of indices to assess fat reserves of over 1,000 car-killed white-tailed deer during early springs of 2014 and 2015 across the state of Wisconsin. Additionally, we assessed pregnancy and litter size for ~650 female deer. Using remotely-sensed landcover and weather data, we investigated the interacting influence of habitat and weather on fat reserves of deer. We found strong regional variation in fat indices; deer in farmland regions in central and southern Wisconsin had much greater fat reserves than deer in the forested regions in central and northern Wisconsin. Juvenile deer (deer experiencing their 1st winter) consistently had lower fat reserves than adult deer, and approximately 40% of juvenile deer in the northern forest region had apparently exhausted their fat reserves. Winter severity was strongly and negatively related to fat indices while habitat measures had complex relationships with fat indices. Pregnancy rates of adult deer were consistently >90%, statewide. Pregnancy rates of juveniles were highest in the central farmland region (~20%), and notably, were approximately equal in the southern farmland region and northern forest region (~8). Our results clarify how habitat and weather shape spatial variation in population performance in white-tailed deer.

## *Notes*

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## Contact Hours

Attendance at the 2016 WCTWS Winter Meeting can count toward TWS's Professional Development Certificate and/or the Certified Wildlife Biologist Renewal Program.

The following contact hours have been calculated and approved by TWS.

### Wednesday:

Plenary session:	2.5 hours
General session A or B:	3 hours
Business meeting:	1.5 hours

### Thursday:

General Session A or B:	3 hours
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**Maximum total hours for both days: 10 hours**



