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16TH ANNUAL MIDWEST BAT WORKING GROUP MEETING, 2024

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Meeting Hosts

Joseph Johnson, University of Cincinnati
Sarah Stankavich, Bat Conservation International

Meeting Planning Committee

Shane Brodnick, Jeff Brown, Jason Duffey, Jocelyn Karsk, Joe Kath, Bill Leopold, Keith Lott, Adam Mann, Tammy O'Neil, Jo Thompson, Marne Titchenell, Lisa Walker, Jen Woronecki-Elis

Program Overview

Wednesday, April 3rd

8:00 am	Registration opens (Pavilion Foyer, 4th floor)
9:30–10:45 am	Speed Networking event (Pavilion Ballroom, 4th floor)
11:15 am	Welcome (Pavilion Ballroom, 4th floor)
11:30 am	State updates (Pavilion Ballroom, 4th floor)
12:30 pm	Lunch on your own (Pavilion Ballroom, 4th floor)
1:30 pm	Plenary session (Pavilion Ballroom, 4th floor)
2:45 pm	Break (Pavilion Foyer, 4th floor)
3:15 pm	Oral presentation session 1 (Pavilion Ballroom, 4th floor)
5:00 pm	Group photo (Pavilion Ballroom, 4th floor)
6:00–8:00 pm	Poster session and silent auction (Continental Ballroom, Mezzanine)
8:30 pm	Student social, sponsored by SWCA (Urban Axe, 210 Elm St.)

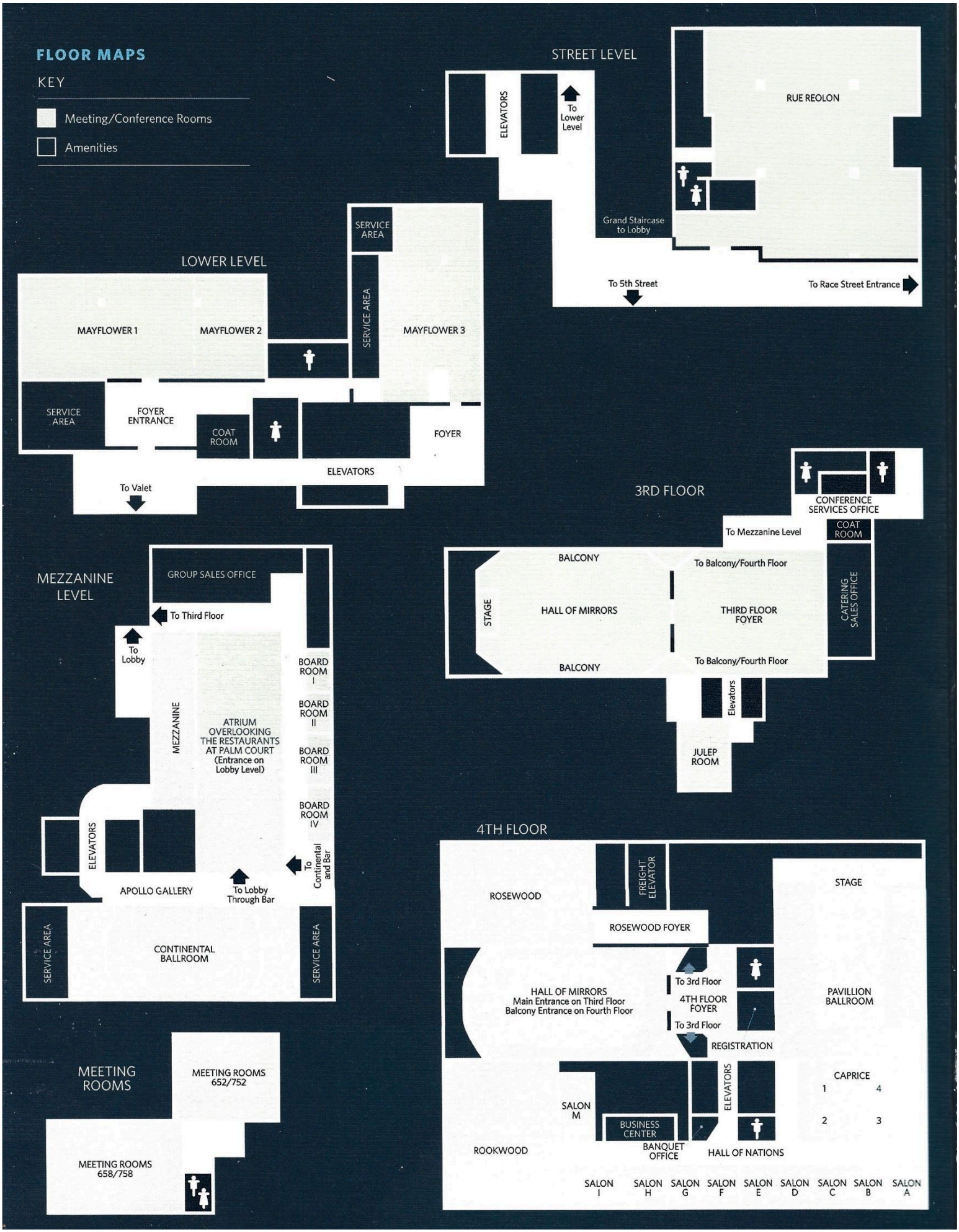
Thursday, April 4th

7:30–9:00 am	Breakfast (Pavilion Ballroom, 4th floor); board meeting (Salon A, 4th Floor)
8:00 am	Registration open (Pavilion Foyer, 4th floor)
9:00 am	Oral presentation session 2 (Pavilion Ballroom, 4th floor)
10:30 am	Break (Pavilion Foyer, 4th floor)
11:00 am	Oral presentation session 3 (Pavilion Ballroom, 4th floor)
12:00 pm	Wildlife Acoustics lunch and learn (Salon H, 4th floor) **or** lunch on your own
1:30 pm	USFWS session (Pavilion Ballroom, 4th floor)
2:15 pm	Break (Pavilion Foyer, 4th floor)
2:45 pm	USFWS Q&A (Pavilion Ballroom, 4th floor)
3:15 pm	Business meeting and awards (Pavilion Ballroom, 4th floor)

FLOOR MAPS

KEY

- Meeting/Conference Rooms
- Amenities



Pre-conference Activities, April 2nd

Must be pre-registered to attend these events

Advances in Radio Telemetry Workshop

Location: Shaker Trace Seed Nursery (8667 New Haven Rd, Harrison, OH 45030).
Please note that you must have received an email confirming you are on the attendance list to attend.

Workshop will begin at 12:00 pm and end at 4:00 pm. Parking is limited; if possible, please carpool to the location. Use this website to start or join a carpool. More information will be sent via email prior to the workshop.

Cincinnati Riverboat Dinner Cruise, Sponsored by the Lukuru Foundation

Use this website to start or join a carpool.

Please note that only registered meeting attendees may join the dinner cruise. Unregistered guests are not allowed to accompany attendees.

RIVERBOAT SOCIAL

BB RIVERBOATS

Date: Tuesday, 2 April 2024
Boarding: starts at 6:00 PM
Launch: 7:00 PM
Return: 9:00 PM

Address: 101 Riverboat Row, Newport, KY 41071
Boat: Belle of Cincinnati
Room: Bellevue (3rd floor)
Note: Room is private. Boat is not. There will be others on board who are not part of our group.

How to Get There:
- Walk (1.3 mi*)
- Drive/carpool
- Taxi/Uber/Lyft
- City bus (Southbank or TANK)

Other Notes:
- Food stations
- Cash bar
- No outside food/drinks
- Top level is open to all
- Some groups have tickets. Ours does not.

Plenary Information

Keynote: Thane Maynard, Executive Director, Cincinnati Zoo & Botanical Garden

OPENING THE DOOR: Local Partnerships Build Conservation Involvement

Thane Maynard is Executive Director of the Cincinnati Zoo & Botanical Garden. The mission of his work mirrors that of the zoo—to celebrate and share the story of wildlife and conservation.Thane has authored more than a dozen books, the most recent, *Hope For Animals & Their World,* was co-authored with Jane Goodall. He has also shared science and environmental news nationwide through his longtime public radio program, “The 90-Second Naturalist.” Maynard’s travels have spanned five continents in promoting biological diversity, natural history, and wildlife conservation, earning him a membership in the Explorers Club. He is an active member of the Association of Zoos and Aquariums (AZA), and a member of the Board of Trustees for the Margo Marsh Biodiversity Foundation, a primate conservation fund headquartered in Washington, D.C. Born and raised in central Florida, Thane earned his bachelor’s degree in environmental studies from Rollins College in Winter Park, FL., and his master’s degree in wildlife ecology from the University of Michigan School of Natural Resources.

NATIVE AMERICAN BAT MONITORING AND CONSERVATION THROUGH COLLABORATIVE EDUCATION AND OUTREACH

Ernest Valdez, Lawrence Abeita, Mike Medrano, Sean Cross, and Roger Rodriguez. *U.S. Geological Survey-Fort Collins Science Center, Albuquerque, NM 87131 (EV); Bureau of Indian Affairs, Albuquerque, NM 87104 (LA); National Park Service, Tumacácori, AZ 85640 (MM); Native American Fish and Wildlife Society, Northglenn, CO 80234 (SC); Oregon State University, Corvallis, OR 97331 (RR)*

Tribes throughout North America have long been stewards of wildlife and their habitats and contemporary Native American natural resources agencies have continued implementing some of the best conservation and management programs for a diversity of wildlife species including for bats. Recognizing the need to enhance knowledge and capabilities for bat conservation, especially in light of recent stressors (e.g., white-nose syndrome), a partnership was initiated among bat biologists and natural resources professionals representing tribal and non-tribal organizations to design and conduct regional training opportunities, with the first of these workshops conducted in the Southwest (Albuquerque, NM), in 2018. Collaborators from these organizations sought to develop a working environment that was focused specifically for tribal wildlife biologists, as well as native students in the wildlife and natural resources sciences, who were interested in learning more bat ecology and the latest methods and technologies used to study and monitor bat populations. In addition, traditional ecological knowledge (TEK) is discussed, especially in context of the region, but also in regard to the parallels between the loss of bat populations and loss of TEK among indigenous people across the landscape. The workshops end with a discussion on how federal and state agencies can improve on collaboration and communication with tribes in a shared goal of wildlife stewardship. Since the first workshop, including expansion outside of the Southwest, there has been an approximate total of 150 attendees, with about 10 different tribes represented at each workshop. Through continued need by the tribes, as well as external support and encouragement, we are working to conduct these workshops in other regions beyond western North America. In doing so, we anticipate these workshops will serve as a catalyst for capacity development in bat conservation and for advancing tribal and non-tribal entity relationship building.

Roger Rodriguez has been studying and working with bats over the past several years throughout the United States and beyond. Since 2017, he's been involved in a partnership among Native American and non-tribal biologists and natural resources professionals to develop and conduct training opportunities to expand capacity in bat conservation among tribes via training in bat ecology and monitoring techniques, as well as intercommunication to improve relationships between tribes and non-tribal organizations. He currently serves as courtesy faculty in the Department of Fisheries, Wildlife and Conservation

Sciences at Oregon State University where he explores a number of bat research studies and mentors graduate students. Aside from this position, he's involved in understanding and mitigating the impacts to bats from wind energy developments as a principal consultant at Natural Power.

THE OHIO DEPARTMENT OF TRANSPORTATION, AN UNLIKELY PARTNER IN BAT CONSERVATION

Matt Raymond, Chris Staron, Matt Perlik, and Megan Michael. *Ohio Department of Transportation Office of Environmental Services, Columbus, OH 43223*

Ohio is home to several species of state and federally listed bats. Federal and state regulations require developers, such as the Ohio Department of Transportation (ODOT), to assess the impacts of their actions on bat populations. To comply with the Endangered Species Act and sections of Ohio Revised Code, the Ohio Department of Transportation has been assessing project impacts to listed bat species for several years. In doing so, ODOT has implemented avoidance, minimization, and conservation measures under the guidance of the US Fish and Wildlife Service (USFWS) and the Ohio Department of Natural Resources (ODNR) to reduce impacts to bats and hopefully promote the recovery of imperiled species. Through partnerships with the USFWS, ODNR, and university and consultant researchers, ODOT has tried to gain a better understanding of the life history components of listed bats and how these animals may interact with roadway infrastructure. These efforts have led to an attempt to establish meaningful avoidance and minimization measures when impacts cannot be avoided. Additionally, ODOT has collaborated with these partners to implement large scale summer habitat conservation areas, and has worked to preserve and enhance unique and important hibernacula. This presentation will briefly highlight some of the partnerships and projects that have grown from ODOT's efforts, and how these partnerships continue to further the science of bat conservation in Ohio and the region.

Matt Raymond is the Ohio Department of Transportation's Ecological Program Manager. He has a B.S. in Environmental Biology and an M.S. in Environmental Studies; 28 years of experience in ecological resource identification and characterization; 25 years of experience in ecological impact analysis, natural resource mitigation design and monitoring, document preparation and review, and ecological coordination for regulatory compliance.

Wednesday, April 3rd

8:00 am	Registration opens
9:30–10:45 am	Speed Networking event
11:15 am	Welcome and opening comments
11:30 am	State updates
12:30–1:30 pm	Lunch (on your own)

Plenary Session (Pavilion Ballroom, 4th floor):

1:30 pm	**KEYNOTE: OPENING THE DOOR: Local Partnerships Build Conservation Involvement** Thane Maynard.
1:55 pm	**NATIVE AMERICAN BAT MONITORING AND CONSERVATION THROUGH COLLABORATIVE EDUCATION AND OUTREACH** Ernest Valdez, Lawrence Abeita, Mike Medrano, Sean Cross, and Roger Rodriguez.
2:20 pm	**THE OHIO DEPARTMENT OF TRANSPORTATION, AN UNLIKELY PARTNER IN BAT CONSERVATION** Matt Raymond, Chris Staron, Matt Perlik, and Megan Michael.
2:45 pm	Break (Pavilion Foyer, 4th floor)

Session 1 (Pavilion Ballroom, 4th floor):

3:15 pm	**WORKING WITH YOUR LOCAL UTILITY** Kelvin Limbrick.
3:30 pm	**FACTORS AFFECTING THE LONGEVITY OF TREE ROOSTS USED BY IMPERILED BATS** Josie Hoppenworth*, Reed Crawford, and Joy O'Keefe.
3:45 pm	**URBAN BATS RESPOND TO LOCAL AND CITY-LEVEL TREE COVER IN THE MIDWEST** Sean M. Obrochta*, Han Li, Sam Stickley, T.J. Benson, and Joy M. O'Keefe.
4:00 pm	**ACCLIMATION TO ARTIFICIAL LIGHT AND SOUND DRIVING URBAN HABITAT COLONIZATION** Aleana R. Savage*, Jeanette Bailey, and Giorgia G. Auteri.
4:15 pm	**CENSUSING LARGE AGGREGATIONS OF BATS USING AUTOMATED ACOUSTIC AND VIDEO METHODS** Valerie M. Eddington*, Vona Kuczynska, Sonja Ahlberg, Easton White, and

Laura N. Kloepper.

4:30 pm **EVALUATING ABANDONED RAILROAD TUNNELS AS HIBERNACULA FOR THREE VESPERTILIONID BATS** Janette Perez-Jimenez*, Greg G. Turner, Micheal R. Scafini, Daniel Bitz, Mattea Lewis, and Joseph S. Johnson.

4:45 pm **A RANGE-WIDE GENOMIC ASSESSMENT OF LITTLE BROWN BATS** Jordyn Z. Chace*, Jordan H. Hartman, Tara C. Hohoff, and Mark A. Davis.

5:00 pm Group photo (Pavilion Ballroom, 4th floor)

6:00–8:00 pm **Poster session and silent auction** (Continental Ballroom, Mezzanine)
Poster session will begin at 6:00 pm, but presenters do not need to be at their posters until 6:30 pm. Silent auction opens at 6:00 pm and closes at 8:00 pm. All winning bidders must pay and pick up their items before lunch on Thursday. Credit card only.

8:30 pm Student social, sponsored by SWCA (Urban Axe, 210 Elm St.)

Thursday, April 4th

7:30–9:00 am Breakfast (Pavilion Ballroom, 4th Floor)

7:30–9:00 am Board meeting (Salon A, 4th Floor)

8:00 am Registration opens (Pavilion Foyer, 4th Floor)

Session 2 (Pavilion Ballroom, 4th floor):

9:00 am **ESTIMATING POPULATION STATUS AND TRENDS OF HIBERNATING BATS FROM THE NORTH AMERICAN BAT MONITORING PROGRAM USING A BAYESIAN HIERARCHICAL VOLATILITY FUNCTION** Ashton M. Wiens, Tina L. Cheng, Teresa F. Bohner, Brad Udell, Bethany Straw, Jonathon Reichard, Winifred F. Frick, Brian Reichert, Wayne E. Thogmartin.

9:15 am **INDIANA BATS IN INDIANA MOVE TO SOUTHERN HIBERNACULA: INFLUENCES OF CLIMATE AND DISEASE** Darwin C. Brack, Virgil Brack, Jr., Katie E. Marshall, and Justin G. Boyles.

9:30 am **WINTER ACTIVITY PATTERNS OF INDIANA BATS AT LIME KILN MINE, SODALIS NATURE PRESERVE, HANNIBAL, MISSOURI** Vona Kuczynska and Russell E. Myers.

9:45 am **A NEW APPROACH TO CONSERVING IMPERILED BATS ACROSS THE EASTERN UNITED STATES: THE USDA FOREST SERVICE BAT CONSERVATION STRATEGY** Peggy Luensmann, Chris Mensing, and Theresa Davidson.

10:00 am **49,000 CARCASSES: A SUMMARY OF MIDWESTERN BAT MORTALITY AT WIND-ENERGY PROJECTS** Megan Seymour, Anthony Lopez, Jay Diffendorfer, Wayne Thogmartin, Brad Udell, Ashton Wiens, Amber Schorg, Trieu Mai, and Bethany Straw.

10:15 am **WHO'S EATING MY CARCASS?** Alexis Levorse.

10:30 am Break (Pavilion Foyer, 4th floor)

Session 3 (Pavilion Ballroom, 4th floor):

11:00 am **MOBILE SURVEYS IN AN AGRICULTURE DOMINATED LANDSCAPE—ARE THEY WORTH IT?** Tara C. Hohoff, Brittany A. Rogness, Mark A. Davis.

11:15 am **SIMULATING AND MEASURING EFFECTIVENESS OF TURBINE CURTAILMENT USING ACOUSTICS** Trevor Peterson, Caroline Byrne, Adam Rusk, and Angela Sjollema.

11:30 am **EVALUATING BAT RESPONSE TO HUMAN-ALTERED LANDSCAPE IN A MIDWESTERN RIVER CORRIDOR** Kathryn A. McGowan and Tim C. Carter.

11:45 am **THE FIRST OHIO BAT WORKING GROUP BAT BLITZ AT GERMANTOWN METROPARK AND TWIN CREEK METROPARK, MONTGOMERY COUNTY, OHIO** Jeff Brown.

12:00–1:30 Wildlife Acoustics lunch and learn *or* lunch on your own

USFWS Session, Business Meeting and Awards (Pavilion Ballroom, 4th floor):

1:30 pm USFWS presentations

2:15 pm Break

2:45 pm USFWS Q&A

3:15 pm Business meeting, awards, closing remarks

Poster Session Presentations

Underlined = Presenting author. Asterisk* = Student competition presenter.

1. TWENTY YEARS OF TRICOLORED BAT CAPTURES; WHERE WERE THEY AND WHERE ARE THEY NOW? Crystal Birdsall, Ian Burns, Zachary Baer, Kelsie Eshler, and Christopher McNees.

2. HOARY NOT STICKING TO THE STORY: FIRST DOCUMENTED DETECTION OF HOARY BATS *(LASIURUS CINEREUS)* OCCUPYING ARTIFICIAL BAT ROOSTS IN ILLINOIS Ricky Gieser, Jordyn Chace, Tara Hohoff, and Mark Davis.

3. HAIR CORTISOL ANALYSIS IN BIG BROWN BATS *(EPTESICUS FUSCUS):* A METHODOLOGICAL COMPARISON BETWEEN IMMUNOASSAY AND MASS SPECTROMETRY Zuyi C. Gooley, Marcus A. Jorgensen, and Aaron C. Gooley.

4. EXPLORING SURVEY METHODOLOGIES FOR ROOSTING BATS WITHIN STRUCTURES Ellen Hall and Ryan Blankenship.

5. BAT ROOSTS IN BRIDGES: ASSESSING ILLINOIS BRIDGES FOR BAT USE Jocelyn R. Karsk, Jean M. Mengelkoch, and Janet L. Jarvis.

6.TOOLS TO OPTIMIZE MANAGEMENT OF DATA FROM COUNTS OF WINTER COLONIES IN THE MIDWEST Bryan Levi*, James Cox, and Joy O'Keefe.

7. MOVEMENTS OF LITTLE BROWN MYOTIS *(MYOTIS LUCIFUGUS)* BETWEEN SEASONAL HABITATS IN OHIO Mattea A. Lewis* and Joseph S. Johnson.

8. BATS AND RABIES IN ILLINOIS Jean Mengelkoch and Joyce Hofmann.

9. ADVANCING KNOWLEDGE TO INFORM BAT-MARKING PRACTICES Ashleigh Cable, Joy O'Keefe, Susan Loeb, Alyssa B. Bennett, Robert Barclay, Sarah Gaulke, Fernando Gual-Suárez, Samara Shames Pérez Harp, Vona Kuczynska, Cori Lausen, Rodrigo Medellin, and Brad Westrich.

10. BATS AND AGRICULTURE: EXPLORING RELATIONSHIPS BETWEEN AGRICULTURAL PRACTICES AND DISTRIBUTION OF BATS IN ILLINOIS Abigail Pagels, Tara Hohoff, and Mark Davis.

11. ASSESSING AREAS FOR INTERACTIONS BETWEEN TRICOLORED BATS AND WIND-ENERGY FACILITIES Roger Rodriguez, James Robbins, and Jared Quillen.

12. FOR THE LOVE OF GUANO AND COMMUNITY SCIENCE IN ILLINOIS Brittany Rogness, Tara Hohoff, Jordyn Chase, and Mark Davis.

13. IMPACT OF BIOPSY SIZE AND BAT SPECIES ON DNA YIELDS Carly R. Trujillo*, Claire N. Robertson, Victor A. Piñeiro, Aleana R. Savage, and Giorgia G. Auteri.

14. DETECTION OF LISTED BAT SPECIES UNDER BRIDGES THROUGH THE USE OF FECAL DNA Faith M. Walker, Susan Dulc, Heather Gates, Cori L. Lausen, Erin Low, Cory Olson, Meagan D. Owens, Daniel E. Sanchez, Abby Tobin, and Carol L. Chambers.

15. BAT ACTIVITY AND SPECIES RICHNESS IN AGROECOSYSTEMS IN RELATION TO DRAINAGE HEDGEROW AND LANDSCAPE STRUCTURE Marlena Warren* and Gregory W. Mitchell.

Oral Presentation Abstracts

Oral presentations listed alphabetically by presenting author (underlined).

Student presenters designated with an asterisk (*).

ESTIMATING POPULATION STATUS AND TRENDS OF HIBERNATING BATS FROM THE NORTH AMERICAN BAT MONITORING PROGRAM USING A BAYESIAN HIERARCHICAL VOLATILITY FUNCTION

Ashton M. Wiens, Tina L. Cheng, Teresa F. Bohner, Brad Udell, Bethany Straw, Jonathon Reichard, Winifred F. Frick, Brian Reichert, and Wayne E. Thogmartin. *U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54650 USA (AMW, TFB, WET); Bat Conservation International, Austin, TX 78746 (TLC, WFF); Ecology and Evolutionary Biology, University of California Santa Cruz 95064 (BU, BS, WFF); U.S. Geological Survey, Fort Collins Science Center, Fort Collins, CO 80526 (BR); U.S. Fish and Wildlife Service, Ecological Services, Hadley, MA 01035 (JR)*

The North American Bat Monitoring Program (NABat) is a collaborative endeavor seeking to address critical gaps in our understanding of bat abundance and population trajectories. We present the program's inaugural Status and Trend results for bats surveyed with winter colony counts. NABat has counts for 14 species, of which sufficient numbers of counts allow status and trend determination for 12 species, including several imperiled species (Indiana Bat, Northern Long-eared Bat, Gray Bat) and key species under review for listing under the Endangered Species Act (Tricolored Bat and Little Brown Bat). We will describe the analytical approach being used (hierarchical Bayesian model with growth rate volatility function). This approach accommodates rapid population changes like sudden declines, which allows for proper description of population rates of change in the face of mortality from white-nose syndrome and other acute stressors. We will present regional and species-wide results of current population trajectories based on count data from 1990 to 2023.

INDIANA BATS IN INDIANA MOVE TO SOUTHERN HIBERNACULA: INFLUENCES OF CLIMATE AND DISEASE

Darwin C. Brack, Virgil Brack, Jr., Katie E. Marshall, and Justin G. Boyles. *Environmental Solutions & Innovations, Inc., Cincinnati, OH, USA (DCB, VB); Department of Zoology, University of British Columbia, Vancouver, BC, Canada (KEM); Cooperative Wildlife Research Laboratory, Southern Illinois University, Carbondale, IL, USA (JGB)*

Climate change and disease are difficult environmental stressors to study. To do so requires establishing a baseline, and an ability to control variables either systematically across time or through analysis. These are often insurmountable when trying to understand the intertemporal effects of environmental stressors, such as observed geographic range shifts. As a case study, we use a 42-year longitudinal survey of Indiana bat *(Myotis sodalis)* winter hibernacula across southern Indiana to track population changes at three cave locations (‘North’, ‘Central’, and ‘South’) spanning 120 kilometers. For nearly 3 decades, Indiana bat numbers increased in North hibernacula, despite less favorable characteristics (e.g. less protection, increased

intra-hibernacula temperature variability). However, inception of white-nose syndrome (WNS), a disease that killed millions of cavernicolous bats, caused populations of previously common species to plummet. Despite the prediction of the extinction of the Indiana bat, populations continued to increase at South hibernacula (90k bats in 2009 to 181k bats in 2022) while decreasing precipitously in the North (96k bats in 2009 to 23k bats in 2022). We show that use of South caves is a viable strategy to combat WNS: the winter season of hibernation in the South is shorter than in the North, attenuating the most devastating impacts of the disease. Energy savings are significant and is the tipping point for moribund bats in North caves.

THE FIRST OHIO BAT WORKING GROUP BAT BLITZ AT GERMANTOWN METROPARK AND TWIN CREEK METROPARK, MONTGOMERY COUNTY, OHIO

Jeff Brown. *Stantec Consulting Services Inc., 9200 Shelbyville Road, Suite 800 Louisville, KY 40222*

The Ohio Bat Working Group (OBWG) organized its first bat blitz event on August 19 and 20, 2022 at Germantown Metropark and Twin Creek Metropark, Montgomery County, Ohio. Over the course of two nights, 11 sites were sampled for 47 net nights resulting in 97 captured bats representing seven species. Nine teams were involved in the capture of 68 big brown bats *(Eptesicus fuscus),* 19 eastern red bats *(Lasiurus borealis),* 4 evening bats *(Nycticeius humeralis),* 3 Indiana bats *(Myotis sodalis),* 1 little brown bat *(Myotis lucifugus),* 1 tricolored bat *(Perimyotis subflavus),* and 1 Seminole bat *(Lasiurus seminolus)*. It is worth noting that this was the first time a Seminole bat was captured in a mist net in Ohio. Additionally, three adult Indiana bats had transmitters attached to them, and their movements were tracked for 18 days to two roost trees located approximately 4 kilometers from the capture locations. The first roost was a dead American elm *(Ulmus americana)* and the second was a dead eastern cottonwood *(Populus deltoides)*. The highest emergence count for the first roost was 136 bats while the second roost was 96 bats.

EVALUATING BAT RESPONSE TO HUMAN-ALTERED LANDSCAPE IN A MIDWESTERN RIVER CORRIDOR

Kathryn A. McGowan and Tim C. Carter. *Department of Biology, Ball State University, Muncie, IN 47306*

Bats continue to face numerous conservation challenges across the United States including wind energy development, the spread of white-nose syndrome, and habitat loss. Human alterations to natural environments can impact the presence of bats. Our goal is to examine bat use across a gradient of habitats altered by humans. During the 21-22 summer seasons, we used acoustic detectors to survey a variety of sites to examine bat response to human-altered habitats along the White River corridor in Delaware County, IN. To ensure sampling occurred across a range of habitat types, we created an a priori model categorizing 1-km sections of habitat into five habitat groups based on habitat structure and human influence. Within each category, we randomly selected for six sample sites, totaling 30 sites along the river corridor. Habitat and environmental covariates were measured using artificial light measurements, field observation data, and ArcGIS Pro. Calls were analyzed using Kaleidoscope and BCID software along with manual identification based on species rarity and call structure attributes. We used a

Dail-Madsen N-mixture model with a negative binomial distribution to estimate call abundance and detection probabilities to evaluate the effects of habitat structure on bat use. The dominant species in the study area were overwhelmingly big brown bats, followed by the Myotis sp. group, eastern red bats, evening bats, silver-haired bats, and tricolored bats. Due to low sample size, hoary bats were ineligible for analysis. Species exhibited a wide variety of responses to urban variables, particularly artificial light. Every species model, whether a forest-obligate or a generalist species, predicted that higher levels of riverbank canopy percentage yield an increased abundance of bats. Our aim is to gain a better understanding of species-specific habitat requirements for struggling bat populations and aid future management decisions regarding habitat protection and the effects of land development on bats.

A RANGE-WIDE GENOMIC ASSESSMENT OF LITTLE BROWN BATS

Jordyn Z. Chace*, Jordan H. Hartman, Tara C. Hohoff, and Mark A. Davis. *University of Illinois, Illinois Natural History Survey, Illinois Bat Conservation Program, 1816 South Oak Street Champaign, IL 61820*

The little brown bat has been impacted by a number of stressors, most notably (in the eastern extent of its range) white-nose syndrome (WNS). The emergence of this disease has decimated many North American cave-hibernating bat species, specifically impacting little brown bat populations, threatening extirpation at regional scales. Should this species become listed for protection, it will be invaluable to have a genomic snapshot before listing to measure future changes against. We have found that, in a relatively short time span, we can detect the impact conservation actions have had on the genomics of our study species. Therefore, a range-wide population genomic assessment of little brown bats is imperative to set baseline population genomic parameters in the age of WNS, delineate populations/subpopulations, examine subspecies presence, determine levels of gene flow/genomic connectivity among populations and between hibernacula and summer colonies, assess the impacts of anthropogenic stressors on genomic health, and estimate effective population sizes across scales. These data will inform regional, and range-wide, strategies for the conservation of little brown bats in hopes of extending their evolutionary history for generations to come. We plan to utilize previous genetic studies of this species across its range, as well as regional genomic studies to produce an extremely high resolution understanding of genomic health indicators as well as identifying regions of the genome that may signal adaptive advantages to persistent or emerging stressors. We are currently seeking samples from a variety of locations and time-periods. We hope that we can utilize this opportunity to fill in gaps from our dataset and set this project up to be as geographically complete as possible.

CENSUSING LARGE AGGREGATIONS OF BATS USING AUTOMATED ACOUSTIC AND VIDEO METHODS

Valerie M. Eddington*, Vona Kuczynska, Sonja Ahlberg, Easton White, and Laura N. Kloepper. *Department of Biological Sciences, University of New Hampshire, Durham, NH 03824 (VME, SA, EW, LNK); Center for Acoustics Research and Education, University of New Hampshire, Durham, NH 03824 (VME, SA, LNK); U.S. Fish and Wildlife Service, Missouri Ecological Services Field Office, Columbia, MO 65203 (VK)*

Bat populations across the globe are declining as habitat loss, disease, and climate change threaten populations. Large, dense colonies of bats are difficult to census and lack reliable

population data as current monitoring methods are often invasive and time consuming. Improved censusing methods are necessary to increase the frequency and accuracy of estimates used to inform management and conservation strategies. Our lab is developing an acoustic censusing model by establishing a relationship between amplitude and the number of bats flying over an acoustic recorder. We are developing a global model that is flexible across habitats, various cave densities, and species. Furthermore, our lab has developed BatCount, a free, user-friendly software that tracks and counts objects as they move across a video. BatCount produces efficient population estimates for bat colonies exiting roosts and offers a variety of user-specified settings, allowing the software to be calibrated to a variety of recording environments. It is imperative that effective and noninvasive methods for monitoring bat populations, such as acoustic censusing and BatCount, are developed to increase population data available for informing crucial management decisions.

MOBILE SURVEYS IN AN AGRICULTURE DOMINATED LANDSCAPE— ARE THEY WORTH IT?

Tara C. Hohoff, Brittany A. Rogness, and Mark A. Davis. *Illinois Natural History Survey, 1816 S Oak St, Champaign, IL 61820*

The Illinois Bat Conservation Program has been collecting data using the North American Bat Monitoring (NABat) framework since 2016, increasing the number of sites to 30 generalized random tessellation stratified sampling (GRTS) units per year in collaboration with the Illinois Department of Natural Resources. The NABat sampling strategy includes deployment of stationary recorders and driving a transect twice through the GRTS while recording acoustic data throughout the survey. We set out to determine if the driving transects are an effective survey technique in an agriculture dominated landscape, particularly if they yield additional species not identified by the stationary recorders surveying in tandem. Preliminary results suggest that the stationary recorders have a much higher return of data and sufficient effort to survey local bat communities at the GRTS. Conversely, mobile transects generally performed poorly, especially for detecting rare species. Ultimately, these surveys may not be appropriate in a Midwestern landscape with limited habitat variability.

FACTORS AFFECTING THE LONGEVITY OF TREE ROOSTS USED BY IMPERILED BATS

Josie Hoppenworth*, Reed Crawford, and Joy O'Keefe. *Human-Wildlife Interactions Lab, Department of Natural Resources and Environmental Sciences, University of Illinois Urbana-Champaign, Urbana, IL 61801*

Cavities, exfoliating bark, and other features present on trees provide roosting habitat for many bat species. With tree maturation taking decades to centuries, tree roosting habitat develops slowly and is often only present after tree death, making it an especially scarce resource. The persistence of tree roosts varies with biotic and abiotic factors like cause of mortality, presence of fungi and microbes, and landscape position. The complex array of potential explanatory factors makes it challenging to understand tree persistence, especially for dead trees (i.e., snags). Since 2012, federally endangered northern long-eared bats and Indiana bats have been found roosting in ~270 trees throughout Morgan-Monroe and Yellowwood State Forests in southern Indiana. During the summers of 2022 and 2023, we attempted to locate 260 historical bat tree roosts (162 snags and 98 live trees) to assess the factors affecting their longevity and

suitability for roosting. For each historical tree roost located, we recorded whether it was living, if it was still standing, and other tree features like height and diameter. We successfully detected 52.3% of the historical tree roosts including 70.4% of historical live trees and 41.6% of historical snags. Most trees were still usable; however, 21.3% of located tree roosts had fallen and were no longer viable. The probability of a snag roost remaining standing decreased with time while the probability of a live tree remaining standing increased with increasing diameter. By comparing models with various combinations of explanatory factors, we were able to predict the probability of a tree roost remaining standing in this southern Indiana landscape. Important predictors of tree roost longevity may vary across the distributions of imperiled bats, but these data should still help forest managers to understand tree roost availability and the potential necessity of creating snags.

WINTER ACTIVITY PATTERNS OF INDIANA BATS AT LIME KILN MINE, SODALIS NATURE PRESERVE, HANNIBAL, MISSOURI

Vona Kuczynska and Russell E. Myers. *U.S. Fish and Wildlife Service, Missouri Ecological Services Field Office, 101 Park DeVille Drive, Suite A, Columbia, MO 65203 (IK); Cave Research Foundation, Ozark Operations, Arcadia, MO 63621 (REM)*

The Lime Kiln Mine is an Indiana bat hibernaculum that hosted over 200,000 individuals in February 2022. Studies of the mine microclimate and wintertime bat acoustics have been ongoing since 2019, to evaluate the vulnerabilities of the hibernaculum. The objectives of these studies have been to understand the physical processes that control the mine microclimates, to understand what conditions the bats favor for roosting, and to learn about the bats' behavior throughout winter. Twenty-six stations have floor and ceiling climate sensors, and 6 of these sites also have Anabat Roost Loggers to record acoustic activity of bats. These studies indicate that strong northerly winter winds penetrate the mine and chill it, resulting in multiple climate domains that vary in temperature range, temperature stability, and relative humidity. The Indiana bats strongly favor protected areas where average February temperatures fall into the 3–6 ºC range. Acoustic loggers show that bats arrive in September, and activity reaches a climax in October before falling off abruptly in November. By November, parts of the mine are chilled to 10 ºC, but temperatures do not drop consistently into the key 3–6 ºC range until January, when activity generally drops to its lowest levels. Activity levels remain uniformly low until the departure of bats in April, which is marked by a few daily spikes indicating that, once they leave, they don't come back. Perhaps the most surprising finding of this study is just how much activity there is during the winter months. Every night, starting at dusk, there is a low-level bump in activity at all sites, which may reflect some bats' need for elimination. Throughout winter bats also respond to changes in temperature by progressively moving out of areas when the temperature drops below freezing. Conversely, when rising outside temperatures cause warm air to flow into the mine, bats throughout the mine respond.

WHO'S EATING MY CARCASS?

Alexis Levorse. *Stantec Consulting Services, 6800 College Boulevard, Suite 750, Overland Park, KS 66211*

When surveying for bat mortality at a wind project, one of the factors integral to calculating estimated mortality is carcass persistence. Carcass persistence can vary between regions and sites. Previous surveys at a wind facility in Arizona had carcass persistence rates of less than a day. We assumed a major contributor to this low persistence rate was scavenging. Camera traps were set in concurrence with carcass persistence trials, during a post-construction fatality-monitoring survey in October 2023, expecting to witness scavenging by snakes, foxes, ravens, and birds of prey. The cameras captured some expected scavengers and an unexpected surprise. Our survey was small and informal, and further, more substantive studies may show an expanded diversity of scavenger species and help determine if there is seasonal variation in scavengers. We will discuss methods for camera deployments for mortality surveys to aid in determining whether carcasses are being scavenged or decomposing.

WORKING WITH YOUR LOCAL UTILITY

Kelvin Limbrick. *ComEd, 2 Lincoln Center, 6th Floor, Oakbrook Terrace, IL 60181*

ComEd is an electrical transmission and distribution company in northern Illinois, with approximately 127,000 acres across which the Vegetation Management and Environmental Service Departments make land-management decisions independently or in partnership with stakeholders. In addition, ComEd maintains over 500 acres of remnant or restored prairie and has identified an additional 15,000 acres of potential land for restoration. Beyond a commitment of safety and reliability, as an Exelon Company, ComEd is dedicated to being a steward of the environment. Across the United States, utilities like ComEd also make land-management decisions in connective corridors that are best managed with an active management process known as Integrative Vegetation Management (IVM). IVM is a system of managing plant communities, in which managers set objectives, consider action thresholds, and evaluate, select, and implement the most appropriate control method or methods to achieve their established objectives. Utilities hold a vested interest in engaging with stakeholders to ensure that best management practices and the best science to protect their assets are used while building resilient ecosystems through IVM.

A NEW APPROACH TO CONSERVING IMPERILED BATS ACROSS THE EASTERN UNITED STATES: THE USDA FOREST SERVICE BAT CONSERVATION STRATEGY

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Populations of four bat species, Indiana bat *(Myotis sodalis),* little brown bat *(M. lucifugus),* northern long-eared bat *(M. septentrionalis),* and tricolored bat *(Perimyotis subflavus)* have plummeted in much of the eastern United States and Canada. While white-nose syndrome was the primary driver in the species' declines, the U.S. Forest Service (USFS) recognizes their role in providing high-quality bat habitat to support remaining populations and promote long-term recovery. Forest management, however, also has the potential to have short-term negative impacts to bats and bat habitat. To continue developing high-quality habitat while minimizing the short-term impacts of forest management, USFS developed a Bat Conservation Strategy (BCS)

collaboratively with the U.S. Fish and Wildlife Service. The BCS will guide management on approximately 22.7 million acres (~9.2 million hectares) of national forest system lands, across 29 USFS administrative units in the eastern United States, and establish management goals and objectives, initiate conservation measures, and provide conservation recommendations for developing long-term habitat and protecting known hibernacula and roosts. Management actions to improve foraging and roosting habitat will be implemented across forested landscapes, and conservation buffers will be placed around features with currently known or suspected species' presence. Varying levels of protection are established depending on the species' biology, specific feature (roost, capture, hibernacula), and abundance. Management actions within the conservation buffers will be prohibited or restricted during critical time periods. The BCS will also serve as the foundation for establishing a streamlined Endangered Species Act section 7(a)2 consultation. Future projects that fully implement all applicable conservation measures will be eligible to use a two-tiered streamlined consultation approach that will be considerably faster than traditional project-level consultations. This collaborative process can be adapted to different landscapes, agencies, and species, providing both on-the-ground conservation for imperiled species and gained efficiencies with regulatory processes.

URBAN BATS RESPOND TO LOCAL AND CITY-LEVEL TREE COVER IN THE MIDWEST

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Even within one region, cities may have vastly different vegetation and land-use regimes, but we know little about how these differences shape urban bat assemblages. Previous urban bat studies in North America have been conducted at the scale of a single, large city; we have thus been unable to detect universal trends. To measure the effects of habitat features on urban bat diversity, we launched the Bats in Small Cities (BiSC) Project, a multi-city acoustic survey of 36 Midwestern urban areas of 50–500K people. Through a volunteer network, we sampled 24 locations per city for a total of 864 sample points. We manually vetted 6,929 total bat calls from nine bat species. For 81.6% of our sample points, at least one bat call was recorded across two surveys. Big brown bat/silver-haired bats were the most frequently encountered in 33 cities, but eastern red/evening bats were most frequent in 3 of the southernmost cities. We also recorded species of conservation concern, such as little brown, gray, and tri-colored bats. We used an information theoretic approach to rank a suite of multi-scale occupancy models to assess the local and city-scale effects of tree and land cover. Increasing local tree cover within a 100-m buffer around the survey point strongly predicted big brown/silver-haired and eastern red/evening bat occupancy, and this local effect was stronger in cities with lower city-scale tree cover. Bats appear to respond to both local and city-scale habitat features, so we recommend more multi-city monitoring of urban bat activity and diversity. Long-term, spatially distributed city surveys might also detect migratory stopovers and range expansions for urban-adapted species.

EVALUATING ABANDONED RAILROAD TUNNELS AS HIBERNACULA FOR THREE VESPERTILIONID BATS

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Suitable hibernacula for bats are rare in many regions. In these areas, there are many notable instances where anthropogenic activities, such as mining, have created important winter habitat. Smaller, seemingly less complex habitats, such as railroad tunnels, are also used as hibernacula, although the characteristics that make some railroad tunnels suitable for bats is poorly studied. Our goal was to locate and survey abandoned railroad tunnels for bats, throughout Ohio, the West Virginia panhandle, and western Pennsylvania, to evaluate their suitability as hibernacula. We surveyed 108 tunnels from 2018 to 2024 and collected data on microclimates, physical dimensions, and use by bats. Twenty-three sites (21%) were used by *Myotis lucifugus;* 31 (29%), by *Perimyotis subflavus;* and 76 (70%), by *Eptesicus fuscus.* We used a machine-learning algorithm, Random Forest, to identify which variables among a suite of 25 potential habitat characteristics were most important at predicting winter bat counts. Preliminary analyses show that tunnel length, range of winter subterranean temperatures, and maximum subterranean winter temperature were the variables most important in predicting abundance of *M. lucifugus* and *P. subflavus*. By contrast, maximum subterranean winter temperature, latitude, and 30-year average precipitation were most important in predicting abundance of *E. fuscus*. Three tunnels were gated by the Ohio Department of Transportation; populations of *M. lucifugus* have increased by 260 and 250% at two of these sites since gating, with no change at the third. These results highlight the value of abandoned railroad tunnels for bats in our region and provide insights into the characteristics that determine how many bats of different species use a site as a hibernaculum.

ACCLIMATION TO ARTIFICIAL LIGHT AND SOUND DRIVING URBAN HABITAT COLONIZATION

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Anthropogenic activity has prompted range shifts, niche shifts, and behavioral changes of native wildlife. As anthropogenic developments and disturbances compromise habitat, some species have begun to exploit urban areas. Light and sound pollution can have major impacts on bat activity and habitat selection. Many species of bats have successfully colonized urban areas in the presence of light and sound pollution, and which species colonize these areas and why has implications for bat conservation and habitat assessments. The gray bat, *Myotis grisescens,* is an endangered species that has increased in abundance following heightened conservation efforts of caves used in summer and winter. The species has, anecdotally, become more common in highly disturbed areas despite previously recorded narrow habitat requirements. We sought to understand whether behavioral differences in the form of light and sound avoidance can be observed between urban bats compared to their rural counterparts. We tested individuals for these behavioral differences using a standard Y-maze, with light and sound branches to mimic urban landscapes. Individuals were studied across a range of urban and

rural habitats in Missouri, with varying degrees of light and sound input. While analyses are ongoing, we expect that bats colonizing near urban areas and in artificial structures will be more tolerant of light and sound stimuli. Preliminary results suggest that urban adult bats are able to acclimate to urban light. Future conservation decisions should be made in consideration of the ecological and evolutionary trajectories of species under selection pressure to adapt to urban areas.

49,000 CARCASSES: A SUMMARY OF MIDWESTERN BAT MORTALITY AT WIND-ENGERY PROJECTS

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Many bat species across North America are declining, with at least one species, the hoary bat, responding specifically to mortality from wind turbines. Post-construction methodologies for monitoring wildlife mortality vary considerably across space, time and facilities, leaving decision makers data-rich and information poor when considering how best to ensure bats and wind power can co-exist. Further, data privacy concerns lead to multiple private data repositories with no public access, which precludes analysis by impartial researchers. The U.S. Fish and Wildlife Service compiled available data from over 600 post-construction mortality reports spanning 25 years and 30 states to inform listing decisions under the Endangered Species Act and minimization measures for several bat species. We grouped projects by region and generated species composition rates, as well as mortality rates in bats per megawatt (MW) per year for each region by correcting reported rates for unsearched portions of the bat active period and unsearched areas where carcasses may fall. Within the Midwest, we have data on bat mortality for over 19,000 MW of installed wind energy including more than 49,000 bat carcasses. We present these regional mortality results for the Midwest and describe future work to be undertaken under a USGS Powell Center Working Group framework to assess landscape and technological factors that most influence bat risk at wind-energy facilities. We make recommendations for standardization of data collection and reporting to understand better how each species of bat is affected by wind power, what factors influence risk the most, and how risk can be minimized. Improving access to these data would enable us to fill persistent knowledge gaps, improve and validate, take predictions, reduce burden, and ultimately maximize the return on investment of the initial data-collection effort.

SIMULATING AND MEASURING EFFECTIVENESS OF TURBINE CURTAILMENT USING ACOUSTICS

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As expansion of the wind-energy industry grows to meet increased demand for renewable energy, so does the need for widespread adoption of measures to reduce fatality rates of bats. Turbine curtailment remains the most effective measure to reduce the number of turbine-related bat fatalities at wind energy facilities. To balance these simultaneous priorities, the wind industry and regulatory agencies need a sensitive metric to measure spatial, temporal, and seasonal variation in bat mortality and evaluate effectiveness of minimization techniques, such as turbine curtailment. We used acoustic detectors deployed on turbine nacelles and towers to measure seasonal and spatial patterns in acoustic exposure and evaluate how effectively curtailment strategies reduced exposure. Accurate simulation of acoustic exposure and associated bat-fatality risk for novel curtailment strategies is an important benefit of acoustic monitoring over carcass searches and provides useful feedback to measure and manage risk to bats at wind-energy facilities.

Poster Presentation Abstracts

Poster presentations listed alphabetically by presenting author (underlined).

Student presenters designated with an asterisk (*).

TWENTY YEARS OF TRICOLORED BAT CAPTURES; WHERE WERE THEY AND WHERE ARE THEY NOW?

Crystal Birdsall, Ian Burns, Zachary Baer, Kelsie Eshler, and Christopher McNees. *Copperhead Environmental Consulting, Inc. 471 Main St. Paint Lick, KY 40461*

The likely listing of the tricolored bat as Endangered by the United States Fish and Wildlife service coincides with the precipitous decline of mist-net captures throughout the eastern US which can in turn be attributed to the effects of white-nose syndrome (WNS). Copperhead Environmental Consulting, Inc. (Copperhead) has been conducting mist-net surveys within the range of the tricolored bat since 2004, prior to the first documented case of WNS in the US. We have compiled all of Copperhead's tricolored bat mist-net capture data between 2004 and 2024 to see if we could tease out any patterns that might help determine where we should focus our netting efforts to catch this species in the post-WNS era. We pulled over 950 capture records together from 16 states and compared where tricolored bats were captured both on a small scale (i.e., individual mist-net sets) and a landscape scale using National Land Cover Data (NLCD). While these data are still being analyzed, preliminarily results suggest a positive correlation between net sets placed over water as well as distance to larger bodies of water on the landscape.

HOARY NOT STICKING TO THE STORY: FIRST DOCUMENTED DETECTION OF HOARY BATS *(LASIURUS CINEREUS)* OCCUPYING ARTIFICIAL BAT ROOSTS IN ILLINOIS

Ricky Gieser, Jordyn Chace, Tara Hohoff, and Mark Davis. *Illinois Natural History Survey, Champaign, IL 61820.*

Non-invasive sampling techniques can be useful for detecting uncommon, endangered, and elusive species. The Illinois Bat Conservation Program (IBCP) has been collecting guano from artificial bat roost sites of interest around Illinois and, through genetic sequencing, are able to identify species from the samples. So far, IBCP has identified four species from these roosts. Hoary bats, a relatively large, solitary, foliage roosting bat, are a widespread but uncommonly detected species. In two samples from two different artificial roosts, we have identified hoary bats from guano. This species is not known to use artificial roosts and unlikely to due to roosting preference, so what do these detections mean?

HAIR CORTISOL ANALYSIS IN BIG BROWN BATS *(EPTESICUS FUSCUS):* A METHODOLOGICAL COMPARISON BETWEEN IMMUNOASSAY AND MASS SPECTROMETRY

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Many bat species have undergone large-scale population declines in North America due to multiple environmental stressors. Immunoassay based hair cortisol analysis has received increasing interest as a minimally invasive tool for monitoring the chronic physiological impacts of environmental stressors on bats. However, the lack of specificity of immunoassay and variations among laboratory techniques (i.e. sample preparation, extraction, and cleanup) may lead to inaccurate values and in-comparable results among different laboratories. Understanding the origin of these differences in sample preparation and analysis is essential for the interpretation of cortisol levels in valuable but especially small hair samples from wild bats. Liquid chromatograph mass spectrometry (LC-MS) has the potential to provide more accurate and precise results in quantifying cortisol, overcomes the cross-reactivity issues of immunoassay, and reduce interlaboratory variation, while allowing for simultaneous quantification of additional steroid hormones. We created an aggregate pool of bat hair from bats provided by the Indiana Department of Health Rabies Lab and used it to (1) assess the effects of sample preparation (i.e. dry milling vs. wet milling), milling time, and cleanup procedure, (2) compare immunoassay and LC-MS measures of bat hair cortisol concentrations, and (3) compare the advantages and disadvantages of both techniques for analyzing stress hormones in bat hair.

EXPLORING SURVEY METHODOLOGIES FOR ROOSTING BATS WITHIN STRUCTURES

Ellen Hall and Ryan Blankenship. *Environmental Consulting & Technology, Inc. (ECT), Gainesville, Florida 32607*

Despite the negative connotation of urban sprawl for bat populations, man-made structures, such as bridges, culverts, water storage tanks, and buildings, have been proven to provide essential resources for roosting bats in the Midwestern United States. However, the use of structures by bats can pose complications for the performance, maintenance, and planned improvements to these occupied structures. Standard survey methods for inspecting these structures have predominantly included visual inspections, DNA sampling, and the use of thermal imagery. The challenge with these conventional methods is that they frequently require the use of specialty equipment, such as snooper trucks and manlifts, to gain access to suitable habitat within a structure. This specialty equipment poses unique challenges considering the associated cost, safety concerns and training requirements of the operators, and logistics of use on steep slopes, forested corridors, and prevalence of overhead electric lines collocated with occupied structures. Recent advances in advancing technologies have resulted in a push for remote sensing methodologies such as drones equipped with standard or thermal cameras to replace the need for specialty equipment. However, in application, Environmental Consulting &

Technology, Inc. has identified that visual inspections utilizing specialty equipment would still frequently be needed to fill data gaps left by the use of these remote sensing methodologies. Based on our project experience for various Department of Transportations, municipalities, and utility providers an appropriate survey methodology should be determined on a case-by-case basis for each project to identify the most suitable processes and equipment to determine bat use within structures.

BAT ROOSTS IN BRIDGES: ASSESSING ILLINOIS BRIDGES FOR BAT USE

Jocelyn R. Karsk, Jean M. Mengelkoch, and Janet L. Jarvis. *Illinois Natural History Survey, Prairie Research Institute, University of Illinois Urbana-Champaign, Champaign, IL 61820*

The Illinois Natural History Survey (INHS) works with the Illinois Department of Transportation to conduct presence/absence surveys in compliance with the Endangered Species Act. From 2017 through 2023, INHS conducted more than 506 structure assessments on bridges and culverts throughout the state following protocols from the Federal Highway Administration, Federal Railroad Administration and Federal Transit Administration. All bridges were checked during the daytime, using high-powered headlamps to illuminate crevices and expansion joints. We found evidence (guano or staining) of bats roosting in 59 structures (56 bridges, 3 culverts; 14.5%). We observed more than 830 big brown bats and 10 tricolored bats and detected presence of northern long-eared bats through guano analysis.

TOOLS TO OPTIMIZE MANAGEMENT OF DATA FROM COUNTS OF WINTER COLONIES IN THE MIDWEST

Bryan Levi*, James Cox, and Joy O'Keefe. *Midwest Bat Hub, University of Illinois Urbana-Champaign, 1102 South Goodwin Avenue, Urbana, IL 61801*

Partners across eight Midwestern states currently follow varied protocols for counts of winter colonies, which makes data consolidation difficult. Therefore, it is beneficial to develop tools to help standardize data-collection methods for efficient aggregation of information from many sources. Our objective was to craft datasheets for winter-colony counts, incorporating fields required and suggested by NABat, as well as other fields that are relevant for the needs of these specific states. Simultaneously, a dedicated database in Microsoft Access was created as a comprehensive tool for data management. Based on previously used datasheets from our partners, the NABat template for winter-colony counts, and data-collection protocols across specific sites within the Midwest, we developed a template datasheet to maximize both ease of data entry and quantity of recorded information. Leveraging these datasheet fields, we created an Access database to store, query, and report data on species presence. The resulting datasheet captures a mix of static and dynamic information. The static details encompass unchanging site characteristics, and we also provide dynamic tables for individual visits and bat observations, organized by site and by section for larger hibernacula. The Access database features user-friendly data-entry forms, record navigation tables, and lookup forms facilitating specific record navigation using designated search criteria. Distributing the datasheet for use and receiving practical feedback is an important next step to increasing its effectiveness.

Additionally, having the ability to incorporate or link reference photographs to the database will help centralize information, thus streamlining the data-storage process.

MOVEMENTS OF LITTLE BROWN MYOTIS (*MYOTIS LUCIFUGUS*) BETWEEN SEASONAL HABITATS IN OHIO

Mattea A. Lewis* and Joseph S. Johnson. *Department of Biological Sciences, University of Cincinnati, Cincinnati, OH 45221 (MAL); School of Information Technology, University of Cincinnati, Cincinnati, OH 45221 (JSJ)*

Conservation of imperiled bats requires knowledge of habitats that are important to species throughout their annual cycle. However, relatively little is known about the movements of bats between seasonally important habitats, such as summer and winter roosts, or how bats move among available habitats such as potential hibernacula. Our goal was to document spring and fall movements of little brown myotis (Myotis lucifugus) in Ohio. Specifically, we aimed to document migration distances, determine if bats migrated directly from hibernacula to summer roosts, and radio-track bats during the fall swarm. We captured little brown myotis year-round, using harp traps during spring emergence and fall swarm, mist nets during the summer, and collecting bats by hand during hibernation. We recorded the age, sex, mass, and forearm length of all bats captured. All little brown myotis were banded, 21 were radio-tagged during spring emergence, and 4 were tagged during the fall swarm. Since 2021, we banded 556 little brown myotis, including 350 males and 206 females. Of these bats, 41 (7.4%) have been recaptured on one or more occasion. Seven banded bats were captured at both their summer and winter roosts, revealing minimum migration distances of 11.25–147.02 km (average = 31.18 km). We successfully tracked 4 female bats during spring emergence, travelling 4.82–27.11 km (average = 13.98 km) to 3 buildings. However, 2 of these buildings were stopover locations were bats stayed for several nights before continuing to migrate. Finally, 4 bats were tracked during the fall swarm, with 2 of these bats visiting multiple hibernacula during this time. While these results are preliminary, they provide insight into the movements of bats between seasonal habitats in Ohio.

BATS AND RABIES IN ILLINOIS

Jean Mengelkoch and Joyce Hofmann. *Illinois Natural History Survey, Prairie Research Institute, University of Illinois Urbana-Champaign, Champaign IL 61820*

Every year thousands of bats in the United States are submitted for rabies testing. We have identified most bats submitted in Illinois since 2002. Although the number of bats submitted for testing in Illinois has varied widely, the percentage of submitted bats that test positive for rabies has remained relatively constant. The vast majority of the submitted bats are big brown bats (Eptesicus fuscus), which frequently use buildings for roosting in the summer and hibernating in the winter. However, the bats with the highest prevalence of rabies are bats that are not typically associated with humans—hoary bat (*Lasiurus cinereus*) and eastern red bat (*Lasiurus borealis*). We will continue to monitor and examine long-term trends of bats submitted for rabies testing in Illinois.

ADVANCING KNOWLEDGE TO INFORM BAT-MARKING PRACTICES

Ashleigh Cable, Joy O'Keefe, Susan Loeb, Alyssa B. Bennett, Robert Barclay, Sarah Gaulke, Fernando Gual-Suárez, Samara Shames Pérez Harp, Vona Kuczynska, Cori Lausen, Rodrigo Medellin, and Brad Westrich. *School of Natural Resources, University of Tennessee, Knoxville, TN 37996 (AC); Natural Resources and Environmental Sciences, University of Illinois, Urbana, IL 61801 (JO); USDA Forest Service, Southern Research Station, Clemson, SC 29634 (SL); Vermont Department of Fish and Wildlife, Essex Junction, VT 05452 (ABB); Biological Sciences, University of Calgary, Calgary, AB, Canada T2N 1N4 (RB); Colorado Cooperative Fish and Wildlife Research Unit, Colorado State University, Fort Collins, CO 80523 (SG); Laboratorio de Ecología y Conservación de Vertebrados Terrestres, National Autonomous University of Mexico, Mexico City, Mexico (FG-S, SSPH, RM); USFWS Missouri Ecological Services Field Office, Columbia, MO 65203 (VK); Wildlife Conservation Society Canada, Kaslo, BC, Canada V0G 1M0 (CL); Indiana Department of Natural Resources, 5596 E SR 46, Bloomington, IN 47401 (BW)*

In 2021, representatives from the USA, Canada, and Mexico formed a working group to advance knowledge of global bat-marking practices. We hosted sessions at regional, national, and international bat meetings, conducted surveys to gather expert insights, and are conducting a systematic literature review on utility of/effects of marking bats globally. In discussion sessions with experts, we identified 13 broad reasons why bats are marked, including monitoring bat health, habitat use, movement, and populations. We identified 14 types of marks—bands, PIT tags, and transmitters were the most universally employed. Participants at regional USA meetings noted a lack of published studies on recovery/injury rates. In a poll, 80% of Northeast Bat Working Group respondents said their agency issues bands and 12% indicated they collect data on injury from marks. Southeastern Bat Diversity Network discussion participants stressed the need for a centralized database to store marking data and information on injury and recovery rates. In both 2022 and 2023, White-nose Syndrome Conference attendees discussed a need for standardized records (e.g., datasheets), reporting of marking information (e.g., banding codes and injury scores), and collaboration among agencies. The 2022 International Bat Research Conference Session raised unique ideas, like the need for training videos and resources on how to apply marks, a call for more studies on determining appropriate marking sizes, and the urgency for understanding sublethal impacts of marking bats. These discussions have guided our group's immediate goals: 1) develop guidance regarding best practices for marking bats applicable to a broad audience, 2) identify knowledge gaps and encourage studies to address these gaps, and 3) develop or identify a centralized system for hosting bat-marking data to facilitate gathering and analyzing data on mark recovery, injury, species-specific observations, or other sublethal effects. We continue to seek ideas for future work and expert insight.

BATS AND AGRICULTURE: EXPLORING RELATIONSHIPS BETWEEN AGRICULTURAL PRACTICES AND DISTRIBUTION OF BATS IN ILLINOIS

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We have some understanding of how bats respond to agricultural practices in Europe and Canada However, little is understood about the use of habitat by bats in an agriculture-dominated landscape like Illinois. Since wind turbines are often sited in these agricultural spaces, it would be helpful to know how bats respond to differing intensity of various practices. Our goal is to compare bat activity and/or species richness at locations with conventional, intensive monoculture to sites characterized by alternative agricultural practices (organic, minimal chemical use, and/or polyculture beyond corn and soy), using locations that we currently survey each year, as part of the North American Bat Monitoring Program. Alternative agriculture and standard agriculture sites will be within 5–20 km of each other. In summer 2023, during the first year of our 3-year study, we deployed acoustic recorders at nine alternative agriculture sites. Our preliminary results will help determine whether bat activity and/or species richness differ between sites using traditional agricultural practices and those using alternative agricultural practices.

ASSESSING AREAS FOR INTERACTIONS BETWEEN TRICOLORED BATS AND WIND-ENERGY FACILITIES

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The tricolored bat (*Perimyotis subflavus*) was recently proposed for listing as endangered by the U.S. Fish and Wildlife Service primarily due to the disease, white-nose syndrome; however, impacts from wind-energy developments were also considered to be a contributing factor. If the species is listed as endangered, then wind-energy projects may be subject to mitigatory actions (e.g., curtailment). Currently, wind turbines are operating in a considerable portion of the species' range. To understand where areas with potential interactions between tricolored bats and wind turbines might occur, we modeled the distribution of the species. Modeling of tricolored bat distribution predicted high occurrence throughout much of the eastern U.S., with sparse occurrence throughout the western portion of its range (central U.S.). Comparisons with current buildout and areas suitable for development suggest a considerable degree of possible interactions between tricolored bats and wind turbines, although more detailed site information is necessary to ascertain this as a generality. Further modeling efforts with additional occurrence data, especially in the western part of the range, and possibly with additional environmental and ecological variables will help elucidate the degree to which tricolored bats occur in this region and the potential for interaction with wind turbines.

FOR THE LOVE OF GUANO AND COMMUNITY SCIENCE IN ILLINOIS

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The Illinois Bat Conservation Program (IBCP), founded in 2016, focuses on the conservation and management of bats in Illinois. In 2017, a community science roost form was made accessible to the public through the IBCP's website (illinoisbats.org). This form collects data on the type of roost structure, its location, and approximately how many bats are present and requests contact information. Through 2023, we have received 117 roost forms from 40 Illinois counties, by promotion through social media and outreach. The type of roost structure with the highest submissions was "other," which included park shelters, bridges, and bat houses/boxes. In summer 2020, to gain additional insights, we asked participants to collect a guano sample and mail it to us, to determine the bat species in their roost. Twenty-four guano samples were returned through 2023, allowing species identification of the bats in these roosts through analysis of DNA. Twenty-one samples were identified as big brown bat (Eptesicus fuscus), while three samples came back inconclusive. This community science project provides insight into the type of roosts used, the species that are using them, their location in Illinois, and approximately how many individuals are at each roost.

IMPACT OF BIOPSY SIZE AND BAT SPECIES ON DNA YIELDS

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Genetic methods are becoming increasingly accessible and ubiquitous, but when taking samples from living animals, there are tradeoffs between the animal's wellbeing, amount of tissue acquired, and sequencing capabilities and costs. For bats, genetic samples are often collected by taking biopsies of wing tissue. To determine minimum biopsy amounts sufficient for genetic studies, we performed a methodological evaluation using deceased bats. From each individual, we collected 2, 4, 6, and 8 2-mm biopsy punches. To explore differences that might arise due to species (i.e., different thicknesses of wing membranes), we sampled from three species: tricolored bats (n = 16 individuals), gray bats (24), and big brown bats (19). We then performed DNA extractions followed by quantification of DNA yields (via Qubit fluorometer). While analyses are ongoing, preliminary results suggest a clear effect of species (with big brown bats yielding the most DNA, and tricolored bats yielding the least) and biopsy amount, as well as between individual specimens. Overall yields for tricolored bats are low enough to be challenging for many cost-effective Next-Generation sequencing methods but are more reasonable for microsatellite and mitochondrial sequencing goals. In contrast, overall yields for big brown bats and gray bats seem to be sufficient for genomic sequencing based on our data. However, there is also unexplained variation in the data, possibly due to minor differences in extraction methodology, reagents, or other factors. Our findings will ultimately help provide guidance for minimum biopsy requirements for different focal species and sequencing goals.

DETECTION OF LISTED BAT SPECIES UNDER BRIDGES THROUGH THE USE OF FECAL DNA

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Detection of listed bat species (i.e., designated endangered by national or international organizations such as the International Union for Conservation of Nature [IUCN]) using bridges is important for wildlife conservation and management. Species that roost under bridges include the Indiana bat (*Myotis sodalis*), a United States (US) federally listed species and the little brown bat (*Myotis lucifugus*), which is listed as endangered by the IUCN and >10 states and provinces. This roosting behavior puts these species at greater risk when bridges require maintenance or replacement. The ability to detect species inexpensively and efficiently will prove essential to bat conservation as infrastructure projects increase. We determined whether bridges could be used to detect listed bat species. We used guano collected at roosts of 118 bridges in the US and 126 bridges in Canada that were provided to our Species from Feces program. We employed DNA metabarcoding or Sanger sequencing to identify bat species. We detected 16 species or species pairs of which ≥3 species are listed in the US or Canada. We found that, like species accumulation curves and our previous samples in mines, the more bridges sampled, the more species detected. However, even a single bridge sample detected a listed species in 4 of 12 states or provinces. Because use of bridges by bats includes both day and night roosting, monitoring bridges using our non-invasive approach can successfully identify species. Our results show that this approach is productive in identifying use by bat species, including those that are listed.

BAT ACTIVITY AND SPECIES RICHNESS IN AGROECOSYSTEMS IN RELATION TO DRAINAGE HEDGEROW AND LANDSCAPE STRUCTURE

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Bats are considered vulnerable to the threats associated with agriculture due to loss of habitat and reduced foraging resources. Hedgerows can provide foraging habitat for bats and are common semi-natural linear features along agricultural drainages in temperate agroecosystems. Two important variables likely to affect bat activity within hedgerows include hedgerow structure and landscape structure. We hypothesized that hedgerows that are taller, wider, and more variable in height, and landscapes with higher forest amount and smaller fields, would support higher bat activity within drainage hedgerows by providing more habitat. To test our hypotheses, we conducted passive ultrasonic surveys of bat activity along drainage hedgerows in 55 landscapes in eastern Ontario. Overall, we found that bat activity was positively associated with taller and more variable drainage hedgerows. We did not detect an effect of drainage hedgerow structure on species richness. With respect to landscape structure, bat activity was generally

positively associated with the amount of forest and negatively associated with mean field size in the landscape. Total bat activity and the activity of the big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*) and little brown myotis (*Myotis lucifugus*) were positively associated with forest amount in the local landscape. Our results show that structurally complex drainage hedgerows and forest patches within the landscape provide valuable habitats for bats in agroecosystems.

Hotel and Area Guide

Hilton Netherlands Plaza, 35 W 5th St, Cincinnati, OH 45202

Parking Information
The Hilton Cincinnati Netherland Plaza is on the corner of Fifth and Race Streets. Valet parking is available on the left side of Race Street (look for the large green arrow sign above entrance). Self Parking is available at Mabley Place Garage on Race Street.

The garage entrance is on the left-hand side of the street, just past the valet entrance. Please note the clearance is 6'6".

Valet Pricing
0–2 hours: $10.00
2–12 hours: $21.00
Overnight (with in/out privileges): $48.00

Mabley Place Pricing
4–12 hours: $18.00
> 12 hours: $22.00
Lost Ticket: $60.00
Overnight (with in/out privileges until 4:00 pm the day of departure): $33.00

Other lots are available within a 15-minute walk for $12/night. Check locations and rates here: https://www.3cdc.org/where-to-park/

WELCOME TO CINCINNATI

TRANSPORTATION

AIRPORT TRANSPORTATION

CVG

Map of Airport

Transportation Options

- Uber
- Lyft
- Taxi
- Airport Shuttle

EXECUTIVE TRANSPORTATION

Airport Shuttle

APPLICATION FOR BUSES AND STREETCAR

transit

STREETCAR

CONNECTOR

Website

Map of Route

BUSES

go•METRO

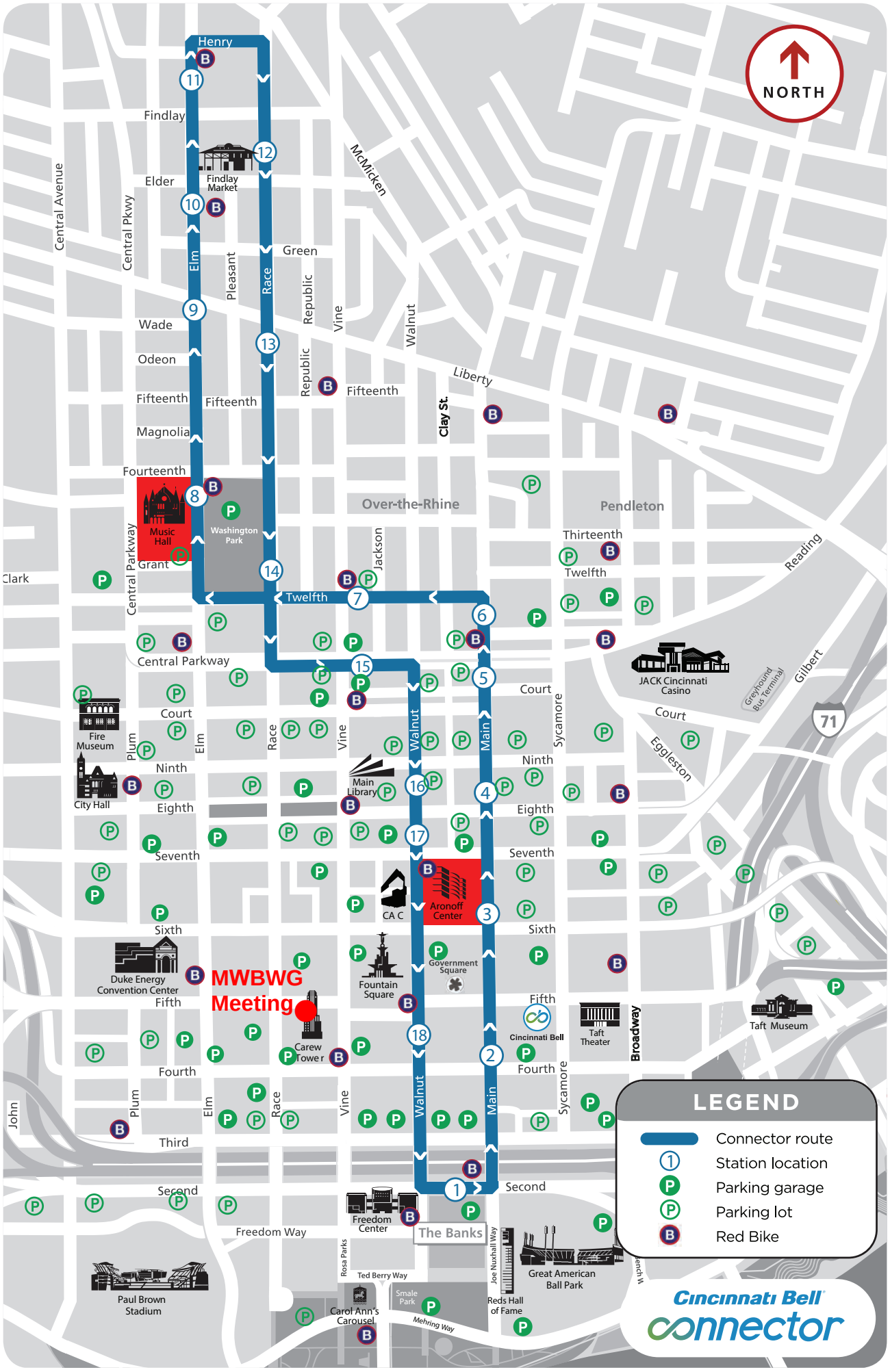
Website

Map of Route

TANK
TRANSIT AUTHORITY OF NORTHERN KENTUCKY

Website

Map of Route


NORTH
Henry
Findlay
Findlay Market
Elder
Central Avenue
Central Pkwy
Elm
Pleasant
Race
Green
McMicken
Republic
Vine
Walnut
Wade
Odeon
Fifteenth
Fifteenth
Fifteenth
Liberty
Clay St.
Magnolia
Fourteenth
Music Hall
Washington Park
Over-the-Rhine
Pendleton
Thirteenth
Twelfth
Reading
Jackson
Central Parkway
Grant
Clark
Twelfth
Gilbert
JACK Cincinnati Casino
Greyhound Bus Terminal
71
Court
Eggleston
Fire Museum
Plum
Elm
Race
Vine
Walnut
Main
Sycamore
Court
Ninth
Main Library
Ninth
City Hall
Eighth
Eighth
Seventh
Seventh
CA C
Aronoff Center
Sixth
Sixth
Duke Energy Convention Center
MWBWG Meeting
Fountain Square
Government Square
Fifth
Cincinnati Bell
Taft Theater
Broadway
Taft Museum
Carew Tower
Fourth
Fourth
John
Plum
Elm
Race
Vine
Walnut
Main
Sycamore
Third
Second
Second
Freedom Center
The Banks
Freedom Way
Rosa Parks
Ted Berry Way
Joe Nuxhall Way
Great American Ball Park
Bench W
Paul Brown Stadium
Carol Ann's Carousel
Smale Park
Mehring Way
Reds Hall of Fame
LEGEND
Connector route
Station location
Parking garage
Parking lot
Red Bike
Cincinnati Bell
connector

WELCOME TO CINCINNATI

ATTRACTIONS

RIVERBOAT SOCIAL

Date: Tuesday, 2 April 2024
Boarding: starts at 6:00 PM
Launch: 7:00 PM
Return: 9:00 PM

Address: 101 Riverboat Row, Newport, KY 41071
Boat: Belle of Cincinnati
Room: Bellevue (3rd floor)
Note: Room is private. Boat is not. There will be others on board who are not part of our group.

How to Get There:
- Walk (1.3 mi*)
- Drive/carpool
- Taxi/Uber/Lyft
- City bus (Southbank or TANK)

Other Notes:
- Food stations
- Cash bar
- No outside food/drinks
- Top level is open to all
- Some groups have tickets. Ours does not.

WALKING TOURS

American Legacy Tours
Historically Entertaining

Newport Gangster Tour starts: 1.5 mi
Ultimate Queen City Underground Tour starts: 0.7 mi

AQUARIUM

1.7 mi

MUSEUMS

Cincinnati Black Music Walk of Fame	Cincinnati Reds Hall of Fame and Museum	Cincinnati Fire Museum	National Underground Railroad Freedom Center	taft Museum of Art
0.5 mi	0.5 mi	0.5 mi	0.4 mi	0.6 mi

* Distance from the hotel.

WELCOME TO CINCINNATI

FOOD AND DRINKS

CINCINNATI SPECIALTIES

Graeter's

0.1 mi*

Skyline Chili

0.6 mi

COFFEE

Deeper Roots Coffee

0.3 mi

Lola's Cincinnati, Ohio

0.4 mi

BAKERIES AND BREAKFAST

Maplewood Kitchen and Bar

0.3 mi

Paris Baguette Bakery Café

370 ft

Taste of Belgium

0.4 mi

AMERICAN

Alcove

0.8 mi

The Eagle Food & Beer Hall

0.7 mi

Jefferson Social

0.6 mi

Moerlein Lager House

0.6 mi

Street City Urban Gourmet

0.3 mi

* Distance from the hotel.

WELCOME TO CINCINNATI

FOOD AND DRINKS

ASIAN

Lotus Thai & Sushi — 0.2 mi*

Mr. Sushi — 0.3 mi

Saigon Subs and Rolls — 0.1 mi

Zundo Ramen & Donburi — 0.7 mi

BRITISH

Nicholson's Fine Food & Whisk(e)y — 0.3 mi

Yard House — 0.4 mi

GERMAN

Hofbräuhaus Newport Brewery & Restaurant — 1.5 mi

The Lübecker — 0.8 mi

IRISH

O'malley's in the alley — 0.1 mi

MEDITERRANEAN

Aladdin's — 0.8 mi

RUSSIAN

Wódka Bar — 0.8 mi

* Distance from the hotel.

WELCOME TO CINCINNATI

FOOD AND DRINKS

MEXICAN

BAKERSFIELD

0.6 mi*

CONDADO
TACOS • TEQUILA • MARGARITAS

0.6 mi

GOMEZ

0.7 mi

PIZZA

GOODFELLAS
PIZZERIA
A SLICE OF NEW YORK CITY

0.8 mi

Lucy Blue
PIZZA

0.7 mi

STRONG'S BRICK OVEN PIZZERIA

1.4 mi

BREWERIES

Braxton
BREWING CO.

1 mi

BREWDOG

0.8 mi

RHINEGEIST
CINCY • MADE

1.3 mi

CINCINNATI
VOODOO
BREW PUB

0.5 mi

* Distance from the hotel.