Conservation of Urban Amphibians and Reptiles

Midwest PARC 2013 Meeting, August 2-4, 2013

Location: Forest Beach Migratory Preserve
(http://owlt.org/visit-our-preserves/forest-beach-migratory-preserve)
4970 Country Club Rd, Port Washington, WI 53074

From Milwaukee, go north on I-43 approximately 30 miles to Exit 100 (WI-32 South) towards Port Washington. At the exit ramp stop sign turn right then immediately turn left onto Hwy. LL at the light. Continue 3.7 mi. to Hwy. P (Dixie Road, there is a red tavern/restaurant on the SW corner and an old Squires Golf Club billboard. Turn right (east) on P. Continue east over the freeway until the road curves to the left and goes right up to the old clubhouse and parking.

Urban Blanding's Turtles are often hidden from view (G.S. Casper)
Program

- **Friday, August 2**
  - **Arrival** Participants are responsible for their own lodging. A list of nearby motels is provided below. The Midwest PARC listserv may be used to find roommates if desired. Free tent camping is available on site (inside bathrooms and kitchen available).
  - **2-5 p.m.** Optional Field Trips: These field trips showcase properties where major habitat restorations are underway and herps are being monitored.
    - **Mequon Nature Preserve:** This property has a 150 year plan to convert agriculture to wildlife habitat, and we’ll trap ponds and check snake boards as we tour [http://mequonnaturepreserve.org/](http://mequonnaturepreserve.org/). Arrive by 2 p.m. at 8200 W. County Line Rd, Mequon. Phone: (262) 242-8055. From I-43 go west on Hwy 167 (Mequon Rd) 4 miles to Hwy 181 (Wauwatosa Rd), then south 2 miles to County Line Rd, then west ¼ mile. Trip leaders: Jason Nickels (cell 920-723-7788), Gary Casper (cell 262-689-4095).
    - **Forest Beach Migratory Preserve:** This former golf course is being converted to wildlife habitat, and we’ll trap ponds and check snake boards as we tour [http://owlt.org/visit-our-preserves/forest-beach-migratory-preserve](http://owlt.org/visit-our-preserves/forest-beach-migratory-preserve). Leave clubhouse parking lot at 2 p.m., see directions above. Trip leaders: Mike Hoffer (cell 910-612-1909), Shawn Graff and Kit Walters.
    - **Urban Ecology Center Riverside Park:** This field trip showcases ongoing riverway habitat restoration and tracking Butler’s Gartersnakes with implanted diodes [http://urbanecologycenter.org/our-branches/riverside-park-overview.html](http://urbanecologycenter.org/our-branches/riverside-park-overview.html). Arrive by 2 p.m. at 1500 E, Park Pl., Milwaukee. (414) 964-8505. From I-43 on the north side of downtown Milwaukee go east on Locust St. 2 miles to N. Oakland Ave., then south 3 blocks to E. Park Pl., then west 4 blocks. Trip leaders: Julia Robson (cell 262-914-7557), Tim Vargo.
  - **2 p.m.** Poster Session Opens: the poster room is available for poster setup. The Poster Session lasts the entire meeting, and authors may setup and take down upon arrival/departure.
  - **5-7 p.m.** Dinner on your own, several fine restaurants in nearby Port Washington
  - **7 p.m.** Social at the Forest Beach Migratory Preserve clubhouse
Saturday, August 3

- Breakfast  On your own
- 8:00 a.m.  Conference Registration: Forest Beach Migratory Preserve clubhouse. Note that pre-registration is required for meals.
- 9:00 a.m.  Introduction: Gary S. Casper
- 10 a.m.  Morning Session
  - 10:00 a.m. - Managing Spiny Softshell Nest Sanctuaries in Twin Cities Parks (M. Linck)
  - 10:20 a.m. - Conservation of the Blanding’s Turtle in the Chiwaukee Illinois Beach Lake Plain (G. Glowacki, A. Kuhns & K. Cassel)
  - 10:40 a.m. - Coffee break
  - 11:10 a.m. - Comparing the Effects of Development on Turtles Across Species and Land-Use Gradients in Wisconsin (B. N. Reid & M. Z. Peery)
  - 11:30 a.m. - Predicting Spring Emergence in a Northern Population of the Eastern Box Turtle (C. Woodley & B. Kingsbury)
  - 11:50 a.m. - The Development of an Electric Fence to Reduce Freshwater Turtle Nest Predation (G. Geller)
- 12:10 p.m.  Lunch: provided on site
- 1:20 p.m.  Afternoon Session
  - 1:20 p.m. - Use of Comparative Brumation and Release Approaches for Headstarting and Recovery of Smooth Greensnakes (A. Sacerdote-Velat)
  - 1:40 p.m. - Invasive Plant Management Creates Ecological Traps for Snakes (E. T. Carter, B. C. Eads, M. J. Ravesi & B. A. Kingsbury)
  - 2:00 p.m. - Monitoring Herptile Response to Habitat Restoration on the Milwaukee River (J. Robson, G. S. Casper, T. Vargo, J. Callaghan & C. Berg)
  - 2:20 p.m. - Wisconsin Salamander Survey, with an Emphasis on Urban Salamanders (R. Korb)
  - 2:40 p.m. - Coffee break
  - 3:10 p.m. - Blue-spots in a Green Hotspot: an *Ambystoma laterale* population on the Grounds of the Milwaukee County Zoo (C. Berg & P. de Tarso Ferraz Meira)
  - 3:30 p.m. - Herptile Monitoring and Restoration at the Mequon Nature Preserve (J. Nickels, G. S. Casper & K. Gies)
  - 3:50 p.m. - Habitat for the Wild and Rare (J. Hastings)
  - 4:10 p.m. - Incorporating Herptile Populations into Restoration and Management Planning (B. Russart & J. Robson)
- 4:30 p.m.  Break / Poster Session / Auction viewing
- 6:00 p.m.  Banquet: provided on site
  - 6:00 p.m. - Eat!
Midwest PARC 2013 Meeting

- 6:45 p.m. - Banquet Presentation: Reservoir Waterdogs: The Neotenic Tiger Salamanders of the Badger Army Ammunition Plant, by Mike Mossman (Wisconsin DNR).
- 7:30 p.m. - State Chapter Updates (go around the room)
- 8:30 p.m. - Auction closes
  - 8:30 p.m. Social at the Forest Beach Migratory Preserve clubhouse

Sunday, August 4

- Breakfast On your own
- 8 a.m. Morning Session
  - 8:00 a.m. - Midwest PARC Update (Bruce Kingsbury & Allison Sacerdote-Velat)
  - 8:15 a.m. - National PARC Update (Priya Nanjappa, PARC State Coordinator): Landscape Conservation Cooperatives, Habitat Management Guidelines, other items
  - 8:35 a.m. - PARC Working Group Updates (go around the room)
  - 9:00 a.m. - Auction results (Bruce Kingsbury & Allison Sacerdote-Velat)
  - 9:10 a.m. Working Group Breakout Sessions (with coffee)
    - Working Group 1
    - Working Group 2
    - Working Group 3
- 11:00 a.m. Midwest PARC Elections
- 11:30 a.m. Wrap-up Session
  - Working Group Reports (go around the room)
  - Announcement of Election Results and next meeting
  - Election results and closing remarks (Bruce Kingsbury & Allison Sacerdote-Velat)
- 12:10 p.m. Lunch: provided on site (Wisconsin PARC Board meeting)
- 1:00 p.m. Wisconsin PARC meeting (Gary S. Casper & Mary Linton)
  - Update on progress; website, membership, organizational guidelines; introduce board nominees, call for new nominees
  - Elections
  - Working group round-table
  - Election results and next meeting
- 2:00 p.m. Optional Field Trips: These field trips showcase properties where major habitat restorations are underway and herps are being monitored.
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Posters:
1. An invasive plant secondary metabolite disrupts embryo development in *Xenopus laevis* and a native amphibian, *Pseudacris triseriata*. (A. Sacerdote-Velat & R. B. King)
2. Short-term Amphibian and Reptile Habitat Use and Abundance in Response to Oak Savanna Restoration. (R. Brodman, A. Marsh, M. Gramhoffer & P. Kellenburger)
3. Detection of Deltamethrin in Salamanders from Wind Cave National Park by High Performance Liquid Chromatography. (S. E. Wiegel, B. E. Smith, K. C. Cabarle & J. Dixson)
4. Blanding’s Turtle (*Emydoidea blandingii*) Conservation and Educational Efforts in a Portion of Wisconsin Affected by Suburbanization. (J. Zellmer)
5. Measuring Niche Overlap in a Community of Invertebrate Eating Snakes. (M. A. Thomas & S. J. Mullin) - CANCELLED
6. Behavioral Responses of Two Syntopic Snakes (Genus *Thamnophis*) to Roads and Culverts (B. Eads & B. Kingsbury)

Auction
Additional auction items can be donated at the meeting.

PARC Products For Sale
At the meeting we’ll have special deals on the beautiful, new and informative PARC publication *Habitat Management Guidelines for Amphibians and Reptiles of the Midwest*, and the even newer and equally informative PARC publication *Inventory and Monitoring: Recommended Techniques for Reptiles and Amphibians with Application to the United States and Canada*. Get ’em while they are hot.
Lodging:

Free tent camping is available at the Forest Beach Migratory Preserve (inside bathrooms and kitchen are available).

Nearby Motels – book early for best availability. Other motels may be found on web searches for Port Washington, Saukville, Cedarburg, or Grafton, Wisconsin.


Butler's Gartersnake (G.S. Casper)
Meeting Sponsors and Donors

Additional Donors: Mary Linton, Priya Nanjappa, Allison Sacerdote, Robert Brodman, and other auction donors whose names were not received in time for this printing. Thanks!
Meeting abstracts are posted on www.mwparc.org
Herpetological Restoration in an Urban Landscape

Robert P. Cook
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Urbanization reduces herpetofaunal diversity and species distribution, often limiting species to habitat remnants. Such remnants, and patches created or enhanced by restoration projects, are often the only available habitat for urban herpetofauna but, because of isolation and limited dispersal abilities, these patches are often depauperate, limiting their contributions to regional conservation. Translocation has been proposed to salvage doomed populations and overcome the demographic and genetic constraints of limited dispersal in urban areas, and may also help to better realize the potential of isolated patches of restored habitat. Yet, translocation success can be low and at best is an experimental strategy of last resort. Beginning in 1980, I began a program of habitat improvements and herpetofaunal translocations to Gateway National Recreation Area, 10,522 ha managed by the National Park Service in the New York Metropolitan Area. Much of its disjunct upland habitat was created in the early 20th century from dredge spoil, and although well known for its significance to birds, dispersal barriers inhibited colonization by amphibians and reptiles. Although the goals of this program were to use these faunally impoverished habitats to salvage local populations and restore/recreate, to the extent possible, the herpetofaunal community historically native to the area, the results of this work also provide a test of herpetofaunal translocations in an urban landscape. The species translocated were historically native to the park and immediate area. From 1980 to 1995, I translocated 20 species to one or more sites, for a total of 40 translocations. I began with lower trophic levels and depending on species, used different life stages. Data from 2002 and 2003 found evidence of persistence in 29 of 40 translocations and recent reproduction in 26 of 40. Based on 7 to 22 years of monitoring, 19 translocations appear successful, 7 probably are, 4 are uncertain, and 10 appear failed. As a result of this program, the park now supports a greater proportion of the area’s original native herpetofauna. However, most of the success with translocations has been with generalist species that remain fairly common outside of large urban areas. Errors of judgment led to failed translocations. These results illustrate the potential and limitations of translocation as a management tool in urban areas, and suggest ways to improve the success of future efforts.
PRESENTATIONS:

1. Managing Spiny Softshell Nest Sanctuaries in Minneapolis Metro Parks

Madeleine Linck  
Three Rivers Park District, Plymouth, Minnesota. mlinck@threeriversparkdistrict.org

For 10 years, Three Rivers Park District has experimented with methods to provide nesting habitat for Spiny Softshell Turtles within two of its parks. Increased shoreline fishing, boating, and swimming were observed to impact nesting turtles. Since this species prefers diurnal nesting June-July, it conflicts with high human activity. Also, with development and extensive use of riprap for erosion control, many shorelines are no longer suitable for nesting. Mammal predation of turtle nests is typically high within the parks. For years, staff at a garden park adjacent to Lake Minnetonka, Hennepin County, observed Softshell Turtles attempting to nest in plantings. The turtles were scared off by visitors until fencing with signs was installed. Volunteers and staff cage nests to prevent predation. Shoreline riprap can trap hatchlings so cages are screened to hold hatchlings. The enclosures are checked daily beginning in August. 200 hatchlings were released at this site in 2012. At another park, sand was added west of a swimming beach. A 4-foot fence was installed so turtles could come ashore with less intrusion from park visitors. Volunteers watch for turtles to identify nests. Screened enclosures prevent predation, but allow hatchlings to exit. Volunteers keep visitors back and explain why turtles come ashore. Nests on the swimming beach itself would be lost due to raking and recreation. The turtles learned to use the fenced area quickly. There were 6 nests within the enclosure in 2009. The number of nests has since grown steadily to >20 per season. While education was not the original focus, high visibility to a very interested public has made interpretation necessary. Without intensive management, our urban Softshell Turtle populations would likely disappear.

2. Use of Comparative Brumation and Release Approaches for Headstarting and Recovery of Smooth Greensnakes (Opheodrys vernalis)

Allison Sacerdote-Velat  
Reintroduction Biologist, Lincoln Park Zoo, Chicago, Illinois. a.b.sacerdote@gmail.com

Many headstarting efforts keep reptiles active year-round to maximize growth. However, there may be post-release tradeoffs related to overwintering survival and reproduction when reptiles are kept active. Using Smooth Greensnake recovery as a model framework, we compared efficacy of headstarting and release approaches, focusing on incorporation of brumation and soft release for achieving recovery goals. In 2011 and 2012, half of the headstarts were
brumated and half were kept active. Despite decreased body condition index during winter, brumated headstarts exhibited remarkable compensatory growth such that body size and condition did not differ among active and brumated headstarts within one month post-brumation. Brumated females had greater body condition indices than active females at the time of release and exhibited evidence of earlier reproductive maturity. In winter 2012-2013, most headstarts were brumated including snakes that were previously kept active. Post-brumation body conditions among two-year olds that were previously brumated and those naïve to brumation were similar. In all years, we examined growth from hatching to release, body size and condition at release, and post-release survival to brumation in the field. Headstarts were released in 2011 using hard and soft release with no difference in survival to brumation. Releases in 2012 used only soft release with no documented mortalities prior to brumation. Only 18% of the 2011 headstarts, all brumated females, were encountered in 2012. However, Illinois experienced record drought in 2012, limiting captures of wild and headstarted snakes. Assessment of headstart survival from the 2011 and 2012 releases is ongoing.

3. Invasive Plant Management Creates Ecological Traps for Snakes

Evin T. Carter\textsuperscript{a*}, Bryan C. Eads\textsuperscript{b}, Michael J. Ravesi\textsuperscript{b} and Bruce A. Kingsbury\textsuperscript{b}
a - Ecology and Evolutionary Biology, University of Tennessee, Knoxville, Tennessee 37996; b - Department of Biology, Indiana University – Purdue University, Fort Wayne, Indiana 46805. * - Presenter: ecarte19@utk.edu

Non-native invasive species are known to alter ecosystem structure and function. As such, invasive species management is becoming increasingly essential and ubiquitous and can often be unavoidable even within areas where natural resource management is not a primary goal (e.g., for structural integrity). However, established methods for invasive species management can potentially lead to unintended outcomes such as the decline or extirpation of non-target species and habitats. Here, we provide direct evidence of the impacts of invasive plant management on Copperheads (\textit{Agkistrodon contortrix}), showing that several habitats that are subject to invasive plant control can and do attract snakes and simultaneously place them at greater risk of injury and mortality. At the same time, management activities reclaim important resources for native species and can reduce or eliminate impacts acting on additional non-target species and habitats, leaving multiple dilemmas for conservation. Land managers should consider adjustments to current methods of invasive plant management, including altering the timing and frequency of mechanical and chemical treatments, in order to minimize impacts on native species and maximize the value of invasive plant management.
4. Habitat for the Wild & Rare

Jeff Hastings
Trout Unlimited, E7740 Hastings Lane, Westby, Wisconsin 54667. jhastings@tu.org

Each year federal, state and county conservation agencies spend millions of dollars stabilizing streambanks and incorporating habitat for trout. However few stream restoration projects have incorporated habitat for non-game species such as snakes, frogs, turtles and birds; probably due to a lack of knowledge about those species’ habitat needs or limited funding opportunities. Incorporating habitat for other species at the same time that construction equipment is being used for stabilizing streambanks is efficient and cost-effective. Five years ago Trout Unlimited developed a habitat guide for conservationists in the Driftless Area illustrating a wide variety of designs to address limiting factors for a variety of species using the riparian corridor. This guide has fueled a number of new projects with habitat for nongame species, inspired non-traditional partners and opened up additional funding opportunities. In 2013 Trout Unlimited hosted several meetings to capture ideas from professionals to create a 2nd edition with major revisions and designs. The second addition is now completed and contains: a matrix on when and where it is appropriate to install various habitat practices; revised text with photographs; and habitat designs formatted to utilize Farm Bill dollars. This presentation will highlight a number of projects that have incorporated nongame habitat into their projects; will provide a glimpse of some of the formatted designs; and will offer a short discussion on how incorporating nongame species into restoration projects has led to new partners, funding and more ecologically sound projects.

5. Conservation of the Blanding’s Turtle in the Chiwaukee Illinois Beach Lake Plain

Gary Glowacki1, Andrew Kuhns2 and Kevin Cassel3
1 - Lake County Forest Preserve District, 1899 West Winchester Road, Libertyville, Illinois 60048 gglowacki@lcfpd.org; 2 - Illinois Natural History Survey, Prairie Research Institute, 1816 South Oak Street, MC 652, Champaign, Illinois 61820 arkuhns@illinois.edu; 3 - Cooperative Wildlife Research Lab, Center for Ecology, Southern Illinois University, Carbondale, Illinois 62901.

Blanding’s Turtle (Emydoidea blandingii) is a long-lived, semi-aquatic turtle primarily distributed across the Great Lakes region of the United States and Canada that has experienced range-wide declines due to a combination of habitat loss and fragmentation, over collection, road mortality and high levels of predation. It is designated as Threatened (Iowa, Massachusetts, Minnesota, New York, Wisconsin, Ontario and Quebec) or Endangered (Illinois, Indiana, Maine, Missouri and Nova Scotia) in many states and provinces in which it occurs. The Lake County Forest...
Preserve District (LCFPD), in conjunction with the Illinois Natural History Survey and Southern Illinois University, has been monitoring the Blanding’s Turtle population at Spring Bluff Nature Preserve, a small preserve within the 5,032 acre Chiwaukee Illinois Beach Lake Plain in northeastern Illinois and southeastern Wisconsin, since 2004. This population represents one of the largest (N>165) and most well-studied in the Midwest. However, modeling has indicated that the population is not viable long-term and is in decline due to low juvenile recruitment combined with unsustainable levels of adult mortality. In an effort to secure this population, LCFPD and its partners have conducted landscape scale habitat restoration, initiated a head-starting program and have begun experimental control of meso-predators to increase nest success and juvenile survivorship. Preliminary data suggest that these conservation measures have resulted in increased juvenile recruitment and hopefully as these juveniles mature and reproduce, the extinction probability for this population will decrease.

6. Comparing the Effects of Development on Turtles Across Species and Land-Use Gradients in Wisconsin

Brendan N. Reid and M. Zachariah Peery
Department of Forest and Wildlife Ecology, University of Wisconsin-Madison, Madison, Wisconsin 53706-1598.
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Comparisons across species and across different intensities of land use can be vital in evaluating the effects of development on herpetofauna and prioritizing species-specific conservation efforts. We used two metrics (sex ratio and genetic diversity) to evaluate the effects of development on three species of turtles: the endangered Blanding’s Turtle (Emydoidea blandingii) as well as the more common Painted Turtle (Chrysemys picta) and Snapping Turtle (Chelydra serpentina) across Wisconsin. Road density was used as a proxy for urbanization. Increased road density was associated with increasingly male-biased samples in Blanding’s Turtle, suggesting that female-biased road mortality leads to skewed population sex ratios in this species. This trend was absent, however, in Painted and Snapping turtles. Genetic diversity (as measured by individual heterozygosity) was negatively correlated with road density for Blanding’s Turtle; again, however, this effect was not seen in Painted or Snapping turtles. Urban populations of Blanding’s Turtle were also more genetically isolated than populations in less developed areas, while genetic isolation was more related to simple physical distance than landscape context in Painted and Snapping turtles. Increased vulnerability of Blanding’s Turtle to development is not unexpected, given the species’ habitat requirements and life history traits. However, these results provide further evidence for the deleterious impacts of development on this species and a clear rationale for increasing protection on its behalf.
7. Herptile Monitoring and Restoration at the Mequon Nature Preserve

Jason Nickels¹*, Gary S. Casper², Kristin Gies¹
1 - Mequon Nature Preserve, 8200 West County Line Road, Mequon, Wisconsin 53097. 2 - Great Lakes Ecological Services, LLC, and UWM Field Station, P.O. Box 375, Slinger, WI 53086. * Presenter: jnickels@mequonnaturepreserve.org

The Mequon Nature Preserve (MNP) was established in 2004 by the Ozaukee Washington Land Trust for the purpose of restoring 438 acres from mostly agriculture to natural areas. A long term, 150 year, restoration plan was written to 2006, with an emphasis on wetland and mesic hardwood forest restoration. In 2011 the current independent preserve was established. Baseline surveys were begun in 2005 to determine what species of amphibians and reptiles were present. Vegetation and wetland restorations began in 2004 and continue through the present. Monitoring of amphibian and reptile response to the restoration activities has been ongoing. Initially, 6 amphibian species were present in low numbers (American Toad, Western Chorus Frog, Gray Treefrog, Northern Leopard Frog, Green Frog, Bullfrog), Painted and Snapping turtles were present in a permanent farm pond connected to a stream, and Common Gartersnakes were rare. After wetlands were restored and agriculture ceased, a rapid increase in American Toad, Northern Leopard Frog and Gray Treefrog numbers was observed, and one new species arrived – Wood Frog. This was followed by a rapid increase in Eastern Gartersnake numbers, but no other snake species, nor any salamanders, have yet returned. Also, in the last two years, Painted and Snapping turtles have been sighted in all four wetland systems of the preserve. Due to a lack of natural salamander immigration we began a repatriation experiment in 2013, moving 124 Blue-spotted and 483 Tiger salamander eggs into a restored vernal pond in a suitable habitat matrix. These eggs hatched successfully and monitoring and additional translocations are planned. We describe the potential for restoring amphibian and reptile species richness at this property as we continue to restore the natural communities.

8. The Development of an Electric Fence to Reduce Freshwater Turtle Nest Predation

Gregory A. Geller
County Hwy C, North Freedom, Wisconsin 53951. ggeller54@gmail.com

The development of an electric fence to reduce turtle nest predation is reviewed. Camera monitoring during preliminary studies guided the ultimate design of a 3-stranded, solar-powered fence (one electrified wire at 25.4 cm and two non-electrified clothesline strands at 15.2 cm and 20.3 cm above the substrate) over a grounded wire mesh. Fences were effective in reducing raccoon (Procyon lotor) access to two traditional Map Turtle (Graptemys spp.) nesting
sites on the Wisconsin River in Iowa County, Wisconsin, during a 2009-2011 field study, yielding a 74% overall reduction in nest predation rates between fenced treatment and unfenced control areas while concurrently allowing the safe and unhindered passage of nesting turtles. Camera data also provided information on predator-specific exclusion effectiveness and the utility of fence baiting. General electric fencing and predator exclusion principles, as well as suggestions for further context-dependent modifications of this potentially widely usable method, are discussed.

9. Wisconsin Salamander Survey, with an Emphasis on Urban Salamanders

Randy Korb
Gaylord Nelson Audubon Society, P.O. Box 1, St. Croix Falls, Wisconsin 54024. www.rkthefrogguy.com

Citizen monitors in the Wisconsin Salamander Survey (2008-2013) help fill in geographic distribution gaps on four terrestrial species, document new county records, and increase public awareness of salamanders. I share survey methods, results and mapping of salamander distribution in urban wetlands.

10. Incorporating Herptile Populations into Restoration and Management Planning

Brian Russart*1, 2 and Julia Robson1
1- Milwaukee County Department of Parks Recreation & Culture, 9480 Watertown Plank Rd, Wauwatosa, WI 53226; 2- Milwaukee County-University of Wisconsin Extension. * - Presenter: brian.russart@milwcnty.com

The Milwaukee County Parks System contains 4,046 hectares of natural areas and agricultural lands within Wisconsin’s most densely urban county. Natural areas range from forested ravines and clay bank fens along Lake Michigan to flood plain forest, prairie, upland forest, shrub-carr, and oak savanna farther inland. In order to best manage these natural areas using ecological restoration techniques, we began developing and implementing site specific restoration and management plans to guide activities and focus resources. The initial challenge to completing this task was the lack of recent, system-wide potential breeding wildlife population data, especially herptiles. We’ll report on the process staff went through, and continues to go through, to inventory herptile populations and how we incorporate that data into our restoration and management plans.
11. Blue-spots in a Green Hotspot: an *Ambystoma laterale* population on the Grounds of the Milwaukee County Zoo

Craig Berg1*, Paulo de Tarso Ferraz Meira2
1- Milwaukee County Zoo, 10001 West Blue Mound Road, Milwaukee, Wisconsin 53226. 2- AcquaMundo, Aquario Guaruja, Guaruja, Brazil. * - Presenter: craig.berg@milwcnty.com

The current location of the Milwaukee County Zoo is a green oasis in a sea of development. It was built on 185 acres (81 ha.) of a failed housing development. Sixty-five percent of the original parcel was forested. Construction began in 1956 and continued into the late 1960’s. During the process all but 50 acres of the woodlands were removed. Keepers have reported that during the 1960s, Eastern Milksnakes and Gartersnakes were found on occasion, and Tiger Salamanders, Blue-spotted Salamanders, and Western Chorus Frogs were common. Today, only Blue-spotted Salamanders and Western Chorus Frogs remain out of the original complement. During the spring of 1999, Blue-spotted Salamanders were surveyed at the two largest of three ephemeral ponds that support populations. Surveys were conducted by turning logs and checking minnow traps attached to submerged drift fences. One hundred and twenty-six individuals were captured and marked. Snout-vent length, tail length, sex, mass and distinguishing features (such as notched tails) were recorded for each capture. The results of these surveys indicate that Blue-spotted Salamanders are able to persist in relatively small patches of appropriate habitat.

12. Monitoring Herptile Response to Habitat Restoration on the Milwaukee River

Julia Robson1*, Gary S. Casper2, Tim Vargo1, Jennifer Callaghan1, and Craig Berg3
1- Urban Ecology Center, 1500 East Park Place, Milwaukee, Wisconsin 53211; 2- Great Lakes Ecological Services, LLC, and UWM Field Station, P.O. Box 375, Slinger, Wisconsin 53086; 3- Milwaukee County Zoo, 10001 West Blue Mound Road, Milwaukee, Wisconsin 53226. * - Presenter: jrobson@urbanecologycenter.org

We present on amphibian and reptile surveys at an urban habitat site along the Milwaukee River in Milwaukee, Wisconsin. Monitoring surveys began in 2007 at the Urban Ecology Center Riverside Park, an area within the Milwaukee River Area of Concern and noted for wildlife habitat and population impairments. In 2010 the Urban Ecology Center received a major grant through U.S. EPA to improve 40 acres of land along the Milwaukee River as an arboretum of native plant species, and to enhance habitat and bolster the richness of native wildlife species supported. For this project we established historical baseline species richness, and conducted baseline surveys from 2010 - 2013 to document the species present before habitat work is completed. We determined that pre-settlement conditions probably supported 5 salamander, 8
anuran, 3 turtle and 5 snake species. Our surveys documented an impaired species richness, with no salamander, 2 anuran, 5 turtle, and 3 snake species currently present. Two turtle species now present are likely introduced: Red-eared Slider and Northern Map Turtle. We report on survey results, how habitat improvements may enhance herptile populations, and establish baseline data for measuring herptile response in future years.

13. Predicting Spring Emergence in a Northern Population of the Eastern Box Turtle

Chris Woodley* and Bruce Kingsbury
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We report on our study of thermal factors that stimulate Eastern Box Turtles, Terrapene c. carolina, to emerge in spring. Understanding the initiation of the active season is important not only in terms of natural history, but also from a conservation perspective. We have found that turtles that have not emerged are less likely to be killed or injured by prescribed fire, a common management tool in refuges large and small. Resource managers could thus potentially minimize impacts of this and other management tools if they could predict when turtles would be out and thus avoid burning at those times. We monitored body (carapace) and soil (surface, 15 and 30 cm) temperatures with iButton dataloggers, and also incorporated air temperature from a local weather station. Emergence was observed to be bi-phasic, with an initial “surfacing” phase from deeper underground towards the soil surface stimulated by deeper (15 cm) soil temperatures rising above freezing. Complete “emergence” was initiated when surface ground temperatures rose to 9C and virtually complete by the time soils were 16C. Circannual cues were poor predictors of emergence, as was air temperature. In addition, because shell temperatures and average soil temperatures would be practically difficult to measure in most populations of Eastern Box Turtles, a method using Growing Degree Days (GDDs) is reported here in place of direct measures of temperature to predict spring behavior. Such an approach would allow land managers to predict emergence without an extensive collection of soil temperatures. We found excellent predictive power for both surfacing and emergence using this method. With adjustments, GDDs could have broader application for predicting emergence of other herpetofauna and help protect them as well.
KEYNOTE BANQUET SPEAKER:

Reservoir Waterdogs: The Neotenic Tiger Salamanders of the Badger Army Ammunition Plant

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High on the flank of the Baraboo Hills, overlooking the defunct Badger Army Ammunition Plant, a 6-million gallon water reservoir supports a unique fishless ecosystem dominated by a population of some 1,200 neotenic Eastern Tiger Salamanders (Ambystoma tigrinum). It is an accidental experiment in biology and adaptation, which has provided scientists and teachers a rich opportunity for study and observation. Now its unavoidable demise offers a chance to better appreciate the diversity of life, its ability to cope with strange circumstances, and our responsibility to it. I will discuss this ecosystem, the neotenes and their relationship to normal populations nearby, its conservation implications, educational facets, and how the project has brought together a varied lot of interested partners ranging from ecologists, herpetologists, wildlife health specialists, engineers, the Army, museum curators, landowners, teachers, kids, bureaucrats, planners, heavy equipment operators, historians and maritime archeologists.

POSTERS:

1. An invasive plant secondary metabolite disrupts embryo development in Xenopus laevis and a native amphibian, Pseudacris triseriata

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We demonstrate direct effects of an invasive plant European buckthorn (Rhamnus cathartica) metabolite, emodin, on embryo development in the model organism, Xenopus laevis and in the native ephemeral pool breeding Western Chorus Frog, Pseudacris triseriata. European Buckthorn grows aggressively in amphibian breeding sites releasing emodin into soil and water. Emodin has several, often deleterious, bioactive properties in mammals and birds, but no prior assessments of effects on amphibians have been conducted. We quantified emodin in the breeding pond environment to determine concentrations in invaded sites that have experienced recent declines in amphibian diversity and abundance. We performed the FETAX protocol (Frog Embryo Teratogenesis Assay- Xenopus) to assess if emodin affected amphibian
development in *X. laevis*, and we used a modification of the assay with *P. triseriata* (referred to here as FETAP) to determine if effects were upheld in a native species occurring within the invaded range of Buckthorn. Using a gradient of concentrations of emodin including those detected in the environment, the FETAX demonstrated significant embryo mortality and malformation with exposure to emodin concentrations within the range detected in the environment. The FETAP produced similar patterns of embryo mortality and malformation as observed in the FETAX. However, *P. triseriata* were more sensitive to emodin than *X. laevis*. Teratogenicity indices >2 for *X. laevis* and > 40 for *P. triseriata* indicate strong development-disrupting potential of emodin in amphibians. Such effects could contribute to amphibian declines through hatching suppression and poor larval survival and may represent an unrecognized impact of invasive plants.

2. Short-term Amphibian and Reptile Habitat Use and Abundance in Response to Oak Savanna Restoration

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Habitat restoration improves the diversity of community structure of plants, which can have short-term and long-term effects on resident animal populations. To investigate the short-term effects of intense habitat management to restore oak savanna habitat in northwest Indiana on animals, we assessed the habitat use and abundance of amphibians and reptiles on control plots (closed canopy woodlots), treatment plots (use of fire and tree thinning to open canopy), and reference plots with a history of oak savanna management. We collected pre-restoration data on all plots to serve as a baseline in 2009. Intense habitat management occurred on treatment plots in 2010 and 2012, and we collected post-restoration data on all plots in 2011 and 2013. In 2009 we found 817 amphibians and reptiles (18 species). There was no difference in species richness or abundance between control and pre-treatment plots. In 2011 we found 561 amphibians and reptiles (19 species) and in 2013 we found 412 amphibians and reptiles (20 species). Eight species of amphibians and the total number of amphibians were significantly less abundant in post-treatment plots than control plots and pre-treatment plots. The total number of reptiles was more abundant in post-treatment plots. One species of amphibian (Fowler’s Toad, *Anaxyrus fowleri*) and total reptile abundance were negatively correlated with canopy cover. These results indicate that there is a negative short-term effect of restoration management on most amphibians but a positive effect on reptiles and some amphibians. However, reference plots had significantly more species and abundance than control and treatment plots in all years, and post-treatment plots had higher diversity index values than control plots. This suggests that the long-term effect of oak savanna management on the herpetofauna is positive.
3. Detection of Deltamethrin in Salamanders from Wind Cave National Park by High Performance Liquid Chromatography

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Black-footed Ferrets (\textit{Mustela nigripes}) are a highly endangered mammal being reintroduced at National Park Service units in the western United States. They are a specialized predator of Prairie Dogs (\textit{Cynomys} spp.) and are introduced to established prairie dog towns. Black-footed Ferrets are susceptible to the plague bacterium \textit{Yersinia pestes}, transmitted by fleas that can reside on Prairie Dogs. At reintroduction sites, the insecticide Deltamethrin (DLM) is used to control fleas. A reintroduction site at Wind Cave National Park is home to a large population of Eastern Tiger Salamanders (\textit{Ambystoma tigrinum}), a common commensal at Prairie Dog towns. We collected nine \textit{A. tigrinum} at Wind Cave National Park, homogenized 100mg of their liver tissue, and analyzed these samples using High Performance Liquid Chromatography to detect bioaccumulation of DLM. We mixed 65\textmu l of liver homogenate with 135\textmu l of Acetonitrile (ACN). This mixture was put into a centrifuge and spun at 10,000 RPM for 10 minutes. Eighty micro liters of the supernatant was injected into the HPLC. Six of the nine liver samples were found to contain DLM. In future work, samples from the brain and tail will also be analyzed. The assay used on liver tissue will also be used for these analyses.

4. Blanding’s Turtle (\textit{Emydoidea blandingii}) Conservation and Educational Efforts in a Portion of Wisconsin Affected by Suburbanization

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A Blanding’s Turtle (\textit{Emydoidea blandingii}) population in Wisconsin with centralized habitat located within a publicly owned wildlife area has been monitored over the past 20 years through volunteer effort and funding. This population has been negatively affected by suburban residential development, which has fragmented habitat adjacent to this public wildlife area. The negative impacts caused by this suburbanization include: loss of rural habitat, road mortality of turtles, increased human disturbance of nesting turtles, and soil compaction of nesting habitat. Information gathered included: nesting female Blanding’s Turtle activity, road mortality of turtles, nest mortality, nest site locations, and recreational use of public land during nesting seasons. In recent years turtle nests were protected through use of protection devices and information regarding success of egg development was collected. The Blanding’s Turtle has a very long generational time span, and a slow rate of recovery, with hatchlings not reaching reproductive maturity until 14-20 years of age. Proactive conservation efforts should be
required of public regulatory agencies to ensure the continued existence of Blanding’s Turtles and their connected habitats, for future benefit of wildlife and people. Blanding’s Turtle ecological needs are a living educational tool for protecting healthy connections between wetlands and surrounding habitats.

5. Measuring Niche Overlap in a Community of Invertebrate Eating Snakes

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Competition for resources exerts significant influence in the structure of biological communities, particularly when species having similar habitat requirements are involved. Despite their widespread abundance and role as successful predators, there is a paucity of information about niche partitioning among snake species. The dietary ecology of invertebrate specialists, in particular, is difficult to study because of the relatively rapid digestion of prey. Using stable isotope analysis, we quantified the dietary niche overlap between five different species of invertebrate eating snakes (genera: Coluber, Diadophis, Opheodrys, and Storeria). We collected blood, scale, and tail tissue from wild-caught snakes, as well as a range of whole prey specimens to assess niche partitioning between species across a broad temporal scale. All samples were freeze-dried, homogenized, and analyzed using mass spectroscopy. We used a 2-way ANOVA to assess whether or not food-resource partitioning was present in this community, and determine whether or not there were any interactions between species and the rate of resource uptake in tissues. We discuss our findings as they pertain to the co-existence of these snakes in a single habitat. Similar analyses can reveal fine-scale shifts in diet that have the potential to alter the dynamics of the trophic web within a given community.

6. Behavioral Responses of Two Syntopic Snakes (Genus Thamnophis) to Roads and Culverts

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Habitat fragmentation is a major contributor to the loss of biodiversity within ecosystems. Roads are a major cause of fragmentation, presenting hazards as well as potential barriers within landscapes. Impacts of fragmentation by roads include mortality, gene flow loss, and possible disintegration of population structure. In order to mitigate impacts of roads, it is necessary to identify methods for controlling where animals cross roads as well as provide safe corridors they are willing to utilize “through” the barriers imposed by roads. We examined the behavior of two species of wetland-associated snake, the Eastern Gartersnake (Thamnophis
*sirtalis sirtalis* and the Eastern Ribbonsnake (*Thamnophis sauritus sauritus*). We investigated the influence of canopy cover and road substrate on frequency of crossing by Eastern Gartersnakes and Eastern Ribbonsnakes. Both of these species were observed to avoid roads with relatively low crossing rates for both species in all treatments. However, both species were also more willing to cross roads with canopy cover regardless of substrate. We utilized two experimental approaches to explore the minimal culvert design that both species of snakes would use. We also examined in-place culverts at the refuge to determine if snakes used culverts within their habitat. We found that snakes generally did pass through culverts, with a greater willingness for culverts with a greater diameter (one meter). The same trends were observed for the in-place culverts where larger culverts encouraged higher crossing rates. Overall, we found that these species are reticent to cross roads, but more willing to do so with increased canopy cover and over a gravel substrate. They are quite willing to use culverts though less so for small diameters. Land managers can thus control somewhat where snakes might cross roads, and employ all but the smallest of culverts to help promote additional connections between habitat fragments.