**Northeastern Bat Working Group Annual Meeting**
**January 11 – 13, 2012**
**Carlisle, Pennsylvania**

**Oral Presentation Abstracts**
***Denotes Presenting Author**

## Update on the GateKeeper beam-break system in Arkansas, Indiana, and Kentucky, with emphasis on 23 months of data from Saltpetre Cave, Carter County, Kentucky

*Michael D. Baker and Mylea L. Bayless, *Bat Conservation International, Austin, TX 78716*

Bat Conservation International worked with the GateKeeper beam-break system developer David Redell, Wisconsin Department of Natural Resources, to bring the system to six sites in three states between fall of 2009 and summer of 2011. We worked with private foundations, BCI members, and state and federal agencies to fund and install custom-built systems at a variety of sites considered critical to federally endangered Indiana and gray myotis and to a man-made site used as a maternity colony by Rafinesque's big-eared bats. GateKeeper systems are durable site management infrastructure that operate continually, require small amounts of electricity, can be installed at gated or ungated sites, report data through GSM cell phone or Iridium satellite networks to secured websites, can report programmable 'alarm' conditions to cell phone numbers or email addresses, and provide continual behavioral and count data that can be calibrated using samples of simultaneous video. We have encountered some difficulty from water infiltration into some replaceable electronic components and have determined that occasional maintenance and repair will be required for effective long-term monitoring. Graphical data and associated qualitative analyses will be presented. Quantitative modeling of bat activity and population numbers is planned for the near future.

## House Bat Maternity Monitoring

*Alyssa Bennett, *Vermont Fish and Wildlife Department, Rutlant, VT*

Vermont listed the little brown bat (Myotis lucifugus) as state endangered in July of 2011. The decline of this once common species has garnered public sympathy and allowed the Vermont Fish and Wildlife Department to investigate little brown bat house colonies around the state. These investigations were conducted with two main goals in mind: 1. To determine the number, sizes, and distribution of little brown bat maternity colonies, and 2. To provide technical assistance and education, especially in regards to exclusions. Our 2011 preliminary data includes distribution maps of little brown bat, big brown bat (Eptesicus fuscus), and mixed species colonies with a combination of estimated and actual population sizes. The goal of this project in 2012 will include more thorough monitoring of select little brown bat colonies, locating additional colonies, and soliciting homeowner emergence counts.

## Summary of Recent Offshore Acoustic Surveys

*Sarah Boyden, *Stantec Consulting, Topsham, Maine*

2011 marked the third year of monitoring coastal and offshore bat activity and migration patterns in the Gulf of Maine. Beginning in 2009 and continuing through fall 2011, Stantec deployed acoustic bat detectors at 15 separate remote locations up to 26 miles offshore in the Gulf of Maine, spanning a 250(+) mile coastal transect extending from New Brunswick Canada to Gloucester, MA. We have successfully deployed acoustic detectors using a variety of elevated structures including portable and former military observation towers, operational lighthouses, and trees, as well as offshore buoys. Bat activity involving a variety of bat species has been documented at all surveyed coastline, near-, and offshore settings to date. Such information may be instrumental in informing future siting and operational decision processes for offshore wind projects. Information regarding the seasonal presence/absence and activity levels of various bat species over wide regions is also of particular importance in light of expanding White Nose Syndrome concerns. Data collected in the Gulf of Maine will also provide a baseline to which future monitoring efforts can be compared.

## Development of an automated system for acoustic identification of bats

*Eric Britzke, *Environmental Laboratory, US Army Engineer Research and Development Center, Vicksburg, MS 39180*

Ultrasonic detectors are widely used for the study of bat ecology. Current systems are well developed for collecting large amounts of data. However, one factor holding back their potential utility is that analysis requires either visual examination of a large number of files or individuals walking data through steps of a quantitative analysis methodology. As either of these methods can take a vast amount of time to analyze the volumes of data to be collected, we developed software that completely automated and improved the analysis of bat echolocation data. This new program includes reading in raw data, filtering, extracting parameters, identifying suitable pulses, and generating result output. In addition to incorporating several steps to improve identification rates, this program will greatly speed up the analysis of recorded data. Initial testing of the program allowed for ~ 50,000 raw files to be analyzed in < 4 hours. This program will remove burdensome analysis time required and will allow researchers to realize the full potential of ultrasonic detectors for the study of bat ecology.

## Appalachian Summer Bat Roost Counts in PA

*Cal Butchkoski, *Pennsylvania Game Commission, Wildlife Diversity Division, Mammal Section, 4294 Eberle Road, Petersburg, PA 16669.*

The Appalachian summer roost count is a citizen science program where participants count bats at summer roosts. This information is proving useful as a tool to track the affects of Bat White-nose Syndrome (WNS) within the state. In 2011 two-hundred and ninety-four counts were conducted at 159 sites. Species include little brown (*M. lucifugus*), big brown (*E. fuscus*) and at least one site with northern long-eared bats (*M. septentrionalis*). Surveys were conducted in 50 of Pennsylvania's 67 counties. One-hundred and twenty-one of these sites had counts of bats for multiple years. The highest recorded count for these 121 sites was 132,141 bats whereas the high count for these same sites in 2011 was 40,613; a 69.3% statewide decline from historic highs. Ten of these sites no longer contain bats and 61 have counts less than 50% of original high counts. As expected, big brown sites appear to be fairing better than little brown sites. Of the sites where species have been identified by staff or participants, big brown bats (12 sites) are down 15.3 % and little browns (88 sites) are down 70.5% when compared to historic counts. Appalachian bat counts indicate less WNS impacts as of yet in the western 1/3 – 1/4 of the state. Mammal staff has monitored 10 little brown sites in central Pennsylvania counties since 2009 where volant counts have dropped from 17,340 to 1,218 a 93% decline. Continued statewide declines are expected in the next few years as WNS impacts western Pennsylvania counts.

## Very quick summary of recently discovered *Myotis Leibii* roosts

*John Chenger, *Bat Conservation and Management, Carlisle, PA 17015*

Bat Conservation and Management and others have had opportunities to radio track a number of Eastern small footed bats (Myotis leibii) during the course of other fieldwork in the past few summers. Traditionally these bats are thought to summer roost at ground level under rocks in large expanses of talus slopes and large cliff faces with full sun exposure. A collective trend suggests the vast majority of more recently discovered roosts appear to be in habitats enhanced by some form of human disturbance that removes canopy and/or leaves piles of exposed rock behind. Several tracked bats were found to have selected relatively small examples of rocky habitat often in relatively shaded locations, often counter to the traditional expectation of what may be considered ideal M. leibii summer habitat. These demonstrations should be taken into account when planning to conduct habitat assessments or habitat designs for M. leibii.

**Current Status of the Research and Management of Bat White-Nose Syndrome**

*Jeremy T. H. Coleman, *US Fish and Wildlife Service, Hadley, MA*

White-nose syndrome (WNS) has caused unprecedented mortality in hibernating bats in eastern North America since its discovery in 2007. The disease, WNS, and/or the fungus, *Geomyces destructans*, has now been detected on bats at over 200 hibernacula in 19 states and 4 provinces. The rapid spread and devastating impacts of WNS have presented wildlife and natural resource managers with considerable biological and social challenges, which are exacerbated by the many unanswered questions surrounding the origin and nature of the disease. Relatively few tools have become available for managers to combat WNS and conserve vulnerable bat species, but adaptive efforts to both improve our understanding and to make informed management decisions have been underway since 2008. Of the six bat species that have been confirmed with WNS by August 2011, only the Indiana bat (*Myotis sodalis*), is federally listed; the rest of the affected bats are managed as state trust species. Some state agencies have begun efforts to list certain hibernating bat species in order to afford them greater protection, and the US Fish and Wildlife Service is currently reviewing multiple species of hibernating bats for potential listing, three under petition or formal request. Given the scope of the problem, a coordinated effort is required to manage WNS and conserve North American bats, and there are over 100 state and federal agencies, tribes, universities, institutions, organizations, and private entities involved with the organized response. The *National Plan for Assisting States, Federal Agencies and Tribes in Managing White-Nose Syndrome in Bats,* finalized in May 2011, provides the framework for a coordinated national response, and helps to ensure science-based management of WNS.

**Acoustic Monitoring in the Post-WNS World: Preliminary Tests at Fort Drum Military Installation**

*Laci S. Coleman[1], Chris A. Dobony[2], Mark W. Ford[3], and Eric R. Britzke[4], [1]*Department of Fisheries and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, VA,* [2] *Fort Drum Military Installation, Natural Resources Branch, Fort Drum, NY,* [3] *U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit, Blacksburg, VA,* [4] *U.S. Army Engineer Research and Development Center, Vicksburg, MS*

Since white-nose syndrome (WNS) onset in 2008, there has been a marked decline in bat activity at Fort Drum. Summer mist-netting, although costly, has been a typical and accepted way to monitor bats, however, as bat populations decline in the Northeast, this method has become inefficient and ineffective. We suggest acoustical methodologies will likely become the best primary means of monitoring declining populations. In the summer of 2011, we utilized Anabat detectors to repeat passive monitoring at sites previously sampled in 2006, pre-WNS. We also performed active acoustic sampling at these sites and compared methods. Wilcoxon two-sample tests showed a significant decline in mean nightly activity from 2006 to 2011 in *Myotis lucifugus* (78.2 vs. 7.25 passes, $P < 0.0001$), *Myotis septentrionalis* (3.67 vs. 0.34 passes, $P < 0.003$), *Myotis sodalis* (8.76 vs. 1.67 passes, $P = 0.002$), and *Perimyotis subflavus* (3.76 vs. 0.46 passes, $P = 0.0230$). Additionally, we observed declines from 2006 to 2011 in two species not known to be affected by WNS: *Lasiurus borealis* (10.62 vs. 3.46 passes, $P = 0.0435$) and *Lasiurus cinereus* (24.62 vs. 9.91 passes, $P = 0.0136$), possibly due to increased regional wind energy development. High detection probabilities of extant species were achieved in 2 nights per survey site in 2006 vs. $\geq 3$ nights in 2011 for WNS-impacted species. Overall detection probabilities of 1 for little brown bats and Indiana bats in 2006 declined to 0.87 and 0.58, respectively, by 2011. Active sampling appears to be ineffective post-WNS, accounting for lower recorded nightly species richness (2.8 vs. 4.7 species) and far lower overall detection probabilities for myotids (< 0.45). We also initiated a pilot study at Fort Drum to determine the most efficacious ways to deploy Anabat detectors for monitoring bats. Analysis is ongoing; however, methodology and preliminary results will be discussed.

### Shifts in summer bat communities due to White-nose Syndrome

*Laura E. D'Acunto and Joseph E. Duchamp, *Indiana University of Pennsylvania, Indiana, PA.*

We analyzed bat diversity and activity levels across the state of Pennsylvania to determine if longer exposure to White-nose Syndrome (WNS) changes the surrounding summer bat communities in the state. We used a combination of mist netting and acoustic monitoring within 12 randomly selected 50 by 50km grids spanning the state. In each grid, 2 nights of mist netting and 3 nights of active acoustic monitoring on road transects using ANABAT SD1 detectors were completed . Half of the sample grids were located in the eastern portion of the state and the remainder in the west. We compared species diversity and activity levels of bats between these two groups, noting that white-nose syndrome has been prevalent in the east a year longer than the west. We caught a total of 54 bats and were able to identify a total of 1,545 calls to species. Preliminary analyses show greater diversity and activity in western sampling areas compared to eastern. Further analyses and ecological modeling taking landscape characteristics into consideration will be reported.

### White-Nose Syndrome: Lessons learned at Fort Drum Military Installation

*Chris A. Dobony[1], Kate E. Langwig[2], Ryan l. von Linden[3], Joseph C. Okoniewski[3], Michelle L. Verant[4], Raymond E. Rainbolt[1], and Alan C. Hicks[5]. [1]*Fort Drum Military Installation, Natural Resources Branch, 85 First Street West, IMNE-DRM-PWE, Fort Drum, New York, 13602,* [2] *Center for Ecology and Conservation Biology (CECB), Department of Biology, Boston University, 5 Cummington Street, Boston, MA 02215,* [3]*New York Department of Environmental Conservation, 625 Broadway, Albany, NY 12233 ,* [4]*United States Geological Survey, National Wildlife Health Center, 6006 Schroeder Rd, Madison, WI 53711,* [5]*Vesper Environmental, LLC, 108 Laurel St, Hurley, NY 12443*

We monitored a maternity colony of little brown myotis (*Myotis lucifugus*) on Fort Drum Military Installation in northern New York in 2009 - 2011 for impacts associated with white-nose syndrome (WNS). Declines in colony numbers presumed to be attributed to WNS were initially discovered in the spring 2009. Colony numbers initially declined at a rapid rate in 2009 and 2010, but seemingly leveled off in 2011. The presence of *Geomyces destructans* (the causative agent of WNS) has been documented at the maternity colony in 2009 and 2010 using multiple techniques. Dorsal surfaces of wing and tail membranes were streaked directly onto culture plates, which were then monitored for *G. destructans* growth. Surfaces of wing and tail membranes were also sampled using moistened sterile swabs. These samples were subsequently checked for the presence of the morphologically distinctive conidia of *G. destructans.* Additionally, guano was collected from the colony and tested by PCR analysis for the presence of *G. destructans* DNA. Positive samples were cultured to determine viability of any *G. destructans* present. Although tests are ongoing, preliminary results suggest that *G. destructans* is able to persist in the maternity colony throughout April-August, longer than would be expected based on temperature requirements of the fungus. Despite exposure to *G. destructans* and WNS, we have determined that some individual female little brown myotis can survive over multiple years. We also provide evidence that some individual female little brown myotis are able to heal from wing damage and infection associated with WNS within 30-90 days of arrival at the maternity roost. Further, almost all recaptured bats within individual years that had suspected wing damage from WNS when emerging from hibernation also later showed evidence of recent lactation, suggesting that some impacted bats can partition energy into healing, while maintaining a seemingly normally reproductive cycle.

**Wing healing and evaluating WDI in Summer**
*Nathan Fuller, *Boston University*

White-nose syndrome (WNS) can cause lesions on the wings of infected bats that eventually present as large areas of discoloration, scaring, or necrosis during the active season. Early studies showed that the highest prevalence of bats with wing damage was early in the active season (May – June) and steadily declines as the season progresses. In the early days of WNS, many hypotheses were circulated regarding the eventual fate of bats with severe wing damage. One leading hypothesis suggested that bats could not recover from such severe damage and were suffering increased mortality due to complication from reduced flight maneuverability and decreased foraging success. An alternative hypothesis suggested that bats were instead healing their wing tissues and surviving through the active season. Fortunately, recent research has shown that bats are in fact undergoing intensive healing and are able to restore large areas of damaged or lost tissue with little evidence of previous damage. However, this knowledge has yet to be applied to management practices. This talk will discuss how field researchers and wildlife managers can integrate this new information into existing field protocols and wing damage assessment. Armed with a strong understanding of the temporal patterns of wing damage, we will be more able to make informed assessments of wing condition.

**Ultraviolet light a tool for White Nose Syndrome (WNS) and bat research**
***John Gumbs, *BATS Research Center, Shohola, PA 18458*

There are numerous natural and manmade substances, including molds and fungi, that fluoresce under various wavelengths of ultraviolet (UV) light.

Since White Nose Syndrome (WNS) was suspected (2006-7) to be caused by a fungus, we thought that UV light might cause that fungus to fluoresce. Through trial and error we determined that longwave UV light did create a unique fluorescence in tissue under attack by what is now called *Geomyces destructans* (Gd).

This presentation describes the original concept of using Ultraviolet (UV) light to visualize WNS lesions, details some of the equipment and methods used in that research, and follows UV research efforts as a photographic record spanning two years.

**Mist netting in Pennsylvania: Can changes in bat populations be detected using summer netting success**
***James A. Hart, *Wildlife Specialists, LLC*

Since the early 1990's much data has been collected during mist netting efforts by consultants, academics, heritage program staff, and state agency personnel. Currently this data is compiled in the PGC's Mist Netting and Trapping Database. Data collection and compilation can be extremely valuable but if the data isn't useful in answering specific management questions, then the cost and effort expended to gather this data should come into question. This paper will use data collected by Wildlife Specialists, LLC during the 2010-2011 field seasons to attempt to determine whether this type data can be useful in detecting bat population and species trends in Pennsylvania. Since all of the data collection was done in a manner consistent with USFWS Protocols for Surveying for Indiana Bats, these data should be comparable across the entire season regardless of sites surveyed and other variables that could be encountered. Some of the questions to be considered are whether these data can suggest overall trends in statewide bat populations based on capture success, does species capture success rate change over time, are capture rates and species captures comparable between years, and can this type of data be used to determine whether WNS has overall impacts on statewide bat populations.

**Management Guidelines for Indiana Bats**
*Carl Herzog, *NY DEC, Albany, NY 12233*

NY DEC's Indiana bat roost tree database includes over 200 records. Land cover analysis reveals that roost sites typically feature 85-100% forest coverage within 100 meters of the tree, much greater than nearby random points. In contrast, few of the most productive roosts exhibit more than 60% forest cover within 4 km, with the the great majority of highly productive roosts ranging between 35 - 60 percent forest cover. Together these data suggest that Indiana bat presence can be highly compatible with a light level of residential development.

**New York Mobile Acoustic Transects**
*Carl Herzog, *NY DEC, Albany, NY 12233*

NY DEC began performing mobile bat acoustic monitoring transects on a state-wide basis in 2009. The project was designed to gather data on bats that are not well-surveyed by winter hibernation counts, particularly the tree bats. It has proven to also provide useful information for some of the hibernating species as well. Similar to surveys that have been performed in the UK since at least 2003, the project is staffed mostly by volunteers. It has covered approximately 1600 road miles spread over 50 routes in each of the last 3 years. A typical night's survey includes an average ~ 60 individual bats encountered, about 75% of which can be identified to species.

**Springtime at Blackball Mine: *M. sodalis* Tracking in the Land of Lincoln**
***Alan Hicks*, Vesper Environmental LLC,* Joe Kath, *Illinois Department of Natural Resources,* Matt Sailor*, USFWS Rock Island Il.*

To better understand the migratory behavior of Indiana bats (Myotis sodalis) in the Midwest, 52 reproductive females were radio-tagged and monitored during their 2011 spring migration from the Blackball Mine, in LaSalle County, Illinois. Animals released on April 11 (N=37) and April 13 (N=15) were among the last bats still within the mine. Released bats were monitored from 1 or 2 aircraft and 14 to 16 ground stations during their release nights. Transmitters with unique frequencies and pulse rates (N=3) combined with 21 frequencies and pulse rates shared by 2-3 animals each, resulted in at least 24 different radio signatures in use. Twenty-two of these signatures were identified during release monitoring. Most detected animals appeared to move westward. All detected animals moved along the Illinois River Valley and the tree cover associated with its bluffs and tributaries, although they were not necessarily moving over the river, or along its shoreline. We detected bats on day roosts on 105 occasions involving at least 38 animals (3 of 3 unique and 19 of 21 shared signatures). We presume, based on the number of days since release (6 to 20), and multiple animals detected during the only two exit counts, that at least 29 bats were located at their maternity colonies. Straight-line distances traveled to these roosts ranged from 1.7 km to nearly 70 km, although searches for transmitter signals were conducted as far away as 230 km, and involved roughly 8,000 km of flights. There were no detections of animals clearly within, or crossing open agricultural landscapes. There were no detections at roosts in wooded landscapes that would have required bats crossing large expanses of open agricultural lands. As has been the case in other large scale spring emergence tracking projects along the northern edge of the species' range, Indiana bat maternity colonies seem to be concentrated in only a portion of what appears to be suitable habitat.

**Patterns in summer bat activity at a coastal site in Delaware, and future studies with applications for offshore wind energy development**
***Lauren Hooton and Allison Costello, *Normandeau Associates Inc., 102 NE 10th Ave, Gainesville, FL 32601.*

Bat activity was monitored at a site near the Delaware coast for ten days between 19 July and 15 August, 2011. These data were collected as part of an initial pilot study to field test the ATOM (Acoustic Thermographic Offshore Monitoring) system, which is being developed to monitor offshore bird and bat activity. A total of 641 bat passes were collected, with the highest activity occurring in late July. *Lasiurus borealis* accounted for a majority of the detected activity, followed by *Eptesicus fuscus* and *Lasionycteris noctivagans*. The effects of atmospheric variables on bat activity levels were also analyzed. The impact of offshore wind on bats is currently unknown, but future monitoring using ATOM at offshore sites may help to elucidate any patterns and provide insight for potential offshore wind energy projects.

**Quantitative wing damage of bats during fall and spring surveying efforts at Virginia hibernacula**

*Jordan Kime[1], Karen Francl[1], Rick Reynolds[2], Wil Orndorff[3], Jane Rodrigue[4], Tessa Canniff[1] and W. Mark Ford[5], [1]*Biology Department, Radford University, Radford, VA,* [2]*Virginia Department of Game and Inland Fisheries, Verona, VA,* [3]*Virginia Department of Conservation and Recreation, Natural Heritage Program, Christiansburg, VA,* [4]*USDA Forest Service, Northern Research Station, Princeton, WV,* [5]*USGS Virginia Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife Conservation, Virginia Tech, Blacksburg, VA*

Since the detection of *Geomyces destructans* in Virginia hibernacula beginning in 2009, we have intensified our efforts to monitor bat population response and to document individual health. In Fall 2009, we added a new metric to our long-term demographic and health data collections: a wing damage score, as measured by analysis of backlit photographs of wings. We examined the wings of 1382 bats of 9 species over three years from 14 hibernacula. In ImageJ, we calculated the areas of blotches, scars, and holes relative to total visible wing area. Collections of Little brown bats (*Myotis lucifugus*) and Tri-colored bats (*Perimyotis subflavus*) were sufficient to permit statistical analysis of trends over time. Using a general linear model analysis of ranked data, we observed that Little brown bats differed in blotching ($F_{5,958}$=30.84, p<0.0001), scarring ($F_{5,958}$=16.16, p<0.0001) and hole damage ($F_{5,958}$=2.45, p<0.0325) over time relative to time since initial detection of *Geomyces*. Tri-colored bats differed in blotching ($F_{4,241}$=23.13, p<0.0001) and scarring ($F_{4,241}$=9.52, p<0.0001) but not in hole damage ($F_{4,241}$=0.96,p=0.4289) since the time of first detection of *Geomyces*. For both species, percent cover of blotching generally was greater in the first year since WNS detection, then decreased or leveled off in subsequent years. Scarring in the Tri-colored bat was more evident in the second year following WNS detection, whereas the first year showed the most scarring for Little brown bats. For both species, hole damage generally was greater in the spring and lower in the fall, suggesting healing during summer months. Because data collection and analyses are ongoing, additional findings will be discussed.

**Holes in the digital mist-net: Exploring uncertainty associated with acoustic identification**

*Kevin Lager Murray, *Western EcoSystems Technology, Inc., 408 West Sixth Street, Bloomington, IN 47404.*

Identification of bat echolocation calls to species is becoming increasingly important in North American bat research, particularly in monitoring the spread and long-term effects of White-Nose Syndrome and in assessing the risk to sensitive bat species posed by wind development. However, bat call identification is a complex process, often made difficult by highly-variable echolocation calls and overlap in call characteristics among species. Acoustic identification typically relies upon recognizing vocal signatures, i.e., echolocation calls that are characteristic of a particular species. However, bats produce a variety of calls in their echolocation repertoires aside from vocal signatures and this can lead to misidentifications, especially in certain acoustic environments. For example, the echolocation calls of the eastern red bat (*Lasiurus borealis*) have been described by many authors and are generally thought to be relatively easy to identify. However, the eastern red bat has an extremely variable echolocation repertoire, and can emit calls that resemble several other bat species. I examine how call variation in the eastern red bat and other species can lead to uncertainty in acoustic identification. I also discuss how factors such as recording situation, incomplete characterization of the acoustic landscape, and call analysis methodology can further complicate the process of accurately identifying the echolocation calls of bats.

**A new method of analyzing above-canopy acoustic bat activity and wind speed**

*Trevor Peterson, *Stantec Consulting, Topsham, ME*

Analyses of acoustic bat activity patterns and weather variables have demonstrated positive relationships between activity levels and temperature and negative relationships between activity levels and wind speed. Whereas these relationships are often characterized using linear regression analyses, we report on a method to assess distribution of bat activity relative to the amount of time available with certain conditions. This method allows a visual determination of the degree to which bat activity is higher or lower than would be expected based on the amount of time with certain wind speeds. The basis for this method assumes that, rather than a linear relationship existing between bat activity and wind speed, a threshold wind speed exists above which bat activity declines rapidly. Initial analysis of passive acoustic datasets suggests that bat activity levels decline rapidly relative to the amount of time available when wind speeds increase above a threshold of 4-5 meters per second. This relationship appears strongest with acoustic data collected above tree canopy, where wind would presumably have the greatest influence on bat activity patterns.

**Susceptibility and Physiology of Bats with WNS**

*DeeAnn Reeder, *Bucknell University*

White nose syndrome has recently been demonstrated to be caused by the fungus *Geomyces destructans* (Gd). Gd colonizes and invades the skin of hibernating bats and is most visible on the muzzle, wings, and ears of affected bats. A number of physiological changes are now known to occur in WNS affected bats, including a dramatic rise in the number of arousals from hibernation. The frequency of arousals predicts 60% of the variance in death date due to WNS and is significantly correlated with the degree of fungal invasion of the wings. During arousal bouts, affected bats spend significantly more time being 'active' and grooming than do unaffected bats, increasing the energetic costs of an arousal bout and potentially increasing disease transmission. These increased arousals appear to cause death in a way that is not directly related to body mass, suggesting that, while we know arousals to be beneficial, they also incur significant costs. Differences in species and individual susceptibility are likely caused by life history differences such as body size, time in hibernation, and microclimate preference and by physiological differences such as immune competence and differences in thermoregulatory behavior. We have shown that WNS affected bats hibernating at colder temperatures survive significantly longer than those hibernating at warmer temperatures. Current studies in my lab are quantifying what a 'survival phenotype' should look like and directly examining species differences in susceptibility and in the immunological response to WNS using naïve animals from outside the WNS zone that have been inoculated with Gd. Future studies will focus on the physiology and behavior of survivors.

**Visualizing Acoustic Transects**

*David A. Riggs, *Myotisoft LLC, 463 Oak St., Morgantown, WV 26505*

Acoustic transects are effective means of gathering acoustic data over large geographic areas, but interpreting the resulting data in the geospatial domain may necessitate imposing restrictions on the transect route itself, such as discrete point-stops, or may require post-processing in such a way that precise call locations are lost. The author demonstrates custom software, Myotisoft Transect, which allows for visualization of the entire time-space relationship of continuous transect datasets using the freely-available Google Earth software, as well as complex geospatial processing with GIS suites such as ESRI ArcGIS.

**Indiana bat (*Myotis sodalis*) mist net capture efficacy on the Monongahela National Forest**

*Christopher W. Sanders, Chelsea M. Albertson, and Catherine M Johnson, *Sanders Environmental, Inc. 322 Borealis Way, Bellefonte, PA 16823 (CWS, CMA); Monongahela National Forest, 200 Sycamore St, Elkins, WV 26241 (CMJ)*

On the Monongahela National Forest (MNF) in West Virginia, the United States Forest Service (USFS) has conducted bat monitoring, focusing on endangered species, for over a decade. From the year 2000 to the present day, Sanders Environmental, Inc. has performed the annual summer mist-netting on the MNF. This dataset catalogs 11 years of mist-netting data from a single National Forest, providing a rare opportunity to examine, on a large, long-term scale, which netting tactics are most effective at catching bats, specifically, the federally endangered *Myotis sodalis*.

During this study, 8960 bats of 10 species were captured. Of these, 33 individuals were *sodalis*. Two separate datasets (both taken from the 2000-2010 MNF data) were used to evaluate the efficacy of different netting techniques. First, all of the site setup and capture data will be used to examine the frequency and success of various netting tactics. Next, the data pertaining specifically to *sodalis* will be analyzed to determine which methods are most effective for sampling Indiana bats. Overall, this poster will demonstrate which nets (by length and height), configurations (the use of multiple nets as a single "set"), and placements (road vs. water way vs. forest, etc.) result in the most captures, and the best results.

**Large-Scale analysis of correlates of bat susceptibility to white-nose syndrome**

*Brent J. Sewall, *Department of Biology, Temple University, 1900 North 12$^{th}$ St., Philadelphia, PA 19122*

White-nose syndrome poses a severe threat to hibernating bats across North America. Researchers and managers have rapidly mobilized to respond to this threat, but our traditional approaches to research and management – in particular, small-scale studies and management responsibility divided by political boundaries – are challenged by the rapid geographic spread of the disease. Statistical analyses of data compiled from across geographic regions can complement such approaches and facilitate understanding of large-scale spread and impacts from the disease. My objectives in this study were to examine multi-site influences on bat susceptibility to white-nose syndrome. I compiled published data on the impacts of white-nose syndrome on bat colonies, and factors that may correlate with the disease across hibernacula. I then used a multiple regression approach to evaluate the relative importance of each factor in explaining variation in the susceptibility of bat colonies to white-nose syndrome following its arrival in a hibernaculum. My analyses suggest that susceptibility to white-nose syndrome may vary with bat colony size, bat species, and geographic region. Other variables may also influence bat response, but analyses are constrained by the limited amounts of published data in formats amenable to incorporation into the dataset. However, potentially large amounts of unpublished data on bat colony changes and on hibernaculum-specific variables may exist with individual researchers and government agencies. The incorporation of such data across geographic regions could enable a more comprehensive understanding of large-scale influences on bat susceptibility to white-nose syndrome.

**Quick Summary of Recently Discovered Northern Myotis (*Myotis septentrionalis)* Roosts**

*Todd Sinander, *Bat Conservation and Management, Carlisle, PA 17015, tsinander@batmanagement.com*

17 female Myotis septentrionalis were radio tracked between May and August 2010 and 2011. Roost tree fidelity, switching, and species preference data is summarized. Foraging behavior and habitat preferences in forest patch and continuous forest environments are discussed.

**Introducing the Save Lucy Campaign: Plus some musings concerning environmental education, bats, and public perception**

*Leslie Sturges*, The Save Lucy Campaign*

We present an introduction to The Save Lucy Campaign, an awareness-raising effort that encourages youth, and others, to get involved in bat conservation. We also discuss issues in environmental education and effective methods for interpreting bats to the public, including a safe method to use live bats in public programs.

**Using Ultra-Violet Light as a Tool for Research and Determining Presence of Fungal Infection by *Geomyces Destructans***

*Gregory G. Turner, David Blehert, Calvin Butchkoski, John F. Gumbs, Carl Herzog, Mitzi Kaiura, Carol U. Meteyer, Natalia Martinkova, DeeAnn Reeder, and Mick Valent.

White-nose syndrome is a disease that has recently emerged in North America and has been confirmed to cause extensive mortality in 6 species of hibernating bats. In a short period of time, the fungus *Geomyces destructans* has been identified and described, then confirmed to be the causative agent of white-nose syndrome . Although many species of fungi have been documented to grow externally on bat wings, *G. destructans* is unique in that only it has been confirmed to invade the epithelial layer of skin and cause deep dermal infections. Although the flocculent white growth around the muzzle of infected bats is the most commonly noted field sign, it is the infection of wing membranes that is its most defining characteristic. Currently, the only way to confirm WNS is to examine wing membrane microscopically to confirm that the characteristic lesions exist. Adequate wing membrane or muzzle to perform this exam requires euthanasia. We will discuss a new non-lethal technique using ultra-violet light (UV) to screen live specimens and determine presence (and location when present) of these dermal infections, and the 4 separate lines of investigations recently completed to demonstrate that UV will specifically cause these areas of fungal infections on the wing to fluoresce. We will then briefly discuss the direction of on-going investigations using UV light, some management implications, and some of the opportunities for research this technique may provide.

### Acoustic Monitoring: A "Silver Bullet" or a "Sticky Wicket?"

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Bat detectors purport to have numerous advantages over physical capture techniques for performing bat surveys, and as such have enjoyed a rapid rise in popularity and use during recent years. Bat detector surveys are less expensive than netting/trapping surveys. Unlike mist nets, detectors can sample a large, three-dimensional area for bats. Bat behavior is unaffected by detector use and placement. Detectors can be left unattended, to record automatically, and collect data without nightly human costs. Auto-classifiers have progressed to the point where they can confidently identify recordings to species. Yet, each of these assumptions contains flaws that are often overlooked when designing acoustic surveys. Though recent competition in hardware and software has brought many prices down, detectors still contain expensive electronics that are delicate, subject to adverse field conditions, and vandalism, and many models have steep learning curves before they can be effectively deployed. Due to the directionality of detector microphones and the natural variability in air that affects how sound travels, the area sampled by bat detectors is difficult to quantify. Moreover, bat detector microphones placed on the landscape often become novel items, which attract bat scrutiny, affecting their echolocation calls and a bat-worker's ability to confidently classify species. There is a large post-processing cost and data burden for automated call collections that often isn't realized until after studies are completed. The fate of well-documented acoustic recordings determines their future relevance for long term monitoring studies, yet many terabytes of calls are left to languish on hard drives across North America due to inconsistencies in reporting data. Auto-classifiers that attempt to identify bats to species are based on a finite set of voucher calls which were recorded under ideal or controlled field conditions, often not replicated on the landscape during acoustic inventories, therefore they have potential to report spurious results. Thus, acoustic monitoring opens up a "can of worms" for bat inventories. The very real limitations of detectors must be taken into account when designing acoustic monitoring programs in order to prevent erroneous conclusions about bat occupancy or activity patterns and reduce the potential for inappropriate conservation and management decisions drawn from acoustic surveys.

### The Effectiveness of Harp Traps for the Capture of the Eastern Small-footed Myotis (*Myotis leibii*) During Summer Surveys in Pennsylvania (pre-WNS).

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It is well understood that there are many capture biases inherent in the survey techniques commonly used for bats, thus it is best to employ a variety of methods to provide the most robust inventory results. Even so, mist nets have become the "gold-standard" for the majority of summer bat surveys and rarely are the less common techniques routinely practiced. This can lead to inaccuracies when reporting bat presence and relative species composition in an area. An excellent long-term data-set, collected in conjunction with Bat Conservation International (BCI) training workshops in central Pennsylvania highlights this issue for a rarely encountered species: the eastern small-footed myotis (*Myotis leibii*). From 1998 thru 2009 different combinations of mist nets and harp traps were deployed to capture bats during BCI training workshops over a 2-week period in mid- to late-August each year. Though harp traps are commonly used to capture bats outside roost entrances during emergences and at fall swarms, they are also equally effective when deployed just like mist-nets, in flyways, along forest or stream corridors. Moreover, they are likely to capture many of the slower flying, more sophisticated echolocating bats that routinely detect and evade nets. As such their use during summer surveys is promoted and highlighted during BCI classes. As a part of the workshops, detailed data on capture methodology, effort, and results are collected and stored in an automated spreadsheet. Each bat captured is assigned a single record, allowing for the comparison of relative effectiveness for each capture techniques deployed. During the twelve consecutive years of this long-term effort, over 8,000 bats of all eight common Pennsylvania species were captured, including 54 *Myotis leibii*. *M. leibii* were captured in 11 of 12 years, with a high of 12 per year and a low of 1 (average, 4.5 bats per year). Fully two thirds of the bats encountered during this effort were captured in harp traps instead of in mist nets, which were deployed in travel corridors. Had harp traps not been used during these inventory efforts, the occurrence of *M. leibii* would have been grossly under-reported, and missed entirely at some locations. Bat-workers should be encouraged to understand capture biases such as this, and to use species-specific methods and protocols to ensure as complete an inventory as possible.

**Bats, Fruit, and the Amazon Forest**

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Bats, in their roles as seed dispersers, are essential to building new forest in tropical regions. Yet, little is known about how these animals use the forest and move fruit tree seeds around. Our work in Brazil concentrates on using acoustic tools to examine fruit bat activity in forest fragments in the Amazon. In this paper, we describe the methods we used to examine that activity, and to record bat calls for compiling an acoustic library. We used Songmeter SM2BAT detectors attached to *Vismia* spp. fruit trees to collect data over 4 months in 2011. We also mistnetted bats and recorded calls using Pettersson's 240X recorders and tethers with ziplines. Tropical fruit bats have highly frequency-modulated calls with multiple harmonics, but of the calls we recorded, subtle differences allowed differentiation of the 13 species we examined. We discuss the problems and discoveries associated with this work. In addition, I present results of a small study designed to determine if flashlights affect bat activity in the USA. Over 45 days, I recorded bats near a suburban house either with or without a flashlight beam. I turned the light on and off on a random nightly schedule and found that flashlights did not significantly alter bat activity over one flight season. These are encouraging results for people using headlamps during bat work. Nevertheless, in tropical areas, we suspect bats may be attracted to lights.

**Bat activity on golf courses in the Delmarva Peninsula**

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Habitat destruction is one of the biggest threats to biodiversity and therefore habitat preservation is a top conservation priority. Ecosystems may be drastically changed with the loss of just one species. Bats in Northeastern United States are key components of an ecosystem serving as biological pest controls and indicators of ecosystem health. Habitat destruction combined with the devastating effects of white-nose syndrome pose a significant threat to bat populations. With continuous land development new approaches to habitat conservation must be considered. Usually regarded as an environmental problem, golf courses may offer an innovative opportunity of using developed land in conjunction with conservation goals by using natural or man-made features on the altered landscape as possible wildlife habitat. Studies have shown that golf courses can support significant numbers of birds, including threatened species, comparable to nearby natural areas. Hard edges and water-hazards present on golf courses are two elements that encourage foraging bats, and forested patches may offer suitable roosting habitat. Acting as pest predators, bats should be considered beneficial by golf course managers. Using ultrasonic detectors placed at five different microhabitat locations at golf courses across the Delmarva region, I analyzed bat activity and habitat use as it relations to small scale landscape change. Mist netting at the golf courses provided physical confirmation of species present. Preliminary results from acoustic monitoring indicate the presence of seven species in the study region. The most activity occurs near water-hazards and in areas with maintained lawn and high canopy. Open grass areas, dense unmaintained forest patches, and open unmaintained forest patches showed no significant different in activity levels. The implications of my study can be used in making more informed decisions in designing new and managing existing golf course landscapes that are both beneficial to the game of golf and to bat populations.

### Methods to estimate bat mortality at wind facilities

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To date, three Indiana bat fatalities have been observed at wind facilities, and it is generally accepted that some level of risk to Indiana bats exists at some wind facilities within the species range. However, few data are available to understand the magnitude of this risk. As a result, any chosen method to estimate impacts will have its merits and drawbacks. At this time no Indiana bat Habitat Conservation Plans (HCPs) at wind facilities have been released for public review; however, a Biological Opinion (BO) on the effects of the Shaffer Mountain Wind Farm was recently released by the U.S. Fish and Wildlife Service. This presentation reviews possible methods for estimating Indiana bat mortality at wind facilities, the assumptions associated with each method, and the gaps in understanding which lead to necessary assumptions. Two general methods are reviewed: (1) a surrogate species approach used in the Shaffer Mountain BO, and (2) a collision risk model approach used for estimating bird mortality at wind farms, which could be applied to estimations of bat mortality. All methods require estimation of the size of the population of Indiana bats at risk and their likelihood for collision with turbines, yet each arrives at these estimates differently.

### Estimated Survey Effort Required for Capturing Bats During Fall Migration

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In Pennsylvania, little data is available on capture success of bat species during the fall migration. Mist net surveys typically occur during bats' summer roosting and foraging season between 15 May and 15 August. Without data to assist with the development of a standardized fall netting protocol, potential requests for fall mist net surveys at proposed wind facility sites may require contractors to apply the summer net survey protocol for fall survey efforts. To gauge the feasibility of capturing bats during the fall migration and initiate data collection for a fall netting protocol, we inventoried five southwest Pennsylvania survey sites using mist nets in 2007 and 2008. Eighty-seven bats of seven species were captured over 33 survey nights between 31 August and 1 November. Total net effort per bat capture was 494.9 $m^2$/bat. According to the Pennsylvania Game Commission's statewide database of summer bat captures, mist net survey effort per bat capture is less than our fall mist net survey effort. Between 15 May and 15 August, contractors' net effort per bat capture ranged from 37.29 $m^2$/bat to 218.4 $m^2$/bat with a mean of 155.2 $m^2$/bat. These preliminary data suggest that approximately three times more net survey effort is required to capture fall migrating bats between 31 August and 1 November in southwest Pennsylvania. Results from our study should be useful for developing a standardized monitoring protocol for fall mist net survey projects.