



WBWG NEWS

Volume 3, Number 2

Fall 2007

Feature Section:

Bats and Mines



Photos: Janene Lichtenberg (upper left and right), L. Bonewell (lower left)



Western Bat Working Group

WESTERN BAT WORKING GROUP NEWSLETTER

Fall 2007

Volume 3, No. 2

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PRESIDENT'S CORNER

Boy, our summer in the PNW came to dramatic halt – buckets of rain dropped from the sky and the mercury in my thermometer receded without hope of resurrection until next spring. I finally broke down and relit my gas heater. I imagine my colleagues to the south have had to put on a light jacket and maybe even long pants in the evenings, and to the north; certainly the long underwear and insulated boots have moved from the back to the front of the closet. This also is a time when most of us start to refocus our energy on compiling data and writing various reports and publications – those promised prose until ‘after the field season’ are upon us. So goes the cycle.

My promised after-the-field-season prose included a final update of our Action Plan. I like reviewing our Action Plan as it reminds me of all that we've accomplished. Here is a partial list:

- We've achieved non-profit status and adjusted our by-laws to fit that status, thanks to Brad Phillips.
- Tim Snow and Angie McIntire are working as liaisons with the Association of Fish and Wildlife Agencies and The Trilateral (Canada, Mexico, and the U.S.) to assist with re-establishing an umbrella organization that helps to direct bat conservation across North America.
- We've contacted State and Provincial Wildlife Departments to make them aware of WBWG and offer support for completion of conservation strategies and plans.
- We actually have funds in our account.
- Deborah Crough has taken the lead for our educational committee and has started to work on materials to post on the website. Aimee Hart, Erinn Shirley, Michelle Caviness, and Nancy Renison also have stepped forward to work with Deborah.
- We have a wonderful newsletter, thanks to Cori Lausen and Kristi DuBois
- Our website has been updated and continues to evolve under the skilled leadership of Erinn Shirley and Scott Pedersen
- A wind energy and marking committee is putting together a marking database under the leadership of Rob Schorr
- We've adopted a position statement concerning pre-exposure vaccinations for rabies
- We also adopted a voting process for approving actions, position statements, policies, etc.
- Our 2007 conference in Tucson was exceptional, thanks to Angie McIntire, Tim Snow, Nancy Renison, and many others
- We have had 2 performance reviews of the Officers to gage our progress and need for change

The performance reviews have been very positive and I take that as an indication that we are on the right track. There also have been some helpful suggestions. Concern was expressed that too few people were doing the heavy lifting and we might want to recruit more folks to engage in WBWG activities. As I look at our updated Acton Plan, I agree and would be thrilled to see fewer blanks where names should be and more names associated with the action items. Specifically, we identified the need for a Conservation Coordination Committee to identify priority concerns and work that are common across States and Provinces. To me, this is the backbone of what WBWG is about – identifying issues common to our members and providing support and assistance to addressing those issues. We have 3 people on that committee, and they are all board members. If you have ever wanted to get your feet wet on conservation issues, here is your chance. I know the 3 people currently on that committee and they're reasonable and fun to work with (OK, I'm one of them).

Two big issues for 2008 are wind energy and mining. U. S. national direction is being crafted for wind energy by the USDA and re-crafted for mining through revamping of the 1872 Hardrock Mine and Reclamation Act. The Western Bat Working Group is drafting formal responses for both of these efforts. These two issues promise to demand our attention over the next year and I encourage you to consider how you may want to get involved with WBWG to further bat conservation specific to these issues or any others. Your willingness to volunteer an hour or two a week can make a big difference in what we can accomplish as an organization. Yes, I realize I've sent out similar recruitment messages before and I might do it again – I get so enthused by the good work and high energy of the people engaged with the WBWG, I just don't want any of you to miss a chance to have the same experience. So please don't be shy, come join us.

Respectfully,
Pat

HEADLINERS

Website – A new look and direction. Special thanks to Erinn Shirley and Scott Pedersen for a fantastic new website. They have done a great deal of work on providing us with a new look and regular updates, and they welcome your feedback. Ideas are always welcome. There is talk of incorporating a forum into the website, so stay tuned for details!

Change in Representation. We'd like to thank **Meg Goodman** for all of her great work as our Texas Rep; she has moved on to a new career in community development. We welcome **Nyta Hensley** as the new WBWG Rep for Texas.

After 38 years with the BC Ministry of Environment, **Laura Friis** moves ever closer to retirement; we know she must be getting serious, as **Purnima Govindarajulu** has begun to join us on our conference calls – welcome Purnima. We look forward to hearing from both of you about bats in BC!

Thank yous: To **Cori Lausen** for composing a WBWG formal response to the proposed USDA Wind Energy Policy; **Kirk Navo** and **Pat Brown** for drafting a letter to send to State, Provincial, and Federal Wildlife and Mining professionals concerning the importance of addressing bat conservation when closing abandoned mines. A special thanks to the many of you who provided input and edits to both of these efforts, your input greatly improved the effectiveness of the letters.

ABOUT THIS NEWSLETTER

In the last fall issue we included our first “*Feature Section*” which provided pertinent and up-to-date information on the issue of Bats and Wind Energy. This fall we decided to focus on another pertinent issue -- Bats and Mines. Thank you to all who contributed to this special section. If you have ideas for future Feature Sections, please let us know!

The .pdf of this newsletter is available online at www.wbwg.org, or from your WBWG state/provincial representative (see the last section of the newsletter to find out who is your representative on the Board). If you have news items you'd like to share with the newsletter, please contact your representative or send an email directly to corilausen@netidea.com. We accept submissions at any time of the year! Thanks again for making this networking opportunity possible.

Cori Lausen and Kristi DuBois, Newsletter Editors

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FEATURE SECTION

Bats Underground – Caves and Abandoned Mines Closures

Intro by Angie McIntyre and Cori Lausen

Abandoned underground mines provide significant habitat for bats. In fact, more than half of the species of bats in North America are known to use mines, and at least 22 of the 32 species that occur in the west are known to use abandoned mines to some extent. Use of mines by bats may help to offset natural habitat loss and human disturbance at caves. Abandoned mines are important to bats in so many ways, including winter and summer roosting areas, day roosting, maternity sites, shelter from predators, and feeding and watering. But, safeguarding abandoned mines from human entry is a high priority for many agencies and landowners. The cost in time and money for habitat assessment of abandoned mines presents a significant challenge to those agencies charged with keeping humans safe, and to the biologists charged with determining an abandoned mine's importance as bat habitat. Even when a mine has been determined to be important for bats, the landowner may be hesitant to use a bat compatible closure for the fear of increased liability for a gate vs. a conventional backfill closure. Also, many mines are closed without proper bat

surveys (which present yet another challenge) and sealing mines without first evaluating their importance to bats has been deemed by Bat Conservation International as possibly one of the single greatest threats to North American bats.

In 1993, the Bats and Mines Project was founded by BCI and the Bureau of Land Management (USDI) to reduce the loss of bats during closures of abandoned mines. Today, BCI's Bats and Mines Program continues to work towards the same goals as the original project and new conservation directions are being taken in this field (see below). This issue is coming to the forefront of bat conservation; states are recognizing the importance of mines as bat habitat and incorporating the abandoned mines issue into their Wildlife Action Plans and bat conservation plans, and bat-friendly gates are gaining in popularity as evidenced by state submissions that follow in this Feature Section.

Resources on Bats and Mines:

<http://www.mininghistoryassociation.org/>

The Mining History Association (MHA) is an organization of individuals interested in the history of mining and metallurgy. Members include independent scholars, laypersons, college and university professors, historians, miners, geologists, retired mining industry personnel, and many others. The MHA holds an annual meeting, publishes a scholarly journal and a quarterly newsletter, and provides a forum for discussion of the history of mining.

<http://www.osmre.gov/>

U.S. Office of Surface Mining Reclamation and Enforcement

OSM is charged with balancing the nation's need for continued domestic coal production with protection of the environment. In its beginning, OSM directly enforced mining laws and arranged cleanup of abandoned mine lands. Today most coal States have developed their own programs to do those jobs themselves, as Congress envisioned. OSM focuses on overseeing the State programs and developing new tools to help the States and Tribes get the job done.

<http://www.mcrcc.osmre.gov/>

U.S. Office of Surface Mining Reclamation and Enforcement Mid-Continent Region

Has a Bat Conservation and Mining Link, which contains key resource links, including:

<http://www.mcrcc.osmre.gov/PDF/Forums/Bat%20Conservation/TOC.pdf>

Proceedings of Bat Conservation and Mining: A Technical Interactive Forum (November 2000)

<http://www.mcrcc.osmre.gov/PDF/Forums/Bat%20Gate%20Design/TOC.pdf>

Proceedings of Bat Gate Design: A Technical Interactive Forum (March 2002)

Bat Conservation International's Bats and Mines Handbook and Bats and Mines Brochure:

<http://www.batcon.org/home/index.asp?idPage=53&idSubPage=87>

A New Direction at Bat Conservation International –Southwestern Subterranean Program

Dave Waldien, BCI

In 2007, Bat Conservation International has undergone an extensive internal reorganization that, among other things, has resulted in an exciting new, collaborative, multi-year program to conserve mine and cave habitats for lesser long-nosed bats, California leaf-nosed bats and Townsend's big-eared bats in the southwestern United States. The Southwestern Subterranean program will not only advance the conservation of bats but also work collaboratively to enhance public safety through the closure of dangerous mines. The geographic scope of the program includes all or portions of Arizona, California, Colorado, Nevada, New Mexico, Texas, and Utah and includes lands administered by all private, state and federal partners in the region that are willing to collaborate at this scale to conserve bats and enhance public safety.

As part of this program, BCI will work with partners to implement priority management projects at known roosts and conduct rapid assessments at other mines and caves in order to identify additional priority project sites. Our collaboration will develop, test and implement defensible and consistent monitoring protocols that will help the broader partnership achieve explicit conservation and management objectives. BCI will also work with partners to identify and implement collaborative priority research projects to help advance broader management and conservation of bats in the southwestern United States.

BCI will be dedicating a full-time Conservation Biologist position to this critical program and is in the process to identify the right person with the critical skills to work with the diverse partners. Dr. Dave Waldien, BCI's Co-Director of Programs, will supervise the new position and is available to respond to queries until the new person is hired and integrated into the program (dwaldien@batcon.org). Our standard Caves and Mines programs remain in place and can respond to targeted conservation issues throughout North America that may not be explicitly covered by this new program.

Personally, I look forward to working with all of the individuals and organizations associated with the Western Bat Working Group in the future on this collaborative program. I firmly believe that together we will be able to achieve broader bat conservation objectives than what we as individuals could ever hope to achieve.

An Abandoned Mine Survey Protocol for Southeast Alaska is Being Developed by the US Forest Service and Alaska Department of Fish and Game

Aaron Poe, Wildlife Biologist, Chugach National Forest, 907-754-2345, apoe@fs.fed.us; *Dr. Rick Sherwin*, Department of Biology, Chemistry, and Environmental Science, Christopher Newport University, Newport News, Virginia; *Dave Tessler*, Regional Wildlife Biologist, Nongame Program Alaska Department of Fish and Game, Anchorage, Alaska.

There are numerous abandoned hard rock mines on public lands in Alaska. Many of those on US Forest Service managed lands are slated for eventual closure because they pose a risk to public safety. These mines may be important wintering hibernacula for the five species of bats residing in the state, including the rare Keen's myotis. Bats congregate in very large numbers during the winter, and it is possible that a high proportion of Alaska's various bat populations may winter in a small number of mines and caves. Therefore, care and consideration must be exercised when closing mines to avoid posing an undue threat to the conservation of these species.

Most mines on USFS lands in Alaska are remote and difficult to access even during the summer months, and are nearly impossible to reach during the winter. Therefore, the need exists to develop a consistent methodology to assess the potential for wintertime use of mines by bats during summer surveys. In addition to being able to detect bat use with biological metrics, the protocols must be safe for the personnel involved, and surveying mines presents a very different suite of safety considerations than merely surveying caves. A variety of such survey methods have been developed for other regions throughout North America. However some of the inherent assumptions behind those protocols, as well as the methods employed, may not be well suited for the high latitude underground environments present in Alaska. As a result the US Forest Service and the Alaska Department of Fish and Game are collaborating with Dr. Rick Sherwin of Christopher Newport University to develop a mine survey methodology specifically for evaluating bats in the high latitude mines found on the Chugach and Tongass National Forests. It is our hope that this protocol will serve as a resource for other land managers in the region who can likely adapt its procedures to compliment their own management practices relative to abandoned mines. We expect to complete this protocol in early 2008.

Bats and Mines in Arizona

Angie McIntire

Since the Mining Law of 1872, over a million mining claims have been filed in Arizona. The Arizona State Mine Inspector's Office estimates that roughly 10% may have had actual mining conducted on them, which accounts for the estimate of 100,000 abandoned mine openings statewide. The Arizona

Game and Fish Department is assisting the State Mine Inspector's Office with bat surveys at mines in areas that pose a high public safety risk. In addition, AGFD is developing a statewide guidance protocol for surveys and exclusion recommendations for mine closures. Through AGFD's Bat Grants program and in collaboration with the U.S. Marine Corps Air Station, two bat friendly gates will be installed at a California leaf-nosed bat roost on the Barry M. Goldwater Range West near Yuma. In addition, we are working with BLM, City of Peoria, State Mine Inspector's Office, and developer MK Company, on the feasibility of installing a bat friendly structure at the Sunrise Relief Mine. This mine is in a developed area of Phoenix, and is approximately 30 feet from the nearest home. A new development in the area is in progress, making this site a high priority for closure. The mine is home to a large winter roost of California leaf-nosed bats, over 400 bats were recorded in the last winter survey in 2000. The hope is that this will become an example of agencies and developers working together to protect important bat habitat in an urban area.

Mine Surveys in northern, central and southern Arizona

Jason Corbett, jcorbett@epgaz.com

Jason Corbett and several colleagues conducted abandoned mine surveys for close to 100 mines. The sites visited ranged from mere depressions (prospects) to large systems of shafts, adits, and drifts. Bats or evidence of their past presence were found in only a fraction (~20%) of the mines visited and surveyed. Mines visited in the southern slopes of the Santa Rita Mountains were remarkably undisturbed by human traffic of any sort, likely due to the extremely rough terrain. Species found during surveys include *Leptonycteris curasoae*, *Choeronycteris mexicana*, *Corynorhinus townsendii*, *Macrotus californicus*, *Eptesicus fuscus*, and *Myotis* spp.

Mine Surveys and Closures in Northwestern Arizona

*Christine Bates, Colorado District of the Bureau of Land Management, Kingman Field Office,
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Christine Bates put up 43 barbwire fences with signs around shafts this year. With the unfortunate accident at the Brighter Days Mine on private land where 2 girls riding on a 3 wheeled ATV went down a shaft, there has been a great interest in closing abandoned mines. Part of the problem is that some of these mine shafts have adjoining adits and some of the closures do not include bat friendly closure methods. Barbwire fences with signs are the best and most inexpensive solution to the immediate problem for openings that have no fencing whatsoever. We really need to get the word out to all: "Stay Out Stay Alive" and "Stay on the existing roads and trails."

This year we have been working on a Natural Resource Damage Assessment for the Antler Mine. The Antler Mine is located in the Kingman Field Office near the town of Yucca. I surveyed the area and initially determined that the terrible sulfur (rotten egg) smell permeating the area and coming out of the shafts/adits would alleviate any use of this area by bats. An exit count showed that my initial thoughts of the natural exclusion due to heavy Hydrogen Sulfide were inaccurate. To my surprise, I counted *Myotis* and Pallid bats coming out of the adits and shafts. The Pallid bats were also observed flying around the equipment and went down another shaft where there was water. I assume by their actions that they were drinking this sulfur laden water. My conclusion is; always survey for wildlife no matter what the shaft, adit and/or area looks like. This can be accomplished by setting up a night vision scope and a video camera for just 1 hour. Just one hour of counting at the Antler Mine changed my whole perspective of the site. We will now recommend bat gates instead of filling in the holes.

Bats and Mines in Southern California

*Patricia Brown and Robert Berry, Brown-Berry Biological Consulting, 134 Eagle Vista, Bishop CA
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For the past 40 years we have studied bats in mines in the California desert. During that time we have surveyed approximately 5,000 mine features, and 75 % have contained bats or guano, while 10% are critical habitat for bats during some season. Although closure of abandoned mines during renewed

mining has always been an issue, within the last 10 years mines have been closed with greater frequency for hazard abatement. There is increased human activity in the desert as the population of Southern California grows and the use of off-highway vehicles (OHV) proliferates. Every time a person is killed or injured in a mine, there is renewed interest in quickly taking care of the problem. Usually this is done without allowing the time to complete surveys or arrange exclusions at the appropriate season for bats and other wildlife living in mines, such as owls and desert tortoises (a federally threatened species). This band-aid approach to mine management is most prevalent on private land. Mining companies often want to seal all openings permanently to avoid liability and litigation. Unless a bat roost is previously documented, the California Department of Fish and Game will not be involved. Without federal or state-listed bat species, there is no government intervention. Mines are being bulldozed or blasted without concern for animal occupants. The majority of mines are on public lands, and government agencies are more sensitive and knowledgeable about wildlife issues and mine closures. However, budgetary constraints, lack of intra-office communication, and public pressure often override the need for complete mine surveys at different seasons prior to closure. For the past four years, we have been working with the California Office of the Bureau of Land Management and the California Department of Conservation Abandoned Mine Lands Unit to furnish information on critical bat roosts, especially those that pose a human safety issue. Mines that are in heavy OHV use areas receive special attention. Mines with wildlife value usually receive bat-compatible closures. Where this is not feasible, other means of closure are used after the bats and other wildlife have been evicted.

California Death Valley - Conservation and Monitoring

Mike Rauschkolb (amargosabat@yahoo.com), *David Ek* (david_ek@nps.gov), and *Dave Waldien* (dwaldien@batcon.org)

Collaborative bat conservation in the Death Valley region has led to the protection of six sites stretching north to south over a distance 111 kilometers in the past six years. Two of the protected sites are within Death Valley National Park (DVNP), one is on Bureau of Land Management (BLM), and the other three are located on private property owned by Rio Tinto Minerals (RTM).

Death Valley Mine Closure Alliance (DVMCA): Rio Tinto Minerals (RTM), the California Department of Conservation (CADC), Death Valley National Park (DVNP), and Bat Conservation International (BCI) formed a new bats and mines partnership to protect important bat roosts in mines as the partnership implements a broader landscape scale mine closure program to increase public safety. The partners began a cooperative effort to locate and evaluate inactive mine openings along the Furnace Creek drainage within lands owned or managed by RTM or DVNP. The initial fieldwork inventoried and evaluated over fifty mine openings and another field session is scheduled for December 2007. Data from the initial inventory indicated that mine openings visible from hiking trails showed evidence of historic bat use, with few indications of current use, such as fresh guano. Mine adits in difficult-to-access locations or at sites not readily visible from routine visitor-use areas, contained a significant quantity of Townsend's big-eared bat (*Corynorhinus townsendii*) and pallid bat (*Antrozous pallidus*) guano.

Corkscrew mine closure: The Corkscrew mine is located on RTM lands adjacent to DVNP. The DVMCA survey team predicted that good bat habitat would be available at this mine if the barricades used to block the entrances were replaced with bat-compatible gates. RTM and BCI are funding the installation of two gates in November 2007. Two rare borate minerals were discovered at this mine, so the gates will not only protect this bat roost, but will also protect a classic mineral locality and ensure its use for future study.

Gerstley mine, Shoshone, Inyo County: A maternity colony of Townsend's big-eared bats (*Corynorhinus townsendii*) was discovered in the upper stopes of this mine by Brown-Berry Consulting in 2000. In October 2001, Frontier Environmental Solution installed two bat gates on two adits and three air vents on shafts at the mine. Dr. Rick Sherwin was commissioned by RTM and BCI to evaluate the patterns of roost use and to develop recommendations for future management of the site. Dr. Sherwin reviewed 93 hours of outflight video collected since the Townsend's big-eared maternity colony was discovered. The numbers of bats exiting the mine were variable with a high of 82 net bats on July 7, 2003 and a low of 2

net bats exiting on April 21, 2005. RTM's mining lease ended in December 2006 and management of the mine was returned to the landowner, the California State Lands Commission.

Nevada - Conservation and Monitoring

Mike Rauschkolb (amargosabat@yahoo.com), David Ek (david_ek@nps.gov), and Dave Waldien (dwaldien@batcon.org)

A Cave in Death Valley National Park, Amargosa, Nevada: This cave houses a maternity colony of Townsend's big-eared bats (*Corynorhinus townsendii*) each summer. The bats were discovered by Dr. Don McFarlane (Claremont - McKenna College) on June 29, 1992.



The maternity colony at a cave in Nevada. Photo courtesy of Dr. Donald McFarlane

NPS employees Nancy Mitton and Christi Baldino conducted visual counts with night vision scopes in 2002 and 2003 and demonstrated that the population had declined from more than 50 bats to about 20 bats after installation of a cupola gate over the main opening and an air vent over a second smaller opening. In 2004, Bat Conservation International, Death Valley National Park, US Borax, and others hosted a collaborative gate construction workshop to protect this site. The National Park Service provided all of the materials for the construction a new single large cupola over both openings. The workshop was taught by Frontier Environmental Solutions. Outflights have been videotaped each May since the new gate was installed and the colony size has now rebounded above the historic pre-gate population levels. One year after the older structures were replaced with an angle iron cupola the colony rebounded to 44. In May 2006, the second year after the new gate, the outflight increased to 77 bats. A May 2007 outflight had 76 bats.

Videotapes taken inside of the gate reveal that the bats use three flight paths to exit the gate. The most common method was a repeated figure-eight pattern parallel to the inside face of the gate. After a few circuits, bats would sideslip and exit at one corner of the gate opening. The second exit strategy used by the bats was to approach the corner of the gate at a 45-degree angle, then flare to slow down, and then slip through the opening. The least common route was a head-on flight toward the face of the gate, where the bats would glide directly out the opening. More videos showing a bat's eye view of the gate are planned and will provide critical insights into behavioral responses of bats to gates and could enhance future gate designs.

Right: View inside the cave - 2004. Cupola covers both entrances to the cave. Photograph courtesy of Dr. Donald McFarlane



Nevada Bat Working Group – Bats and Mines Blitz

Jennifer Newmark, jnewmark@heritage.nv.gov

This past summer the Nevada Bat Working Group held the first annual Bat Blitz for the state. The 2007 blitz focused on clusters of abandoned mines in Esmeralda county. A total of 78 mines were evaluated as potential bat habitat. Over 20 people participated over 3 nights (Figure 1). This terrific turnout allowed many of the mines to have more than one outflight survey conducted. Of the 78 mines, 63 (81%) were recommended to be excluded and permanently closed for human safety reasons. These mines were permanently closed at the end of September. The Blitz is a demonstration of the power of cooperation and coordination between Federal, State, and private partnerships. We intend to conduct the Blitz each year and while the focus may not always be abandoned mine closure, it will always focus on working together with all interested parties.



Figure 1. *Part of the Nevada Bat Working Group, 2007 Bat Blitz crew.*

Other work around the state included the installation of at least 10 bat gates by the Bureau of Land Management in Clark County and three bat gates on Forest Service land. An additional three gates are scheduled to be constructed this fall on Forest Service land around Jarbidge, Elko County.

Nevada Division of Minerals - Abandoned Mine Lands Backfill Program

Mike Visher, mvisher@govmail.state.nv.us

As part of the annual Abandoned Mine Lands Backfill Program, the Nevada Division of Minerals (NDOM) assisted with numerous internal and external pre-closure surveys at sites proposed for backfilling in Washoe, Douglas, and Esmeralda counties. These surveys were coordinated and supervised by staff from Nevada Department of Wildlife (NDOW) and Nevada Natural Heritage. Thanks to this survey work, 97 potentially fatal abandoned mine hazards were excluded as significant habitat and backfilled this year (Note: some of these were the same mines surveyed as part of the Bat Blitz). As recommended by NDOW, nearly 40 of these sites required and received exclusion netting (Figure 2) (3 days prior) and/or exclusion smoke bombs prior to backfill. Also thanks to the pre-closure survey work, at least 32 abandoned mine hazards were identified as having significant habitat (requiring gating) or requiring additional study.



Figure 2. *Exclusion netting covering an abandoned mine in Nevada.*

NDOM also recently supervised the construction of five bat-compatible closures at abandoned mine hazards on state-owned land just north of Gabbs in Nye County (Figures 3 and 4). This work was performed as part of a Supplemental Environmental Project conducted by Coeur Rochester and the contractor was Rob Cordtz from Richland, Oregon. Rob was assisted in the closure designs and exclusion work by Dr. Rick Sherwin (Christopher Newport University, Virginia), who also conducted some last minute pre-closure internal surveys. In preparing for these and additional planned bat-compatible closures at the site, winter internal and summer external surveys were conducted by biologists from NDOW and Nevada Department of Environmental Protection.



Figure 3. *Construction of a bat gate near Gabbs, Nevada*



Figure 4. *Completed bat gate near Gabbs, Nevada*

Our staff, interns and contractors continue to collect cursory bat habitat information when logging new abandoned mine hazards. This information is now included on our hazard inventory sheets and is also entered into our ever-growing database.

Nevada Department of Wildlife – Bat Exclusion from Mines

Jason Williams, jasonw@ndow.org

NDOW is developing statewide standards that describe proper methods of excluding bats from abandoned mines. Once completed, NDOW will ask the NDOM, USFS, and BLM to abide by these guidelines during closure processes. NDOW, NDOM, BLM, and USFS are working together to prioritize two databases. One database prioritizes AML sites needing bat surveys, so that Nevadans can be one step closer in securing these hazards. This database is currently being used to direct both internal and external survey efforts in the state, and progress is working considerably well, as often bat surveys are the slowest aspect of the NEPA closure process. The other database prioritizes sites that Nevadans already know are important to bats and warrant bat gates. This database is prioritized primarily from human safety considerations, and is being used by NDOW's gate contractor to determine which sites in Nevada to gate with the limited gating funds available. NDOW has contracted with the USFS bat gate building crew based in Idaho to build gates in Nevada. This contract will last approximately 2 years and through a cooperative agreement with the BLM, the USFS will be able to build on BLM lands also. All cooperators are excited at the opportunity of securing many AML hazards in Nevada, and already progress has been made and the contract was finalized just a month ago!

Bureau of Land Management, Nevada

Mike Herder, Michael_Herder@blm.gov

Abandoned Mine Reclamation. BLM recently received a Round 7 Southern Nevada Public Lands Management Act (SNPLMA) grant to address remediation of abandoned mine sites on BLM public lands in Lincoln County. The fund is providing over \$750,000 to inventory AML sites, conduct biological and cultural surveys, and install the most appropriate closure method (foam core, back fill, bat gate, etc.).

Bats and Mines in Oregon

Pat Ormsbee

Oregon doesn't quite have the large number of mines our colleagues are faced with in more southern parts, such as Nevada or Colorado. Many of our mines are too cool in summer and or too warm in winter to provide good bat habitat. One exception to this scenario is Hell's Canyon National Recreation Area – the mines in "The Canyon" as we like to call it, are prime real estate for maternity colonies of *Myotis yumanensis* and *Corynorhinus townsendii*. Hell's Canyon is where Burr Betts did his research demonstrating that colonies of bats, especially large colonies, could raise the temperature of roost sites via their communal body heat (Betts 1997).

Right: Ruth Seeger, USFS minerals specialist, thigh high in Hell's Canyon bat guano and still smiling.

We really don't know where our bats go in winter, so we've invested some energy in setting out motion sensors and temperature/RH recorders to see if we can establish a pattern of motion and roost-climate conditions that might indicate winter use at mines and caves. So far we've collected some data and still need to take a look at it for obvious patterns.



In most cases, our mining experts have found that it's easier and cheaper to gate abandoned mines than to get equipment to the site to back fill it. Plugging or blasting hasn't been real popular as these methods often fail to permanently close a mine and can create bigger problems down the line when they do fail. One of our Mines folks, Greg Visconty, submitted for and received \$250,000 to do pre-closure surveys, including bat surveys, across NE Oregon. He also developed a mine closure sign that improved on what was out there. Oregon is lucky to have progressive leadership when it comes to managing abandoned mines – bats are definitely on the radar screen of our mines folks.

Betts, B.J. 1997. Microclimate in Hell's Canyon mines used by maternity colonies of *Myotis yumanensis*. JWM: 78(4) 1240-1250.

Right: Greg Visconty, mining specialist locking up after an internal survey in Hell's Canyon



Bat Surveys in Colorado's Abandoned Mines

Kirk Navo, Colorado Division of Wildlife, Monte Vista, CO K.Navo@state.co.us

In the 2006 field season, 232 mines were evaluated, including 132 BLM, 53 USFS, 32 private, and 15 local government sites. A total of 354 surveys were conducted, including 72 detector, 46 capture, 33 video, 135 internal, and 71 pre-surveys. Of the mines evaluated that season, 55 sites had verification of roosting by bats to species (approximately 8% of the mines in the project). Bat gates were recommended for 43 features that season, approximately 18% of the total evaluated. (Actual number of mines is around 30, as several mine complexes are prominent in the gate recommendations.) We documented 214 bats, including 54 *Corynorhinus townsendii* (Townsend's big-eared bat), a state species of special concern, during the surveys of abandoned mines in the state. We documented 31 new *C. townsendii* roosts in 2006, and 55 total new bat roosts. The 2006 surveys resulted in 43 bat gate recommendations to the land management agencies and Division of Mining, Reclamation and Safety.

Mine surveys continued for the 2007 field season, which is now close to finishing up for the year. Winter evaluations will start again this January. Additional new roosting sites for Townsend's big-eared bats were located in 2007, and bat gates will be recommended at many sites. Renewed mining activity in Western Colorado remains a concern for bat conservation.

Photo by L. Bonewell



Bats and Mines in Western Canada

Document by *Susan Holroyd* for *Laura Friis*, B.C. Ministry of Environment, Victoria, B.C.

Part of the Bat Conservation Strategy for British Columbia and Alberta includes a section on “Bats and Mines”. There is also a separate section called “Cave and Crevice Management”. This document is currently in draft form; for information, please contact Susan at susanholroyd@hotmail.com.

Bat Friendly Mine Closures on the Flathead Indian Reservation, Montana

Janene Lichtenberg, Wildlife Biologist, Confederated Salish and Kootenai Tribes, Wildlife Management Program, Pablo, MT 59855, 406-883-2888 ext. 7291, email: janenel@cskt.org

The Confederated Salish and Kootenai Tribes (CSKT) Wildlife Management Program is working on conservation projects to protect bats and bat habitat on the Flathead Indian Reservation. The Reservation has at least eight species of bats including *Corynorhinus townsendii* (Townsend’s big-eared bat) a state listed ‘Species of Concern’. One of only five known or suspected *C. townsendii* maternity colonies in the state is located on the Reservation in an abandoned mine (reconfirmed 2005). Internal surveys of additional abandoned mines in the area confirmed that *C. townsendii* and other bat species were using some of the mines for hibernacula and roost sites. Two of these mines were also receiving a lot of human visitors. Biologists were concerned about the impacts of human disturbance to the bats as well as the potential human safety hazards of the open mines. In August 2007, two bat-friendly gates were installed with cost-share funding from the Natural Resource Conservation Service, Wildlife Habitat Incentive Program. The gates were constructed by BatWorks of Rapid City, South Dakota. *C. townsendii* have already been observed roosting in one of the gated mines. Future plans include installation of a third bat-friendly mine gate, mine surveys at additional sites, and monitoring of bat activity at the gated sites.



Joel Tigner (middle photo) of BatWorks watches welder Rod Hubbard (left and middle) during their construction of bat gates on the Flathead Indian Reservation in Western Montana. The right photo shows one of the finished gates.

Bat-Mine Surveys in New Mexico

Trish Griffin

Dr. J. Scott Altenbach continues to conduct biological surveys of mines throughout the state, and elsewhere, to survey for bat habitation prior to mine closures. Dr. Altenbach can be contacted at (batmine@unm.edu). More information on the New Mexico Abandoned Mine Lands program can be found at <http://www.emnrd.state.nm.us/Mmd/AML/AMLmain.htm>.

Marikay Ramsey (U.S. Forest Service mramsey02@fs.fed.us) continues to conduct internal and external surveys for bats in abandoned mines on National Forest System lands. She is surveying multiple workings across several National Forests in New Mexico and Arizona, and will provide management recommendations. Marikay also hosted a field tour for Dr. Merlin Tuttle of BCI this summer.

Roost Protection in South Dakota

Brad Phillips

Working with the South Dakota Game, Fish and Parks Dept, and the Black Hills National Forest bat friendly gates were installed on six abandon mine sites in 2007.



This brings the total number of protected roosts (abandoned mines and caves) to 37 in the Black Hills region of South Dakota. We are also encouraged by the fact that private land owners with abandoned mines are contacting SDBWG wanting to know more about bat friendly closures.

Bats and Mines in Washington

Gerald Hayes

Mining has been a significant industry in Washington's history. Underground workings were established in an estimated 3,400 mines in the state. Information on location and structure of mines in the state was based on several sources. Few mines have been surveyed for bats. The Geology and Earth Resources Division of Washington Department of Natural Resources is partnering with EPA, USFS, BLM and BCI to build a database and GIS coverage of mines in the state and to survey mines to determine potential safety hazards and prioritize sites for hazard mitigation. Bat researchers are participating in these hazard surveys to ensure that surveys are conducted appropriately to determine bat use and to ensure that sites of significance to bats are managed for continued use by bats.

In 2000 and 2001 bat researchers began visiting mines to assess their significance as bat habitat. Interior surveys were conducted at several sites and exit surveys for bats were conducted at some sites. The most common mine type in the state is an adit less than 50 feet in length. Mines with extensive underground workings and multiple openings are much less common and potentially of greater importance to bats. At several of these mines with extensive underground workings significant bat activity was documented. A large stope with one or more openings appears to be a significant structure at occupied sites. At least ten mines under various public ownerships have been closed with bat-friendly gates. All had significant human visitation or potential for such. Several are known to have significant bat use. The rest have great potential for bat use. This summary is based on work conducted by John Fleckenstein of the Washington Department of Natural Resources and Neal Hedges of the Bureau of Land Management.

Abandoned Mines Legislation - WBWG Sends Official Letter

In response to the proposed legislation to revamp the 1872 mining law (Hardrock Mine and Reclamation Act 2007; H.R. 2262), Pat Ormsbee and others drafted a letter from the WBWG.

The Hardrock Mining and Reclamation Act 2007 current text can be found at: www.govtrack.us/congress/billtext.xpd?bill=h110-2262. This was introduced into the House in May. The letter was sent to Dale Sparks of Indiana State University who was soliciting responses from individuals in the West with expertise in mine assessments for bat use. As the newly elected chair of the legislation and regulations committee for the American Society of Mammalogists, Dale is interested to know if the proposed bill meets the needs for mine reclamation in the West. Specific issues that concerned him were whether sections 306, 401, and 402 provide adequate protection for bat habitats in old mines. If you'd like to see a copy of the letter that WBWG sent regarding this bill, please contact Pat Ormsbee. The H.R. 2262 Hardrock Mining and Reclamation Act of 2007 was approved in the House of Representatives 1 Nov. 2007. Senate and White House approval is still needed.

STATE/PROVINCE UPDATES

ALASKA

Submission from Aaron Poe

Distribution of bats in Southeast Alaska and selection of day-roosts in trees by Keen's myotis on Prince of Wales Island, Southeast Alaska

Julia Boland, Department of Forest Science, Oregon State University, 321 Richardson Hall, Corvallis, OR 97330 julia.boland88@hotmail.com; *John Hayes*, Department of Wildlife Ecology and Conservation, University of Florida; *Winston Smith*, U. S. Forest Service, Pacific Northwest research Station

We conducted capture and acoustic surveys for bats in Southeast Alaska from mid-May to September in 2005 and we continued surveys on Prince of Wales Island from mid-May to September in 2006. We determined the level of effort required to catch each species and documented ranges in morphology and

periods of reproduction. We captured little brown myotis, *Myotis lucifugus*; California myotis, *M. californicus*; long-legged myotis, *M. volans*; and Keen's myotis, *M. keenii*, and we acoustically detected and sighted the silver-haired bat, *Lasionycteris noctivagans*. Capture success varied by species, year, and type of capture site. The little brown myotis was found in each area sampled and appears to be the most abundant species in the region. California myotis and Keen's myotis were captured as far north as Juneau. The long-legged myotis was captured on Wrangell and Prince of Wales Islands and the silver-haired bat was detected on Prince of Wales Island. Given low rates of detection, all species appear to occur in low densities in Southeast Alaska. Better understanding of population status and trends and examination of habitat ecology and response to forest management in the region is needed to prioritize conservation strategies.

We examined selection of day-roosts in trees by male and female Keen's myotis at three spatial scales (tree, tree plot, and landscape) on Prince of Wales Island, Southeast Alaska, from May to September 2006. We tracked 13 females and 6 males to 62 and 24 roosts in trees, respectively. Selection of day-roosts by female Keen's myotis was most strongly influenced by characteristics of trees and trees used as roosts were primarily large in diameter (\bar{x} = 106.5 cm) with structural defects. In plots surrounding roosts of female Keen's myotis, trees had large mean diameters and there was a high abundance of roost-like trees. Roosts of females were generally located closer to roads and riparian areas and in landscapes with more old-growth rainforest than were randomly selected points. Selection of roosts by males was most strongly influenced by characteristics at the landscape scale. Male Keen's myotis exhibited flexibility in types of roosts chosen, but trees used as roosts were primarily snags in early to intermediate decay that were surrounded by a higher relative abundance of roost-like trees, closer to roads, and further from riparian habitat than were randomly selected points. Selected habitat features differed between males and females at each spatial scale and differences are likely a reflection of energetic strategies associated with reproduction. Our findings suggest that maintaining structural components characteristic of old-growth rainforest will promote conservation of Keen's myotis in Southeast Alaska.

Pilot Study Initiated in Skagway, Alaska

Dashiell Feierabend, Wildlife Technician, Klondike Gold Rush National Historical Park, Skagway, Alaska, Dashiell_Feierabend@partner.nps.gov

The Klondike Gold Rush National Historical Park (KLGO) in southeast Alaska, initiated its first bat monitoring study during the summer of 2007. Using Anabat 2 units paired with ZCAIMs, we have collected a number of high quality call sequences from six locations within the Skagway and Taiya Inlet Watersheds. We are currently in the process of analyzing them for species identification, and our expectations are to find primarily *Myotis lucifugus*, but we will also be watching for *M. keenii*, *M. volans*, *M. californicus*, and *Lasionycteris noctivagans*, of which there have been a small number of records further south in Alaska. We will continue outdoor acoustic monitoring in low elevations during the winter, while also installing a detector in a historic gold rush building to check for winter roosts. Finally, we are looking forward to establishing a long-term recording station in the park next summer with the new Anabat SD1 we recently acquired. The park would like to thank Aaron Poe and the Chugach Forest Service for loaning KLGO the Anabat equipment that enabled this study to take flight.

The Alaska Bat Monitoring Project: Utilizing Citizen Science to Map the Distribution of the Little Brown Bat (*Myotis lucifugus*) and its Habitats in Alaska

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The little brown bat (*Myotis lucifugus*) is the most common and widely distributed bat in Alaska, and is believed to be the only species found north of the Alaska panhandle. Although broad latitudinal patterns of *M. lucifugus* have been sketched out, its distribution and abundance remain poorly understood. Prior

to 2004, distribution in Alaska was described entirely from a 279 specimens collected at 54 sites dating from 1883 to the present, and neither maternal roosts nor reproduction in the region had been confirmed. With the exception of isolated accounts, there is little contemporary information on the summer distribution in Alaska, and even less information on their wintering distribution. It is speculated that the widely dispersed summertime population migrates southward to concentrate in as yet unidentified winter hibernacula, but neither these large-scale movements nor the presence of hibernating concentrations have been identified in Alaska.

The Alaska Bat Monitoring Project was established in 2006 to use citizen volunteers to gather baseline distribution data on *M. lucifugus* and its habitats in Southcentral, Western, and Interior Alaska. Because *M. lucifugus* is believed to be the only species present throughout most of the state, it is an excellent subject for “citizen science.” Concurrent project objectives are to promote public involvement in bat conservation, and to develop a robust volunteer program for monitoring changes in distribution over time. We conducted educational programs at schools and various public venues, and developed a CD-ROM of training, outreach, and promotional materials for distribution to partners, enabling them to conduct their own programs while delivering a uniform message. We produced an excellent educational poster on the “Bats of Alaska” for distribution throughout Alaska’s schools, and published the website www.akbats.net to provide background information, survey instructions, and data sheets for volunteers. We used a variety of mass media elements to promote the project, and our outreach efforts included state and federal resource agencies with field crews throughout the state. To date, we have conducted over 25 public programs reaching over 600 individuals, and have received thousands of phone calls, website hits, and written requests for information. Over 100 volunteers have returned detailed survey forms from locations ranging from Fairbanks to Sitka, Yakutat to Sleetmute, from sea-level to over 500 meters. Volunteers have helped document the first three maternity colonies discovered in interior Alaska. We are currently following these locations to determine if bats overwinter at summer roosting sites, or leave for unknown locations over winter. We are also monitoring recently discovered summer roosting sites in mines to determine if they are utilized as winter hibernacula. The baseline data collected by citizen volunteers is providing the invaluable starting point for directed research efforts on questions such as: where do Alaskan *M. lucifugus* spends the winter? Do they hibernate in place, or do they migrate, and if so, where do they go? Do individuals return to the same summer and winter roosts year after year? Have bats followed human development into interior Alaska, or have they been there all along?

Bat-friendly mine closures and continued internal survey work on the Chugach National Forest

Aaron Poe, Wildlife Biologist Chugach National Forest, Girdwood, Alaska apoe@fs.fed.us 907-754-2345; *Mary Ann Benoit*, Wildlife Biologist, Chugach National Forest, Seward, Alaska

Abandoned mines are common throughout lands managed by the US Forest Service and there are hundreds on the Chugach and Tongass National Forests in Alaska. In Alaska few details are known about bats in general, but we do have evidence that at least some mines are hosting bats during winter and summer months. Forest Service biologists have conducted external surveys at abandoned mine sites on the Chugach and Tongass using Trailmaster motion sensors placed at entrances to detect bat use. These efforts combined with a year of monitoring internal temperature and humidity conditions led us to believe that the Granite Mine in the western Prince William Sound as well as the Monarch Mine near Girdwood, Alaska offered potential habitat for hibernacula. These mines exist adjacent to trail networks used by visitors to the Chugach National Forest and as a result pose a potential public safety hazard. We were able to mitigate a potential safety concern with a bat gate and cable net closures which will allow for the protection of important potential habitat for bats. In addition to these closure efforts both the Brown Bear and Swetmann mines on the Kenai Peninsula near Moose Pass Alaska are also being considered for closure by Chugach National Forest. Internal surveys of these two mines demonstrated summer season use by an unknown species of bat. A similar type of summer roost was discovered in 2003 at the nearby Case Mine and offers additional evidence about the possible importance of mines to bats during summer months. These operations were accomplished with contracted assistance from Holistic Wildlife Services from Newport News, Virginia.

ALBERTA

Updates from Alberta Bat Action Team

Lisa Wilkinson, lisa.wilkinson@gov.ab.ca

Our protocol entitled “*Bats and Wind Turbines. Pre-siting and pre-construction survey protocols*” has been updated and is undergoing a review. Hopefully, it will be posted on the ABAT and WBWG websites by January (the May 2006 version is currently posted). ABAT website:

<http://www.srd.gov.ab.ca/fishwildlife/wildlifeinalberta/batsalberta/abat.aspx>

With an increase in need for bat inventory work as a result of wind farms and other industrial activities, we were concerned that people without suitable bat experience might be conducting bat studies. Therefore, we developed criteria to assist government to assess the qualifications of people applying for permits to conduct bat research. This document has now been submitted to the Alberta Government, and should help to ensure quality and reliability of data.

Provincial status reports are being prepared for *Myotis septentrionalis* and *Myotis ciliolabrum*.

ARIZONA

Submission from Angie McIntire

HOLY BAT DOGS!

Or How My Summer Went to the Dogs

Carol Chambers and Alan Kaufmann, School of Forestry, Northern Arizona University

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This year, my summer vacation was getting paid to take dogs for walks in the woods. Although this sounds flippant, and everyone involved (including the dogs) seemed to enjoy themselves, this project actually has implications for wildlife conservation.

C.J. and Bruiser are rescued chocolate labs that have been specially trained to search for signs of wildlife. PackLeader (<http://www.packleaderdogtraining.net/>) trained me and my assistant to be dog handlers and leased the dogs to me for 6 weeks to test the dogs' abilities in finding bat roosts. Between the two dogs, they know how to find scat of bobcats, bears, mountain lion and, for the “bat dog” project, guano of bats. My research assistant and dog handler, Liz Mering, and I worked the summer in ponderosa pine forests on northern Arizona searching for bat scent. The dogs' job was to find bat guano, and their reward, when they correctly identified a source, was play time with a tennis ball. The dogs love their work, and the tennis ball is the driver for finding feces.

Many species of bats in northern Arizona roost in snags, so forest management treatments can have enormous short and long term impacts. This project was the second phase of a 2-year project designed to test the ability of conservation detector dogs to locate bat roosting sites. Last year, Alice Chung-MacCoubrey initiated the project and tested the influence of weather, amount and pattern of guano and other factors on the dogs' ability to find bags of bat poop in pinyon-juniper woodlands. This year she handed the reins (or leashes) to me since she moved to a new job and couldn't continue going to the dogs.

I was able to use 26 known roosts of *Myotis occultus*, *M. evotis*, and *Idionycteris phyllotis* that my graduate students had located this summer just prior to the start of the Bat Dog Project. Shelly Johnson is looking at how bats react to thinning and prescribed burn treatments in the Flagstaff Wildland Urban Interface, with possible ramifications for bat-human interactions and health; Ben Solvesky is tracking down roost sites of Allen's lappet-browed bat, which is a Sensitive Species for the Forest Service and BLM. Both graduate students were radio tracking pregnant or lactating female bats to snag roosts. Having known roosts allowed me to test the dogs' abilities to work through a "real" situation; other tests I used involved hanging 5 or 20 g bags of a mixture of guano from 5 species to test the dogs' ability to find known sources of guano. This innovative technique could be of enormous benefit to wildlife researchers and managers in studying bats if it pays off (data analysis is in progress).

Bat Activity along the San Pedro River, Cochise County, Arizona

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During the summer of 2007, I measured bat activity and insect availability along the upper San Pedro River, located in Cochise County, Arizona. A total of 96 bats were captured during 12 nights of mist netting, May – September. Species captured include: 44 *Tadarida brasiliensis*, 21 *Eptesicus fuscus*, 18 *Myotis velifer*, 5 *Lasiurus blossevillei*, 4 *Lasiurus cinereus*, 1 *Myotis californicus*, 1 *Myotis occultus*, 1 *Nyctinomops macrotis*, and 1 *Lasiurus xanthinus*. Bat capture rates above the river increased throughout the dry season but declined during the Monsoon. Bat activity patterns were related to aquatic insect availability.

Monitoring Covered and Evaluation Bat Species for the Lower Colorado River Multi-Species Conservation Plan

Allen Calvert, Bureau of Reclamation (acalvert@lc.usbr.gov)

The Lower Colorado River Multi-Species Conservation Program (MSCP) is a coordinated, comprehensive, long-term multi-agency effort to conserve and work towards the recovery of endangered species, and protect and maintain wildlife habitat on the lower Colorado River. The plan for this 50-year effort includes the goal of creating more than 8,100 acres of riparian, marsh and backwater habitat for listed species and 16 other species native to the lower Colorado River. Focal and evaluation bat species include western red bat, western yellow bat, California leaf-nosed bat and pale Townsend's big eared bat. Restoration activities are underway to create and enhance roosting and foraging habitat. A two year monitoring program will be implemented to provide information on distribution and habitat preferences of focal and evaluation species.

Preliminary surveys were conducted in July and September to see what species could be captured in the restored areas. Mist netting surveys were conducted at three sites July 16-19: Beal Lake Riparian restoration at Havasu National Wildlife Refuge captured 4 *Myotis yumanensis*; at Cibola Nature Trail at Cibola NWR we caught 1 *Myotis yumanensis*, 1 *Macrotus californicus*, 2 *Eptesicus fuscus*; and at Pratt Restoration Demo site near Yuma we caught 33 *Eptesicus fuscus* (mostly captured in a 20 ft. high net), 5 *Antrozous pallidus*, 2 *Macrotus californicus*, 1 *Myotis yumanensis* and 1 *Lasiurus xanthinus*. Mist netting surveys were conducted September 10 and 12 at Ahakhav Tribal Preserve on Colorado River Indian Tribe land, *Myotis velifer* (6), *Myotis* spp (5), *Antrozous pallidus* (4), *Lasiurus xanthinus* (4), *Myotis yumanensis* (4), *Myotis californicus* (1), *Macrotus californicus* (1), *Tadarida brasiliensis* (1).

On-Going Bat Work in Southeastern Arizona and Sonora, Mexico

Karen Krebbs, Arizona-Sonora Desert Museum (kkrebbs@desertmuseum.org)

Karen Krebbs completed the eighth year of a ten-year bat inventory and monitoring project for the National Park Service at the Chiricahua National Monument (ChrNM) and Fort Bowie National Historic Site during the summer. A total of 204 bats and 15 species were captured at the 2 parks during the summer fieldwork. A *Lasiurus blossevillei* was netted during the summer work and this is only the second time that this species has been captured for the project. A PowerPoint presentation was made to ChrNM staff discussing the bat research and importance of long-term inventory and monitoring projects within the parks.

Additional bat work was carried out at The Nature Conservancy Muleshoe Ranch Cooperative Area at the south end of the Galiuro Mountains this summer. Nine evenings of netting in Bass Canyon and at the ranch headquarters produced 46 bats of 10 species. A colony of *Myotis velifer* was identified roosting in an abandoned house in Bass Canyon during the fieldwork. The bat work at Muleshoe Ranch will continue in 2008 and will include a new location in a Nature Conservancy Preserve at the Cobra Ranch at the east end of Aravaipa Canyon.

During the summer, several trips were made to Alamos, Sonora, Mexico to train and provide equipment to the biologists of the SEMANART office within this area. A visit to one of the local mines in the Alamos area revealed a maternity colony of *Leptonycteris curasoae* that housed both lactating females and adult males. Twenty-two *L. curasoae* were netted at the mine out of the thousands of bats found roosting there. Nets were also set up at two ranches in the Alamos area and produced 24 bats of 6 species. In 2008, the bat training will continue and an educational campaign for *Desmodus rotundus* will be initiated.

The bat house research project that was initiated in 2002 at the Arizona-Sonora Desert Museum continues to be successful and *Tadarida brasiliensis*, *Eptesicus fuscus*, and *Myotis velifer* occupy more than 20 of the houses. *Tadarida brasiliensis* utilizes several of the houses as maternity roosts during the summer and for the past 3 years this species has also occupied the houses during the winter months.

The Arizona-Sonora Desert Museum is working closely with the El Pinacate Biosphere Reserve and the University of Mexico to monitor the maternity colony of *L. curasoae*. This is one of the largest *L. curasoae* maternity colonies (up to 200,000 bats) in northern Sonora and each year several trips are made to the roost to film the bats as they exit this roost. This data is then turned over to both the El Pinacate Biosphere Reserve and the University of Mexico.

Acoustic Monitoring near Kingman, Arizona

Robert Faught, (ecologicalventures@earthlink.net)

Robert Faught has done acoustic monitoring from 2004 to 2007 near Willow Creek (30 miles east of Kingman). Habitats surveyed include dense willow/cottonwood riparian with perennial creek, desert grassland, and pinyon-juniper woodland. Numerous species have been detected in these areas.

Bat Grants Program and Mexico Collaboration

Angie McIntire, Arizona Game and Fish Department (amcintire@azgfd.gov)

Seven projects were selected to receive full or partial funding for fiscal year 2008 Bat Grants Program: 1)Wellton Hills Bat gates (protection of two *Macrotus californicus* roosts on the Barry M.Goldwater Range); 2)Obtaining Baseline Data on Bats at Picacho Peak State Park (monitoring two mines used by *Macrotus californicus*, *Myotis velifer* and *Tadarida brasiliensis*); 3)Water for Wildlife Escape Ramp Building Workshops; 4)Video Monitoring Equipment Purchase for Lesser long nosed bat Monitoring in Southern Arizona and Northern Mexico; 5)Acoustic Monitoring Equipment Purchase for Monitoring in Grand Canyon National Park; 6)Statistical Analysis of 14 years of Bat Monitoring data at Organ Pipe Cactus National Monument and areas in southwestern Arizona; 7)Monitoring of Factors Influencing the Use of Artificial Roost Structures by Bats in Central Arizona.

More than 25 used mist nets were distributed to Mexican biologists. Thanks to all who donated nets.

Cotton Lane Bridge Bat Lodges

Nancy Renison, Arizona Game and Fish Department (nrenison@azgfd.gov)

Arizona Game and Fish Department (AGFD) Bat Project met with Kiewit Construction Company Superintendent, Brent Jacobsen at the Cotton Lane Bridge construction site near Goodyear. Construction crews installed three large bat lodges under the new four-lane, half mile long bridge spanning the Gila River. The Maberry Bat Lodges are designed to accommodate 2,500 - 4,000 bats depending on the species. AGFD staff installed data loggers to monitor temperature regimes inside the lodges over the next year. The bat-friendly bridge construction is a joint project funded by Maricopa County Department of Transportation (MCDOT), City of Goodyear and local developers.



Bat Workshop at Maricopa County Flood Control Tunnel

Nancy Renison, Arizona Game and Fish Department (nrenison@azgfd.gov)



On October 10, Arizona Game and Fish Department (AZGFD) staff, conducted a bat workshop at the Maricopa County Flood Control Tunnel, summer home to several thousand Mexican free-tailed bats. Approximately 90 people responded to AZGFD website calendar or media release. Folks mingled with bat experts to learn about the local bat population, viewed bats exiting the tunnel, listened to bat calls on bat detectors, and met two live bats from Adobe Mountain Wildlife Center. The team also set up an infrared camera focused on exiting bats that was projected onto a screen in the public viewing area. The event, a Watchable Wildlife pilot program,

was well received by the attending public and teachers. Members of the planning team hope to refine the program and conduct several Watchable Wildlife bat events next year for this or other bat watching sites.

Bats are where it's at! School Presentations

Nancy Renison, Arizona Game and Fish Department (nrenison@azgfd.gov)

AGFD staff and volunteer presenters gave this animated presentation to about 2200 children at 44 different schools over the past year. The presentation consists of a short quiz (T or F) given verbally, then a PowerPoint slide talk, that includes some interaction with the children (e.g., what do you think this bat

eats & why?). Children are able to try on kid-sized bat wings and then meet “our live educational bat”. Our live bat usually steals the whole show!



BRITISH COLUMBIA

Submission by Cori Lausen

Retired, But Still Looking After the Bats

After nearly 38 years with government, Laura Friis officially retired at the end of Oct. this year. However, luckily for the bats and bat enthusiasts in B.C., she will remain part-time for awhile to look after bat-related work in the province, including the new bat systematics project that she just started this year. Her official replacement is Dr. Purnima Govindarajulu who has now been hired by the BC Ministry of Environment as the new small mammal and herp specialist. Purnima completed her PhD at the University of Victoria in B.C. looking at the effects of bullfrogs on native amphibian species; more recently she has been looking at amphibian diseases, primarily chytrid fungus.

Long in the Ear – Looking to Decipher the Species



Laura Friis, BC Ministry of Environment, initiated a multi-year project to sample long-eared *Myotis* in western B.C. with support from the BC Ministry, Gwaii Haanas National Park Reserve and Haida Heritage Site, and the Forest Science Program of the Forest Investment Account and Ministry of Forests and Range. The goal of this project is to fully characterize morphology, diet and echolocation calls in relation to genetic identifications to determine whether the four species of long-eareds (*M. septentrionalis*, *M. evotis*, *M. thysanodes*, *M. keenii*) can be confidently identified in the field, and conclusively be classified as separate species. This summer was the first field season for the project. Collaborators on this project include Dave Nagorsen (Mammalia Consulting), Cori Lausen (Bats R Us, Canada), and Doug Burles (Parks Canada Agency) who sampled from the Hazelton area in northern B.C.,

the Skagit Valley in south-western B.C. and the Queen Charlotte Islands. The summer weather started off unseasonably cold which may have, in part, accounted for what seemed like low ratios of reproductive to non-reproductive females: Hazelton (9 reproductive vs. 17 non-reproductive) and Haida Gwaii (12 reproductive vs. 13 non) this year. Three species of Long-eared myotis were captured and released. In addition to a standard set of morphological traits, wing punches were taken for DNA, and echolocation calls were recorded with both Anabat and Pettersson D240x detectors. One highlight of the summer was the capture of a possible *M. yumanensis* in Gwaii Haanas National Park Reserve and Haida Heritage Site on the Queen Charlotte Islands. If genetics confirm this identification, this will be the first record of this species on the islands.

West Kootenay Fringed Myotis (*Myotis thysanodes*) Distribution and Roosting Ecology

Thomas Hill and Ross Clarke, Fish and Wildlife Compensation Program – Columbia Basin

Nelson, BC Thomas.hill@bchydro.com and Ross.clarke@bchydro.com

The Fringed bat reaches the northern limit of its range in southern British Columbia (BC). Until 2005, this species was thought to occur exclusively in the intermontane grassland portions of BC (COSEWIC 2004) until a breeding population was identified in Interior Cedar-Hemlock (ICH) Biogeoclimatic Zone near Creston, BC. This finding initiated a small project to determine the distribution and roosting ecology of the species in the region. We are using bat detectors and mist netting to identify new populations of Fringed bats and radio-telemetry to identify roosts. Distribution sampling was limited this summer due to back orders and subsequent late deliveries with detectors. Analysis of calls recorded this year has yet to be completed. Two male Fringed bats were captured and fitted with radio transmitters in the Creston Valley this summer. Three day roosts and one night roost were identified, all occurring in fractures in granite cliffs in the xeric, warm (xw) subzone of the ICH Biogeoclimatic Zone. We plan to continue with distribution sampling in 2008 using bat detectors.

CALIFORNIA

Submission from Betsy Bolster

State of California Wind Energy Guidelines

Bronwyn Hogan, Environmental Scientist, Water Branch, California Department of Fish and Game,
bhogan@dfg.ca.gov

The California Energy Commission and the California Department of Fish and Game have completed the “Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development.” After a year-long process, California now has a set of guidelines that, while voluntary, will push wind developers to conduct standardized pre- and post-construction surveys for bats and to consider bats more seriously as an issue when developing wind sites. As a bat biologist, there are things that I wish had been included that weren’t, but I think these guidelines are certainly better than what we had before (which was nothing ;-).

The final version of the guidelines can be read at: <http://www.energy.ca.gov/reports/>

As a member of the Science Advisory Committee, who (without much experience in the area of bats and wind energy) ended up in the hot seat at more than a couple of workshops and meetings, I wanted to thank a number of people. Thanks to Ed Arnett, Paul Cryan, and Ted Weller for answering questions at a moment’s notice and giving input to the commission. Ed, Ted, and Betsy Bolster also called into several of the public hearings. Thanks to Bill Rainey, who was also on the Science Advisory Committee, for backing me up with information when I had to answer questions about acoustic equipment. I also wanted to thank Pat Brown for calling in to the final public hearing before the commissioners made their decision. Thanks to our Canadian colleagues for developing a protocol that we could point to at the very beginning. Thanks also to the California Bat Working Group wind subcommittee (Betsy Bolster, Pat Brown, Bronwyn Hogan, Heather Johnson, Bill Rainey, Dixie Pierson, Joe Szewczak, and Ted Weller) for putting together a Bats and Wind Energy document that raised the bar (especially Betsy and Dixie for the last minute effort to get it done in time to submit as a public comment early in the CEC guideline process). Without all of this, and the input of those who wrote letters or otherwise commented, it could

have been entirely possible that bats would have been relegated to footnotes (or, as one industry person requested, dropped all together).

**Abstract for Channel Islands symposium presentation:
Townsend's Big Eared Bats on Santa Cruz Island: Preserving Historic Structures as
Critical Habitat for a Rare Species**

Patricia Brown, Robert Berry, (Brown-Berry Biological Consulting, 134 Eagle Vista, Bishop, CA 93514 USA patbobbat@aol.com), *Cathy Schwemm* (Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara, CA 93106 schwemm@lifesci.ucsb.edu), and *Tim Coonan* (Channel Islands National Park, 1901 Spinnaker Dr., Ventura, CA 93001-4354 USA Tim_Coonan@nps.gov)

A maternity colony of Townsend's big-eared bat (*Corynorhinus townsendii*) roosts in the adobe at Scorpion Anchorage on Santa Cruz Island. This habitat appears to be extremely important for the maintenance of this population. Because the adobe is an historic structure, this situation presents challenges for preserving and interpreting a cultural resource that is also critical habitat for a rare mammal. Efforts to preserve the building may have disturbed the bats, as could future plans for interpretive use of the adobe. *Corynorhinus* typically roost in caves or cave-like structures and are very sensitive to human disturbance. The species has declined in numbers across the western United States, particularly in coastal California. Several causative factors have been identified, and roost disturbance or destruction appears to be the most important. The Western Bat Working Group rates *Corynorhinus* at the highest risk of imperilment across its range. The authors have monitored the population in the Scorpion adobe since 1994. Since 2005 the population has declined by almost 50%. A 1994 telemetry study determined that these bats foraged up to five kilometers from the coastal roost in native vegetation in an area with many small natural caves. Although these caves were used for night roosts, the bats exhibited high fidelity to the adobe. Thermal data-loggers were placed for a year in the adobes at Scorpion and Smuggler's Cove, and in coastal and inland caves. The Scorpion adobe provides a warmer environment during the maternity season, and this may be a reason for the bats' preference. The purposes of the current research are to monitor the resident bat population at Scorpion Ranch; to survey for additional colonies on SCI; to provide recommendations for protecting the colony from disturbance; and to develop guidelines for alternative roosts in the event the colony is evicted from the Scorpion adobe.

Bats and Mines California

See Feature Section for California Death Valley conservation and monitoring.

COLORADO

Submission from Kristen Philbrook

First Bat surveys and results on the Paonia Ranger District of the Gunnison National Forest

Dennis Garrison USFS Paonia, CO dgarrison@fs.fed.us

In 2007, the Paonia Ranger District of the Gunnison National Forest began an inventory and monitoring program for forest bats on the district. Prior to this, no bat work had been done on the district, and no information on bat presence in the area was available. Ten sites were mistnetted in 2007, with just over 100 bats captured. Six species were confirmed, including hoary bat, silver-haired bat, little brown bat, long-eared myotis, hairy-winged myotis, and western small-footed myotis. 90% of bats captured were of three species: little brown bat, silver-haired bat, and hoary bat. None of the three FS Sensitive bat species (Townsend's big-eared bat, spotted bat, or fringed myotis) were observed.

Continuation and expansion of the program is planned for 2008. A powerpoint summary of the season's work and results is available upon request.

The district has three major coal mines, but no known abandoned mine shafts.

Bat Surveys in Colorado's Abandoned Mines
(See Feature Section for summary of 2006 and 2007 mine surveys)

MONTANA

Submission by Kristi DuBois

Lewis and Clark Caverns State Park Bat Surveys
Kristi DuBois, kdubois@mt.gov and Todd Caltrider, toadus2004@hotmail.com

Todd Caltrider, University of Montana, monitored the Townsend's big-eared bat maternity colony in Lewis and Clark Caverns, and surveyed for other bat species in the cave and state park during summer 2007, under an internship for the state park. Todd is analyzing data and preparing the results as part of a senior thesis project at UM this fall. The Townsend's big-eared bat (*Corynorhinus townsendii*) maternity colony using the caverns was known to be declining based on visual estimates based on the size of the clusters, but no standardized methods have been used to estimate the population. State park managers have been hesitant to employ methods that would disturb the bats (such as photos using flash or standard lights). Todd recorded the Townsend's big-eared bat colony at weekly intervals during the summer with a Sony camcorder on nightshot mode, using a small IR light for illumination to minimize disturbance to the colony. Adult female clusters were filmed during the daytime, prior to parturition. Pup clusters were filmed at night while the females were out feeding, once the pups were large enough to cluster together. Digital videos of the bats are being analyzed by Todd at the University of Montana Mammalogy Lab to get population counts.

Acoustic surveys conducted in and adjacent to the state park revealed the presence of spotted bats (*Euderma maculatum*) in several areas near the Jefferson River, helping to verify an auditory detection by Kristi DuBois in 2005.

Bat Friendly Mine Closures on the Flathead Indian Reservation, Montana
(See Feature Section for this summary of 2007 mine gate installations)

NEVADA

Submission from Derek Hall and Jennifer Newmark

Nevada Test Site (National Security Technologies, LLC)
Derek Hall, halldb@nv.doe.gov

Data from a long-term acoustic monitoring station was collected for a fourth consecutive year at a site in Pinyon-Juniper-Sagebrush habitat on the Nevada Test Site (NTS) in south-central Nevada (Figure 1). Files were given to Mike O'Farrell (O'Farrell Biological Consulting) for analysis. BAT Loader software, developed by Robert Peppard (National Security Technologies, LLC), was used to extract data from the text files generated by ANASCAN and convert these data into Microsoft Excel pivot tables. Mr. Peppard has also developed software that can take climatic data and organize these data so they correspond with bat activity for correlation purposes. This software is currently in the testing phase. To date, tens of thousands of files have been analyzed and calls have been identified to species. Preliminary results are found in Tables 1 and 2 below.

Table 1 shows activity, defined as minutes of activity by species, for the calendar year 2005. Over 100,000 minutes of bat activity were recorded for 14 different species. Most of the activity was detected from May to September with peak activity occurring in July. *Myotis ciliolabrum* dominated the activity with nearly twice as many minutes of activity as any other species. Table 2 shows bat activity data during three winters. Over 11,000 minutes of winter activity was recorded for 11 species, including *Lasionycteris noctivagans*, *M. ciliolabrum*, and *M. volans* that were previously not documented to be winter active in this region, based on a large amount of capture data. Data in Tables 1 and 2 are presented to highlight the

kinds of data that can be obtained from long-term acoustic monitoring stations. Future analysis will attempt to elucidate patterns of bat activity and correlate activity with climatic variables.

Also, two bat gates were installed in a tunnel that was being closed. These were the first bat gates to be installed at the Nevada Test Site. Future monitoring will evaluate if bats continue to use this site after gate installation.



Figure 1. Long-term acoustic monitoring station at Camp 17 Pond, Nye County Nevada.

Table 1. Minutes of bat activity by species for Calendar Year 2005.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ANTPAL	17	2	6	84	261	488	800	117	62	40	18	27	1922
CORTOW			2	6	1		3		4	2			18
EPTFUS			10	56	527	1803	3062	528	366	103	44	64	6563
LASBLO				1		6	33	14					54
LASCIN				792	2862	362	13	172	105	214	3		4523
LASNOC	55	8		171	5	1			39	206	281	254	1020
MYOCAL	3		76	324	472	1868	2657	1629	1774	527	278	227	9835
MYOCIL	32	16	166	1471	3522	5790	9260	4399	3644	1891	1417	1134	32742
MYOEVO				12	42	159	166	100	219	72			770
MYOTHY	2		1	6	80	174	303	185	446	161	1		1359
MYOVOL	16	10	69	1164	3499	4280	3572	881	2527	978	734	567	18297
MYOYUM						10	1	1	34	17	3		66
PIPHES	14		94	64	420	2590	10244	3504	1122	113	112	79	18356
TADBRA	4		158	564	1318	1499	2087	1397	1656	1841	191		10715
Total	143	36	582	4715	13009	19030	32201	12927	11998	6165	3082	2352	106240

Table 2. Minutes of bat activity by species for three winters (2003-04, 2004-05, and 2005-06).

	2003	2004	2005				2006		Total	
Species	Dec	Jan	Feb	Dec	Jan	Feb	Dec	Jan	Feb	
ANTPAL	212	99	45	111	17	2	27	9	13	535
CORTOW		7								7
EPTFUS							64	10	43	117
LASNOC	345	146	77	140	55	8	254	153	269	1447
MYOCAL	422	170	31	221	3		227	70	161	1305
MYOCIL	947	515	83	936	32	16	1134	384	1075	5122
MYOEVO		3								3
MYOTHY	6	2		8	2				1	19
MYOVOL	569	248	37	308	16	10	567	105	158	2018
PIPHES	168	173	52	119	14		79	27	78	710
TADBRA	2			16	4					22
Total	2671	1363	325	1859	143	36	2352	758	1798	11305

O'Farrell Biological Consulting
Mike O'Farrell, mike@mammalogist.org

This year I have monitored bat activity in Nevada using long-term acoustic monitoring stations. Monitoring at the following stations continued this year: Spring Mountains, Clark County, Upper Kyle Canyon station at Echo 3 Well site; three locations in Las Vegas Wash, Clark County for the Southern Nevada Water Authority; and eight locations at the Table Mountain Proposed Wind Farm, Clark County. In addition, monitoring stations at eight locations at the South Spring Valley Proposed Wind Farm and one at Ash Meadows National Wildlife Refuge were set up this year.

Bureau of Land Management
Mike Herder, Michael_Herder@blm.gov

Wind Energy. Jason Williams (NDOW) and I have been working on a draft wildlife monitoring protocol (focusing mainly on bats) for proposed wind energy projects. The intent is for the document to be reviewed by Nevada BLM biologists. After this review, the document would go to the NDOW for review. Then we would submit it to the Nevada BLM State Office for review and finalizing. BLM recently acquired 5 new Anabat units for use in monitoring met towers in Nevada, particularly around Ely, White Pine County.

Abandoned Mine Reclamation. (see Feature Section)

Water Developments. I have been working with members of the BLM Washington Office staff on a proposal to revise and reissue a water development manual for BLM employees that includes recommendations for incorporating wildlife friendly designs into new and existing water developments.

NEW MEXICO
Submitted by Trish Griffin

New Mexico Bat Working Group

The next meeting of the NMBWG is at Bosque Del Apache National Wildlife Refuge in November 2007. The group is about 65 members strong, and typically about 1/3 of our membership attends any given meeting. At our upcoming meeting the group will be reviewing other western state bat conservation plans, and formulating a strategy for tackling the NM Bat Conservation Plan without funding in place for a coordinator or contractor.

Updated guide: Bats in Buildings: Proper Exclusion Techniques in New Mexico

Jon Boren of the NMSU Cooperative Extension Service updated this guide in cooperation with the New Mexico Bat Working Group, BCI, and Bat Conservation and Management. This guide is greatly improved, and will be a useful resource for the public and hopefully for other states. It can be downloaded at this link: http://cahe.nmsu.edu/pubs/_1/1-202.pdf

Socorro Wildlife Water Escape Ramp Workshop

A free day-long workshop was provided in Socorro by Bat Conservation International and the BLM Socorro Field Office. Presentations were given by BCI, BLM, NRCS, USFS, and the Quivira Coalition. The workshop focused on the importance of free water to bats and other wildlife, agency policies and perspectives, and on the design and construction of wildlife water units and escape ramps to benefit wildlife. The group spent the afternoon building several escape ramps, and touring water developments in the field. The workshop was so well attended that it was standing room only. Attendees included

ranchers and state and federal agency personnel. Thanks to Dan and to Carlos Madril (Socorro BLM) for sponsoring this valuable workshop.



Workshop attendees discuss the difficult task of installing an escape ramp in a tractor tire water trough.

Lepto Surveys in the Bootheel

Mark Hakkila, BLM, Las Cruces Field Office (Mark_Hakkila@nm.blm.gov)

The Las Cruces District of the Bureau of Land Management is continuing investigations into habitat of Endangered greater and lesser long-nosed bats in the booteel of Southwestern New Mexico. We explored an important roost site in April, which we named Lepto Splat Cave. We are also sampling Palmer agave throughout the region to determine herbivore impacts to flower stalks in support of livestock grazing permit renewals.

Basewide Bat Surveys to Determine Species, Cave/Mine Usage, and Roost Sites on Kirtland Air Force Base

Carol Finley, Kirtland Air Force Base (carol.finley@kirtland.af.mil)

This is a multi year project starting in 2007. The project team members are: Nancy Cox, Kate Thibault, Travis Perry, and Christa Weise. Surveys will determine bat diversity, including migratory, breeding and over wintering bats on Kirtland AFB. Ultra-sonic bat detectors/recorders will be placed in strategic areas during the spring and summer. This equipment will be placed around caves/mines, water sources, and other structures that appear to provide suitable bat habitats.

In order to identify maternity roost sites radio transmitters will be placed on several individuals of various bat species. The age, sex and reproductive status will be recorded. Those individuals that show signs of being in high reproductive state will be outfitted with transmitters. This year the project did not start until later in the season, so only minimal mist netting events took place. Ten species of bats were caught and released during mist netting attempts: Pallid Bat (*Antrozous pallidus*), Brazilian Free-Tailed Bat (*Tadarida brasiliensis*), Western Long-Eared Bat (*Myotis evotis*), Silver haired Bat (*Lasionycteris noctivagans*), Southwestern Bat (*Myotis auriculus*), California Bat (*Myotis californicus*), Big Brown Bat (*Eptesicus fuscus*), Hoary Bat (*Lasiurus cinereus*), Western Small-footed Bat (*Myotis ciliolabrum*), and Townsend's Big-eared Bat (*Corynorhinus townsendii*).

Pollination Studies of *Agave palmeri* in Southern New Mexico

Angela England, Graduate Student, University of New Mexico (aengland@unm.edu)

Angela is studying pollination of Palmer's agave in the one area in the U.S. where all three species of nectar-feeding bats are found. Studies were conducted in 2007 in the Big Hatchet and Cedar Mountains

of New Mexico, comparing visitation patterns and resulting fruit sets at high-density agave sites. Angela has returned from the field with more data than she knows what to do with. She is hoping to find time to analyze the data before the next ice age.

Gila Wilderness Bat Study

Lyle Lewis, U.S. Fish and Wildlife Service (lyle_lewis@fws.gov)

Lyle and Ben Solvesky, a student at Northern Arizona University, spent a week doing bat surveys in the West Fork of the Gila River watershed in the Gila Wilderness. This was the fourth consecutive year of surveys in the Gila Wilderness in southwestern New Mexico. Although the focus of the surveys has been to detect Allen's lappet-eared bats (*Idionycteris phyllotis*), a great deal of information has been collected about the bat species assemblage in the Gila Wilderness. Over 500 bats have been captured and released using mist nets, and AnaBat systems have been used for acoustic surveys. The western portion of the Gila Wilderness surveyed in 2005-7 provides maternity roosts for Allen's big-eared bat, southwestern myotis, big brown bat, Arizona myotis, fringed myotis, long-legged myotis, and long-eared myotis, as was apparent from the capture of pregnant bats. This area appears especially important for big brown bats, Arizona myotis, and Allen's lappet-eared bats. Ben Solvesky's research on Allen's lappet-eared bats in Arizona and New Mexico and Lyle's surveys in New Mexico have provided valuable insights into what constitutes suitable habitat for this animal along the Mogollon Rim.

Upcoming Manuscripts by Keith Geluso

Keith Geluso, University of Nebraska at Kearney (gelusok1@unk.edu)

With my teaching load here in Nebraska, I have not been as active working on new bat projects this past year in New Mexico. Currently, I am "slowly" working on manuscripts for publication on previous data I have collected in New Mexico. I now have three manuscripts that are in press. The bottom one should be out in the next issue of Southwestern Naturalist (SWAN) seeing that I just examined the proofs, the *Tadarida* paper should be out in some issue of SWAN next year, and the *Euderma* paper will be in the first issue of Western North American Naturalist in 2008. The next manuscript that I will submit likely will involve new records and data on natural history of the big free-tailed bat (*Nyctinomops macrotis*) in NM. After that manuscript, I will revisit my bats and bridges dataset and the *Idionycteris/Euderma* project and get those data published too. That's all the news from up here in Nebraska.

Geluso, K. In Press. Spotted bats (*Euderma maculatum*) from Mt. Taylor, New Mexico. Western North American Naturalist

Geluso, K. In Press. Winter activity of Brazilian free-tailed bats (*Tadarida brasiliensis*) at Carlsbad Cavern, New Mexico. The Southwestern Naturalist

Geluso, K. In Press. Winter activity of bats over water sources and flyways in New Mexico. The Southwestern Naturalist

Bat Surveys and Management at White Sands Missile Range

Trish Griffin, White Sands Missile Range (trish.griffin@us.army.mil)

White Sands Missile Range (WSMR) is slowly continuing a baseline survey effort to identify bat species and their distribution at WSMR. We also continue to investigate and monitor structures throughout the range for use by bats. WSMR has over 100 water sites developed for livestock and big game species. This year we are replacing small drinkers (16x16 in.) at 16 sites with 8 ft and 12 ft diameter drinkers suitable for bats. We are working with Bat Conservation International to monitor use by bats and develop effective escape ramps for wildlife at all of our water sites.

Hibernating Bat Surveys for the BLM Roswell Field Office

Jennifer Foote, Volunteer; and Dan Baggao, BLM (Dan_Baggao@nm.blm.gov)

The Roswell Field Office continues to monitor hibernating bat populations on a biennial basis. Some sites have been surveyed periodically since the late 1980s or early 1990s. In February the Pajarito Grotto performed a hibernating bat count for Roswell BLM. Surveyors this year included: Jennifer Foote, Brian

Kendrick, Steven Ball, Gosia Allison-Kosior, Bill Ellis, Laura Stark, Dan Baggao(BLM), and Nancy Huelsman (BLM). We found nearly 12,000 bats hibernating in Torgac Cave including *Myotis velifer*, *Corynorhinus townsendii*, *Pipistrellus hesperus*, and *Myotis ciliolabrum*. In Ft Stanton we found *Corynorhinus townsendii* and *Myotis ciliolabrum*. These caves are closed to recreation during hibernation season November through April.

Bat Diets and Ectoparasites

Ernie Valdez, United States Geological Survey (ernie@usgs.gov)

Dr. Ernie Valdez is teaching mini-courses on analyzing bat diet. He is also examining the food habits of big brown bats (*Eptesicus fuscus*) from Colorado, and the food habits and ectoparasites of bats from Mesa Verde National Park. Ernie's areas of particular interest include the impact of bats on insect pests (i.e., problem species on agriculture and forest lands), as well as temporal and spatial changes in the feeding habits of bats.

OREGON

Submissions from Anthony Kerwin and Steve Langenstein

Acoustic Monitoring, Table Rocks, Jackson County, Oregon

Anthony Kerwin, Norm Barrett, Marylou Schnoes

We set up six acoustic detectors on Table Rocks above the Rogue River for one night of monitoring in late spring. Significant species we detected include the hoary bat (*Lasiurus cinereus*) and the Brazilian free-tailed bat (*Tadarida brasiliensis*), species we know we have in the area, but don't often detect.

Oregon Bat Grid, Jackson County, Oregon

The Medford District mist netted seven sites and conducted acoustic monitoring at seven sites as part of the Oregon Bat Grid effort in two cells. We captured 156 bats of eight species included the fringed myotis (*Myotis thysanodes*) in each of the cells we monitored. Our busiest night was 98 bats, capturing all eight species. With the exception of this one site all sites had generally lower number of captures with one site having approximately 25% of the 2006 captures. Nights were generally cooler than last year and that could explain the differences.

Townsend's Big-eared Bat Management Plan, Josephine County, Oregon

*Anthony Kerwin, Environmental Protection Specialist, Bureau of Land Management, Grants Pass
Resource Area, 2164 NE Spalding Ave. Grants Pass, OR 97526 (541) 471-6564*

I wrote a Management Plan for the known Townsend's big-eared bat (*Corynorhinus townsendii*) roost sites on the Grants Pass Resource Area of the Medford District BLM. The plan includes information on the life history and ecology of the species, site descriptions (mostly abandoned mines), survey history and known information on the colony (maternity/hibernacula use, colony size, etc), site specific threats, and general and site-specific management recommendations for fuel hazard reduction, protection buffers and road and bat-friendly mine closures. The latest site surveys were completed in 2006.

Oregon Surveys

Oregon Grid Monitoring in Coos and Curry Counties, Oregon – the Coos Bay District mist netted six of the eight sites established during the 2006 Oregon Grid surveys due to a small change in the survey protocol. Six additional sites were surveyed to collect acoustic bat data at sited paired to the net sites. We captured 28 bats in this coastal Oregon region.

Two attempts to conduct inventory protocols, one on the Coos Bay District and one on the Siskiyou National Forest, Gold Beach Ranger District were started and not completed. These two sites were in association with proposed timber sales and unique habitats adjacent to proposed sale units.

Surveys were completed by Kip Wright – Wildlife Biologist, Theresa Bolch – Wildlife Technician, Jamie Fereday – Volunteer (a Science Educator at Sunset Middle School in Coos Bay), and me.

SASKATCHEWAN

News from the University of Regina Bat Lab

Submission from Mark Brigham

Jackie Metheny (a M.Sc student who I co-supervised with Matina Kalcounis-Rüppell at UNC-Greensboro) has a major paper in press at Behav. Ecol stemming from her genetic research on Cypress Hills big browns. *Kristin Bondo* completed her last field season in Cypress Hills and is in the process of writing up. She evaluated the importance of the levels of sunlight falling on cavities as a factor in roost site selection. *Miranda Milam-Dunbar*, who is a student representative on the Board of Governors for NASBR has left for a winter of measuring metabolic rates across North America for second field season as part of her PhD. *Julia Kilgour* joined the lab formally on 1 Sept. She spent the summer helping Kristin and will begin her own field work next summer. She aims to explore the fission-fusion system employed by bats there.

Dr. Erin Gillam joined the lab as a post-doc. She comes from Dr. Gary McCracken's lab in Tennessee where (believe it or not) she learned to curl. Besides honing her skills at the roaring game, she is going to undertake some population level studies of big browns in the Cypress Hills and we are collaborating with Dr. Tom O'Shea in Colorado to work up some of his data from Ft. Collins.

Recent Publications:

- Arbuthnott, D. and R.M. Brigham. 2007. The influence of a local temperature inversion on the foraging behaviour of big brown bats, *Eptesicus fuscus*. Acta Chiropt. 9:193-201.
- Swystun, M.B., J.E. Lane and R.M. Brigham. 2007. Cavity roost site availability and habitat use by bats in different aged riparian cottonwood stands. Acta Chiropt. 9:183-191.
- Willis, C.K.R. and R.M. Brigham. 2007. Social thermoregulation exerts more influence than microclimate on forest roost preferences by a cavity-dwelling bat. Behav. Ecol. Sociobiol. 62: 97-108.

SOUTH DAKOTA

South Dakota -- Bat Working Group Report

Brad Phillips, SDBWG Chairman

Bat roost habitat protection and public education were our main focus in 2007.

Bat Festival

Our 2nd annual SDBWG Bat Festival (held in Custer State Park on August 11th) was a success with well over 100 people showing up. There were displays on abandon mines, bat houses, and home exclusions. A slideshow presentation and a station devoted to children had a 'bat-facts' instructor. The mist-netting and acoustical survey stations were very interactive and people got a chance to see bats up close. Special thanks to the SD Game, Fish and Parks Dept, Batworks, and Custer State Park.

Public Education

Public 'bat' education presentations numbered around 25. SDBWG is currently working on a series of educational brochures on topics such as *abandon mines and bats to home-owner bat exclusion tips*. These are expected to be completed in 2008 where we will be looking for a 'funding partner' to cover printing costs.

Roost Protection

Working with the South Dakota Game, Fish and Parks Dept, and the Black Hills National Forest bat friendly gates were installed on six abandon mine sites in 2007. (See Feature Section)

TEXAS

Submission from Nyta Hensley

Quantitative Analysis of Occupancy and Roost Requirements for the Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii*) and Southeastern Myotis (*Myotis austroriparius*) in East Texas

Leigh Stuemke, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, P.O. Box 6109 SFA, Nacogdoches, TX 75962, 936-468-2044, stuemkela@sfasu.edu and Chris Comer, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, 936-468-2317, comerce@sfasu.edu

During summer 2007, we began fieldwork on a cooperative research effort between Stephen F. Austin State University, Texas A&M University, and the Texas Parks and Wildlife Department. This research will examine the Rafinesque's Big-eared Bat (CORA) and the Southeastern Myotis (MYAU) within their western range of East Texas. This project has multiple goals that should assist land managers by giving them the tools to effectively include these species in their management plans. Our research plan is to quantify relevant habitat characteristics at roost and landscape scales for both bat species, resulting in a functioning predictive GIS model for occupancy by these species. In addition, we will be refining survey techniques for these elusive animals and estimating occupancy rates in bottomland hardwood habitats of East Texas.

Although the extremely wet weather in summer 2007 limited our access to study sites, we were able to accomplish preliminary field work at several sites across the region. The summer started out at Trinity River National Wildlife Refuge in Liberty, Texas. Laurie Lomas, the refuge biologist, was very gracious in allowing us to test our acoustical, mist-netting and radio tracking techniques in the vicinity of their two occupied artificial roost towers. We were successful in acquiring CORA calls for our call library and also successfully radio tagged some bats. After getting flooded out at Trinity River, we moved to Caddo Lake National Wildlife Refuge and Wildlife Management Area in Karnack, Texas. With help from refuge biologist Paul Bruckwicki and Texas Parks and Wildlife diversity biologist Ricky Maxey, we again had success locating target species and implementing our various survey methods. Overall this summer we captured eight species of bats including both target species, identified several suitable study sites, and refined our field methods for the next two field seasons. We will be sure to provide updates as the project progresses.



Trinity River National Wildlife Refuge

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Trinity River National Wildlife Refuge would like to announce that it has had another successful Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) breeding season! The maternity colony returned from the winter roosts and began colonizing the artificial roost structures in March. By May, 60 adult bats had been counted in the maternity colony. During the full swing of the breeding season, 85 bats had been counted. This number reflects the number of individual adult and newly born bats seen. Pups grow very quickly leaving it difficult to distinguish juvenile bats from adult bats. There were approximately 25 newly born bats seen this year.

Now that the first major cold front of the autumn season has arrived, the bats have begun seeking winter roosts. The artificial roosts that once housed approximately 85 bats during the middle of summer only housed 11 bats during last week's occupancy check.

While occupancy data has only been collected at Trinity River Refuge for 2 years, an anecdotal trend has been identified within those two years of data. The occupancy data trend for 2007 consistently reflects at least 10 more bats occupying the artificial structures from March to October, the period of time at which the bats are actively present. The occupancy data also reveals at least 5 more individuals, present during the 2007 birthing season (mid-May to mid-July) as compared to 2006.

While there are many gaps in the knowledge we have about these bats, we are striving to gain more knowledge. During the first weekend in November, we will be fitting several individuals with radiotracking devices in effort to find winter roosting structures. We will also be banding bats to gain a better understanding of roost fidelity.

UTAH

Submission from George Oliver

Utah Bat Geospatial Database

Ben Sutter, Utah Natural Heritage Program, Utah Division of Wildlife Resources, Salt Lake City, Utah 84116

In cooperation with the Department of Defense (Dugway Proving Grounds, U.S. Army), the Utah Division of Wildlife Resources and the Utah Natural Heritage Program are compiling all existing bat locational data for Utah. These data are being stored in a geospatial database with web access. All those who participate and contribute data will have full access to the assembled data set. Once the initial assemblage of existing geospatial data is complete, efforts will be made to standardize data collection and recording methods statewide, and participating bat biologists will be able directly to enter their data via the web and will have access to data collected by all other bat researchers working in the state. Thus far, approximately 13,000 records for bats have been gathered.

WASHINGTON

See the Feature Section for a history of bats and mines in Washington.

YUKON

Little Brown Bat Maternity Colony Studies in the Yukon Territory

Brian Slough, 35 Cronkhite Road, Whitehorse, YT Y1A 5S9 (867) 668-3295, slough@northwestel.net

2007 was the 11th season of research at several *Myotis lucifugus* maternity colonies in buildings and rock crevices in the southern Yukon Territory. Recaptures from a sample of over 900 bats banded at several sites has documented roost and foraging area philopatry, population dynamics, longevity, longer-distance roost switching and cohesive movements of colonies. A crevice roosting colony routinely basks in the sun. Topics addressed in other research efforts are the distribution of *M. lucifugus* subspecies, seasonal food habits, daily and seasonal activity patterns and the presence of other bat species. Collaborators for a comparison of population genetics of *M. lucifugus* in the Yukon and Southeast Alaska, where Yukon bats may hibernate, are being sought.



Little Brown bats basking in the sun in crevices over the Yukon River, near Whitehorse. Crevices with different aspects are used throughout the day to maintain optimal exposure.

University of Calgary -- Small Mammal Research in the Yukon Continues

Lea Randall, MSc Candidate, Supervisors: Robert Barclay/Tom Jung/Mary Reid, Biological Sciences Department, University of Calgary, lrandall@ucalgary.ca

This was the second field season that I conducted an acoustic survey of bat activity in the Haines Junction region of the Yukon. I examined bat activity with respect to forest disturbance (beetle-infested, logged, and burned) from the beginning of May until mid-August. I measured light, wind speed, temperature and insect abundance and distribution. I identified roost site locations using radio telemetry.

In conjunction with my colleagues at the University of Calgary, the Yukon department of Environment, and Parks Canada, we conducted a mist-net and acoustic survey of bats in and around the Kluane National Park in July.

All research was done in cooperation with Tom Jung, Yukon Department of Environment.



Strange Things Done in the Midnight Sun Jennifer Talerico, University of Calgary

This summer I continued my MSc research in Watson Lake Yukon. My research focuses on how little brown bats (*Myotis lucifugus*) adjust their foraging behaviour and strategies where there is a short reproductive season, low temperatures and short nights. From mid-May to early July I passively monitored bat activity within the forest interior and along the edge of the lake. I was interested in determining how habitat use changes throughout the summer season, specifically during the short nights near solstice. Do bats use more protected habitats like the forest interior when nights are short and bright? These data have not been analyzed.

Results from my 2006 field season show that *M. lucifugus* always emerged from the maternity roost after sunset and returned to the maternity roost before sunrise. Foraging time was therefore limited to approximately two hours midsummer. Preliminary fecal analysis shows the presence of spiders in the diet of *M. lucifugus* indicating that they may be gleaning in the Yukon. Research was conducted in conjunction with Thomas Jung, Yukon Department of Environment.

Biodiversity Survey of Bats Across Southern Yukon

Cori Lausen, Bats R Us Canada, info@batsRus.ca; Tom Jung, Yukon Department of Environment, Thomas.Jung@gov.yk.ca; Jennifer Talerico, University of Calgary, jmtaleri@ucalgary.ca; Lea Randall, University of Calgary, lrallan@ucalgary.ca; Brian Slough, slough@northwestel.net

We conducted a capture and acoustic bat survey for southern Yukon. While *M. lucifugus* is well known from the territory, many other species are likely to be present given that in 2006 Cori found seven bat species north of 61 degrees latitude in the neighbouring Northwest Territories. Jung et al. (Canadian Field Naturalist, 2006) recently reported the first record of the Northern Long-eared Bat, *Myotis septentrionalis* (3 males) in southeastern Yukon on the La Biche River. Acoustic records from north-central Yukon in 1999 (Brian Slough) showed the presence of what was likely *Eptesicus fuscus*.

Funded in part by Yellowstone to Yukon Conservation Initiative, the Northern Research Institute (Yukon College), and Kluane National Park, the survey took place during the last two weeks of July extending from the southeast near Watson Lake, through the Teslin and Tagish areas of south-central Yukon and extending as far southwest as possible to Kluane National Park in the Haines Junction area.

Cori and Jen were extremely delighted to capture 5 Northern Long-eared Bats (one adult male and four adult females; awaiting genetic confirmation) in mist nets near Watson Lake, in southeastern Yukon. This record represents a range extension of ~ 270 km W of known populations in the Yukon and about 180 km NW of apparent populations in northeastern British Columbia. The capture of lactating females provides the first confirmation of a breeding population in the Yukon.

Captures overall were few, as is typical in northern surveys, but acoustic sampling in the Teslin area and Kluane National Park produced low frequency (~25 kHz) bat passes, one of which could be identified as *Lasionycteris noctivagans*. A pass of the western long-eared, *Myotis evotis*, was also recorded in Teslin. These are new species for the Yukon, and we hope to actually capture these species in a continued survey effort next summer focusing on the Teslin area. Because access by road is very limited across the Yukon, and especially in the Teslin area, survey will be by boat.

The Discovery Channel Daily Planet filmed us during one night of our survey in the Haines Junction area. Our show was a segment in a series called "Daily Planet Up North" which aired in October, but will air several times again throughout the winter.

NEWS FROM BAT CONSERVATION INTERNATIONAL

Submission from Dan Taylor

Southwestern Subterranean Conservation Program

(see Feature Section for more details)

BCI's new Southwestern Subterranean Conservation Program will work with local and regional partners to conserve key mine and cave habitats for important colonies of the endangered lesser long-nosed bat, the state-listed California leaf-nosed and Townsend's big-eared bats. The Program evolved from the Bats & Mines Project with input from private, state and federal partners interested in a comprehensive approach to the challenge of conserving important habitats for bats in mines in the southwest, while also increasing public safety. BCI is currently reviewing applications for a Program Coordinator.

The Bats & Mines program is in the final planning stages to gate the Buckeye Mine, AZ, housing several hundred California leaf-nosed bats and continuing to work with the California Department of Conservation, Bureau of Land Management, Death Valley National Park and Rio Tinto Minerals to identify and implement protective actions at priority sites. In the fall of 2007, we will work with the Death Valley Mine Conservation Alliance to gate the Corkscrew Mine, a Townsend's big-eared bat site. The Project also worked with Sandy Wolf, Bat Research and Consulting, to conduct rapid assessments of eight mine features and one cave in the Santa Rita Mountains, AZ to locate reported roost sites for endangered lesser long-nosed bats. One mine has a large pile of cave *Myotis* guano and another has been modified to provide a critical water supply to bats and other wildlife. Approximately 600 endangered lesser long-nosed bats were discovered in Papago Springs Cave, which needs a seasonal closure to limit the reported disturbance.

BCI is in the final stages of editing prior to producing a new publication, to be titled *The Handbook for Effective Management of Bats and Mines*, authored by Drs. Rick Sherwin and Scott Altenbach. This publication will be edited by Kim Vories of the Office of Surface Mining.

Bats and Wind Energy, Water For Wildlife, Artificial Roosts

Bats and Wind Energy Cooperative-- The cooperative concluded a major study of two wind power facilities in late 2004. The peer reviewed findings as well as summary recommendations are available at www.batcon.org/wind. From 2005-2007, research was refocused to at PPM Energy sites to evaluate pre-siting techniques used to assess risk at proposed locations for wind power facilities. The 2007 field season will be completed at the end of October. By 2008, we will begin comparing our pre-siting results with post-siting mortality rates, providing the first test of acoustic detectors as a tool for risk assessment. We continued field tests of potential acoustic deterrent devices in 2007, including studies to determine if bats may habituate to the device over time. A new deterrent system was also field tested at a wind facility in New York by using thermal imaging to observe bat behavior near the device mounted on turbines. These data are being analyzed and reports will be prepared this winter. If our findings indicate that the device

can be effective, we will continue field tests at wind facilities and compare bat mortality at turbines with and without deterring devices in summer and fall 2008.

Public and Scientific Education-- Ed Arnett helped coordinate the first symposium on bats and wind energy, held at the joint 14th International Bat Research Conference/37th North American Symposium for Bat Research in Merida, Mexico and another at the 14th annual conference of TWS in Tucson, Arizona.

Policy and Planning--Ed is working closely with BLM and USFS biologists to develop standard monitoring protocols for these agencies that will be completed this coming winter and is working with other conservation groups to develop guidelines for siting and monitoring wind facilities in Texas, which has the nation's largest installed capacity of wind energy capacity, and many new facilities planned. Ed also worked with several colleagues and organizations on a TWS position statement on wind energy and wildlife currently under review and it will be released in winter 2008.

Artificial Roosts

During the past six months, project coordinator Mylea Bayless has been developing projects and working with collaborators to establish new directions for the program, which will be comprised of three components: Bat House Education and Outreach, Bats and Bridges Consultation, and Integrated Pest Management Research.

Bat Houses--BCI is continuing collaboration with local architects at the University of Texas to develop construction plans for a large bat house (approximately 8ft x 8ft footprint) suitable for installation where excluding large colonies of bats is anticipated or in communities where large bat colonies consistently live in buildings. At least 5 communities in GA, TX, and OR have expressed interest in constructing these large, freestanding structures that could accommodate up to 50,000 bats. We anticipate completing these plans by January 2008 and distributing them free of charge through our website to communities, parks, and government agencies.

Bridges--In late May, Mylea Bayless represented BCI's bats and bridges program at the 4th bi-annual International Conference on Ecology and Transportation in Little Rock, Arkansas. At this conference, BCI met with State Department of Transportation (DOT) representatives from across the U.S. and discussed the current success and future direction of the Bats and Bridges program.

Integrated Pest Management

BCI is collaborating with UC Davis Co-op Extension, CDFG, and the USDA Agricultural Research Service to investigate the benefits of bats to farmers in California's Central Valley. Using DNA technology, the USDA can identify the genetic residue of codling moths and other key insect pests in bat fecal material. If we demonstrate that resident bats living adjacent to orchards consume codling moths, we will pursue a more comprehensive research project exploring the economic benefit of attracting bats to walnut, pear, and apple orchards. Mylea Bayless traveled to California in August to collect guano from local colonies of *Tadarida* roosting in barns near walnut orchards in Solano County to test for the presence of codling moths in the bats' diet. Results from our pilot study will be available this winter.

Water for Wildlife Project

The Project is currently distributing the *Water for Wildlife* handbook to FS, BLM, and NRCS offices across the west. In the coming year, the Project will expand its training and outreach efforts and focus on both cooperative, grassroots projects and landscape-level integrated conservation efforts. In June, July, and September, 2007, the Project conducted 5 Livestock Water Developments and Wildlife workshops in AZ, NV and NM attended by more than 150 ranchers and range and wildlife managers representing over two dozen agencies and organizations. Additional trainings are being considered for AZ, CA, ID, MT, and NM for 2008.

Conservation and Education--Dan helped facilitate and implement a special wildlife escape structure building event in July with the AZGFD, Kaibab NF, Grand Canyon Trust, Americorps, and the Babbitt Ranch. Together, these partners constructed more than 150 wildlife escape structures, and assisted the Game & Fish Dept. with the improvement of more than 100 livestock waters on the Babbitt Ranch. Additional efforts are in the planning stages for 2008 on the Quivira Coalition's ranch, the Mescalero Apache Reservation, and Lincoln NF in NM. In July, an NRCS Conservationist and former workshop attendee organized the construction of 100 wildlife escape ramps with the Chucker Foundation and the Bridgerland Applied Technology College, and the WY NRCS state office coordinated with the Niobrara Conservation District, WY Wildlife and Natural Resources Trust, WY Private Grazing Lands Team, and local Sage Grouse Working Groups, to fund and assist with the construction of more than 2,300 wildlife escape structures. These wildlife escapes will be distributed along with copies of BCI's *Water for Wildlife* handbook for free to ranchers on private and state land across Wyoming.

Research and Management--The Project initiated two pilot "demonstration" research projects during the summer of 2007 with biologists at the Cabeza Prieta NWR in AZ and the DOD's White Sands Missile Range in NM. These research projects are intended to determine if improved water development designs can increase bat use and diversity. Baseline monitoring was conducted by acoustic monitoring expert Deb Buecher and agency biologists in August of 2007, and the new waters are currently under construction. Expanded monitoring at the new and old waters is scheduled for 2008, as well as the addition of a third southwestern site.

Workshops

2007-08 Participation--A total of 71 people attended this summer's Bat Conservation and Management workshops in AZ and PA, plus an Acoustic Monitoring workshop in KY. Participants included 8 university students and 2 professors, 15 federal biologists or land managers, 12 representatives of state and local agencies, 18 consultants and 7 representatives of conservation groups. In addition to North Americans, the workshops trained residents of Brazil, Kenya, and the United Kingdom.

Student Research Scholarship Program

Awards and Reports in 2007--BCI received a record 95 scholarship applications for 2007. We are in the process of funding 21 scholarships. These scholarships range from \$2,450 to \$5,000, with an average of \$3,364 and a total of \$70,656. The research will be conducted in 12 countries: Argentina, Australia, Brazil (2), Canada (3), Costa Rica, Kenya, Madagascar (2), Mexico (3), the Philippines, Thailand, the United Kingdom (2) and the United States (4). Since projects often take a year or more to complete, current reports are for the 2005-2006 granting period.

WBWG News and Committees Updates

Action Plan

Our action plan was developed based on feedback gathered from a questionnaire sent to our members in March 2005 with subsequent annual updates occurring based on input from the Board of Directors. Our Action Plan serves as a guidance document to identify priority work, who is responsible for conducting the work, and a means to monitor progress.

Below are the subjects addressed in our Action Plan and a brief description of the intent of the actions associated with each subject. Although we welcome involvement with any of the actions, those that are in particular need of attention are identified. You can view the Action Plan in its entirety on our website.

Bylaws Now that we've had them a while, we need to assess our bylaws to make sure that they align with our business needs.

Conservation Coordination Committee Identifying priority conservation issues relevant to all of our constituents and making agencies and other key players aware of these issues is the focus of this committee. In particular, mining the State and Province Conservation Strategies and Plans for common issues and interacting with WAFWA and the Trilateral are paramount to this effort.

We could use help with this action item.

Funding Exploring and defining ways to fund WBWG activities and provide a vehicle for our members to apply for grants under the umbrella of our non-profit status is the focus of these action items.

Research Strengthening the involvement the research community in WBWG and insuring a science-based foundation for our conservation efforts is the focus of the action items and our Research Committee.

We need motivated leadership and involvement for our Research Committee.

Centralized Resources and Standards Pulling together existing database opportunities, providing standardized data elements and data bases, promoting WBWG survey protocol products as they come available, are the focus of action items under this topic.

Education Action items under this subject focus on providing educational tools and materials for our members, collaborating with other educational efforts, and reaching out to educators to enhance their ability to teach elements of bat conservation.

Training Actions under this heading focus on making members aware of training opportunities and exploring options to provide training.

Inventory and Monitoring Actions for this subject focus on dissemination of the WBWG survey protocol on its completion and making other products such as The Bat Grid protocol and sampling frame available to members.

Newsletter and Website The newsletter and website are our main avenues for communicating with our membership and the actions in our plan identify the need to maintain and update these venues of communication.

Document Track Record Making our meeting notes available online allows our activities to be easily reviewed by our members. Also, establishing a handbook on the roles and responsibilities of each Officer position and our process for elections will benefit the next election and incoming Board.

Monitor Progress and Accomplishments of the Board Under this heading we've identified actions that provide for accountability from the Board of Directors, Officers, committees, and for our Action Plan.

Member Involvement The focus under this subject is to develop opportunities for members to easily access information off our website, interact, and be connected with their State or Provincial Rep.

Wind Energy Committee The focus of actions under this heading identify the need for a committee to address wind energy issues and coordinate with other committees and organizations also involved with this issue.

Wind Energy Committee Update

We reviewed the recently released draft document of the USDA Forest Service Proposed Wind Energy Directive. The bat component of this document can be viewed in Chapters 80 and 70 at:

<http://www.fs.fed.us/recreation/permits/energy.htm>

We have drafted a letter on behalf of the WBWG that addresses our concerns regarding this document and makes suggestions for revisions. This letter is currently being reviewed by WBWG state/provincial reps; if anyone would like to receive a copy of this letter, please email Cori Lausen (corilausen@netidea.com). This letter will be sent to the USFS on or before the deadline for comments (Nov 23).

Research Committee in Need of Chairperson

The WBWG Board of Directors is seeking a motivated person to fill the position of Chair on the research committee. This committee is essential to crucial functions of WBWG and this position requires someone who is willing to develop processes for these functions. The research committee's portion of the action plan defines some of these functions:

- developing and reviewing position papers
- evaluating grant proposals
- prioritizing research goals
- potentially, funding projects of its own in the future

However, the processes for tackling these functions as a committee have not yet been developed. We need a leader, someone who is excited to make the research committee the strong functional committee it needs to be to support the goals of WBWG. (This person must be associated with an agency research facility or research institute.) Please contact Toni Piaggio toni.j.piaggio@aphis.usda.gov if you are interested in this position. Bring your inspiration!

SPECIAL INTEREST SECTION

The following is an excerpt of a document describing the various Fish and Wildlife agencies/associations. The entire .pdf can be downloaded from www.wbwg.org.

Introduction to Fish and Wildlife Agencies Hierarchy

Angie McIntyre, Tim Snow

The agencies responsible for fish and wildlife management are organized into groups, or associations (much like the bat working groups). This brief overview is meant to provide basic background on the mission and organizational structure of the Canada/Mexico/U.S. Trilateral Committee (Trilateral), Association of Fish and Wildlife Agencies (AFWA or Association), Western Association of Fish and Wildlife Agencies (WAFWA), Midwest Association of Fish and Wildlife Agencies (MAFWA), Southeastern Association of Fish and Wildlife Agencies (SEAFWA), and Northeastern Association of Fish and Wildlife Agencies (NEAFWA). These associations were created to form a structure from which careful planning can take place, facilitate communications, and have a unified voice on issues that cross state, region, or international borders. The Trilateral Committee (consisting of Canada, Mexico, and U.S. representatives) facilitates communication on issues that span international boundaries and provides guidance and recommendations to the Association of Fish and Wildlife Agencies. AFWA represents all of North America's fish and wildlife agencies and exists (in part) to ensure that all fish and wildlife agencies work collaboratively on the most important issues. AFWA provides many services as well as a platform to work on common issues, and its leadership is possibly the most valuable resource to the regional associations. It was through AFWA's leadership that the Partners In Flight and Partners for Reptile and Amphibian Conservation groups were initiated. The four regional associations (WAFWA, MAFWA, SEAFWA, and NEAFWA) are AFWA's most important partners in setting the standard for conservation and wildlife management efforts.

The Canada/Mexico/U.S. Trilateral Committee (Trilateral)



<http://www.trilat.org/> Canada, Mexico, and the U.S. share a wide array of ecosystems, habitats and species. To more effectively address priorities of continental significance and boost the concerted efforts of the three countries of the North American bioregion, the Canada/Mexico/U.S. Trilateral Committee for Wildlife and Ecosystem Conservation and Management was established in 1996. The Trilateral Committee assists coordination, cooperation, and development of partnerships among wildlife agencies of the three countries and other interested groups. It facilitates programs and projects for conservation and management of biological diversity and ecosystems of mutual interest. The Trilateral Committee implements the conservation priorities of each country; develops, implements reviews, and coordinates specific cooperative actions; and facilitates communication on issues that span international boundaries. The Trilateral Committee is headed by the directors of the Canadian Wildlife Service, U.S. Fish and Wildlife Service and the Coordinating Unit for international Affairs of the Mexican Ministry of Environment and Natural Resources (SEMARNAT). There is an annual meeting where a broad array of biodiversity issues in eight primary areas are addressed: Executive; Law Enforcement; CITES; Shared Species; Biodiversity Information; Migratory Birds/Wetlands; Protected Areas; and Wildlife Without Borders – Mexico.

Where do bats belong? Bat conservation needs are addressed at the Shared Species of Common Concern Table (which includes species that move across borders or populations that are shared among countries). This table facilitates dialogue between North American resource managers, allowing them to learn from each other's experience; also encourages, supports, facilitates and endorses activities for conservation of native species and habitats.



Association of Fish and Wildlife Agencies (Association or AFWA)

<http://www.fishwildlife.org/> The Association of Fish and Wildlife Agencies is the organization that represents all of North America's fish and wildlife agencies. The Association of Fish and Wildlife Agencies represents the fish and wildlife professionals in the 56 states and territories, and the federal agencies of the United States. The Association also represents many provinces of Canada and Mexico. Its core functions are inter-agency coordination, legal services, international affairs, conservation and management programs, and legislation. The Association provides its member agencies and their senior staff with coordination services that range from migratory birds, fish habitat, and invasive species, to conservation education, leadership development, and international relations. The Association represents its state agency members on Capitol Hill and before the Administration on key conservation and management policies, and works to ensure that all fish and wildlife entities work collaboratively on the most important issues. The four regional associations (WAFWA, NEAFWA, SEAFWA, MAFWA) are AFWA's most important partners in setting the standard for conservation and wildlife management efforts. AFWA meets twice annually, and functions through a committee system. The regional associations have many of the same committees to address topics pertinent to their region.

Where do bats belong? Bat conservation needs have been discussed at the Threatened and Endangered Species Committee. Potential Future Goal: Form a Bat Conservation Committee that would be a standing committee at all AFWA meetings. How? To begin, bat conservation needs must be on every agenda in future AFWA meetings. As bat conservation needs become a regular topic at AFWA meetings, formation of a committee will be a natural progression.

Western Association of Fish and Wildlife Agencies (WAFWA)



<http://www.wafwa.org/> The Western Association of Fish and Wildlife Agencies, founded in 1922, is a quasi-governmental organization of 23 public agencies charged with the protection and management of fish and wildlife resources in the western part of the United States and Canada. WAFWA has been a key organization in the promotion of sound resource management principles and the strengthening of federal, state and private cooperation in protecting and managing fish and wildlife and their habitats in the public interest. Their mission is "Delivering conservation through information exchange and working partnerships". WAFWA holds meetings, publishes proceedings of the annual conference, and reports to members on issues of immediate or special concern. WAFWA has no salaried staff, but relies on the voluntary efforts of its members to accomplish its tasks. Examples of ongoing work include: sage grouse/sagebrush steppe; black-tailed, white-tailed and Gunnison's prairie dogs; **Townsend's big-eared bat**; mule deer; pigmy rabbits; and lesser prairie chickens. This collaborative approach to delivering conservation efforts on-the-ground is also being used to address regional priorities for species in greatest need of conservation attention as recently identified in the 19 individual western states' Wildlife Action Plans.

Where do bats belong? The regional associations mirror many of the committee groups at AFWA; bat conservation needs have been discussed by WAFWA's Threatened and Endangered Species Committee. Conservation efforts for Townsend's big-eared bat are reported on annually at the T&E Committee.

Midwest Association of Fish and Wildlife Agencies (MAFWA)



<http://mafwa.iafwa.org/> MAFWA is an organization of 14 state and 3 provincial Midwest fish and wildlife agencies. MAFWA advocates state's rights in fish and wildlife issues; promotes efficiencies in government by exchanging research and management information; initiated a wildlife education program designed to be used in teachers in the classroom. Project WILD is an interdisciplinary, supplementary education program for grades K-12; promotes multi-state, range-wide initiatives to keep species from being listed under the Endangered Species Act; Attracts attendees from federal land and wildlife related organizations.

Southeastern Association of Fish and Wildlife Agencies (SEAFWA)



<http://www.seafwa.org/> SEAFWA is an organization whose members are the state agencies with primary responsibility for management and protection of the fish and wildlife resources in 16 states. What SEAFWA does: Participate with the Association of Fish and Wildlife Agencies, other regional associations, other governmental agencies and citizens' organizations in pursuing mutual goals benefiting fish and wildlife resources; Maintain a variety of committees consisting of fish and wildlife professionals who explore and analyze a wide range of issues and factors affecting fish and wildlife resources and make recommendations as appropriate; Sponsor cooperative fish and wildlife programs among member states and other entities to address issues of mutual interest and to benefit fish and wildlife resources; Provide effective, efficient and allied representation for member states regarding natural resource matters, particularly for issues which are beyond the capability of one agency to address or which may unduly tax the ability of individual states.



<http://www.neafwa.org/> Information is currently not available on NEAFWA mission.

NASBR/International Bat Conference Update

A Conference Like No Other

Heather Johnson, California



No coffee mugs or mouse pads with the logo on them as mementos for this conference -- I was handed over a bag of registration materials and warned 'Be careful, there's tequila in there...' In response to my surprised face the student gestured for me to look inside and there was a tequila shot glass with the logo on it! It definitely set the tone -- we celebrated our willingness to take the chance -- literally 'fly into the hurricane'. In the days before the NASBR we watched news and websites as Category 5 Hurricane Dean headed directly to the host city of Merida, Yucatan. We received an email that the conference might be cancelled, then the day before the meeting Rodrigo Medellin sent an email that it was proceeding and emergency plans were in place; he advised us to make individual choices as to whether or not to attend. How bad was it? We had a great time mist-netting in the Royal Botanical Gardens on the day the hurricane passed through the city. Landfall brought the hurricane down to a Category 1 and it was like a bad winter storm that we watched from inside the lovely Fiesta Americana Hotel. Rodrigo reports that well over 80% of the registrants attended (although numbers increased after the hurricane passed!); a record-breaking 48% of attendees were students; 33 countries were represented in 329 participants. The combination of 37th NASBR and the 19th International Bat Research was fantastic. Some of the international highlights included a report from a bat study near the Sea of Galilee, an Irish step dance before a Latin limbo (the banquet rocked!!!), a story of hiking two weeks through tropical jungle to reach a study site, details on the "paradox" style of tent roost made by tent-making bats, painfully cute pictures of tube-nosed bats from Japan, and much much more. Awesome videos included disc-winged bats climbing into their curled leaf roosts, a bat eating a walking stick insect like a kid slurping up a spaghetti noodle, slow motion replay of high-speed filming of approaches and attacks on insect prey, a tent-making bat tugging on the two halves of a leaf *with her thumbs* to break the leaf ribs (everyone 'oohed' and 'aahed' in the audience), and among my favorites was a "dancing line" of roosting *Rhynchonycteris* bats that were weaving and fluttering their wings in perfect time to the accompanying salsa music- this video was captioned "La Vida es un Carnival." I was enthralled by the plenary lectures on the sensory ecology of neotropical bats; ecomorphology and mechanics of feeding in phyllostomid bats; global patterns of bat species distributions; and ancient DNA shedding light on the history of bats in Europe.

Please visit <http://batconference.confhost.net> to see the program and award winners; we had 10 symposia which included wind energy, ecology and conservation of bats in agroecosystems, evolution and ecology of bat pollinating systems, and environmental education. The legendary researchers who attended included Richard LaVal, Gilberto Silva Taboada, and Otto von Helversen. When Taboada accepted his Spallanzani award his quiet remarks moved me to tears -- he studied bats for decades when no one else was and his country's government made it difficult. Back to the dancing -- 316 people attended the banquet -- and the cheering and laughing (and doing shots) and dancing and honoring achievement and appreciating one another was one of the very best times I've ever had in my life.

The Bat Bulletin Board

Bat Resources

Subscribing to Bat Research News

Some of you have asked how to join Bat Research News (BRN) so we are providing that information here and on our website.

BRN is a quarterly peer-reviewed publication of short articles, notes, conference abstracts, opportunities, letters and announcements concerning bat research and conservation worldwide. BRN is available in print or electronically and cost starts at \$15 US. For more information go to:

<http://www.batresearchnews.org/>

Document Now Available Online:

Spotted Bat (*Euderma maculatum*): A Technical Conservation Assessment

Document by *Robert Luce* and *Doug Keinath*. Distribution by *Peter McDonald*, Asst. Regional Manager, Endangered and Sensitive Species Program USDA Forest Service - Rocky Mountain Region 740 Simms Street tel:303.275.5029 Golden, CO 80401 fax: -5075 petermcdonald@fs.fed.us

We're pleased to announce the publication of the technical conservation assessment for the Spotted Bat on the SCP website. This is the final terrestrial species assessment under the Species Conservation Project. Five fish assessments are still pending.

The assessment is most relevant to Forests in Colorado and Wyoming, where the species is identified by the Western Bat Working Group as being of high conservation priority. Much remains to be learned about the ecology, limiting factors, and distribution of spotted bat populations, but what is known is of course consolidated in this assessment. The spotted bat does appear to occur in locally isolated sub-populations, where all habitat components including roosts, foraging areas, and water must be juxtaposed in a way that is useful to populations. While this could be said of many bat species in general, this appears to be especially so with the spotted bat. Such habitat juxtaposition needed by the bats can be highly disjunct.

The authors point out that sound spotted bat and habitat management requires a landscape-level approach that identifies areas across the Forests most likely to have the requisite spatial arrangement of roosting, watering, and foraging areas, and might be focus for further surveys and management planning.

You can find the spotted bat assessment here:

<http://www.fs.fed.us/r2/projects/scp/assessments/spottedbat.pdf>

Scholarships, Grants, Awards

North American Bat Conservation Fund

The North American Bat Conservation Fund provides grants of up to \$5,000 to help support projects that most effectively aid bats in the United States, Canada and Mexico. Applications for 2008 grants will be accepted online (www.batcon.org) beginning September 1, 2007. The deadline for receipt of applications for 2008 NABCF grants is **December 15, 2007**.

2008 BCI Student Scholarship Program

Each year, BCI sponsors students in conducting conservation-relevant research. Lack of knowledge about bat ecology and behavior is one of the greatest impediments to bat conservation progress. The goal of this program is to support exceptionally talented students in research initiatives that will contribute new knowledge essential to conserving bats and the ecosystems they serve. The maximum one-year award per

student is now \$5,000. It is hoped that these funds will open opportunities for matching grants from other conservation organizations, government agencies and private foundations, and that BCI's support will grow in future years.

Special Scholarships

The U.S. Forest Service International Programs and Bat Conservation International also offer graduate students the opportunity to double their award (\$5,000 - \$10,000), if they focus their research on subjects of special concern to bat conservation. This year's Special Scholarships are restricted to research on bats' pollination of durian or Old World mangroves. Anecdotal observations suggest that both are highly reliant on bats for pollination. The durian is the most commercially valued fruit in much of Southeast Asia and nearby Pacific Islands, but farmers often mistakenly assume that bats reduce (rather than enhance) durian production. Coastal mangroves are ecologically essential but are disappearing at alarming rates. Their primary bat pollinators are also disappearing rapidly but are largely ignored in mangrove-conservation planning. Studies documenting bat roles as durian and mangrove pollinators are urgently needed. On your online application, please choose "Yes" if you qualify. These applications will be competitive and chosen on the basis of reviewer assessments.

The deadline for receipt of applications for 2008 BCI Scholarships is **December 15, 2007**. Visit www.batcon.org.

To Strengthen Wildlife Habitat Protection Request for Proposals: Wildlife Habitat Policy Research Program

Cheryl Horton, Center for Science Solutions, National Council for Science and the Environment (NCSE),
(202) 207-0007

NOW AVAILABLE at www.whprp.org

The Wildlife Habitat Policy Research Program (WHPRP) is soliciting Letters of Intent (Due December 3, 2007) for our competitive awards program. Application for the awards is open to everyone.

The WHPRP will fund six specific projects in 2008 related to the implementation of State Wildlife Action Plans and wildlife habitat conservation in the United States. Project topics include:

- Analysis of the efficiency of land conservation spending for priority habitats
- Examining time sensitivity of priority habitats
- Evaluating hazard mitigation policy applied to coastal and floodplain habitats
- Developing a research framework for climate and wildlife habitat policy and management
- Investigating the impacts of bio-energy production on conservation of wildlife habitat
- Using State Wildlife Action Plan priorities to direct and shape policies as well as direct expenditures at multiple levels of government

The WHPRP's mission is to develop and disseminate new information and tools to accelerate the conservation of wildlife habitat in the US. The WHPRP sponsors work that is of the highest technical quality and also relevant to the needs of policy makers, administrators, resource managers, practitioners, and landowners.

Based upon the Letters of Intent, three candidates for each project will be invited to submit full proposals for external review. Awards are expected by mid-April 2008 and will range from \$100,000 to \$150,000 each, depending on the project. Further information, full project descriptions, and instructions for Letters of Intent are available at: www.whprp.org

The WHPRP is a program of the National Council for Science and the Environment (NCSE), an independent, not-for-profit NGO, dedicated to improving the scientific basis for environmental decision-making. Please contact Cheryl Horton at chorton@ncseonline.org or 202.207.0007 if you require further

information. The WHPRP program is supported by a four year grant by the Doris Duke Charitable Foundation (DDCF).

Other Bulletin Items

Information About Migratory Bats Requested!

Lydia Leclair (Research Assistant) and *Thomas H. Kunz*, Boston University

The Kunz lab at Boston University is preparing a document entitled "Migratory bat species at risk," with the goal of including all available information from the peer-reviewed literature (journal articles), books and book chapters, and unpublished reports (e.g., bulletins, web-based materials, original unpublished data, etc.) on the eastern red bat (*Lasiurus borealis*), western red bat (*Lasiurus blossevillei*), silver-haired bat (*Lasionycteris noctivagans*), and hoary bat (*Lasiurus cinereus*). As you probably know, we know least about these four species than many others in North America. In some regions, these species have experienced population declines from historical estimates, and more recently experienced unexpectedly high fatalities at wind energy facilities in North America. This document will be an invaluable resource for the scientific community, and with your help will aid in conservation and management efforts to help protect these species from further losses.

The project is to be completed by the end of the year, so please respond with information no later than **November 15** for it to be included in our report to the U.S. Fish and Wildlife Service. You will be acknowledged for your contribution, and unpublished manuscripts or theses will be cited appropriately.

Please email leclair@bu.edu, or kunz@bu.edu. Information can also be mailed to: Dr. Thomas H. Kunz, Professor and Director, Center for Ecology and Conservation Biology, Boston University, Boston, MA 02215. We look forward to hearing from you.

Upcoming Events...

4th Biennial Meeting of the Western Bat Working Group will be held in Austin, Texas early April 2009. The last meeting in Tucson, Arizona (April 2007) was a tremendous success, and we are all looking forward to the next one in 2009! Ed Arnett together with BCI will be hosting this conference – stay tuned for details in upcoming newsletters, and be sure to check out www.wbwg.org this time next year for full details! Tentative agenda includes field trips to Bracken Cave and to Congress Ave. bridge to watch the famous *Tadarida* emergence.

38th North American Symposium on Bat Research, 22-25 Oct. 2008, Scranton, PA – at the Scranton Hilton Convention Centre. Check out www.nasbr.org for details.

6th international workshop on *The Biology of Desert-dwelling Bats* 20 July to 1 August 2008

- The workshop is open to undergraduates who have recently completed their degrees in biology and to M.Sc. students in biology.

- To be held at the Blaustein Institutes for Desert Research on the Sede Boqer Campus of BGU at Midreshet Ben-Gurion and focusing on:

- Predator-prey interactions -- emphasizing ecological aspects of echolocation**

- Physiology -- emphasizing water and energy balances.**

The number of participants is limited, and acceptance will be based on academic criteria.

- **Deadline for registration: 1 May 2008**

- The workshop will be in English. • For further information about the workshop curriculum and fees, and to obtain registration forms, please contact Dr. Carmi Korine**.



The workshop will include lectures by the course instructors*, and guest lecturers; laboratory exercises in acoustics and physiology, and field and laboratory research projects.

***Course Instructors** Dr. Carmi Korine and Dr. Berry Pinshow (BGU); Dr. Marc Holderied (UoB, UK). Others to be announced.

****Contact and registration** Dr. Carmi Korine (ckorine@bgu.ac.il)

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