



Saving Bats From Decline

The corporate role in preserving the ecological and economic benefits of bats

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The little brown bat is one of the most common bats found in North America. Photo: Bat Conservation International.

Message from our sponsor

Across Ontario, Ontario Power Generation (OPG) is working to help create a sustainable future with cleaner air, stronger economies and more livable communities. Producing almost half of the electricity that Ontario relies on each day, we are committed to ensuring our energy production is reliable, safe and environmentally sustainable. Embedded in our Environmental Policy is a commitment to science-based habitat stewardship and the protection and enhancement of significant natural areas and species of concern.

OPG has been a proud member of the Wildlife Habitat Council (WHC) since 1996. Our WHC-certified programs have received numerous awards recognizing our commitment to conservation and engagement of community groups, educational institutions, and conservation organizations. OPG also believes in reaching beyond our fences to help organizations address key conservation priorities. Our Regional Biodiversity program supports large-scale regional habitat initiatives by our conservation partners in the area of wetlands, woodlands, grasslands, and lakes and rivers.

We are pleased to sponsor this white paper on bats. Bats are a vital part of a healthy ecosystem. That is why OPG has extensive monitoring programs to assess and track bat activity. Our Eastern Operations is a partner with the River Institute to protect and enhance habitat for little brown myotis at the Chats Falls Hydroelectric Station on the Ottawa River. This includes locating potential roosting sites, installing passive full spectrum bat detectors, and educating staff. OPG has also installed two “Motus” wildlife-tracking receivers at our Saunders and Nanticoke facilities to capture signals from tagged migrating wildlife, including bats. These receivers contribute to the scientific knowledge of bat ecology.

Through the coordinated efforts of corporations, conservation and research organizations, and education partners, along with support from groups like the Wildlife Habitat Council, we can all help secure the long-term future of bat species in North America.

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Introduction

Bats are a unique group of animals with ecological, economical and cultural significance around the world. They are the only mammals that fly. They are ubiquitous, with 1,300 species living on every continent but Antarctica. They appear in ancient and modern cultural lore all over the world, associated with good luck, bad luck and everything in between. They are omnipresent in western Europe and the U.S. during Halloween celebrations and are used as short-hand for all sorts of nocturnal fear in popular culture today.

The value of bats as key ecosystem service providers is just now being accounted for. Recent research has shown that insectivorous bats save North American agriculture approximately \$23 billion a year¹ through predation of a multitude of agricultural pests.

Other bats eat fruit and nectar, acting as pollinators and spreading seeds of the fruit they eat, proving essential to the success of many food products like tequila and chocolate,² consequently contributing to the global economy.

Unfortunately, bats have long been overlooked by the scientific community. When white-nose

syndrome struck bats in North America in 2006, decimating entire populations of hibernating bats, not enough was known about bats to effectively combat the disease. When, for reasons of human safety, old and unstable mines were being secured, little was understood about their value as habitat for bats. When wind power was being assessed for wildlife impacts, it was a surprise to many researchers that bats were the most common victim of propeller strikes, and as off-shore wind turbines were being tested, scientists once again drew a blank since the migratory paths of bats had not been mapped as closely as those of birds. These emerging threats only compound the pressures from habitat destruction and fragmentation that bats and other species face worldwide.

White-nose syndrome, while devastating North America's bat populations, did prove to have a silver lining. In the U.S. it accelerated research into the habits and habitat needs of bats. It elevated bats from cultural totems to real species that would benefit from conservation efforts at all stages of their life cycle, from providing safe and adequate summer roosting structures, protecting foraging and



Mexican free-tailed bats flying outside a cave preserve in Texas.

roosting habitats, and securing hibernacula for safe passage through the winter. In addition, advances in technology created accessible monitoring devices that allowed scientists and now citizen scientists to learn more about where bats are and where they go.

With increased need, heightened interest and accessible technology, now is an opportune time for corporate landowners to engage in bat conservation projects. This white paper illustrates the range of projects that can be easily done on corporate lands of all types in urban and rural locations to help bats survive and thrive. From wetlands and forests to abandoned mines, bat conservation projects on corporate lands have the potential to be ecologically meaningful while also connecting this enigmatic and misunderstood species to employees and community members.

Why are BATS important?

More than **1,300** species of bats around the world are playing ecological roles that are vital to the health of natural ecosystems and human economies.



Bats save \$\$\$

Bats save U.S. farmers \$23 billion annually in pesticides and reduced crop damage by consuming vast amounts of insects, including some of the most damaging agricultural pests



They're pollinators, too

Bats pollinate more than 500 species of plants, ensuring the production of fruits that support local economies, as well as diverse animal populations



Just some of the benefits bats provide worldwide

Farmers of the tropics

Nickname for fruit-eating bats in the tropics who disperse seeds that are critical to restoring cleared or damaged rainforests



No tequila?

Tequila is made from the agave plant, which relies on bats to pollinate its flowers and reproduce



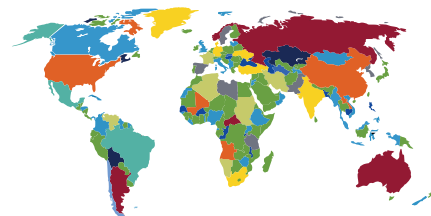
Waste not

Bat droppings (guano) are valuable as a rich natural fertilizer worldwide providing economic benefits for landowners and local communities



Pregnant or nursing mothers of some bat species will consume up to their body weight in insects each night

Bats live on all continents



except Antarctica

Information provided by Bat Conservation International: www.batcon.org

In the know...

Here we define technical terms, tactics and information mentioned in this white paper.

Roost

A place where bats sleep or rest during the day, usually consisting of a cave, tree, or man-made structure like a bat house.

Hibernaculum

A cave, tree cavity, or other habitat where non-migratory bats hibernate during the winter.

White-nose syndrome

A rapidly-spreading and largely fatal disease in North America caused by the fungus *Pseudogymnoascus destructans* that causes bats to rouse from hibernation too frequently, using up their winter fat reserves too quickly.

White-nose syndrome sanitation protocols

Cleaning protocols for clothes and gear used both before entering a cave or mine used by bats and upon exiting to prevent the spread of white-nose syndrome between hibernacula.

Bat gate

A structure placed at the entrance of a cave or closed mine, designed to allow the free movement of bats and other wildlife while preventing unauthorized entry by humans.

Echolocation

The detection of obstacles and prey using sound waves; bats emit rapid, high-frequency sounds and listen to the way in which they're reflected back to determine an object's location, direction of movement and speed.

Mist net

A type of trap that uses a fine, lightweight net to catch flying bats without causing them harm.

Harp trap

Another type of trap that uses a series of parallel strings (resembling a harp) used to catch flying bats without causing them harm.



Why mines?

Mines are an important habitat resource for many bat populations, including more than half of the bat species in North America. Mines often provide similar microclimates as the caves where many bat species roost in the summer and hibernate over the winter, and have become increasingly important as disturbance has forced many bat populations out of traditional roosting and hibernation habitat. In fact, in the southwestern U.S., little brown bats are almost entirely dependent on abandoned mines for hibernation sites.³ Bats will use both abandoned and active mines and seem to prefer hibernating and roosting in horizontal adits,⁴ although vertical shafts can still provide important entry and exit points to reach their preferred areas.



How to count bats?

A typical roost monitoring tactic is counting bats during their nightly emergence from their home. This requires volunteers to be positioned near the roost 30 minutes before sundown. Bats usually come out before it's completely dark. You'll know when to stop counting when the exit slows down and bats are starting to come back to the roost.

● Creating and protecting roosting habitat

One of the biggest threats to bats around the world is the destruction or loss of roosting habitat,⁵ which bats need for shelter, hibernation and pregnancy. For a number of species, installation of artificial roosting structures like bat houses offers an opportunity to provide roosting habitat when it is otherwise lacking in the surrounding ecosystem.

Bats can be incredibly selective about where they roost. Bats need different roosting conditions at different times of the year and they will often move around to find a roost that meets their needs.⁶ Success will be more likely if land managers apply thoughtful, careful design and placement considerations that incorporate up-to-date recommendations and the specific roosting needs of bat species in the region. The structure's location and design are particularly influential factors in whether bat houses are used, as they affect a number of bats' preferences such as daytime temperature inside the structure, proximity to foraging areas and proximity to open water for drinking.^{7,8}

It is important to note that even with the right design and location, it can take up to two years for bats to start using a new structure. Areas that have

been impacted by white-nose syndrome may also experience lower rates of bat house use, as species like little brown bats that have historically been typical bat house occupants have been decimated by the disease. If the structure is still not in use after two years, it's important to not give up, but to keep trying new locations and adjusting roost designs every few years until success is found.⁹

Location, location, location. Employees at DTE Energy's Taggart Compressor Station in Michigan meticulously constructed and placed bat houses for roosting habitat.

The Taggart Compressor Station site spans 2,350 acres in Six Lakes, Michigan. The facility is used for natural gas storage and processing and includes habitats such as forested areas, ponds and lakes.

Using guidelines from Bat Conservation International, DTE Energy employee volunteers carefully selected locations for a dozen bat houses on the site. The locations have few obstructions to flight and an abundance of direct sunlight near the ponds and forested areas, which support flying insects for bats to eat. The houses were installed at the recommended height and orientation.



Great care should be taken in determining the design and location of bat houses.

To monitor the bat houses for occupancy, the ground below the boxes is checked for the presence of guano (bat excrement), from which an estimate bat occupancy can be derived. It has been estimated that 50 to 60 bats used the houses in 2017, and all but one house has been used by bats in the last few years.

The program was first certified by WHC in 2003.

Knowing bat house occupancy is never guaranteed, the employees at LafargeHolcim's Onoway Aggregates in Alberta, Canada implemented regular evaluation and adaptations of habitat that resulted in a successful bat house program.

Located on 320 acres in a rural area of central Alberta, the Onoway Wash Plant is a sand and gravel operation that also incorporates conservation into site activities.

A team of employee volunteers at LafargeHolcim constructed and installed 10 single-chamber bat houses using design recommendations from Alberta Sustainable Resource Development in 2010 and six multi-chamber bat houses the following year. All of the houses were placed in an area near the creek that are not disturbed by gravel extraction or other operations.

After two years, it was determined that the single-chamber houses were not being used. LafargeHolcim then focused its monitoring and maintenance efforts on the populated multi-chamber houses. As of 2016, all six multi-chamber houses were occupied, with an estimated 100 bats using them.

In addition to directly monitoring the bat houses, employees engage in acoustic monitoring and capture-release monitoring to assess the species composition and population size of bats using the site, and submits data to Alberta Environment and Parks. Bat echolocation calls are recorded over the course of several months each autumn, and results are analyzed using a specialized software. In the past few years, these surveys have detected seven bat species. Capture-release surveys conducted in 2011 and 2014 utilized mist nets (a thinly netted fabric used to capture bats. Their purchase and use may require permits, which vary by state and country.) However, with growing concerns about transmitting white-nose syndrome fungal spores during handling, LafargeHolcim has discontinued mist netting for the foreseeable future.

The program at Onoway Wash Plant was first certified by WHC in 2010.

Defending bat hibernacula against disturbance and disease

Cave- and mine-dwelling bats are susceptible to disturbance from predators, cavers, vandalism and harassment. In North America, they are also threatened by the spread of white-nose syndrome, a disease which is caused by the growth of a white fungus, *Pseudogymnoascus destructans*, on bats' wings and skin. As it grows, the fungus has a complex physiological effect on bats that causes them to rouse from hibernation more frequently than normal, using up their energy reserves too quickly.^{10,11}

White-nose syndrome was first discovered in New York in 2006 and has since spread rapidly through much of North America, often killing most or all of the bats in infected caves. The little brown bat, northern long-eared bat, and tri-colored bat appear to be the most susceptible to mortality from this disease, which has killed millions of bats in North America so far.^{12,13} Unfortunately, it appears that white-nose syndrome has the potential to spread to other regions. In Australia, for instance, researchers have determined that it is likely to spread to the continent within a decade.¹⁴

Land managers wishing to protect cave and mine bat habitat have a number of options. Bat gates

are a commonly-used tactic, designed to enable the movement of bats into and out of the mine while excluding large predators and unauthorized personnel from entering. Bat gates also help to defend against the potential introduction of white-nose syndrome, while also protecting humans against the potential dangers of entering a mine.¹⁵ They do not appear to have appreciable impacts on bat use of mines over the long-term.¹⁶ For abandoned mines, bat gates also provide a less expensive and biodiversity-friendly alternative to the traditional methods used for mine closure.¹⁷

Covia has several mines that provide hibernacula for bats. Two programs in Wisconsin, Hager City/Bay City program and Maiden Rock program, are managed with similar goals and tactics.

The Hager City/Bay City and Maiden Rock facilities, located within a few miles of each other in west-central Wisconsin near the Minnesota border, both specialize in processing high-quality industrial sand products for glass manufacturing, construction, animal bedding, and oil and gas exploration.

Covia partners with the Wisconsin Department of



A bat cluster in the Covia Hager City/Bay City mine in Wisconsin.

Natural Resources (DNR) to protect and manage bat populations using the mine tunnels at the Hager City/Bay City and Maiden Rock facilities, which serve as important hibernacula for tens of thousands of bats. Covia has implemented several measures to protect bats using the mines. Bat gates were installed to keep out predators and unauthorized entry, and protective screens were placed over ventilation fans to prevent bats from being injured by the fans. Drilling and other mining activity is also avoided near the hibernaculum. The overwintering habitat provided by the hibernacula is complemented by on- and off-site bat houses, which provide summer roosting habitat and were constructed and installed with the help of youth groups.

Since 2011, Covia, the Wisconsin DNR, U.S. Fish and Wildlife Service and local university students have conducted annual research audits of the hibernaculum to count the bats, identify the species present, and evaluate their health. The Wisconsin DNR supplements these surveys by using harp traps (a bat-specific trap without webbing so as not to entangle bats) and acoustic monitoring to monitor bats entering and exiting the mines, and Covia installed temperature, humidity, and air flow sensors to monitor changes in the mines' microclimates. The surveys have identified

four species using the sites—little brown bat, big brown bat, northern long-eared bat, and tri-colored bat—all of which are listed as threatened by the state of Wisconsin.

At one point, the mines created one of the largest shelters for hibernating bats in the Midwest. Unfortunately, as is the case in so many hibernacula, bats infected with the fungus were discovered in both mines in 2016. The disease has devastated the bat population at the Bay City sand mine, which decreased from nearly 56,000 in 2011 to only 12,400 in 2018, with a large majority of bats showing symptoms of infection in 2018. At the Maiden Rock mine, the bat population dropped 60% from a high of over 128,000 bats in 2016 to about 40,500 in 2017. Similar declines have been observed in other hibernacula throughout the state. Covia hopes to prevent the disease from spreading to other caves and mines, and continues to observe strict decontamination protocols, informing all workers and visitors of the presence of white-nose syndrome and enforcing clothing and equipment guidelines.

The Hager City/Bay City program has been certified by WHC since 2010, and the Maiden Rock program has been certified since 2006.



Monitoring at the Covia Hager City/Bay City mine.

Covia’s Tamms/Elco Plants, a closed mine in Illinois, provides a hibernaculum for a thriving population of Indiana bats.

Tamms/Elco Plants is comprised of two processing plants, an active surface mine and inactive underground mine (Magazine Mine) in the neighboring communities of Tamms and Elco in the southwestern corner of Illinois, spanning approximately 2,000 acres. Magazine Mine is the largest abandoned, underground silica mine in the state of Illinois.

Since 1995, Covia has worked in conjunction with conservation organizations and state agencies to manage and monitor the Magazine Mine for the large population of bats—primarily Indiana bats, as well as some little brown bats and northern long-eared bats—that use the mine for roosting and hibernation. With the help of the Illinois Department of Natural Resources, Covia stabilized the mine entrances, installed bat gates to protect the hibernaculum, and put into place strict sanitation protocols to prevent the spread of white-nose syndrome. Employees maintain the entrance and escort research teams, educational tours, and other authorized visitors into the mine.

Regular surveys done in conjunction with partners such as the Illinois DNR and U.S. Fish and Wildlife

Service have been conducted since 1997, with a temporary suspension between 2012-2017 due to ground instability in the mine. Thanks to the protection measures in place, the mine’s bat population has grown substantially from about 9,000 bats in 1999 to 69,000 bats in 2018. The Magazine Mine is now home to approximately 10% of Indiana bats in the U.S., one of the largest populations of this species in the nation.

In 2018, Covia transferred ownership of the mine to Bat Conservation International, ensuring the preservation of bats at the mine in perpetuity.

The Tamms/Elco Plants program has been WHC-certified since 1997.

● Debunking myths about bats through education

Education is an important aspect of bat conservation. These events, whether in person or online, can help to increase participants' knowledge about bats and debunk the myths that often surround these extraordinary creatures. Bat education helps to promote a more positive attitude towards bats and motivates participation in bat conservation.

Marathon Petroleum's Palestine Neal Pit engages the community and its employees through learning opportunities and community events.

The Palestine Neal Pit comprises 80 acres west of the Illinois-Indiana border. Formerly mined for gravel, it is now used to provide water for refinery purposes, and includes forest, grassland and wetland habitats.

The site provides a unique educational opportunity for through Nature Days, an employee run event showcasing the on-site flora and fauna. Local students, their parents and teachers participate in a bat learning station where crafts, stories and talks help demystify bats and help learners become more aware of the importance of bat conservation. Through Nature Days, as well as presentations to interns at the Illinois Environmental Protection Agency, Marathon Petroleum notes an increase in the number of learners who indicated they liked bats more after the educational sessions.

Bat Week, an international celebration of bats, presents a yearly opportunity to engage and enlighten employees and the community about bats. Employees from the Palestine Neal Pit as well as other facilities in Illinois were treated to a fun day of activities to increase bat awareness, and community members were invited to Marathon Petroleum's bat-themed "Trick or Treat at the Trail" event.

The program at the Palestine Neal Pit has been WHC-certified since 2006.



Live animal demonstrations

Offering a safe experience with live bats can play an important role in shaping attitudes about bats. Live animal demonstrations are a particularly memorable source of information and encourage a more positive views of bats by providing participants with an in-person, up-close view and a chance to talk with educated bat handlers.¹⁸

Conserving critical bat foraging habitat

Although bat conservation efforts often focus on enhancing roosting and hibernation habitat, it is equally important to ensure bats have adequate food sources, as the degradation and loss of foraging habitat is a major threat to bat species worldwide.¹⁹ Opportunities to enhance foraging habitat on corporate landscapes will depend largely on the bat species living in the surrounding area, which may feed on insects, fruit or nectar. The creation or enhancement of native habitat that promotes flying insects or that includes preferred fruit-bearing or flowering plants will help provide food resources. Managing water bodies with good water quality and healthy vegetative buffers will also promote insect populations for insectivorous bats.

In Arequipa, Peru, Freeport-McMoRan's Unidad de Producción Cerro Verde manages both roosting and foraging habitat for Peruvian long-snouted bats, a nectarivorous and frugivorous species endemic to Peru.

Spanning over 154,000 acres in southern Peru, the Unidad de Producción Cerro Verde is an open pit copper and molybdenum mining complex, producing

1 billion pounds of copper annually. The site is home to a unique community of plants and animals that are well adapted to extreme aridity of the surrounding Atacama Desert, which typically receives less than an inch of rain per year and is considered the driest desert in the world.

Since 2007, Freeport-McMoRan has engaged in a multi-pronged approach to benefit Peruvian long-snouted bats, (listed as near threatened on the IUCN Red List) which roost in the mine's tunnels. To start the approach the company held a workshop with local research experts and members of the Latin American Net for Bat Conservancy to identify threats to the bats and propose guidelines for protection. Freeport-McMoRan employees then inventoried the mine's tunnels to determine where they were roosting and implemented several measures to protect the roosting bats, including installation of bat gates and limits on mining activity near the roosting galleries.

In addition to safeguarding their roosting areas, Freeport-McMoRan works to protect and enhance foraging habitat for the bats. Peruvian long-snouted bats are the primary pollinator and seed disperser for a type of ceroid cactus, Weberbauerocereus weberbaueri.



*Freeport-McMoRan manages habitat for *Weberbauerocereus weberbaueri*, a type of ceroid cactus that Peruvian long-snouted bats feed upon and pollinate.*

By feeding on the cacti's nectar and spreading pollen between flowers, the bats increase the cacti's fruit production, benefitting a variety of fruit-eating birds and mammals. The on-site feeding grounds have been protected from operations through restrictions on road access and signage, and any ceroid cactus that is in danger in operational areas is rescued and relocated.

The success of bat management efforts is monitored on multiple fronts. Bat populations are surveyed using a combination of acoustic monitoring and capture-mark-release monitoring with mist nets and pit tags. Bat foraging activity and the nectar content of cacti flowers are also monitored to assess the benefits of cacti management.

Freeport-McMoRan also creates educational links between the bats on the site and local school children through a variety of creative tools including custom coloring and story books designed and distributed by the facility.

The program at Unidad de Producción Cerro Verde has been certified by WHC since 2011.



Feeding on nectar is much less common among bats than feeding on insects or fruit.

The majority of bat species eat fruit most of the time and only feed on nectar opportunistically.

However, all nectarivorous species provide important pollination services to both native ecosystems and agricultural systems. Of the 528 plant species pollinated by bats, many are important agricultural crops like mangos and cocoa, and several important crops like agave and durian rely heavily on pollination by bats for reproduction.²⁰

● Providing valuable research on local bat populations

One of the most powerful tools in bat conservation is research. Of the approximately 1,300 bat species around the world, the IUCN lists 227 species as data deficient,²¹ highlighting a need for continued study of these elusive creatures. Using research to increase knowledge about bat species and their distribution in an area helps to provide clarity on local conservation needs, and adding to scientific understanding about bats' biology and ecological roles can provide insights into conservation tactics. Research is also a crucial tool in the fight against white-nose syndrome, seeking more effective ways to prevent the spread and lethality of the disease, as well as potential cures.

There are a number of research tactics that can be deployed to better understand local bat populations. These include direct counts of bats emerging from their roosts, acoustic monitoring of bats' echolocation calls, trap-and-release with mist nets or harp traps, and thermal imaging. Often a combination of techniques can provide a more complete inventory. For example, acoustic monitors may not detect a specific species, therefore trapping

can provide additional data such as sex, age, and parasite load that other techniques cannot.²²

BASF's Vermont site in Johnson, Vermont works with several local partners to conduct surveys of the site's bat species and their population.

Located in the northern part of the state near the Lamoille River, the 330-acre Vermont site comprises several habitats that benefit bats. These habitats include a pond that provides open water for drinking, a large forested area that can be used for summer roosting by tree-roosting bats, and Johnson Talc Mine, which was closed in 1983 and is now used by cave-dwelling bats for summer roosting and winter hibernation. A bat gate was installed over the mine entrance in 2005 to allow bats to enter and exit safely while excluding predators and unauthorized entry.

Since 2015, BASF has partnered with biologists from the Vermont Fish and Wildlife Department, Northern Stewards, Butternut Mountain Farm, and ELM Site Solutions to determine which bat species were using the property and how abundant they were. Acoustic monitoring was initially used to confirm that bats are



A hoary bat, one of the bat species identified on the BASF Vermont site. Photo: Bat Conservation International.

using the mine, and additional acoustic monitoring in other nearby areas has been used to identify species.

Trap-and-release monitoring using harp traps has also been conducted in conjunction with acoustic monitoring to identify species and gather additional information. Due to the presence of white-nose syndrome in Vermont, surveyors take care to follow strict decontamination protocols to prevent accidental spread of this disease to bats using the mine or other hibernacula in the region.

So far, the studies have observed five of Vermont's nine bat species using the site: little brown bat, big brown bat, northern long-eared bat, red bat, and hoary bat. BASF uses the results of its surveys to determine the potential for implementing habitat management activities to benefit bats, and also shares the results with the Vermont Fish and Wildlife Department and the U.S. Fish and Wildlife Service.

The Vermont program first received WHC certification in 2017.

Engaging audiences with accessible technology

In recent years, access to technology for wildlife observation has increased to include audiences who did not previously have the means to procure such technology.

For species like bats, thermal imaging cameras and acoustic detectors that can be used with mobile devices provide easy access to seeing and hearing these nocturnal, fast-moving animals with ultrasonic calls. Technology like this can be exciting and foster the imagination, and when they are designed to be user-friendly and non-technical, audiences of all kinds are able to participate in bat observation with confidence and minimal training.

Engaging with these kinds of innovative technologies to observe bats and other wildlife can be particularly valuable for younger audiences. It generates interest in science and bat conservation and demystifies the equipment and methods used by bat scientists.

General Motors Milford Proving Ground in southeast Michigan engages employees in bat monitoring with acoustic monitoring devices designed for non-technical users.

At 4,000 acres in size, the Milford Proving Ground is one of the world's largest automotive testing facilities. With 140-miles of roadways covering two counties the property also includes woodland, grassland and wetlands areas that support flying insects—all excellent habitats for bats.

In 2017, the Milford Proving Ground participated in WHC's pilot program to test acoustic monitoring of bats using Echo Meter Touch 2 devices, which plug into a smartphone or tablet and uses a special app to analyze bat echolocation calls. The app allows participants to see and hear the echolocation sounds that bats use to navigate and hunt for food at night. When the pilot program ended, the site purchased



Students learning how to make bat boxes from Chevy Volt battery covers at GM Milford Proving Ground.

their own devices to continue the acoustic monitoring. Monitors survey 12 locations on warm, calm nights with no rain or fog, which are optimum conditions for recording bats. So far, the initiative has identified 7 species and recorded 262 echolocation calls, and all data is sent to Bat Conservation International.

To enhance roosting habitat, General Motors installed bat houses in suitable areas of the site, such as employee recreation areas. The newest bat houses, installed in 2018, were constructed using recycled Chevrolet Volt battery covers and placed using guidelines from Bat Conservation International.

The Milford Proving Ground was first certified by WHC in 2011.



How do bat detectors work?

Bats use high frequency calls normally beyond the range of human hearing to build up a sound picture of their surroundings. This echolocation system enables them to wing their way through the dark night hunting the tiniest of insects. Acoustic detectors use circuitry and software to transform ultrasonic bats calls into audio that you can hear and data you can see as a spectogram. Because different bat species hunt different prey and are different sizes, they make different calls, which can help identify them.²³

A call to action for corporate landowners

As this white paper demonstrates, there are a variety of bat conservation activities companies can execute on their lands. These projects have the potential to excite and engage employees and community members in activities that benefit local bat populations, challenge myths and elicit new cultural and scientific understanding about these creatures.

In addition to the tactics mentioned in the case studies in this white paper—installing bat boxes, gardens and bat gates, contributing to research, and engaging in educational activities—the following are ways in which corporate landowners can engage in actions to enhance bat habitat and awareness.

- Download WHC's Bats Project Guidance to assist you in designing a project that will result in meaningful conservation and education impacts for bats. This document describes how to build a sound conservation project that targets bats and provides strategies to help programs achieve stronger outcomes.
- Assess the size and species composition of existing bat populations using the site.
- Evaluate the size and location of potential bat habitats on-site, including foraging areas, roosting areas, and hibernacula.
- Install bat boxes for roosting habitat needed for shelter, hibernation and pregnancy. Conduct regular monitoring and make adjustments to locations as necessary.
- Protect against disturbance and disease by installing bat gates and following strict protocol for all visitors.
- Create food sources by planting habitat that promotes either insects or fruit, or management of water bodies with healthy vegetative buffers.
- Manage manmade structures that are used by bats for roosting, such as building eaves, the undersides of bridges, garages and abandoned buildings. Existing bat colonies should be protected where possible, or alternative roosting structures can be placed nearby when humane exclusion is necessary. In some cases, the structures can be retrofitted with panels that provide additional crevices for roosting.



The employee volunteer team at Freeport-McMoRan Cerro Verde in Peru.

- Plant trees that provide habitat for bats, such as fruit-bearing trees for frugivorous bats and preferred roosting trees for bats that roost among the leaves or under loose bark. Forested areas, tree corridors and wooded riparian areas can also be created or enhanced with bats and their food sources in mind.
- Control invasive species that degrade bat habitats and food sources, such as invasive vines that smother roosting trees, invasive fish that eat flying insects' immature aquatic forms, and invasive terrestrial plants that crowd out the native species used by bats and their food sources.
- Adjust wind turbine operation to prevent bat fatalities, which tend to be associated with slower-spinning turbines.²⁴ These fatalities can be significantly reduced by curtailing turbine operation during low-wind nights, either by raising their "cut-in speed" (the wind speeds at which they begin spinning) or shutting them off entirely.²⁵ Companies can also explore the installation of bat deterrent devices that repel bats away from the rotors.
- Work with white-nose syndrome research teams. Research in recent years has greatly enhanced scientists' understanding of white-nose syndrome and has revealed a number of potential routes to treat or even cure infected bats. Companies that manage bat hibernacula could partner with research teams and local wildlife authorities to further this research, such as testing the efficacy of potential treatments.
- Engage and educate employees and community members through bat conservation activities that demystify bats and increase bat conservation awareness.
- Share your story of a successful bats project by seeking WHC Conservation Certification, a rigorous, third-party standard. Through the WHC Bats theme, WHC Conservation Certification recognizes and incentivizes voluntary conservation activities that benefit bats, such as protection of bat habitat, installation of artificial roosting structures and educational initiatives.

Endnotes

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