BCI and the wind industry are seeking the best path forward to protect bats from wind turbines.
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OFF THE BAT
Within the broader world of conservation, the moment for the bats is now

SPECIES SPOTLIGHT
The hoary bat holds the title of the most widespread bat species in the Americas

FORCE MULTIPLIER
When a group of BCI scientists and volunteers recently visited Fiji, they came equipped with more than enthusiasm

BAT SIGNALS
BCI news and conservation updates
- Young entrepreneur turns to social media to raise money for bats
- BCI welcomes Kenda Lovecchio
- Meet BCI Member Roger Levine

FIELD NOTES
Research news from around the globe
- Conserving the Mexican long-nosed bat with bat-friendly agricultural practices
- Recent discoveries in Texas indicate White-nose Syndrome continues to spread

MAKING A DIFFERENCE
Recognizing the many generous friends and members who have recently supported BCI

BAT SQUAD!
The echolocation game; Bat Squad! answers the conservation call

SEEKING ANSWERS IN THE WIND
BCI and the wind industry are seeking the best path forward to protect bats from wind turbines

An estimated 128,000 hoary bats are killed each year by wind turbines in the U.S. and Canada.
The bat moment

By MIKE DAULTON

When I became executive director of Bat Conservation International, I did so with a core belief: Within the broader world of conservation, the moment for the bats is now.

Recent headlines in conservation news only confirm that bats need our help more than ever before. In the Washington Post on March 23, we saw the tragic news that White-nose Syndrome has spread to Texas, in an article aptly titled “Merciless Fungus on the Move Again.” White-nose Syndrome has devastated bat populations throughout the northeastern United States, with many hibernacula suffering 99 percent population losses, and the fungus now threatens to spread to critical bat populations in Texas and across the American West.

In February, we saw news that confirms that wind turbines pose a substantial threat to migratory bats like the hoary bat. In that story, a peer-reviewed scientific study led by BCI Senior Director of Conservation Science Winifred Frick found that collisions with wind turbines could put the hoary bat, and other migratory bats, at risk of permanent extinction within 50 years.

That is why BCI’s work today is more important than ever. Working with government and industry partners, BCI is leading the charge to identify new technologies and management practices that reduce impacts of wind development on bats and give new hope to migratory bats like the hoary bat. BCI is on the cutting edge of research to give bats a chance at survival in the fight against White-nose Syndrome, funding scores of innovative studies and identifying new pathways to developing scientific breakthroughs.

With new hope in these key fights for survival, bats can have a brighter future. But it takes involvement from all of us. That’s why BCI is empowering local conservation leaders across the globe to protect bats where it matters most.

In Fiji, where the critically endangered Fijian free-tailed bat relies on a vital maternity roost known as Nakannaci Cave, BCI is working with local volunteer leaders to ensure habitat is protected for future generations. In Fiji, just as in Texas and across the West, the moment for bats is now. With your help, we will give our bats the help they need to survive.

Mike Daulton
BCI Executive Director
Bright Future
Young entrepreneur turns to social media to raise money for bats

When 7-year-old Alena Colon found out the fungus that causes White-nose Syndrome had reached Texas, she knew she had to do something to save her beloved bats. Alena, who has been passionate about science since she was 3 years old, and is currently deciding between a career as a marine biologist or a mammologist, devised a plan to help the bats. Along with her younger sister, Alena created popsicle stick and pipe cleaner dragonflies to raise money for BCI. The young entrepreneur utilized social media to advertise her goods (with the help of mom) and was able to raise over $80 to help protect bats from threats like White-nose Syndrome. Alena continues to work to spread her love and appreciation of bats. Young conservationists like Alena give us hope that the future of bats is a bright one. Way to go Alena!

JOIN THE BAT SQUAD!
You don’t need to be an adult to help bats. To become a Bat Squad! member, visit batcon.org/batsquad.
BCI welcomes Kenda Lovecchio

Bat Conservation International welcomes Kenda Lovecchio as the new Chief Development Officer. Kenda joins BCI with more than 16 years of nonprofit fund development under her belt. Her previous roles include serving as the Director of Advancement for Chicago Children’s Choir; the Corporate Relations Program Officer and the Major Gifts Officer for the Field Museum of Natural History; as well as serving on the board of Association of Fundraising Professionals (AFP) in Chicago. She is also a recent member of the AFP Austin Chapter, and leads a mentorship initiative for development professionals.

Kenda earned her B.A. in Theatre from Northwestern College in Orange City, Iowa. In 2000, she co-founded a theater company in Chicago, where she served as Managing Director. She was an adjunct faculty member for the Arts Entertainment and Media Management Program at Columbia College Chicago, and taught fundraising and management at both the graduate and undergraduate levels.

“I am thrilled to have the opportunity to work for such a reputable, outstanding organization. I have been incredibly impressed with the high caliber of our programs, the intelligence of our staff, and the passion that our donors have for our mission. It is a privilege to be joining our collective efforts to make a profound impact on bat conservation.”

Nat Geo to Feature Bracken Cave

On July 9, the world will be able to witness the breathtaking spectacle of Bracken Cave in what is being described as the ‘Super Bowl’ of natural history television. Hosted by Jane Lynch, the National Geographic Channel’s event, dubbed Earth Live, will be a two-hour live television broadcast showcasing some of nature’s most spectacular landscapes.

The event will be anchored in a New York City studio and broadcast globally on National Geographic, Nat Geo WILD, and Mundo, in 171 countries and 45 languages.

The residents of Bracken Cave will get special treatment as the new Canon ME20, dubbed the ‘Moonlight Camera,’ will be utilized to film the bats at night without the use of any external lighting.

This new technology will be coupled with live radar images of the emerging colony from local weather stations so that viewers can witness the immense scale of the Bracken emergence. The show is set to air at 8 p.m. ET, July 9.
Meet BCI Member
Roger Levine

Roger Levine, a BCI member from Redwood City, California, is a retired researcher who specialized in education research, evaluation research and health services research. Nowadays, he is a self-described wine geek, golfer and bat enthusiast. BATS sat down with Levine to find out more about his involvement with BCI.

What is your favorite bat?
I really have no favorites, in the same way that I have no favorite child or favorite cat.

Why did you join BCI?
In 1988, I read an article in the New Yorker about Bats (and BCI), by Diane Ackerman. I shared it with my spouse, whose interest in bats dates from elementary school. This motivated us to join BCI.

Tell us about your experience with BCI? (Any fun stories?)
In responding to a BCI member survey, I mentioned my survey research expertise and volunteered my services. I was subsequently contacted by BCI about an education project. This led to assisting with the design and implementation of a study to assess the impact of the Bat Squad! webcast series, as well as helping with the analyses of data. The results demonstrated the webcasts had a clear, strong and statistically significant impact. They resulted in favorable changes in students’ knowledge and feelings about bats, as well as significantly reducing misconceptions.

WISH LIST
Help support online learning

The Bat Squad! webcasts are just the beginning. BCI is investing in bringing bat education to students and teachers around the world via online education resources. Help us by donating toward our goal of $10,000 to provide online lesson plans and interactive materials for students. Visit batcon.org/onlinelearning.
THERE ARE 1,331+ SPECIES OF BATS IN THE WORLD. THIS IS ONE OF THEM.

**Hoary Bat**

**BINOMIAL**
Lasiurus cinereus

**FAMILY**
Vespertilionidae

**COLONY SIZE**
Solitary

**WINGSPAN**
13 – 16 inches (34 – 41 cm)

**DIET**
Insectivorous

**STATUS**
Least Concern

**REGIONS**

Photo: MerlinTuttle.org
The Hawaiian subspecies, *L. c. semotus*, is the island chain’s only native terrestrial mammal.

**Pop quiz:** What small mammal can be found in northern Canada, Hawaii and Panama?

**Answer:** the hoary bat (*Lasiurus cinereus*). The hoary bat holds the title of the most widespread bat species in the Americas, with a transcontinental range stretching from southeastern Canada to Hawaii.

The hoary bat is a migratory bat species, which means instead of spending winter months hibernating in large colonies, this solitary bat migrates to warm winter habitats. Summers are spent concealed in the foliage of mature deciduous and coniferous trees, typically near the edge of a clearing. Their distinct grey-white coloration (for which the bat is named) and furred tail membrane are prime adaptations for its lifestyle of hanging in tree foliage. In fact, hoary bats camouflage themselves as dry leaves by hanging by one foot and using their tail membrane to wrap themselves up – almost as if they had their own little personal sleeping bags!

Hoary bats may fly as fast as 13 miles per hour and as high as 8,000 feet during their long-distance migrations in the autumn and spring, hunting at night for moths, mosquitoes and occasionally other bats.

These bats are not the most social of creatures, preferring to lead mostly solitary lives in the tree foliage. After mating in autumn, females will move to the northern, eastern and central United States to give birth, often to twin pups (rare in bat species) in mid-May to early July. Males remain in the mountainous areas of the western United States.

Though, much like running into George Clooney at your local store, humans have a small chance of ever encountering a hoary bat. These solitary bats seldom enter houses and spend the daylight hours well concealed in the tree foliage. This has given researchers a handicap as they try to study the bats’ behavior. “Answering questions like, ‘How many bats are there?’ is difficult because you can’t just count them coming out of a cave. As they move around between multiple tree roosts and over long distances it is hard to mark and recapture them,” explains Bat Conservation International Senior Director of Conservation Science Winifred Frick.

“Hoary bats have always been a bit of enigma. They are widespread, but are rarely encountered by bat biologists because of their solitary nature and the difficulty in observing them roosting in trees during the day, even if they may be right over our heads,” echoes Ted Weller, ecologist with the U.S. Forest Service.

“New technological developments are allowing us to monitor movements of individual bats, and we are finding that many of these bats make long-distance movements on a nightly basis that we wouldn’t have predicted. We are also finding that some hoary bats use torpor during winter in ways that aren’t much different than bats hibernating in caves, despite the fact that they are doing it alone while hanging in a tree,” explains Weller.

Unfortunately, we may be running out of time to discover the secrets of the hoary bat, as the species is facing an increasingly bleak future. Hoary bats are heavily impacted by wind turbines. Although currently considered common across North America, an estimated 76,000–152,000 hoary bats are killed each year by collisions with wind turbines. Scientists from Bat Conservation International are working with the wind industry, as well as conservation and government partners, to develop and implement solutions to reduce this mortality rate. By changing how wind turbines are managed and developing acoustic deterrents to discourage bats venturing near the spinning blades, BCI has high hopes that the wind industry can be sustainable not only for our climate, but the future of our bat species as well.

With its distinct salt-and-pepper coloration and luscious glossy fur, the hoary bat may just be the George Clooney of the bat world. But there is more to this bat than just its good looks.

Female hoary bats (*Lasiurus cinereus*) can weigh 40 percent more than their male counterparts.

**To learn more about bats and wind energy, visit [batcon.org/wind](http://batcon.org/wind).**
BCI and the wind industry are seeking the best path forward to protect bats from wind turbines.

By Michele Z. Donahue

Wind energy research with USGS and BCI.

Photo: Michael Schirmacher
What's long been suspected is now being confirmed: wind turbines can have serious, rapid impacts on entire bat populations. Collaborative research led by BCI Senior Director of Conservation Science Winifred Frick puts fresh urgency into the need to pursue a workable solution, and at least one bat species' survival may depend on it.

A new study that looked at hoary bat (*Lasiurus cinereus*) fatalities at wind energy facilities revealed the population of this species may plunge by a staggering 90 percent over the next 50 years—even if no new turbines are built.

For the study, the first of its kind, international experts, academics and biologists from several federal agencies came together to better understand whether fatalities from wind turbines may be causing large-scale species declines. Using a range of estimates of hoary bats' reproduction and survival rates, and by comparing those figures with estimated fatalities at wind turbines, the authors of the study described a variety of possible species-level impacts.

The study used conservative figures of bat fatalities—128,000 hoary bat fatalities annually in the U.S. and Canada—and assumed no new wind turbines are to come online in the future. They found, with the highest-possible population estimate of 10 million hoary bats, the species could still experience a 50 percent decline over the next 50 years.

With a more conservative and likely population estimate, around 2.5 million individuals reproducing at a more plausible rate, that impact intensifies to a 90 percent decline within the next five decades.

But wind energy is only growing, producing 5 percent of today's electricity generation in the U.S. and Canada, and it's expected to triple by 2050.
In 2003, Bat Conservation International became a founding member of the BWEC, along with the American Wind Energy Association, the U.S. Fish and Wildlife Service and the National Renewable Energy Laboratory.

Frick, the lead author of the study, said the findings underscore the need for immediate action.

“We should be concerned about our migratory bats that have high levels of fatality from wind turbines,” Frick said. “It’s a wake-up call for thinking about the impact on other migratory bats as well.”

But bats being bats, they are hard to find and even tougher to follow around. Researchers rely on existing and emerging technologies to track, observe and even repel bats from wind turbines. BCI continues to partner closely with wind industry companies to find solutions to producing wind energy that can be simultaneously bat-friendly but also economically sensible.

**Shifting Practices**

Bats’ natural curiosity about their environment does not serve them well when it comes to turbines. Michael Schirmacher, BCI’s Wind Energy Program Manager, said from analysis of infrared video of bats investigating the airspace around turbines, it’s clear they have no inkling of their jeopardy.

“It’s not a learning experience, unfortunately. One hit is all it takes,” Schirmacher said.

Since the first reports of thousands of dead bats at a wind energy facility in West Virginia in 2003, BCI has been deeply involved over the last decade to understand the causes, and with the help of partners in government and the wind industry itself, to develop mutually beneficial strategies.

Research, spearheaded by the Bats and Wind Energy Cooperative (BWEC), a research consortium of government, industry, academia and non-profit partners including BCI, has focused on ways to reduce bat fatalities at wind turbines. So far, the most effective method is to employ a strategy known as operational minimization, alternatively known as curtailment. Dozens of studies have shown that bat fatalities could be reduced from 44 to as much as 93 percent just by limiting the rotation of the blades during narrow windows of time when bats undergo autumn migration—at night, under low wind conditions, from late summer through early autumn.

Bats tend to be killed more often at low wind speeds, blowing at 11 to 13 miles per hour, and many turbines don’t even begin to push energy into the grid until winds pick up to near those speeds. Moreover, the majority of fatalities take place during the warm nights of autumn migration. Rotating turbines out of the prevailing wind, or angling the rotor blades parallel with the breeze until wind speeds are slightly higher, can significantly reduce fatalities.

In late 2015, the American Wind Energy Association (AWEA) announced a voluntary program for its members that aimed to reduce bat fatalities by about 30 percent. This best management practice was the first of its kind for the industry and showed its awareness of the severity of the impact wind turbines have on bats.

Participation has been widely implemented by the wind industry, yet additional measures are needed. A great deal of the work BCI has been pursuing in recent years entails a better understanding of how, why, where, when and which species of bats are killed at wind facilities, to minimize fatalities and maximize wind energy production.

Though the reduction of electrical generation capacity caused by curtailment varies by market, some studies peg the loss of capacity at anywhere from 1 to 3 percent.

“[Curtailment] is an example of the industry stepping up and finding a way to reduce impacts while not unduly impacting the economics of wind,” said Tom Vinson, vice president for federal regulatory affairs for AWEA.

Cris Hein, Director of BCI’s wind energy program and Program Coordinator for BWEC,
In 2003, Bat Conservation International became a founding member of the BWEC, along with the American Wind Energy Association, the U.S. Fish and Wildlife Service and the National Renewable Energy Laboratory. Affirmed that efforts are underway to devise even more specific recommendations to minimize reductions in electricity generation. But it requires much more information—including details like the exact time of night bats interact with wind turbines, weather data, such as temperature and barometric pressure, and exact wind speeds and direction.

“The wind industry has a legacy of care for the environment,” said Peter Kelley, AWEA’s vice president for public affairs. “We recognize that it’s important to continually work to reduce any impacts we do have, while keeping this as a major solution to the country’s need for clean energy.”

“We do have a collaborative relationship with the industry, and this is an opportunity to work with them to find a solution,” Hein added.

“The industry agrees with conservation organizations, like BCI, that advancing the science and working to answer the questions are valuable, to the extent that there are impacts to mitigate,” Vinson said.

Tech Solutions

There is some evidence to suggest that some species of bats are attracted to something about the wind turbines themselves, but what that is, if anything beyond sheer curiosity, remains unknown. Innovative new technologies, as ever in the bat world, are necessary to illuminate their cryptic behaviors.

One promising solution Hein and Schirmacher are investigating is the effectiveness of turbine-mounted ultrasonic acoustic deterrents, designed to “jam” bats’ echolocation or make the airspace around the turbine aurally uncomfortable.

Understanding how bats approach and use the airspace around wind turbines is another key area of research as well. GPS tags have finally gotten small enough to be attached to bats, albeit larger species, so that researchers can track bats’ movements more closely during migration and nightly foraging. High-resolution thermal security cameras are also allowing BCI and its research partners to better see what even tiny 12-gram bats are doing at night around the turbines, Schirmacher said. The U.S. Geological Survey has been a key partner in this work, and in developing software to help streamline analysis of the resulting footage.

By comparing video data with environmental information already being collected by the turbines themselves—wind speed, humidity and temperature—researchers can pinpoint which bats are dying, when and where, and under what conditions, to even further define dangerous conditions for bats.

“For many years, we were limited in our ability to relate fatalities to specific conditions. If we found a dead bat underneath a wind turbine and we identified it as dying the previous night, we could only relate that fatality to the night’s average weather conditions,” Hein said. “Now, with the use of infrared cameras, we can record the exact time of night, specific weather conditions and area of the wind turbine where interactions occur. It has really opened the door to a better understanding of the behavior of bats around wind turbines.”

Though the outlook at the moment is grim for the hoary bat and other migratory species, there are many paths and possibilities moving forward.

“We have the goal of working collaboratively to resolve this issue that meets everybody’s needs,” Hein said. “Not only BCI’s goals of protecting bats, but also in being able to generate renewable electricity. We have our work ahead of us.”

“We do have a collaborative relationship with the industry, and this is an opportunity to work with them to find a solution.”

— Cris Hein, Director of BCI’s Wind Energy Program and Program Coordinator for BWEC
Fiji’s beaches are legendary tourist destinations, and justifiably so; with sugar-sand beaches, crystalline water and lush greenery, the nation’s coasts abound in natural beauty.

But what most may not realize is that the islands’ rugged volcanic interiors, where few tourists stray during their tropical sojourns, are the real backbone of the country’s economy. Forestry and agriculture account for a greater share of the nation’s gross domestic product than even tourism. Covering around 50 percent of the nation’s landmass, trees in Fiji’s jungles and cloud forests are harvested for timber, and cleared for sugarcane plantations and mining operations.

As much as the thousands of plant, bird and insect species feel the impacts of these human activities, none may be more affected than Fiji’s six native species of land mammal—all bats. One species is found nowhere else in the world, and the majority are currently threatened or endangered.

BCI recently deployed a team of experts to assist one of Fiji’s only conservation non-profits, NatureFiji-MareqetiViti, build on their work to craft a comprehensive, science-based plan for protecting bats on the islands. For the first
Fiji has three official languages – English, Fijian (with over 200 different dialects) and Hindustani.

time, the science team also included several BCI members who volunteered their bat-related technical expertise.

For BCI, involving members with specialized research or technical skills and a desire to volunteer those skills holds great potential for the impact of future, similar research missions.

“We have a lot of skilled people, both within and outside our membership, that we can draw on as volunteers to really up the ante with our conservation initiatives and projects around the world. The force multiplier effect is incredible,” said Jason Corbett, director, Subterranean Program for BCI.

The research trip is part of an ongoing initiative with partners including the National Trust of Fiji, Birdlife International and the University of the South Pacific.

In Fiji in January 2017, the crew of volunteers included Mike Davis and Emily Warner, professional cavers with decades of combined experience in mapping and charting caves; Jeff Huebschman, a professor of biology at the University of Wisconsin-Platteville; Heather Kaarakka, a conservation biologist with the Wisconsin Department of Natural Resources; and Paul Heady, an environmental consultant specializing in bat conservation.

Together with Winifred Frick, BCI senior director of Conservation Science, Dave Waldien, BCI’s past director of Global Conservation, and Corbett, the team targeted Nakanacagi Cave and its environs. Located on Fiji’s second-largest island, Vanua Levu, the cave is the only known roost and maternity colony of Fijian free-tailed bats (*Chaerephon bregullae*) in the country.

Though the team focused primarily on the Fijian free-tailed bat on this visit, their work with local partners will ultimately play into species management plans for the free-tailed bat as well as the Fijian sheath-tailed bat (*Emballonura semicaudata*) and the Fijian monkey-faced bat (*Mirimiri acrodonta*).

Huebschmann and Kaarakka used their expertise in telemetry to help local partners learn how to use the equipment and conduct the radio tracking of bats. Difficult in the best of circumstances, the job was made even tougher by the steep terrain, lack of roads, patchy cell service and spotty radio communications.

They found, somewhat surprisingly, that the bats seemed to head mostly for the forested mountains above the cave instead of foraging in the sugarcane and rice fields below, which will help identify areas in need of greater protection.

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The bat processing station where (clockwise) BCI’s Winifred Frick collects genetic samples, Jason Corbett glues light tags to bags, BCI volunteer Heather Kaarakka photo documents the process, BCI volunteer Jeff Huebschman processes bats by sexing, weighing, and measuring them, NatureFiji-MaraqetiViti’s Siten Tikoca photo documents the process, and local Fijians observe.
And in the cave itself, Warner and Davis coped with challenges that included dodging resident white-rumped swiftlets, birds that share the cave with the bats, and noise from rushing water that drowned out speech, requiring researchers to constantly run back and forth to share measurements. Together with the biologists, the team discovered the presence of breeding males, indicating it was also a mating site for the bat species.

Though the practice has declined over the last decade, Nakanacagi’s bats have long been hunted by locals for food. Siteri Tikoca, endangered species program manager for NatureFiji, said that knowledge of mating and breeding habits is exactly the kind of critical information her organization needs in order to involve local communities in the bats’ conservation—they can’t approach those communities empty-handed.

“The Fijian way is, if you come into my house, I won’t chase you out; I’ll listen to you,” Tikoca said. “So we encourage discussions and try to answer questions as best as we can. Awareness helps communicate what conservation really is, what protection is. And all of this new knowledge will help us mold our next moves.”

The close collaboration between the BCI scientists and skilled volunteers, Tikoca added, will be a boost to local partners’ efforts into the future. Though she and others are trained scientists, often what’s lacking to gather real data, and lots of it, is modern equipment and training in how to use it. The organization will continue telemetry work over the next year with antennas and receivers left behind for their use.

One common theme of the Fiji volunteers’ experience: delight in the chance for cross-cultural communication and collaboration, beyond being able to use their specialized skills outside of their usual scope.

“There is no getting around having a local perspective on their environment,” Huebschman said. “There was a fair bit of pride from the people at Nakanacagi Village, realizing people were coming from across the world to their cave, to work with their bats. They really embraced the significance of what they have there with that population in that cave.”

“Getting to be in the field, and seeing the real Fiji away from the resorts was everything we could have imagined, and more,” said Warner.

“We’re committed to working with our partners to analyze these data and think about how to incorporate it into conservation planning for the protection of the species,” said Frick. “It was a great expedition, but the work doesn’t end at the end of the trip—it’s just one piece of a larger vision and project.”
The forest’s edge

Studying bat diversity outside protected areas

Farah Carrasco-Rueda, a Ph.D. student from the University of Florida, is studying the response of bat species to the expansion of agriculture land use in the Amazon region of Peru. To recognize the immense conservation value of her work, Farah was awarded the inaugural Women in Conservation Science Award from Bat Conservation International. This award recognizes female scholars from developing countries who are working on key bat conservation initiatives. Bats sat down with Carrasco-Rueda to learn more about her work and life in the field.

**Bats:** What is the focus of your research?

**Carrasco-Rueda:** I am interested in how and why different land use types affect bat diversity and the ecosystem services provided by bats. I am also interested in the differences present at the forest edges when they are adjacent to different types of land uses. My study design allows me to compare bat diversity and community composition in three different habitats: forest, edge and production land.

With my study, I will be providing information about the diversity of bats in areas that are located outside protected areas. As part of my dissertation work, I will be informing local Peruvian people through extension activities about the benefits that bats can provide to their forest and their life.

**Bats:** What is it like working the field?

**Carrasco-Rueda:** Something fun always happens in the field! One night, my two volunteer field assistants and I were capturing bats in a cattle pasture close to the highway. We were wearing white and red light headlamps. After an hour, there were five motorcycles and around 15 people watching us. The next morning, the owner said people thought a meteorite had fallen on his land. Our lights moving around in the evening drew attention. That night, without noticing, we brought some excitement to Alegria.

**Bats:** Do you have any advice for women in science?

**Carrasco-Rueda:** Prepare yourself. Look for the best scientific training in your field. Persevere, no matter how many times you might fail. Do not doubt your own capacity, keep working, follow your own rhythm but keep pushing forward. Once you see what you are able to do, you will increase your own view of what you are capable of doing and that will feed your own confidence. With your own work, you will inspire other women to work even in non-science fields. Do what you love.

**Bats:** Why is the Women in Conservation Science Award important to you?

**Carrasco-Rueda:** The Women in Conservation Science Award recognition incentivizes me to keep working and persevering in conducting science and studying bats, increasing the efforts to achieve bat conservation and their appreciation by people. It is not only a recognition for me as a person but for all the women who support me in my career, starting with my mother and including colleagues, mentors and advisors. It is also important to me that this award will motivate other women in science and in this particular field of study to keep working, and to realize how important is our participation as women for the development of science.

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**Carrasco-Rueda:** Something fun always happens in the field! One night, my two volunteer field assistants and I were capturing bats in a cattle pasture close to the highway. We were wearing white and red light headlamps. After an hour, there were five motorcycles and around 15 people watching us. The next morning, the owner said people thought a meteorite had fallen on his land. Our lights moving around in the evening drew attention. That night, without noticing, we brought some excitement to Alegria.

**Bats:** Do you have any advice for women in science?

**Carrasco-Rueda:** Prepare yourself. Look for the best scientific training in your field. Persevere, no matter how many times you might fail. Do not doubt your own capacity, keep working, follow your own rhythm but keep pushing forward. Once you see what you are able to do, you will increase your own view of what you are capable of doing and that will feed your own confidence. With your own work, you will inspire other women to work even in non-science fields. Do what you love.

**Bats:** Why is the Women in Conservation Science Award important to you?

**Carrasco-Rueda:** The Women in Conservation Science Award recognition incentivizes me to keep working and persevering in conducting science and studying bats, increasing the efforts to achieve bat conservation and their appreciation by people. It is not only a recognition for me as a person but for all the women who support me in my career, starting with my mother and including colleagues, mentors and advisors. It is also important to me that this award will motivate other women in science and in this particular field of study to keep working, and to realize how important is our participation as women for the development of science.
We sit on the side of a mountain in northeastern Mexico in darkness that is only punctuated by the dim light from the camcorder video screen in front of us. Two softball-sized infrared lamps sit on a tripod on the rocky ground beside us, illuminating the scene with invisible light that only the Sony NightShot camcorder can see. We wait in silence, intently watching for nocturnal visitors to a clump of flowers on an agave plant. The agave’s stalk reaches nearly 20 feet into the air, advertising its flowers full of nectar to bats scouting for their nightly meal. The silence is interrupted by the whooshing of a
small group of endangered Mexican long-nosed bats as they rocket into the area to feed on the agaves, and we watch as they take turns sipping the sugary liquid from the plants.

I excitedly scratch tally marks on a piece of paper each time a bat drinks from the flowers. After several minutes of feeding, the bats move on to another area, and we wait in silence again for the next bout of feeding activity.

This monitoring is all part of my Ph.D. research to help conserve the Mexican long-nosed bat (*Leptonycteris nivalis*), a bat that is in danger of extinction. Every year, Mexican long-nosed bats migrate more than 600 miles between central and northern Mexico and the southwestern U.S., where each female gives birth to one pup (baby). In northeastern Mexico, the bats depend on the nectar of agaves as their only food resource. During feeding, the bats pollinate the agaves, ensuring the exchange of genetic material and increasing the plants’ resistance to pests and diseases.

You may have heard of agaves: they’re the plants that tequila is made from! Agaves are also used by rural Mexican communities for many other cultural products, including for food and several traditional beverages. Unfortunately, during harvest, farmers often remove the flowering stalk to increase the yield of sugar, which removes the food supply for the bats. Ultimately, extensive harvesting of wild agaves may be causing declines in bat populations.

With a grant from Bat Conservation International that is supporting my field research, I am working with a local conservation organization in Mexico (Especies, Sociedad y Habitat, A.C.) to help communities implement bat-friendly agave management and harvest practices, such as replanting agaves in areas where they have been harvested or planting agaves as fences on their properties. These practices will allow people to continue harvesting agaves for their important cultural products, but also help provide ample food sources for the migratory bats.

My research is an important first step in this effort. Nights spent in the darkness watching the bats’ feeding behavior will enable us to discover what draws the bats to an area to feed. For example, do the bats prefer to feed in areas with a higher number of flowering agaves? Do they prefer to feed on plants with more flowers? Answering these questions will ultimately help us figure out where bat-friendly practices should be targeted.

However, bats are only part of the story. Conservation is not just about the animals or plants we are trying to protect, but also about people. In situations where wildlife and people are tightly connected, paying attention to human needs and engaging local people is just as important as studying wildlife needs. In my research, I am working with rural Mexican communities to understand how they use and manage agaves on their land, and to discover how bat conservationists can encourage bat-friendly management practices in these communities.

Back on the mountain slopes, we continue watching the bats circling the agave flowers, drinking their fill of the nectar. While conservation of these bats won’t be achieved overnight, our time spent in the dark as silent observers to this dance of survival is a step in the right direction.
A team of BCI biologists have been on a hunt for the past six years. Each winter, before the blue bonnets begin to flower along the highways of Texas, the team delved underground to survey the bat populations in the caves of the Texas panhandle. They are on the hunt for signs of the deadly disease, White-nose Syndrome.

Unlike most hunts, this was one they hoped they would never conclude. Every year they came back with negative results—and a sigh of relief. But this year was different. One by one, samples came back positive. From one county, two, three. Ultimately, the fungus that causes White-nose Syndrome, *Pseudogymnoascus destructans* (Pd), was detected across six Texas counties on three species of hibernating bats: the cave myotis, Townsend’s big-eared bat and the tri-colored bat. This is the first discovery of Pd on the cave myotis and the first detection of the fungus on western populations of Townsend’s big-eared bats—two bat species with distributions extending further into the west.

The samples were collected in January and February by BCI and Texas A&M University (TAMU) biologists, as part of a larger national surveillance study led by University of California, Santa Cruz.

“We’ve been looking for it for years, hoping to never find it, unfortunately now we have,” explains Katie Gillies, BCI’s past Director of Imperiled Species.

“At this early stage of detection, we have not observed any visible signs of the disease on any bats in the state, such as white fungal growth on the nose and wings. Detecting the fungus when it first arrives gives us a chance to take action and try to minimize the impacts from White-nose Syndrome on our Texas bats.”

They say that “everything is bigger in Texas,” and that certainly holds true to the state’s diverse...
fauna. Texas, with 32 bat species, has the greatest diversity of bat species in the country. The state is also home to the famous roosts of Mexican free-tailed bats at the Ann W. Richards Congress Ave. Bridge in Austin and Bracken Cave near San Antonio (one of the largest bat colonies in the world). However, Mexican free-tailed bats do not hibernate all winter and may not be highly susceptible to the disease.

"While we are cautiously optimistic that Mexican free-tailed bats will not be heavily impacted by the disease, we do have serious concerns for hibernating species, such as the cave myotis that often share their roosts," says Winifred Frick, BCI Senior Director of Conservation Science.

"We have seen entire colonies wiped out once the disease gets established in a location. White-nose Syndrome seems to have a wide range of impacts on different species, and we are not sure how devastating it may be to western bats."

Texas represents the eastern edge of cave myotis' population range, with the species being found throughout southwestern U.S. and into Mexico.

The discovery of the fungus in Texas speaks to a national concern. Biologists are worried that the spread of Pd into western states will be exacerbated, as this and other western species are exposed.

Understanding the patterns of fungal spread and minimizing human impacts is key to combating the disease.

"We will be expanding our targeted surveillance to get a better understanding of the distribution of the fungus," explains Gillies. "We will also be reaching out to landowners and the community to help protect bat roosts and emphasize decontamination to reduce the likelihood of an accidental spread of the fungus to a new location."

While good news in the fight against White-nose Syndrome may seem scarce, it does not stop BCI from working on this disease.

"Investing in research and fostering innovative partnerships is more important than ever. We work with some amazing partners, federal and state wildlife agencies alike as well as other non-profits and researchers, in a coordinated response to this disease," says Mike Daulton, Executive Director of BCI.

"The communication and partnerships that have resulted from our efforts have not only been effective in furthering our understanding of this disease and finding new pathways or tools to help bats survive; it has also created a successful framework that can be replicated for future diseases, as we know White-nose Syndrome is not the last wildlife disease we will have to tackle."
We thank these donors whose gifts were received in the four months between December 1, 2016 and March 31, 2017.

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We thank the members and contributors who support the conservation of the world’s bats.
Did you know that bats use their ears to help "see" in their environment? They will make a noise and listen carefully to the echoes to determine where an object is located. Bats and other animals, like dolphins, use this skill called "echolocation" to help find food and navigate their surroundings. Test your echolocation skills with this fun game!

**Play The Echolocation Game**

**Materials**
- Blindfold
- A friend

**Instructions**
- **Pick someone to be the bat.** Have them put on the blindfold and listen carefully to the environment around them. No peeking!

- **A friend will move quietly around the room and clap in different locations.** Can the bat correctly locate where the sound is coming from?

- **Take turns being the bat.** Play the game both inside and outside. Discuss the differences between the locations. What was easier? Why?
Hi! I’m Calvin. I am 11 years old and I live in Lubbock, Texas. I was five years old when I saw my first real live bat. Since then I have been interested in bats and ask questions to learn more about them.

I learned there is a fungus that causes a disease called White-nose Syndrome. It’s really bad. It has killed millions of bats in just 10 years. It started on the East Coast in New York and has spread to many states. I worried that if the fungus spreads to Texas it could reach the largest bat colony in the world, which is near Austin.

I had many questions. I emailed scientists and learned more about the fungus and different kinds of bats. I was able to test some of my questions and share what I learned in my local science fair. I learned the fungus wakes the bats in the wintertime when there is no food for them to eat and they starve to death.

Fighting Fungus

To answer his research question, Calvin set up an experiment to trap flying insects. He documented the size of the insects and the temperature of the air when he caught them.

But Texas is different. Our winters are warmer and shorter. I thought maybe if the bats wake up they would be able to find a few insects to eat. I had more questions. I wanted to know what kind of insects bats eat, when they eat them and how much they eat.

Again, I asked different scientists for help. Not far from where I live there are some caves with hibernating bats. I set up an experiment to trap flying insects. I did this during the Christmas holiday during our coldest months.

Guess what? There were some nights I didn’t see or catch anything. Then one night, I saw a bat fly over me! I was so excited! That night I caught flying insects in the trap. It was just a few degrees warmer that night. I felt better knowing if the bats wake up because of the fungus, there is some food out there for them to eat.

While I was testing my experiment, scientists from BCI and the Texas Parks and Wildlife were in the same area checking the caves for bats and the fungus. I am sad to report that they did find the fungus in those caves. The fungus has spread to Texas.

This problem just keeps getting worse. But if we all ask more questions, talk to scientists and get out there and do more experiments, we will have more information to help the bats. What’s your research question?
HOW DO YOU WANT TO READ BATS MAGAZINE?

At BCI, we value our members, and take what’s important to them seriously. To explore ways in which BCI can be a better steward of the environment, we’re investigating delivery options for BATS magazine. Would you be interested in selecting an electronic-only option to receive BATS magazine via an app or email? What do you like about BATS magazine and do you have suggestions for improvement? We would like to hear from you!

Please email our membership director, Jessalyn Giacona, at jgiacona@batcon.org, or call her at 512-327-9721 ext. 360 and let us know what you think about making this an option for our members!

BRACKEN MEMBER NIGHTS ARE BACK!

The bats are back! We are excited to announce the implementation of a new online system for you to book your BCI Bracken Cave Member Nights.

Don’t wait — member nights fill up quickly! Go to www.batcon.org/visitBracken to sign up for your preferred event. You will need your Member Access code to register (contact the membership department at 512-327-9721 or email membership@batcon.org if you do not have your code).
Introducing Echo Meter Touch 2.

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