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Help Conserve Bat Diversity

Bats & Coffee
in Sumatra's Rainforests

Probing the Depths
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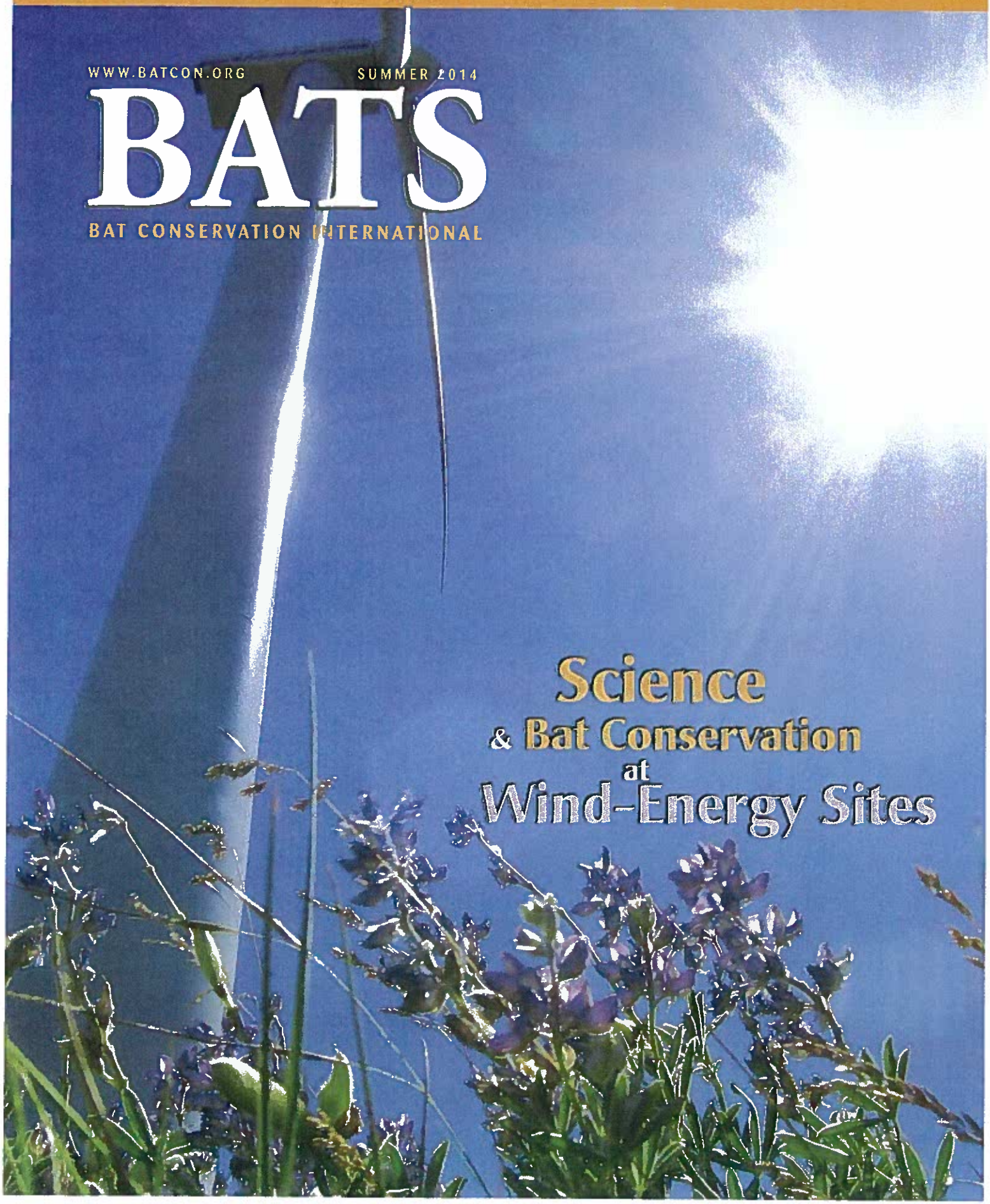
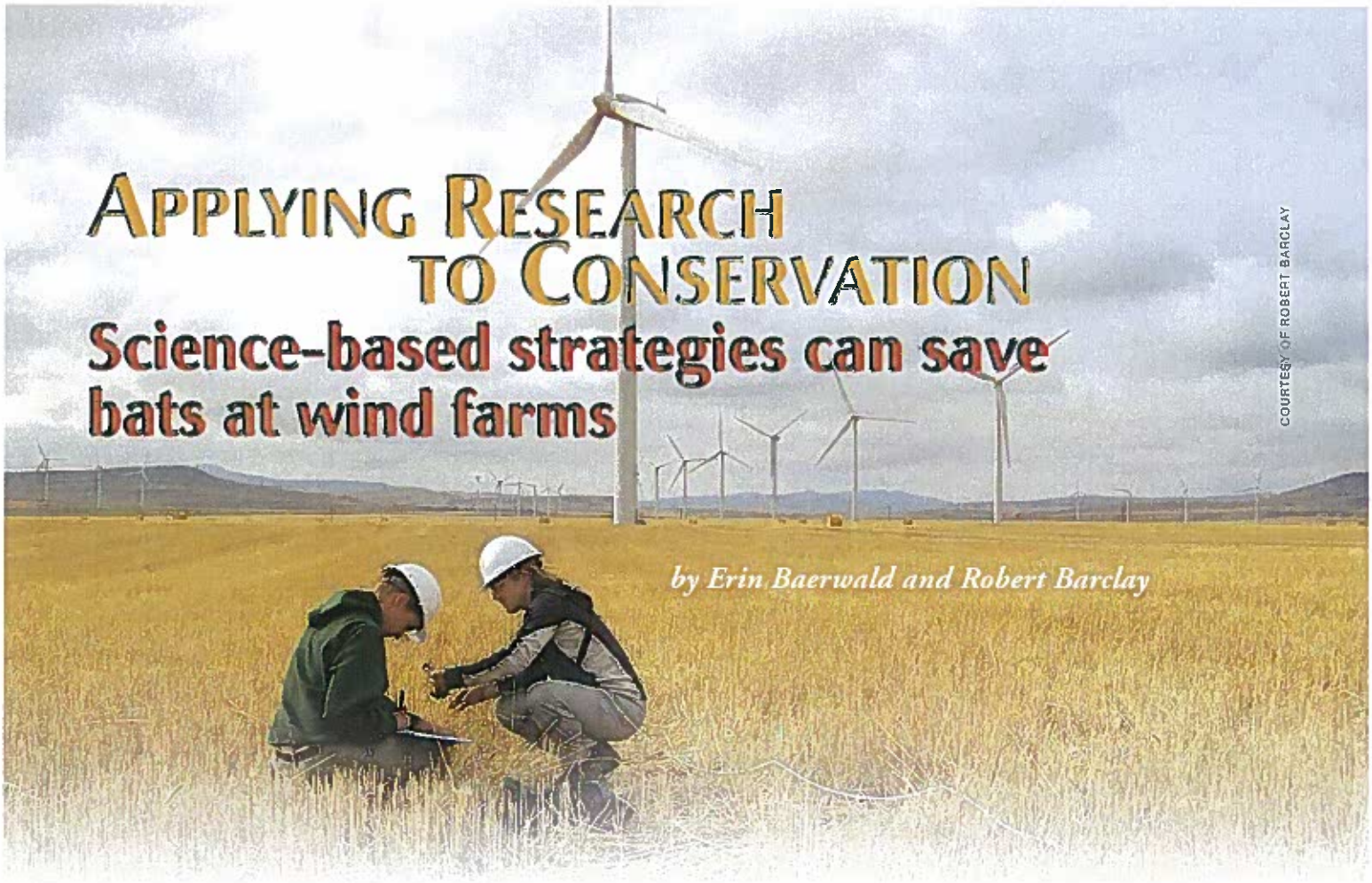


Science & Bat Conservation at Wind-Energy Sites

Applying Research to Conservation

Science-based strategies can save bats at wind farms

by Erin Baerwald and Robert Barclay



COURTESY OF ROBERT BARCLAY

Researchers Erin Baerwald and Cori Lausen examine and record the body of a bat killed at the Summerview I Wind Farm in Alberta, Canada.

The conservation calculus for wind energy changed dramatically in Fall 2003. Bird fatalities had been the primary environmental concern at the giant, spinning turbines, especially eagles, hawks and other raptors. Then a study commissioned by FPL Energy discovered many more bat carcasses than birds at FPL's Mountaineer Wind Energy Center in West Virginia. The concerns about environmental impacts of wind power began to change across North America.

The Mountaineer finding caught everyone off guard. A planning session hosted by Bat Conservation International in December 2003 brought together U.S. government agencies and wind-industry representatives. That led in early 2004 to the first major bats-and-wind-energy workshop, which generated far more questions than answers. FPL Energy was host for the workshop. One outcome was the creation of the Bats and Wind Energy Cooperative (BWEC) of key agencies, wind-energy groups and international experts that is led by BCI.

In the years since those bat carcasses were found at Mountaineer, we have learned a great deal about this serious threat to bats. And none of that could have been accomplished without the direct involvement and serious financial support of the wind-energy industry. But now, as wind power continues to grow dramatically around the world, wind companies need to implement strategies that have been proven to reduce bat fatalities.

This is the story of one firm that stepped up.

Indeed, our own bats-and-wind research was initiated and championed by Canada's largest wind-energy producer, TransAlta. In 2005, as wind energy was beginning to boom in Canada, we wondered if we would see bat fatalities at new wind facilities. We got the answer that fall, when hundreds of dead hoary bats (*Lasiurus cinereus*) and silver-haired bats (*Lasionycteris noctivagans*) were found at the new Summerview I Wind Farm in southern Alberta.

TransAlta was surprised and contacted us. We were also surprised. Few bat fatalities had been found at other wind facilities in the area, and Summerview is located in the prairies, smack in the middle of pastures and crops – hardly the place we expected to find so many migratory tree-roosting bats. The company asked us to help them investigate, and we gladly accepted.

So began a close working relationship that produced an undergraduate honors thesis (by Jesika Reimer), a Master's thesis and a Ph.D. degree (by Erin Baerwald) and almost a dozen peer-reviewed publications. Of course, all this research does not

happen in a bubble. Given the potential for fatalities at other wind facilities in southern Alberta, TransAlta formed a research consortium with fellow Canadian wind-energy firms Suncor, Enmax and Alberta Wind Energy Corporation.

This consortium, along with additional funding from BCI, the Alberta Conservation Association, the University of Calgary's Institute for Sustainable Energy, Environment and Economy, the Natural Sciences and Engineering Research Council of Canada and Shell Canada, provided unprecedented access to wind sites and data, which led ultimately to a much better understanding of bat fatalities at wind-energy facilities.

By having access to multiple facilities, we were able to address questions that could not have been answered at single sites. For instance, we quickly learned that fatality rates vary tremendously from facility to facility. By analyzing data from across North America, we showed that one reason for this is that newer, taller turbines kill more bats than older, shorter ones.

As elsewhere in North America, the majority of bat fatalities at our study sites were of migratory species during the fall migration. We found that more bats were killed at sites on nights when echolocation activity, as measured with bat detectors, was greater, and that activity decreased among migrating bats the farther we moved from the eastern slopes of the Rocky Mountains into the mostly treeless prairies. This leads us to hypothesize that tree bats may be choosing migration routes based largely on the availability of tree roosts.

We also documented that weather influences the behavior of migrating bats much as it does migrating birds. More bats are killed when wind speeds are low (and bats are more likely to be flying), when barometric pressure is falling (which usually occurs before a storm), and when the moon is especially bright (which makes sense if, as hypothesized, bats are attracted to turbines and can see them more easily in moonlight).

BCI and BWEC, meanwhile, also explored the influence of wind speed on bat fatalities and, as early as 2005, proposed that bat-fatality rates might be reduced by adjusting the turbines so their blades do not spin during low-wind periods, when little or no electricity is being generated.

TransAlta suggested that we conduct the first large-scale test of this mitigation strategy. In the summer of 2007, we altered half the turbines at TransAlta's Summerview site so their blades remained stationary at low wind speeds. We compared those to turbines that operated in the standard way.

The results were dramatic: bat fatalities fell by 60 percent at the experimental turbines. Since our study, other wind-energy facilities have tested this strategy and also report large reductions in bat fatalities with only modest reductions in energy production. BCI and BWEC have been leading this critical research, and we hope to see this effective strategy implemented by wind-energy operators throughout the world. Millions of bat fatalities could be prevented.

TransAlta, meanwhile, has demonstrated its continuing commitment to better understanding and reducing bat fatalities.

"Following the successful implementation of the bat mitigation program at Summerview I, TransAlta has continued to explore ways of reducing its environmental impacts across its

BATS & WIND: A LONG SEARCH FOR SOLUTIONS

by Cris Hein
Director, BCI Wind Energy Program

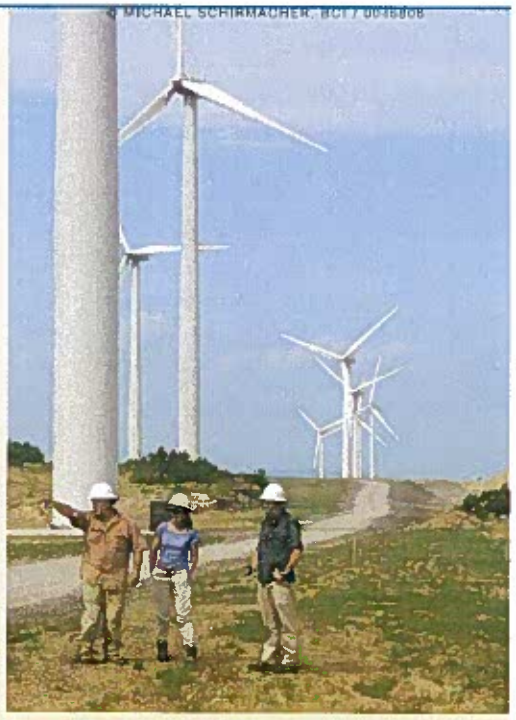
One of the first studies by Bat Conservation International and the Bats and Wind Energy Cooperative (BWEC) provided strong circumstantial evidence of a potentially powerful and low-cost strategy for reducing bat fatalities at wind-energy facilities.

The 2004 research at the Mountaineer, West Virginia, and Meyersdale, Pennsylvania, wind facilities (operated by key partner Florida Power and Light Energy) found that, of the 64 wind turbines studied, only one produced no bat fatalities. It was out of service, with its blades "feathered," or left to rotate slowly. This led scientists urged experiments to test the impact and costs of simply not attempting to power up blade rotation until wind speeds reach profitable levels (*see* BATS *Fall 2005*).

Those tests had to wait until 2008, when BCI, under the auspices of BWEC, a BCI-led alliance of key federal agencies, wind-industry groups, academia and international experts, initiated the first U.S.-based operational minimization study at Iberdrola Renewables' Casselman Wind Power Project in Pennsylvania.

We investigated the effects of raising the cut-in speed (the wind speed at which the spinning turbine blades begin to generate electricity) by 1.5 to 3.0 meters per second (4.9 to 9.8 feet per second) above the manufacturer's preset speed. The result was an impressive 44 to 93 percent reduction in bat fatalities, with only an estimated annual loss of energy production of just 0.3 to 1 percent.

BCI and other researchers have since worked with additional industry partners, including BP Wind Energy, EDP Renewables, Exelon Energy, First Wind and Invenergy,



Researchers Ed Arnett, then with BCI (*left*), Manuela Huso and John Hayes study bats and wind turbines at the Casselman Wind Project in Pennsylvania.

Erin Baerwald stores a bat carcass collected during bats-and-wind-energy studies in Canada.

wind fleet," says Mike Peckford of TransAlta. "At Summerview II, we worked with the turbine manufacturer to test and refine a process that automatically changes the 'cut-in speeds' – the minimum wind speed at which turbine blades begin generating electricity – during particular times of the year and day when bats are known to be at a greater risk of interacting with turbines."

Peckford said TransAlta is also experimenting with varied cut-in speeds at wind farms in Ontario and Alberta. And the company is working "to reduce its environmental impacts" by the continued implementation of these mitigation strategies at Summerview I and II and "through the creation of site-specific Operations Environmental Management Plans for each of our wind facilities." TransAlta is also instituting a new WInd Stewardship Plan and Environmental Reporting (WISPER) initiative that includes long-term monitoring of bird and bat populations at its wind facilities.

While the collective efforts of many scientists, government agencies and industry partners have greatly increased our understanding of the wind-power threat to bats, key questions remain. And as more and more wind facilities are added to the energy mix in North America and elsewhere, widespread adoption of proven mitigation strategies that will reduce bat fatalities remains elusive. TransAlta is the exception rather than the rule, and bats by the tens of thousands are at risk at wind facilities as a result.

Perhaps recognizing those companies that voluntarily act to minimize damage to bats will encourage others to follow suit.

ERIN BAERWALD is completing her Ph.D. at the University of Calgary, where ROBERT BARCLAY is Professor and Head of the Department of Biological Sciences.

to produce and disseminate results from similar studies. A consistent finding shows that by changing turbine operations during a relatively narrow period of time (the late-summer and fall migration season) and under specific conditions (when wind speeds are low), the numbers of bats dying at wind turbines can be significantly reduced at relatively little cost.

There is even an opportunity to reduce bat fatalities with no loss in power. By simply feathering the blades (pitching them parallel to the wind so they are moving slowly) below that preset speed, bat fatalities can be reduced by an average of 35 percent.

Regrettably, this strategy – a seemingly win-win solution – has yet to be voluntarily adopted by the wind industry.

Of the nearly 905 wind-energy facilities across the United States, only a handful are implementing any form of operational minimization to reduce bat fatalities. Beech Ridge Wind Energy Project (West Virginia), Buckeye Wind Power Project (Ohio), Fowler Ridge Wind Farm (Indiana) and Kawailoa Wind Power (Hawaii) have finalized Habitat Conservation Plans (HCPs) with the U.S. Fish and Wildlife Service to receive "Incidental Take" Permits to protect themselves in case a federally endangered Indiana bat (*Myotis sodalis*) or Hawaiian hoary bat (*Lasiurus cinereus semotus*) is killed by their turbines.

In addition, a region-wide HCP is being developed for the Midwest that would provide consistent minimization and mitigation guidelines for participating companies. And with the possible Endangered listing of the northern long-eared myotis (*M. septentrionalis*), additional HCPs are likely.

While BCI applauds these efforts and encourages all wind companies to work with state and federal agencies, we believe the wind-energy industry has an obligation to pursue scientifically proven minimization strategies to reduce adverse wildlife impacts before they can be considered environmentally "green."

We support the immediate implementation of feathering blades below the preset cut-in speed and strongly encourage wind-energy facilities to raise turbine cut-in speeds. Meanwhile, we will continue to work closely with our partners to fine-tune current operational minimization recommendations and to develop new strategies to reduce bat fatalities.

By incorporating new data on bat behavior around wind turbines and on activity patterns associated with other weather variables, we can better determine exactly when to alter turbine operations – resulting in a more ecologically sound and economically viable strategy.

BCI also is working with partners to develop a new generation of ultrasonic acoustic deterrents that are designed to steer bats away from turbines. Initial results were promising, and we have redesigned the existing deterrent and improved sound generation and weatherization. Further testing is needed, however, and a commercially available acoustic deterrent is still years away.

Wind-energy development will no doubt continue to expand across North America and around the world, and we will need multiple tools to protect bats – while reducing our dependence on carbon-based fuels. We are grateful to our industry partners who have shown real environmental leadership and supported the pursuit of solutions to this complex issue. We now look to the industry to showcase its environmental stewardship and begin implementing the strategies that have been collaboratively developed.