



This research explores important factors to improve the conservation of bats, a critical component of Mid-Atlantic ecosystems and the main control of night flying-insect pests. Golf courses may provide good habitat for bats, which will help control turf pests. Wind turbines are threats to bats as they kill thousands per year. Testing of a device that curtails the turbine at low wind speeds significantly improved bat survival.

## The Value and Conservation of Bats

### Who cares and why?

Research is being conducted on bats on the Delmarva Peninsula and in several countries in Latin America to determine population sizes, species diversity, activity levels, and insect control by these ecologically important mammals. Bat populations have been devastated by the emerging bat disease White-Nose Syndrome, which is estimated to have killed as much as 90% of the population of bats in some areas of the Northeastern US. A further threat to bats has come from wind turbines, which kill bats at higher rates than birds. Bats ingest enormous quantities of insects, in some cases nearly the bat's entire weight per night. Many of these insects are agricultural pests, which have been estimated to cost farmers in the US about \$1 billion per year, an estimate that includes the cost of pesticides and crop losses from damage by insects. Bats are critical in the biological control of numerous insect pests, including many that attack

economically important Delaware crops, such as corn and soybean. Bats attack Noctuid moth cutworms, turf scarab beetles, Japanese beetles, June bugs, fall armyworms, cabbage loopers, tobacco budworms, corn earworms and cotton bollworms. In addition, they eat mosquitoes, which spread diseases to horses and chickens, two other economically important industries in Delaware. Researchers have calculated that the annual value of insect suppression by bats is nearly \$1.7 million in benefit to farmers. And let's not forget the human toll of mosquito-borne diseases that may be reduced through the efforts of bats. In the American tropics bats also provide ecosystem services through pollination and seed dispersal.



### What have the projects shown so far?

We monitored bat activity through ultrasonic recorders on five Delmarva golf courses to determine what microhabitat on the courses bats used. Tall, maintained canopy habitat on golf courses shows seven times more activity than the most undisturbed habitat, that of tall, natural canopy. Ponds have the second greatest amount of activity. Our expectation was that forested patches with the least amount of human maintenance would have the most bat activity. What we actually found

was that these maintained high canopy areas (maintained for golf cart transit) actually had the most bat activity. We found this very surprising, but we believe this result reflects an interaction of both cover from predators plus a clear flying corridor for the bats.

In addition, we are examining the bat mortality at a solitary wind turbine on the campus of University of Delaware's Marine Laboratory. Bats have been a major focus of the potential environmental impacts

of wind turbines since 2004. The 2 MW Lewes turbine alone killed an estimated 36.6 bats/MW during 2011 (see x-ray below showing bats with both broken bones and those with barotrauma). From 3 years of research, we found that bats are 8 times more likely than birds to be killed at the Lewes turbine. The bats suffering the greatest mortality are primarily lasiurine tree bats (*Lasiurus borealis*, *Lasiurus cinereus*, *Lasionycteris noctivagans*), and it appears that the greatest mortality at the Lewes turbine is during the migration season (August-Oct). From 1 July - 31 October 2013 we implemented a weekly alternating curtailment strategy at the UD Lewes wind turbine to test the new Gamesa Bat Shield. Every other week the turbine's cut-in speed (the minimum hub height wind speed required for the turbine to start generating electricity) was raised from 3.5 m/s to 5

m/s for the first two hours following sunset, which is when bat activity levels peak. At higher wind speeds bat are less likely to be active, thus reducing mortality chances. We found a significant reduction in bat mortality during the weeks with a cut-in speed of 5 m/s.



## Impact Statement

Bats are important keystone species in ecosystems in the Mid-Atlantic due to their consumption of pest insects. It is essential for agriculture and native ecosystems that we conserve bats, which now face critical threats from habitat development, new diseases, and from the rapid development of wind energy facilities.

Golf courses can offer a novel opportunity to conserve habitat for bats. Managers are encouraged to keep a range of habitats available for use by bats, which will help control pests and allow reduction of pesticides.

Wind turbines, while generating green energy, can present a major threat to bats. We found that curtailing the turbine at wind speeds of 5m/s or less significantly reduced bat deaths at this solitary turbine.

### What research is needed?

More research needs to explore how bats are using farmlands and other anthropogenically-disturbed habitat in the Mid-Atlantic. Our study of golf courses can be expanded to examine maintained parks and even suburban yards for bat-friendly

habitat. In addition, our work with solitary turbines can be expanded to determine how small, privately owned turbines and larger wind turbine facilities can be made safer for bats.

### Want to know more?

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Additional Links:

<http://www.umes.edu/ard/Default.aspx?id=46285>

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