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Chasing Migratory Tree Bats
Scientists aim an aerial spotlight on tree bats
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The turning leaves of autumn cover Pennsylvania mountaintops with a blanket of gold, crimson and copper that creates breathtaking vistas in late September. But while human visitors contemplate the beauty, the high-country wildlife is busy preparing for the hardships to come when temperatures plunge and snow coats the mountains. Pennsylvania bats have two basic strategies for surviving winter: they can escape the cold by hibernating in caves, mines or tunnels, or they can head south for the winter.

Six of Pennsylvania's nine bat species hibernate, drastically reducing their metabolism and living off fat reserves built up in the fall as they wait for insect populations to revive in the spring. The remaining three species, collectively known as tree bats, usually embark on long-distance, southward migrations in the fall to escape the Commonwealth's long winters. These travelers are the hoary (Lasiurus cinereus), eastern red (L. borealis) and silver-haired (Lasionycteris noctivagans) bats.

Hibernating bats face the scourge of White-nose Syndrome, which has been confirmed in Pennsylvania. But migratory tree bats also face a growing threat: within the past decade, the higher elevations throughout the Mid-Atlantic states have become popular for wind-energy development. An alarming number of bat fatalities have been documented at wind sites by the BCI-led Bats and Wind Energy Cooperative and others. Some researchers suspect wind facilities also have the potential to change bats' migratory behavior. Among frequent victims of wind energy are the migratory tree bats.

Faced with rapidly increasing wind-power development in Pennsylvania (and across the country) and an incomplete understanding of bat-migration patterns and behavior, a group of biologists partnered with the advocacy group Mountain Watershed Association, Inc. (MWA) for a multiyear study. Specifically, biologists were interested in migratory activity along the Allegheny Mountains of southwestern Pennsylvania, a popular location for wind-power development.

The long-distance migration project was planned in consultation with the Pennsylvania Game Commission. Our plan was to capture and attach miniature radio transmitters to migrating bats and track them with a telemetry-equipped airplane and three ground vehicles.

The challenges were significant. Tree bats have not been surveyed during migration time in Pennsylvania, so we had no previous results to guide us. Migrating bats turned out to be very difficult to track, even with a transmitter glued to their backs, and the inconsistent availability of an airplane during our first season created frustrations. We nonetheless obtained some important, if preliminary, results concerning when these migrating bats are â€“ and are not â€“ on the move and perhaps what prompts them to start moving. We also learned some important lessons that will improve future studies.

Data collection began in fall 2007. We decided to focus on the migratory ecology of the

eastern red bat, although we also tagged and monitored other tree bats if they were captured in our nets. No previous studies had used radiotelemetry to monitor tree-bat migration in Pennsylvania, so our project included many moments of trial and error. We planned 30 days of fieldwork to ensure we'd have time to evaluate the impact that such factors as time of year, temperature, fog or precipitation might have on capture and tracking success.

Our study was modeled on telemetry projects performed by the Pennsylvania Game Commission to track the migration of hibernating bat species. We began mist-netting in late September at Yellow Creek State Park and continued until we had captured at least one of our target species. As the project progressed, we moved our mist nets south along the Allegheny Mountains, first to State Game Lands on Chestnut Ridge, then to Laurel Hill within the boundaries of Forbes State Forest. Each time a targeted bat was captured, we attached a miniature radio transmitter and released the bat for tracking.

We tagged eight eastern red bats and one silver-haired bat in 2007. However, logistical challenges such as the spotty availability of our aircraft limited our monitoring ability. When the plane could not immediately join the search, we used as many of the antenna-equipped ground vehicles as possible for radiotracking. Yet the bats routinely escaped the ground crews. When the airplane eventually became available, usually the following day, we made aerial searches to locate radio signals from the missing bats as they roosted during the day. Such searches were futile.

The most interesting observations from that first season involved two eastern red bats that were radio-tagged during the nights of September 30 and October 4. Both bats continued foraging within the capture area, one for 10 nights and the other for six. Then, on October 9, both bats foraged for about half the night before abruptly leaving the area and quickly outdistancing our ground trackers. Since the plane could not immediately join the effort, both bats disappeared despite hours of ground searching. That same night, we also captured one additional eastern red bat and one silver-haired bat. Both escaped the ground crew within 2Â½ hours of release.

So why were these four bats in such a hurry to leave the area during the night of October 9? The answer is likely found in weather data: during the previous afternoon, a storm front moved through the area, suggesting that the change in weather patterns spurred the migration. Also, mortality studies at eastern U.S. wind facilities showed that bat fatalities frequently increased after a weather front passed through an area.

We modified our 2008 protocol to reflect the successes and lessons of our first year. This time, we began in early September, although budgetary constraints limited our field season to 14 nights. We captured only one eastern red bat on September 8 and a silver-haired bat two nights later. We radio-tagged both of them. We also netted and released 56 bats of non-targeted species.

Both bats foraged within two miles (3.2 kilometers) of the capture area for several nights. A storm was predicted for September 14. This time, with our 2007 experience in mind, we were prepared with ground crews and an airplane on September 15.

The silver-haired bat left its foraging area shortly after coming off roost that evening, while the eastern red bat foraged for about 25 minutes before leaving the area. Both bats were found about two hours later. The airplane located the silver-haired bat about 36 miles (58 kilometers) southeast of its previous roost, while the ground crew found the red bat 17 miles (27 kilometers) southeast of its roost. Both were lost again after about 15 minutes and

were not located again.

Our initial work confirms that eastern red bats and silver-haired bats can be captured and radio-tagged during fall migration, that they may not migrate every night during the fall migration, and (although our sample size is small) that the night following a storm front probably is a preferred time for migrating out of an area.

Logistically, our experience suggests that airplane searches for radiotagged migrating bats are futile if delayed, at least among the topography of southwest Pennsylvania. It is, therefore, critical to have a telemetry-equipped aircraft in the air or on standby at all times. Finally, without very close monitoring on the ground and in the air, radio-tagged tree bats can outdistance search efforts or slip into areas where radio signals are difficult to retrieve.

Although additional research is clearly needed, we are making progress in understanding the migratory patterns and behavior of the eastern red bat and other tree bats. Continued progress should eventually produce enough data to predict these bats' migratory routes across the Pennsylvania landscape, which should help produce the best conservation and management practices for operating wind facilities while protecting migratory bats.

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