MONITORING WIND TURBINE PROJECT SITES FOR AVIAN IMPACTS

This session focused on existing wind projects are monitored for their impacts on birds and bats. How many existing energy projects are or have been monitored for avian and bat impacts? Are there case examples of requirements for such monitoring? What are the options for designing and implementing scientifically sound monitoring programs for avian mortality – how is monitoring conducted? Are results made public? What are the metrics being employed to measure impacts?

Bird and Bat Fatality Monitoring Methods

by
Wally Erickson, *West, Inc.*[9]

Protocol development and review. Protocols for bird and bat fatality monitoring depend to some degree on the requirements of the permitting agency. One approach (used at the Vansycle site and now at most new projects) employs a Technical Advisory Committee (TAC) to help develop and review monitoring protocols, gather and process peer review reports, and make recommendations to permitting authorities on further studies and possible project/site changes necessary to mitigate impacts. Consultants on the development of such protocols may include organizations, agencies, and private interests such as Audubon Society, USFWS, state wildlife agencies, developers, researchers, and landowners. Bird and bat fatality monitoring protocols usually are part of an adaptive management approach, ensuring room for flexibility as new data/information is made available.

Methodology. Standardized carcass searches are the primary method employed to determine the level of bird and bat mortality at project sites. Both rectangular and circular plots have been used, with rectangular plots being easier to manage. Plot size depends on turbine size, the distribution of fatalities, habitat at the site, and the cost of the study versus the data researchers anticipate gathering. Search plots may need to be extended on the down-wind side, where more carcasses tend to be located. (Slides show rectangular search plots mapped for the Nine-Canyon wind project, along with the distribution of distances from bird and bat fatalities to the nearest turbine. At this site, bird fatalities tended to be within 120 m of the nearest turbine, while bat fatalities tended to be within 50 m of the nearest turbine. Turbines were 92 m tall to the blade tips, with rotors 62 m in diameter.)

Depending on plot size and terrain, time spent searching around each turbine can range from ten minutes to two hours, at a walking pace of 30-60 m/minute. Some studies only sample portions of plots, usually mowed areas. Search frequency varies from daily to every five weeks. Uncertainty in fatality estimates increases as the ratio of interval between searches to mean removal time increases. Longer search intervals also limit the ability to

[9] 2003 Central Ave., Cheyenne, WY 82001

understand potential associations between fatalities and weather. One way to compensate is to intensively search a small sample area, and search the remaining sample area less intensively. This can help clarify the relationship between weather events and fatalities and allow researchers to adjust the scavenging rate.

Carcass search studies categorize finds as *intact*, *scavenged*, or as a *feather spot*. "Intact" indicates that the carcass is completely intact, not badly decomposed, and showing little or no sign of having been fed upon by a predator or scavenger. "Scavenged" denotes an entire carcass which is to some degree dismembered and shows signs of having been fed upon by a predator or scavenger. A "feather spot" consists of ten or more feathers, or two primary feathers at one location, indicating predation or scavenging. Most recent studies include feather spots as project-related fatalities. This means that fatality rates may be artificially high as some may have resulted from natural predation or other non-project related cause. For example, at Buffalo Ridge, Minnesota, estimates of fatality rates at plots without turbines were one-third of the estimate at turbines.

Adjusting for scavenging rates. Fatalities attributed to wind turbines must also be adjusted upward to account for carcasses that are removed by scavengers during the intervals between scheduled searches. This is done by conducting carcass removal trials. A variety of carcasses – including rock dove, house sparrow, starling, upland gamebird, waterfowl, and raptor carcasses are placed in a field to see what environmental effects they experience, primarily whether they disappear or are fed upon. Carcasses (which are frozen but have been thawed for 8-24 hours before use) are placed randomly in the vicinity of turbines which are part of a regular search regime, near turbines not routinely searched, and within plots away from turbines. The percentage of carcasses removed by scavengers or by other means is usually tracked daily for the first few days, and less frequently for the remainder of the trials. Removal rates are used to adjust observed fatality rates upwards, and should also be used to determine the search interval.

Adjusting for observer detection bias. Observer detection trials are employed to adjust observed fatality rates for searcher bias. The result of this method is an estimate of the average probability a wind turbine fatality that is available is found during a search. The trial carcasses are placed randomly in search plots. Searchers are not informed when and where trials are taking place, though they may become aware of the trial if they find a marked carcass.

The solutions employed for adjusting fatality rates for the standardized carcass search may contribute their own biases. For example, some casualties or injured birds may land or move outside of the search plot. Ignoring this potential source of bias could lead to underestimating the fatality rate. Other issues brought up by others include the fact that removal trial carcasses located away from turbine strings may be scavenged at a different rate than carcasses near string, which could also bias the findings. Scavengers may be attracted to the scent of humans who put carcasses in the field, which would artificially increase scavenging rates. Lastly, small bird trials may not be representative of bats.

Simulations show that formulas for calculating fatality estimates are unbiased or close to unbiased, and that potential biases that exist in the sampling procedures of carcass searches

and carcass removal trials mostly lead to an overestimate of bird fatalities. The most effective answer to these problems may be more intensive sampling at some turbines, which is an approach currently taken at a couple of sites.

The methods described in this presentation were published in a peer-reviewed article about research at Buffalo Ridge, Minnesota (Johnson et al. 2002). There is a forthcoming article describing these methods as they were used at the Stateline project in the Pacific Northwest. Some of the earlier fatality studies were conducted over periods as long as four years, however, protocols have changed and this is less common now.

Reference

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd, and S.A. Sarappo. 2002. Collision mortality of local and migrant birds at a large-scale wind power development on Buffalo Ridge, Minnesota. Wildlife Society Bulletin 30:879-887.

Discussion, Questions and Answers

Has the hypothesis that small passerines basically disintegrate when they fly into turbine blades (the so-called "poofing principle") ever been tested?

Responses: 1) Most fatalities that are found tend to be intact. 2) Researchers could examine airline trials that test the impacts of windshields on birds.

What is done with birds found alive, but injured?

Response: If a bird is rehabilitated and released then it is not included in fatality data. If it dies or is euthanized, it is included.

Please distinguish between carcass search and carcass removal trial methodologies.

Fatality searches and carcass removal trials are conducted separately, with detection and scavenging data kept separate. "Availability" estimates resulting from carcass removal trials (i.e. scavenging adjustment) are integrated into the final calculation of fatality detection results. At Tehachapi Pass, carcass removal trials were conducted at sunup and then at sundown. It was found that most carcasses were scavenged during the day because ravens locate carcasses by sight. In addition, large carcasses were taken before smaller ones. Carcass removal trials tend to overestimate scavenging rates, which in turn leads to an overestimate of overall fatality rates from wind turbines.

Other points noted by participants:
A participant suggested that if only about 1-3 birds are killed per turbine per year, this does not seem like a major food source that would attract scavengers or predators.
There appears to be more annual variation in fatalities for bats than for birds. There is seasonal variation for both.