

The Importance of Baseline Surveys for Wind Turbine Siting Decisions and AOK Sanctuary Operations

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John and Galen Pittman have done preconstruction baseline surveys of flora and fauna present on proposed wind farm sites, and John has recorded censuses of bird populations at the AOK Hutton Niobrara Ranch Sanctuary for fifteen years.

Baseline surveys are simply exhaustive censuses or catalogues of all the flora and fauna—the plant and animal life—found on a certain site or property. They are a snapshot in time of the life-forms supported on that site, constituting useful tools for conservation management. In some cases, as in siting wind energy generating facilities, they may be an essential requirement.

Barring traumatic events—conversion of prairie to cropland, mass application of herbicides, biome-altering fires, climate change—flora are less of a challenge to makers of baseline censuses than are fauna. Their mobility complicates cataloguing fauna: birds and animals may range widely to and from the site of a baseline survey, be present at some seasons and not others, and suffer population fluctuations because of disease, parasitism, drought and adverse weather phenomena. It is precisely to have records of the effects of some of these phenomena that baseline surveys are so important, both in determining appropriate sites for wind turbines, and in keeping track of trends on wind farm sites as well as protected habitats, like the AOK sanctuaries.

Baseline studies are an essential first step in assessing the suitability of proposed wind turbine sites from the standpoint of potential impact on birds, animals, and habitat. Potential impact is of two kinds: the most obvious is direct impact, such as collisions with turning blades, and disruption of habitat by construction or, in the case of some species, introduction of large vertical structures. But there is also indirect impact: breaking up contiguous habitat, interrupting patterns of movement from roosting to feeding areas, making inroads by predators easier. Although initial concerns over the effects

of wind farms on wildlife centered on collision mortality of raptors and other migratory birds (*e.g.*, Johnson *et al.* 2002, Barrios and Rodriguez 2004, Smallwood and Thelander 2008), concern is steadily increasing about the indirect effects of wind-energy development on birds (Rubenstahl *et al.* 2012). Studies have shown that wind-energy development may cause a variety of raptors and breeding grassland birds to avoid or be displaced from otherwise suitable habitat within wind resource areas (*e.g.*, Leddy *et al.* 1999, Larsen and Guillemette 2007, Farfán *et al.* 2009, Pearce-Higgins *et al.* 2009, Garvin *et al.* 2011). Similarly, although there is a recognized need to explore the implications of wind-energy development for bird productivity, only one study has investigated the indirect effects of wind farms on nesting success (Rubenstahl *et al.* 2012). Nevertheless, from studies exploring the implications of other forms of anthropogenic disturbance on birds, we know that human development and changes in land use can cause nest failure and a decrease in postfledging survival (Bennett *et al.* 2011, Johnson *et al.* 2012). For example, frequent disturbance by wind technicians at the site, turbine noise, and shadow flicker from rotating turbine blades could alter incubation or nestling provisioning behavior in nesting adults.

A further implication of wind-energy development for breeding grassland birds may be the indirect effect of the wind resource area on predator populations, activity, and behavior (Martin 1993). For example, wind-farm access roads may provide travel and foraging corridors for mammalian nest predators (Frey and Conover 2006), providing greater access to grassland habitats and increasing the frequency of nest predation. Additionally, the ability of a bird to perceive a change in predation risk may depend on local factors (Chalfoun and Martin 2010, Kovařík and Pavel 2011). Again, turbine noise and shadow flicker could affect nesting females' perception of predation risk. Researchers urge prudence in siting decisions: "We recommend that wind turbines be placed within cropland habitats that support lower densities of grassland passerines than those found in CRP grasslands" (Leddy, Higgins and Naugle, *Wilson Bulletin*, Vol. 111, No. 1 (Mar., 1999)).



Long-billed Curlew. Photo by Bob Gress, BirdsInFocus

Assessment of direct impact might seem simpler, but John Schukman notes that even with careful preliminary bird data, it is often difficult to interpret how mortality of birds might be affected by a given event—such as the introduction of wind turbines. One study concluded that “there was no clear relationship between predicted risk and the actual recorded bird mortality at wind farms.” The assumption of a linear relationship between frequency of observed birds and fatalities proved to be incorrect. “Bird mortality in wind farms is related to physical characteristics around individual wind turbines,” while Environmental Impact Assessments usually take in the whole wind farm as a unitary entity. Research needs to be species-specific, and focused on specific features of the proposed location. It would also need to consider seasonal changes in conditions, as well as nocturnal and diurnal factors. In other words, the more narrowly specific, the more granular the assessment, the more likely that it accurately represents the actual case for any given machine; the sum of individual cases would give the range of likely mortality on the site (Ferrer *et al.* 2011).

What about the AOK sanctuaries and wind farm sites? John notes that, although there are wind turbines about five miles from the Achterberg Demonstration Farm, he thinks the habitat there is a small plot, and not a high sensitivity area. However, there are no surveys to date other than an eBird checklist with dates and observers recorded.

Many grassland bird species are an object of concern because of falling populations and reduced habitat nationally, but in the limited number of observations on the Achterberg Farm, other than non-breeding meadowlarks, no Prairie-Chickens,



Wind turbines on formerly intact prairie south of Beaumont, Kansas. Photo by Ron Klataske

Upland Sandpipers, or other species of concern have been listed. [See chart 1, a summary list of species of birds observed on all three AOK Sanctuaries, keyed to sites where each has been found]

The Hutton Ranch on the Niobrara River in northwest Nebraska, however, does have good bird lists compiled over fifteen years. [All observations over the fifteen years are included in the list in Chart 1] It represents a large area of native habitat, and some literature shows a high sensitivity to disturbance by wind energy development (Fargione *et al.* 2012). Sharp-tailed Grouse, Sandhill Cranes, Bald Eagles, Long-billed Curlews, and Upland Sandpipers are among species of concern that have been recorded over the years at Hutton. Census-takers have recorded both the Marsh Wren and the Sedge Wren, and the Yellow-breasted Chat. The Bobolink is a frequent breeder.

Studies have shown that there exist large areas in the Northern Great Plains where wind development would likely have few additional impacts on wildlife (Fargione *et al.* 2012). Estimates are that the around 1,056 GW of potential wind energy available across this area strictly in areas of low impact on biodiversity amount to over 35 times present development goals. The issue lies in directing development solely to these low-impact areas—and away from sensitive areas that shelter species of high concern, like the Hutton Niobrara Ranch.

Among AOK’s other properties, Mt. Mitchell is not likely to be encroached upon by wind turbines, and other prospective properties likewise seem not to be immediately threatened.

John Schukman-- Bibliography of key relevant articles.

Fargione, J, J. Kiesecker, M. Slaats, and S. Olimb. 2012. *Wind and wildlife in the Northern Great Plains: identifying low-impact areas for wind development*. PLOS ONE: <https://doi.org/10.1371/journal.pone.0041468>

Ferrer, M., M. de Lucas, G. Janss, E. Casado, A. Munoz, M. Bechard, and C. Calabuig. 2011. *Weak relationship between risk assessment studies and recorded mortality in wind farms*. *Journal of Applied Ecology* 49:38-46. <https://doi.org/10.1111/j.1365-2664.2011.02054.x>
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