Wind Turbine Siting

Backgrounds

Even living as we are in the throes of the third industrial revolution, as the service sector outpaces manufacturing, and electronics and high tech displace heavy industry as the drivers of GDP, our economy has not outgrown its need for energy. The graph of US energy usage per capita from 1960 to 2015 has fluctuated in a narrow range from a low of 5,612.08 kg of oil equivalent in 1960 to a high of 8,438.40 kg in 1978, with 6,803.92 kg the latest reported figure, from 2015.[1] But total US energy consumption has increased in almost every year since 1949 with minor fluctuations, from around 35 quadrillion British thermal units in 1950 to around 100 quadrillion British thermal units in 2019. In 2017, coal accounted for 17.8% of US primary energy production, trailing petroleum (including crude oil and natural gas plant liquids) at 28%, and natural gas at 31.8%.[2] We—the US, the planet—cannot continue in this addiction to increasing consumption of dirty, polluting energy sources if we hope to avoid a greater than 1.5 degrees Celsius increase in global warming by mid-century—the predicted tipping-point beyond which, for our complex societies, the planet rapidly slides into becoming uninhabitable .

A shift to renewable, wind-powered energy production would appear to be a godsend, particularly in Kansas, where all of the state except the eastern-most sector is blest with some of the highest average wind speeds of anyplace in the country, high even for the so-called "central U.S. Wind Belt."[3] In eleven years in Kansas, from 2005 to 2016, wind energy jumped from less than 1% to 30% of total electricity generated in the state.[4] The Nature Conservancy estimates that over

---

[1] https://www.google.com/search?ei=qQQOX5PUIcP0swWZu6bwBQ&q=energy+usage+in+the+us&oq=energy+us&gs_lcp=CgZwc3ktYWIQARgIMgIIADICCAAyAggAMgIIADICCAAyAggAMgIIADICCAAyAggAMgIIADoECAAQRzoICAAQ6gIQjwE6BQgAEJECOgQIABBDOggIABCxAxCDAToFCAAQsQM6CggAEJECEEYQ-QE6BwgAELEDEENQxxhYh1Fg3IQBaAFwAXgAgAGFAYgB-QaSAQM1LjSYAQCgAQGqAQdnd3Mtd2l6sAEG&sclient=psy-ab (consulted 14 July 2020)

[2] https://www.americangeosciences.org/critical-issues/faq/what-are-major-sources-and-users-energy-united-states. (Consulted 14 July 2020). All renewable energy sources were catching up, at 12.7%.

[3] See Fig. 1 in "Site Wind Right: Accelerating Clean, Low-Impact Wind Energy in the Central United States:" Nature Conservancy, July 2019: http://www.nature.org/sitewindright (consulted 14 July 2020)

[4] American Wind Energy Association. 2016. Kansas Wind Energy. Retrieved October 31, 2017, from http://awea.files.cms-plus.com/FileDownloads/pdfs/Kansas.pdf

1,000 GW of wind energy could be developed in this area, exclusively in areas of low conservation impact. They point out, "This is more than 10 times current U.S. wind 2019b, USDOE 2018)."[5] The region studied, a seventeen-state area, "encompasses nearly 80 percent of the country's current and planned onshore wind capacity (AWEA 2019a)." Kansas has been ranked third in the nation for its potential wind resources.[6] However, it also contains our largest remaining tracts of intact temperate grasslands, among the most altered and least protected habitats in the world (Hoekstra et al. 2005).[7]

Of what was once some 170 million acres from Texas to Canada, the habitat of bison, pronghorns, elk, wolves, and bears, only about 4% of tallgrass prairie remains, two-thirds of it in the Flint Hills of eastern Kansas and Oklahoma. The Flint Hills supports more than 30% of the global population of Buff-breasted Sandpipers during their migration, and has been designated as a Western Hemisphere Shorebird Reserve Network site. But destruction and fragmentation of habitat and other human activity have particularly devastated the ground-nesting grassland birds of this region, as well as the shorebirds that use the prairie lakes and *playas*, and the big refuges like Cheyenne Bottoms and Quivira National Wildlife Refuge, that are resting and refueling sites for their long-distance migrations. An article in *Science* in 2019 reported a decline in grassland-breeding bird populations across the U.S. and Canada of more than 50%, while migratory shorebirds have declined more than 70% in that same period.[8] Other hallmark denizens of regional habitats like Least Terns and Piping Plover, as well as Lesser and Greater Prairie Chickens, have become "species of concern" to the USFWS.

Prospects

So the great Midwestern grasslands are the site of a rapidly growing source of "green" energy—installed wind-generation capacity in Kansas has jumped 500% in the last decade, and in 2019, Kansas ranked fourth nationally in installed wind capacity. But they are also the increasingly threatened, diminished remnant of a once-grand and incredibly rich ecosystem. The urgent question we face is, can we have both, power and wildlife? And if so, how? Lowell Larkin, Professor of Conservation Biology at the University of Nebraska-Lincoln, allows that the threat of

---

[5] P. 5 in "Site Wind Right: Accelerating Clean, Low-Impact Wind Energy in the Central United States:" Nature Conservancy, July 2019: http://www.nature.org/sitewindright (consulted 14 July 2020)

[6] KDWPT position paper on wind power: **Wind Power Position 11/17** *(PDF 100.69 kB)* https://ksoutdoors.com/Services/Environmental-Reviews/Wind-Power-and-Wildlife-Issues-in-Kansas/Wind-Power-Position

[7] *Ibid.,* p. 2.

[8] All data in this paragraph from Greg Breining, "Power or Prairie: Can Wind Energy and Wildlife Coexist in the Flint Hills?" *Living Bird* magazine, Spring 2020.

wind power to Prairie Chickens, for example, is not clear-cut, with conflicting research pointing both ways; but, he adds, wind power with its growing footprint on the landscape could be a bigger potential problem in the future. "I would always say there's still potential [problems] if in the future wind facilities are bigger and there's more infrastructure."[9]

It is true that according to research published back in 2015, bird mortality from wind turbines is dwarfed by other causes: domestic and feral cats account for an astonishing 2.4 billion bird deaths in the U.S., another 204 million in Canada; collisions with building windows cost 599 million birds U.S., 25 million Canada; automobiles 200 million U.S., 14 million Canada; flying into power lines some 23 million U.S., 26 million Canada. Communication towers killed some 6.6 million birds in the U.S., plus 220,000 in Canada, and electrocution from power lines killed 5.6 million U.S., 481,000 Canada. Deaths attributable to wind turbines amounted to only 234,000 in the U.S., augmented by another 17,000 in Canada[10]. Recall, though, that reported 500% increase in wind-generation capacity in Kansas alone in the past decade. Barring drastic changes in engineering of the turbines themselves, improved bird detection measures, and/or avoidance of inappropriate siting, more wind turbines will inevitably mean more avian (and chiropterid!) fatality statistics. The Obama administration set a challenging target of having wind supply 35 percent of power by 2050 (a huge leap upwards from the 6 percent today). But a 2016 National Renewable Energy Laboratory exploratory study calculated that 73 percent of wind energy's technical potential might be affected by wildlife issues, and 28 percent by Golden Eagles alone.[11] And Golden Eagles are a "species of concern" on the USFWS radar.

The USFWS Wind Energy Guidelines (March 23, 2012) declare that the guidelines are specifically designed to "form the best practical approach for conserving species of concern"—which are defined as including migratory birds, bats, Bald and Golden Eagles and other birds of prey, Prairie and Sage Grouse, and "listed, proposed, or

---

[9] Breining, pp. 4-5.

[10] A high estimate of 573,000 bird deaths from wind turbines in 2012 was reported by the American Bird Conservancy, which also estimated that if the U.S. manages to reach by 2030 a Department of Energy-projected 35 percent of electrical energy generated by wind, then up to 5 million birds could be killed annually, not counting losses to associated power lines and towers—hundreds of thousands or even millions more annually. See https://abcbirds.org/program/wind-energy-and-birds/

[11] Molly Bennett, "How New Technology Is Making Wind Farms Safer for Birds," https://www.audubon.org/magazine/spring-2018/how-new-technology-making-wind-farms-safer-birds, originally published as "Surveil and Protect" in *Audubon* magazine, Spring 2018. (consulted online, 14 July 2020). The National Audubon Society's (even more ambitious?) goal is to ensure that 50 percent of America's total energy comes from all renewable sources, including wind power, by 2030.

candidate endangered and threatened species."[12] Moreover, raw statistics quantifying bird mortality in general prove a blunt instrument when threats to particular species or types of creatures, such as Golden Eagles, become the urgent question.

When endangered species are at risk, comparing domestic cat kills with wind turbine mortality is beside the point. Some deeply disturbing incidents have been documented, particularly involving raptors. Wind farms first appeared in the United States in the early 1980s, and one of the first big complexes was sited along the mountain ridges at Altamont, California, a geographical feature frequented by hawks and Golden Eagles riding the wind currents that rise off the slopes. At one time, over 7,000 wind turbines spinning along the ridge tops killed an estimated 1,300 raptors per year. Lawsuits launched by several local Audubon groups and the California Attorney General brought about a settlement with the operators of the turbines to reduce deaths of Golden Eagles, Red-tailed Hawks, Burrowing Owls, and bats by half. Progress was achieved both by powering down the blades when birds were at risk, and by replacing older turbines with newer versions less lethal to raptors. Nevertheless, the Executive Director of the Golden Gate Audubon Society in Berkeley, California, Pam Young, reported recently that further measures need to be pursued: monitoring of just one Altamont Pass Wind Resource Area site recorded 32 Golden Eagles killed, 111 Red-tailed Hawks, and estimated kills of 49 Burrowing Owls and 1,742 bats, fatality figures that still exceed levels stipulated in the mitigation agreement between the operators and the USFWS.[13]

County officials in Kern County, California, have approved projects in what FWS biologists have identified as California Condor range, over the opposition of USFWS experts. In October 2011, the Sierra Club and two other environmental groups sued Kern County over its approval of a 300-megawatt NextEra Energy Resources wind project that state and federal officials had warned posed a high risk to the severely endangered condors. For comparison, an estimated 2,000 vultures are killed annually in Spain by wind turbines, and the figure may underestimate the actual toll: "The Spanish Ornithological Society (SEO/Birdlife) wrote (translation): we were able to verify the occulting [hiding] of bird carcasses by wind farm employees, who perhaps thought that their jobs depended upon the number of birds being killed in their wind farms, and that behaviour reduces the mortality rate shown in

[12] https://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf (consulted 9 July 2020)

[13] From Gustave Axelson, "Analysis: Is It Possible To Have Wind Power While Keeping Birds Safe?" in *Living Bird* magazine, Spring 2020 issue. https://www.allaboutbirds.org/news/living-bird-spring-2020-table-of-contents/ (consulted 15 July 2020)

monitoring studies." And Spain has an estimated population of 40,000 vultures, while there are only 400 California Condors.[14]

Proponents of wind energy might argue that we should eliminate feral and outdoor prowling domestic cats before we fight to prevent the expansion of their desperately needed "green" energy, while bird enthusiasts and the USFWS point out that poorly sited wind farms pose an unnecessary, out-sized threat to particular iconic, hallmark species, species already endangered, in some cases, to the tipping point.

But wind energy and conservation of native birds and bats, especially endangered "species of concern," need not be an all-or-nothing choice. Joel Merriman, Director of the American Bird Conservancy's Bird-Smart Wind Energy Campaign, points out that "wind energy and birds can coexist, but only if turbines are sited and managed properly. Alternative energy is critically important to address climate change, but we strongly believe that renewable energy sources should not be embraced without question. It must be demonstrated that the benefits outweigh the impacts." And Amanda Rodewald, Co-director of the Cornell Laboratory of Ornithology's Center for Avian Population Studies, cautions that "We need to be mindful that generating energy in any manner will impact birds directly or indirectly. Bird mortality from wind turbines may be more obvious than from other sources, but the habitat loss, water contamination, pollution, and greenhouse gas emissions from other energy sources, especially coal, are far more detrimental to birds and other species, including humans. Fortunately, the conservation community has a real opportunity to reduce negative impacts from wind energy by working with industry to properly site turbines and avoid important bird areas."[15]

Particulars

In the past decade, conservation organizations, the government, and cooperative efforts involving both the conservation community and the wind energy industry have devoted a great deal of work to devising practical, sound guidelines for wind turbine site determination, research on potential impact on wildlife and habitat, construction impacts, monitoring of operations, and, when necessary, mitigation of adverse consequences of wind energy generation. Guidelines have even been published to set best practices for decommissioning wind energy operations when their useful lifetime is over (estimated at 20 to 25 years for the average machine).[16]

---

[14] Save the Eagles International joint release, Feb. 5, 2012: savetheeaglesinternational.org/releases/wind-farms-to-wipe-out-california-condor.html (consulted 14 July 2020)

[15] Axelson, "Analysis," https://www.allaboutbirds.org/news/living-bird-spring-2020-table-of-contents/

[16] From "Where Do Wind Turbines Go To Die," by Rebecca Jacobson, 9 September 2016, on IE Inside Energy; http://insideenergy.org/2016/09/09/where-do-wind-turbines-go-to-die/ (consulted 15 July 2020)

Numerous groups have published guidelines, including the American Bird Conservancy (a wind-risk assessment map highlighting areas important to birds);[17] various state and National Audubon Society chapters;[18] the Nature Conservancy;[19] The Kansas Energy Council;[20] the Kansas Department of Wildlife, Parks, and Tourism;[21] and the already-mentioned national standard, published 23 March 2012, as ***U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines***, a publication based on the work of the Wind Turbine Guidelines Advisory Committee, which served from 2008 – 2011. Rob Manes of the Kansas Nature Conservancy and AOK Board Member Professor Robert Robel from Kansas State University were members of the advisory committee, and there were representatives of renewable energy companies and state wildlife departments, as well as National and Massachusetts Audubon, The Nature Conservancy, Bat Conservation International, Defenders of Wildlife, and the Blackfeet Nation.

More or less comprehensive and detailed in their marshalling of the diverse considerations and problems that must be taken into account in choosing a site, researching potential problems and impact on wildlife and habitat, overseeing

[17] See https://abcbirds.org/program/wind-energy-and-birds/wind-risk-assessment-map/

[18] For reports on some state initiatives, see "Putting Wind Turbines out of Wildlife's Way," by Amber Williams, n.d.https://www.audubon.org/news/putting-wind-turbines-out-wildlifes-way

[19] See the comprehensive "Site Wind Right: Accelerating Clean, Low-Impact Wind Energy in the Central United States. The Nature Conservancy's Great Plains Renewable Energy Initiative." July 2019: http://www.nature.org/sitewindright Includes essential maps showing average wind speeds and siting locations that are unsuitable for various reasons.

[20] "Wind Energy Siting Handbook: Guideline Options for Kansas Cities and Counties," Kansas Energy Council Special Report 2005-1, April 2005.

[21] "2020 Wind Energy Conversion System Criteria," 21 pages of directives covering everything from specifying the area a Commercial Wind Energy Conversion System may cover to turbine and blade design requirements and noise standards, through planning and application requirements, to operational requirements, and covering even decommissioning, restoration of site, and sanctions for abandonment. May be found at https://www.hutchnews.com/assets/pdf/KS36369619.pdf See also the (earlier?) position paper at https://ksoutdoors.com/Services/Environmental-Reviews/Wind-Power-and-Wildlife-Issues-in-Kansas/Wind-Power-Position.

construction, monitoring performance, and devising, when necessary, mitigation measures, all these guidelines agree on basics. There is agreement that wildlife conservation concerns must be addressed at all stages of land-based wind energy development. "The most important thing a developer can do is to consult with the [USFW] Service as early as possible in the development of a wind energy project."

The first caveat for developers is that, even if not precluded by federal law, some areas "may be inappropriate for development because they have been recognized as having a high wildlife value based on their ecological rarity and intactness."[22] But there are other rare and intact values besides wildlife value to be considered. As the Nature Conservancy "Site Wind Right" publication notes, beyond Wind Energy Guidelines, local regulations, and consultation with state and federal wildlife agencies, "there are other social and cultural factors that may make utility-scale renewable development inappropriate in some sites."[23] In addition to recognizing the need to avoid siting in unaltered, intact native prairie and other diminished ecosystems of unique features and value, this stipulation recognizes what one AOK member characterized as "people's desire to embrace and defend their land community—their sunrise and sunset, their night sky," and rancher and song-writer Annie Wilson described in one of her songs as "The Clean Curve of Hill Against the Sky"—"The idea is that there are just so few places on earth that you can see that, but you can see it here, where there are no trees, no towers, no buildings. . . just the prairie horizon."[24] In the case of these unique, irreplaceable scenes and experiences, that have roots deep in the psyches of the people who live and work there no less than in the life-modes of the other creatures that inhabit them, it is best, in the words of the title of a recent book by David Gessner (borrowing from Teddy Rooseveldt), to *Leave It As It Is.* If for no other reason than goodwill (and avoidance of acrimony and lawsuits), a wise developer will avoid antagonizing the local populace by imposing a wind generation facility on a site where it is widely and bitterly resented.

Clearly, a developer will want to consider whether a wind generation project can profitably be sited on any given piece of land. But to avoid possible legal and

---

[22] Quotations, unless otherwise indicated, will be from the USFWS Wind Energy Guidelines.

[23] "Site Wind Right," p. 3: http://www.nature.org/sitewindright

[24] Breining, "Power or Prairie," *Living Bird* magazine, Spring 2020.

financial difficulties down the road, the developer needs to evaluate the potential impacts of the projected facility during construction and operational life, on the landscape, the habitat at the site, and the behavior and well-being of the wildlife on site and in the vicinity. Initial surveys should provide a baseline catalogue of resident and visiting fauna as well as indigenous plant species to facilitate monitoring impact through the life of the project. As outlined in the USFWS Guidelines, this research and collection of data may take a year or more, and require consultation with experts. "To establish a trend in site use and conditions that incorporates annual and seasonal variation in meteorological conditions, biological factors, and other variables, pre-construction studies may need to occur over multiple years."

On the basis of the site-specific data collected in this period of research and observation, it will be possible to assess potential impacts on wildlife and plant communities of two kinds: there are first, the obvious direct risks involved in the disruption from construction and the continuing alteration of the landscape by the presence of the turbine towers and ancillary structures, and the threat of birds and bats colliding with the rotor blades. Second, there are "indirect risks:" less obvious effects degrading habitat over time, affecting behavior of wildlife, perhaps having ramifications compromising a larger regional population.

Indirect impacts, as well as direct impacts like collision risk, must be taken into account. Collision risk in the "rotor-swept zone," the first thing that would occur to most people anticipating problems, is most likely to affect only species like raptors and cranes and waterfowl, the latter especially if installations intercept the birds' flight path to refuges and wetlands habitually used; however, the possible danger of collision for migrating passerines, vulnerable during their ascents from and descents to stopping places, and during inclement weather, must also be considered.[25] More studies are called for. A study around the Great Lakes using radar has suggested that many migratory birds often fly at lower levels than once thought. [26]

Bats are a whole subject to themselves, with the Indiana Bat in particular meriting

[25] However the American Bird Conservancy also suggests that "nighttime migratory songbirds including Yellow-billed Cuckoos, Golden-winged Warblers, and Kirtland's Warblers are particularly vulnerable." https://abcbirds.org/program/wind-energy-and-birds/challenges/

[26] See Bowden et al. 2015; cited in "American Bird Conservancy's Bird-Smart Wind Energy Program," https://abcbirds.org/wp-content/uploads/2019/02/CCAPBirds-4-Wind_190207.pdf

63 pages in Sections 7 and 10 in the 26 October 2011 USFW Guidance for Wind Energy Projects. Traumatic injuries to bats—sheared-off wings, headless bodies, head injuries, gashes—are consistently reported by researchers. At the Buffalo Mountain, Tennessee wind farm, for example, 43.3% of the 522 bodies recovered had evidence of a major injury. A more surprising and less obvious threat to bats is barotrauma. "Barotrauma is damage to air-containing structures due to a rapid and excessive change in air pressure." While experts think the zone of risk is "very small (i.e., less than a meter)" from rotating blades, "Baerwald et al. (2008) found internal hemorrhaging in 92% of bats necropsied, indicating that internal injury is common at wind facilities."[27] There is speculation that barotrauma might also produce impairment of hearing or echolocation in bats, which would certainly directly affect the creature's chances of survival, but there is currently insufficient information to assert this positively. Bat mortality appears significantly correlated with turbine tower height and rotor diameter. Wider and longer blades on taller turbines produce far greater blade-tip vortices and blade wake turbulence compared to smaller turbines, and perhaps are more conducive to barotraumatic injuries.[28] The tips of blades seemingly rotating at a leisurely pace can achieve velocities approaching 200 miles an hour.

The rotating turbine blades at normal speeds produce another effect on wildlife less obvious than the danger of collision. They can generate levels of sound beyond ambient background levels, masking communication between animals and lessening their ability to detect danger. "Data suggest noise increases of 3 dB to 10 dB correspond to 30 percent to 90 percent reductions in alerting distances for wildlife, respectively." In addition to possible damage to hearing from acoustic over-exposure, turbine rotor sound can cause deleterious behavioral and/or physiological effects.

Other direct effects on wildlife from wind turbine projects include habitat loss owing to construction of turbine pads, roads, and other infrastructure, and habitat fragmentation. As a largely indirect effect, habitat fragmentation is a less apparent issue than replacing prairie grass and sod with concrete, electric transfer stations, and fencing, but its impact on species already beleaguered by regional degradation of preferred habitat can be subtler and far-reaching. Smaller, isolated tracts may strand breeding populations, causing genetic problems and loss of population vigor,

[27] P. 41 of USFWS Guidance for Wind Energy Projects, Indiana Bat Sections 7 and 10.
[28] *Ibid.,* p. 38.

and expose a local population to extinction owing to disease or natural disaster (think of the Heath Hen). Fragmented habitat disrupts foraging and shelter, and increases "edge" effects, creating both barriers to traditional patterns of movement, and pathways opening the way to nest predation and nest parasitism. Habitat fragmentation favors introduction of invasive plants, access by predators, and alterations in the natural fire regime, all of which may only become apparent over time. "Indirect impacts may be difficult to quantify but their effects may be significant."[29] Remember that the prairie ecosystem that is our concern here is seen as already the most threatened and diminished of any of our North American landscapes.

In the initial stages of choosing a site for a wind energy generation facility, the developer needs to consider the possible impact on particular species, the "species of concern" of the USFWS guidelines. These include, but are not limited to, species covered by the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (BGEPA) and the Endangered Species Act. Others of particular concern in our area include the Whooping Crane, Greater and Lesser Prairie Chicken and other prairie grouse, and raptors in general; the Least Tern and Piping Plover; and the Black-footed Ferret and Prairie Dogs (as Prairie Dog towns harbor the endangered ferret, provide nesting holes for Burrowing Owls, and are a magnet for Golden Eagles, Ferruginous Hawks, and other raptors). Although research on the Greater Prairie Chicken is inconclusive, prairie grouse in general have been thought to avoid nesting in proximity to tall structures, like wind turbines. There are reports of leks being abandoned because of nearby construction of wind farms, though there are other studies that show no disruption or a return to use after construction activities ceased. Older investigations recommended 5 mile buffers around leks;[30] however, a more recent seven-year study led by Brett Sandercook of Kansas State University indicated that wind turbines have little effect on Greater Prairie Chicken populations, while other range management practices are much more crucial.[31] In

[29] USFWS Wind Energy Guidelines, citing Stewart et al. 2007, Pearce-Higgins et al. 2008, Bright et al. 2008, Drewitt and Langston 2006, Robel et al. 2004, Pruett et al. 2009.

[30] E.g., *Briefing Paper*: "Prairie Grouse Leks and Wind Turbines: U.S.Fish and Wildlife Service Justification for a 5-Mile Buffer from Leks; Additional Grassland Songbird Recommendations" Date:July 30,2004 https://www.fws.gov/southwest/es/oklahoma/documents/te_species/wind power/prairie grouse lek 5 mile public.pdf

[31] http://www.osti.gov/bridge/product.biblio.jsp?osti_id=1080446.

any case, until more solid and consistent data on other species of prairie grouse are available, the Nature Conservancy Site Wind Right guidelines recommend avoiding siting wind facilities in any areas where there are known occurrence records of Attwater's Prairie Chicken and in the Refugio-Goliad Prairie Conservation Area in Texas; Columbian Sharp-tailed Grouse production areas and winter range in Colorado, and creation of buffer zones ranging from 5 km to 2 km around known leks and production areas of prairie grouse in Wyoming, Colorado, Kansas, Oklahoma, and Missouri.[32] Clearly, more research is needed, but in the meantime, prudent avoidance of impinging on leks and associated nesting habitat of prairie grouse with new wind farms would seem to be indicated.

Procedures

Substantial agreement exists among all the various published guidelines on basic principles governing siting of wind generation facilities, points most of which are articulated concisely by the KDWPT official statement published in November 2017.[33] They are: 1) Siting should be on previously altered landscapes such as areas of extensive cultivation or urban and industrial development, avoiding intact native prairie and sensitive wildlife habitats and important migration corridors and staging areas. 2) Projects should conform to siting guidelines, such as the Land Based Wind Energy Guidelines produced by the USFWS. 3) Adequate studies by qualified experts should be conducted before construction begins, during construction, and during operation of the completed facility, to inventory plant and animal communities and enable careful monitoring of impacts, and devising correctives. 4) Avoidance of siting that creates unmitigable high risk to birds and bats is always preferable to compensatory offsite mitigation efforts. 5) During operation of the site, employ qualified experts to conduct censuses of plant and animal communities following on baseline studies, and to determine seasonal use, as for example, rest and refueling sites during migration, or wintering sheltering areas. 6) Involve scientific experts as well as staff of federal and state wildlife agencies in assessing impacts of the project's wind energy generation on wildlife and habitat. 7) Finally, most guidelines provide directives anticipating the retrofitting and repowering of the turbines during their useful life, and their eventual decommissioning and restoration of the site to its original state, as nearly as may be. Running through all these guidelines the importance of early and regular communication between developers and the USFWS is stressed.

---

[32] "Site Wind Right," p. 11: http://www.nature.org/sitewindright

[33] https://ksoutdoors.com/Services/Environmental-Reviews/Wind-Power-and-Wildlife-Issues-in-Kansas

The USFWS publishes the most comprehensive set of guidelines, breaking down the recommended steps to be taken into five "Tiers," and providing 27 briefly summarized "Best Management Practices" for operations, plus five more covering retrofitting, eight on repowering, and nine on decommissioning. The tiered approach is designed to assure early discovery of problems, and to facilitate and regularize the process of choosing a site, assessing potential impacts and risks, and dealing with unforeseen problems.

Tier 1 specifies "landscape-scale screening of possible project sites." This stage would seem to serve mainly to rule out sites that are too close to federal, state, and private wildlife reserves, major staging areas for migrants, breeding grounds for "species of concern" such as raptors and prairie grouse, or sites that have already been identified as "having a demonstrated and unmitigable high risk to birds and bats." Much of the screening anticipated here could be done from published state and federal data and maps, and compilations such as The Nature Conservancy's Site Wind Right maps.

Tier 2 moves to site-specific surveys and evaluation of attendant risks. The third tier moves from the results of Tier 2 studies to devising in consultation with the Service ways of mitigating potential direct and indirect impacts discovered. The USFWS anticipates that not every tier will be required for every project; if the first two or three tiers have not identified significant problems for wildlife and habitat, the developer need not proceed to the fourth and fifth; likewise "distributed and community facilities[34] will not need to go beyond Tiers 1 and 2." There is reason to be concerned about a certain laxity in application here, though, as the document asserts that "in the vast majority of situations, appropriately sited small wind projects are not likely to pose significant risks to species of concern." "Vast majority," "not likely," and "significant" are clearly doing a lot of work in that qualification. Also, "answering Tier 1 questions satisfactorily" is seen as "precluding, in many cases, the need for full detailed pre-construction assessments or monitoring surveys." It can be rash to allow the broad-brush review specified in Tier 1 to obviate the need for careful site-specific study and assessment, given the range and local variation possible within a broadly defined zone or regional habitat. However, if Tier 2 is done, and if it reveals the presence of "species of habitat fragmentation concern," or "the presence of plant communities that provide habitat

[34] "Distributed wind" designates "small and mid-sized turbines between 1 kilowatt and 1 megawatt that are installed and produce electricity at the point of use to off-set all or a portion of on-site energy requirements."

for species of concern," or "critical congregation areas for species of concern," then the developer must move on to the more rigorous and thorough field studies documenting site wildlife and habitat in granular detail, and predicting and devising mitigation for project impacts.

By the time the developer has reached Tier 3, then, possible problems may have been uncovered that necessitate more thorough and extended study. And the USFWS recommends very thorough and extended study, indeed; in some cases, requiring studies to be conducted not only in different seasons, at different times of day, and in different years, from two to several. Here, too, detailed consultation with qualified experts, biologists, botanists, ecologists and other scientists, becomes essential. The USFWS Guidelines provide detailed instructions and citations for methodologies to be employed in conducting, for example, "diurnal avian activity surveys," "raptor nest searches," and "prairie grouse and Sage Grouse population assessments, and nocturnal and crepuscular bird surveys." Elaborate recommendations for bat monitoring methods, roost searches and exit counts are provided, both in the Guidelines and in the separate document, revised 26 October 2011, dealing specifically with the endangered Indiana bat and how their habits and vulnerabilities differ from other, unrelated bat families. The data turned up in Tier 3 studies feed the attempts, also relegated to Tier 3, to adapt or invent mitigating strategies to reduce problems discovered to "acceptable" levels.

Tiers 4 and 5 go on specifying guidelines and practices for monitoring impacts predicted by the studies conducted in earlier tiers, and addressing further efforts to strengthen mitigation efforts, if necessary.

The thoroughness of the "Best Management Practices" recommended in the USFWS Guidelines is indeed admirable; many points of detail are worth incorporating into any proposed state or county regulations. Low and medium voltage connecting power lines associated with the wind energy development should be buried, or, if burial is impracticable, located away from such high bird crossing areas as between roosting and feeding areas, or between lakes, rivers, and prairie and sage grouse leks and nesting habitats; they should be "marked in accordance with Avian Power Line Interaction Committee (APLIC) collision guidelines," and power lines, transformers, and conductors should follow the 2006 or most recent APLIC "Suggested Practices for Avian Protection on Power Lines." Guyed communication towers should be avoided. Lights used should be equipped with motion sensors and switches to keep lights off when not required; likewise, lights should be directed downward to minimize horizontal and skyward illumination, and high intensity lighting should be minimized. Non-disturbance buffer zones should be installed to

protect sensitive habitats or areas of high risk for species of concern, as identified in pre-construction studies, their extent to be determined in consultation with "credible experts as appropriate." (These buffers also protect the turbines from damage during periodic controlled burns.) Avoid impacts on hydrology and stream morphology; use appropriate erosion control measures. Use invasive species prevention and control measures as directed by county, state, or federal requirements; clean vehicles and equipment that might import known invasive species into the site, use locally sourced topsoil, and monitor for and remove invasive species at least annually. Use native species when seeding or planting during site restoration. When the wind facility is retired, no longer needed roads and facilities should be demolished, removed, and their footprint stabilized and re-seeded with native plants appropriate for the soil conditions and native habitat.; topsoils removed during decommissioning should be stockpiled and used as topsoil when restoring plant communities. In conjunction with the land owner and state and federal wildlife agencies, the facility operator should restore the natural hydrology and plant community "to the greatest extent practical."

Commented [E1]: This shifts to second person. Should this whole paragraph summarize the suggested practices with bullet points in second person?

Problems

Clearly, an immense amount of thought and discussion has gone into devising these detailed guidelines for siting wind energy facilities to minimize impact on vulnerable wildlife and habitat. But the fundamental problem consists in the fact that all these suggested practices and step-by-step directives are just that: "guidelines," "suggestions," "voluntary engagements." Everything is presented in the subjunctive mode: "developers *should,*" "studies *may* need to occur." Says Dr. Michael Hutchins, National Coordinator of the American Bird Conservancy's Bird Smart Wind Energy Program, "Attempts to manage the wind industry with voluntary as opposed to mandatory permitting guidelines are clearly not working. Wind developers are siting turbines in areas of vital importance to birds and other wildlife, and this new data shows that the current voluntary system needs radical improvement." [35] Concerning pre-construction surveys of risk called for in the USFWS Guidelines, the ABC reports:

> these assessments are typically conducted by industry-hired consultants. We consider such non-independent analyses of risk to be a conflict of interest. Indeed, ABC and others have noted several cases of paid consultants downplaying the potential risk to wildlife so that their clients can obtain the necessary permits and begin construction, including at least two cases in Minnesota. This is highly

[35] https://abcbirds.org/article/wind-turbines-being-installed-in-sensitive-bird-habitat-on-massive-scale/

> problematic since, to our knowledge, no wind energy company has ever been shut down post-construction, not even the notorious Altamont facility that has killed thousands of federally-protected birds.[36]

Moreover, the ABC asserts that the USFWS recognizes wind energy companies' claim that statistics on bird kills on their projects are property of the companies, as if they were "trade secrets." Without access to such data, how can government agencies, conservationists, or the public hold wind energy companies accountable for damage done?

The only enforcement "teeth" that the voluntary USFWS Guidelines have is the option of the government bringing suit against a wind company to recover fines and mandate corrections when "species of concern"—species protected under the MBTA, BGEPA, or ESA (and "candidate species") are "taken." Since fatalities among these protected birds exceeding the predicted norms for any given project could result in millions of dollars in costs to an energy company, even after a project has been completed and is operational, there is a strong incentive for companies to be less than forthcoming with data on bird kills. The ABC warns that

> Self-reporting of bird (and bat) fatalities continues to be a major conflict of interest, especially since wind energy companies may be subject to expensive fines, mitigation, or prosecution if they are forthcoming. We believe it is time for independent monitoring of bird deaths at wind energy projects.[37]

Although over 400 MBT violations were lodged by the government against oil and gas companies in the two decades preceding the promulgation of the wind energy guidelines, there had been no prosecutions of a wind energy company prior to the issuance of the Guidelines. In 2013, however, Duke Energy Renewables was charged with killing 163 protected birds including Golden Eagles, larks, and blackbirds at two Wyoming sites. The following year, also in Wyoming, PacifiCorp Energy was prosecuted for avian mortalities at two of its sites. Both companies pled guilty to having knowingly constructed facilities that they knew would likely kill protected birds. Both companies were fined—Duke $1 million, PacifiCorp $2.5 million—and ordered to put in place mitigation plans.[38] However, as noted above, in November 2014, Pacifico sued the USFWS to keep information on bird kills secret.[39] As long as such information is not available to the public or researchers, as well as

---

[36] https://abcbirds.org/program/wind-energy-and-birds/challenges/
[37] See https://abcbirds.org/program/wind-energy-and-birds/challenges/
[38] From https://www.audubon.org/magazine/spring-2018/how-new-technology-making-wind-farms-safer-birds

[39] "Wind Energy and Birds: Are They Compatible?" ABC: https://abcbirds.org/program/wind-energy-and-birds/challenges/

the USFWS, all the provisions in the USFWS Guidelines stipulating projections of likely impacts compared with studies of actual mortality figures are nugatory.

The ABC has published a very useful bird risk assessment map,[40] which identifies particularly vulnerable areas: "major migratory routes, breeding areas, and sensitive habitats such as wetlands." The areas identified as "critically important," colored red on the ABC map, "have extreme potential for major negative impacts on federally protected birds," but these comprise less than nine percent of the total U.S. land area. In Kansas, the areas around Cheyenne Bottoms and Quivira National Wildlife Refuge, and the extreme southwestern corner of the state are the only areas colored red on the ABC map, but all of the state from Salina and Hutchinson in the east to west of Goodland, Garden City, and Liberal are overlaid with three shadings of yellow-ochre, with the darker shading, representing Bird Areas of Globally High Importance, covering most of the center of the state west of US Highway 81. (There is also a "critically important" red area that starts just north of the Oklahoma state line southwest of Wichita, adjacent to several concentrations of existing wind turbines.) The ABC concludes that overlaying their Bird Risk Assessment Map with U.S. Geological Survey and Federal Aviation Administration maps show that "tens of thousands of turbines already exist in sensitive areas for birds, and tens of thousands more are planned." 5,500 existing turbines are already located in the migratory corridor of the endangered Whooping Crane, and 18,500, with their associated power lines and towers, are planned for that critically important area.[41] "Wind turbines may now be among the fastest-growing human-caused threats to our nation's birds. Attempts to manage the wind industry with voluntary as opposed to mandatory permitting guidelines are clearly not working. Wind developers are siting turbines in areas of vital importance to birds and other wildlife, and this new data shows that the current voluntary system needs radical improvement", said Dr. Michael Hutchins, National Coordinator of ABC's Bird Smart Wind Energy Campaign.[42]

Research by ABC with the dateline August 20, 2014 showed that nearly 30,000 wind turbines have already been installed in those red areas marked of "high importance" to federally protected birds in the U.S.; at that time, another 50,000 more were planned in similar areas, including more than 16,000 in the Whooping Crane migration corridor, and 1,800 in sage-grouse breeding strongholds. "We were dismayed not only to find that the wind industry is building turbines in high bird impact areas but also in areas where the wind resources and return on taxpayer investment are marginal at best," said Dr. George Fenwick, President of ABC. "In fact, more than 10,000 turbines are planned in or close to sensitive bird locations in

[40] https://abcbirds.org/program/wind-energy-and-birds/wind-risk-assessment-map/
[41] "Wind Energy and Birds: Are They Compatible?" https://abcbirds.org/program/wind-energy-and-birds/challenges/
[42] https://abcbirds.org/article/wind-turbines-being-installed-in-sensitive-bird-habitat-on-massive-scale/

areas with wind power class grades one or two, the lowest categories for profitability."[43]

A notable instance of bad behavior by a wind energy company was the refusal of the Humboldt Wind Energy Project to pay any attention to concerns raised by experts, the California Department of Fish and Wildlife, environmental organizations, and many concerned citizens. The 47 wind turbines proposed for the Bear River and Monument Ridges in Humboldt County, California, presented substantial risks to federally threatened species, including the Marbled Murrelet and Spotted Owl, as well as other "species of concern" like the Bald and Golden Eagle. The proposed site overlaps the National Audubon Society-designated Cape Mendocino Grasslands Important Bird Area. Concerns raised included questionable calculations of numbers of threatened birds likely to be killed by the project, inadequate compensation measures for mortality of birds and other wildlife, and insufficient provision of long-term monitoring and mitigation measures. Joel Merriman, Director of the Bird-Smart Wind Energy Program at ABC, commented, "It's hard to conceive of a worse place to put wind turbines." In a 37-page comment letter, the California Department of Fish and Wildlife charged that "all or portions of the wind turbine facilities fall into Category 4, Project Sites Inappropriate for Wind Development." This judgment would suggest that the project ought to have been abandoned. However, the developer did not shelve the project, and suggested mitigation measures fell on deaf ears. Comments on the Draft Environmental Impact Report from local experts suggesting measures that would have reduced impacts on birds and other wildlife were largely ignored in the Final EIR, and the Humboldt County Planning Commission fast-tracked the public hearing with only four days allowed for response to the FEIR, and the hearing for final approval set for only nine days later. Tom Wheeler, Executive Director of the Environmental Protection Information Center (EPIC) commented, "Too many proven measures have been left on the table—things that have been adopted, often voluntarily, at other wind projects." Urging the Humboldt County Planning Commission to send the project back to the drawing board until an acceptable substitute could be drafted, Merriman summarized, "This proposed project does not provide enough information, proposes inadequate mitigation, and ignores precedent and best practices. This puts too many rare and iconic bird and other wildlife species at unnecessary risk."[44]

When wildlife advocates in three separate counties in Kansas—Reno, Marion, and McPherson Counties—recently contacted AOK because industrial wind companies were threatening their "land communities," AOK found that site proposals included native prairie, migration corridors, wildlife gathering spots, and sites too close to state wildlife areas, all violating state and federal guidelines. In Reno county, eight proposed turbines would incur multiple violations, fragmenting native prairie,

[43] Ibid.
[44] https://wildcalifornia.org/wp-content/uploads/2019/11/Humboldt-Wind_Press-Release_Nov-2019_ABCbirds_Final.pdf

impacting wetlands, degrading critical habitat for threatened and endangered species, and violating the three-mile buffer around Cheney State Park and the Cheney Lake Wildlife area. The developer ignored objections, noting that Kansas's guidelines were "purely a recommendation—not a rule or regulation." When objections were raised, the developer of a proposed site in Marion County simply refused to schedule the recommended KDWPT official site review.

Clearly, there are good citizens and bad citizens among wind energy producers. Organizations like the American Wind Energy Association and the American Wind Wildlife Institute have cooperated with the Nature Conservancy's Great Plains Site Wind Right initiative. Evergy, a power company serving more than 1.6 million customers in Kansas and Missouri, is using Site Wind Right maps in making their wind facility siting decisions.[45] The Skookumchuck Wind Energy Project in western Washington State contrasts markedly with the Humboldt Wind Energy Project on the Bear River and Monument Ridges in California. Skookumchuck, the only approved wind energy project in the Marbled Murrelet's breeding range, has complied with stipulations that it curtail turbines during high bird activity periods in the Marbled Murrelet breeding season.[46] Curtailment (turning off the rotors) is an approved best practice for wind energy projects at discreet periods when bird or bat activity threatens unacceptable fatalities; it is even used at some California wind turbine sites, for example, at the Tehachapi Wind Resource Area, when an individual condor sporting a miniature radio transmitter or GPS transmitter is tracked as approaching operating turbines.[47] This is a process often referred to as "informed curtailment." It has been used to avoid collisions of rare and protected species such as Whooping Cranes and Golden Eagles, in addition to California Condors. It is enjoined on the operators in both the PacifiCorp and Duke plea agreements in 2014.[48] (Clearly, fitting all species of concern with radio transmitters or GPS would be impractical; it works for condors because there are so few of them, most released from captive breeding programs. Some curtailment regimes employ human spotters—a labor-intensive approach that might serve in predictable, limited

[45] Breining, "Power or Prairie," *Living Bird* magazine, Spring 2020.
[46] "Conservation Groups Urge Rejection of Controversial California Wind Energy Project": https://wildcalifornia.org/wp-content/uploads/2019/11/Humboldt-Wind_Press-Release_Nov-2019_ABCbirds_Final.pdf
[47] Molly Bennet, "How New Technology Is Making Wind Farms Safer for Birds," *Audubon* magazine, Spring 2018: https://wildcalifornia.org/wp-content/uploads/2019/11/Humboldt-Wind_Press-Release_Nov-2019_ABCbirds_Final.pdf
[48] 1 September 2017 "A Review of Options for Mitigating Take of Golden Eagles at Wind Energy Facilities," by Taber D. Allison. J. of Raptor Research, 51(3):319-333 (2017). (consulted 19 July 2020) https://doi.org/10.3356/JRR-16-76.1.

periods of high activity, say, of Whooping Cranes in migration approaching known resting areas.)

Much remains to be known about actual consequences of wind turbine interactions with wildlife and wildlife habitat; research continues, and evidence accumulates for the accuracy of preliminary estimates of impacts on species of concern and others, and for the effectiveness of measures taken to compensate for or mitigate losses predicted in those estimates. But fundamentally, in the USFWS Guidelines for Best Practices and similar guidelines issued by state wildlife agencies, conservation organizations, and local governments, we find that we already know that the first requisite for an acceptable wind energy facility is proper siting; and we already know what factors determine proper siting, and what locations and conditions ought to be avoided altogether. But all this accumulated and accumulating knowledge is rendered useless by slapdash preliminary screening of potential sites, short-circuiting of consultation with the USFWS and qualified local authorities, rejection of sound practices as "suggestions, not laws," and lack of candor in assessing and reporting project impacts.

This is not to mention the reports of wind project developers steam-rolling local authorities to gain permissions, threatening lawsuits if denied, presenting one set of plans for approval and then switching after approval is secured (for example, building wind towers many feet higher than the dimensions submitted and authorized). Bad actors that engage in such behavior can scarcely be expected to follow through with the monitoring studies and reports that assure the safest operation of their facility. That lack of follow-through is doubly damaging, because such studies and reports would become part of the base of information on which future changes to the guidelines will depend. Despite the shining examples of good citizenship and cooperation afforded by many wind energy companies, a patchwork of state "suggestions" and the largely voluntary federal guidelines constitute a wholly unsatisfactory solution to a growing environmental problem. If nothing else, the lack of a uniform national code that is enforceable would present a constant threat to migratory birds that pass from one jurisdiction to another, and to environmental resources that, in some cases, like our national parks and monuments, though actually located in one state or more, are part of the heritage of the American people at large. This is why federal regulations and laws, not just "guidelines" and suggested practices, are essential.

It will be hard, in America, to persuade legislators to enact adequate laws that would answer to the need. Politicians are reluctant to interfere with owners of private property who wish to supplement their income with wind farm leases, even though the greater good of the community would seem to call for such action. Even the voluntary agreement protecting the Flint Hills in Kansas, negotiated by then-governor Kathleen Sibelius and extended by Governor Sam Brownback, has been challenged by pressure on current Governor Laura Kelly from at least one county board to allow more wind projects into the protected area now known as the "governor's box." "Every time we get a new governor the issue comes up again,"

says Brad Loveless, Kansas Secretary of Parks, Wildlife, and Tourism. "I don't imagine there's a lot of appetite on the part of the Legislature to legislate at protecting certain areas. All it takes to make a project work is a developer willing to site a project, a county that's willing to accept it and approve it, and somebody that's willing to buy the power. Given the right circumstances, all those things could come together and they could put wind power in a really bad spot."[49]

Green energy is good, but not all wind energy generation is harmless. But we don't have to oppose wind energy categorically; studies conducted by the Nature Conservancy estimated that even after subtracting sensitive wildlife habitats from the nearly 222 million acres of land in the Central Plains that would be suitable for development, based on wind speed and terrain, approximately 91 million acres would remain, amounting to nine percent of the region; and these low-impact areas could yield approximately 1,099 GW of electrical energy. That amounts to more then ten times current U.S. wind capacity and is equivalent to the total generating capacity from *all* sources (AWEA 2019b, USDOE 2017.[50]

"We can and must do better if future generations of Americans are going to have a chance to see some of our nation's most iconic bird species," said [Dr. Michael] Hutchins [ABC National Coordinator of the Bird Smart Wind Energy campaign]. "Our nation's wildlife should not be collateral damage in the battle against climate change, especially when much of the conflict could be easily addressed through better siting of wind projects and improved regulation."

--M. L. Donnelly

19 July 2020

[49] "Power or Prairie," by Greg Breining: *Living Bird* magazine, Spring 2020.
[50] "Site Wind Right," The Nature Conservancy, July 2019.
http://www.nature.org/sitewindright