# WHAT DO WE KNOW ABOUT CUMULATIVE OR POPULATION IMPACTS?

This session was structured as a panel discussion concerning the potential cumulative impacts of wind turbines on bird and bat populations over time. Panel members gave brief presentations that touched upon what is currently known, what laws apply, and the usefulness of population modeling. Topics addressed included which sources of modeling should be included in cumulative impacts, comparison of impacts from different modes of energy generation, as well as what research is still needed regarding cumulative impacts of wind energy development on bird and bat populations.

## *Paul Kerlinger, Curry & Kerlinger, LLC*[18]

With respect to permitting on private land, almost all states with state-level permitting processes make permitting conditional on looking at potential significant biological impacts (local, regional or global), especially for declining, threatened, or endangered species. Permit applications often ask about cumulative impacts. By definition, any project will have cumulative impacts. But how do you deal with that? Do you add potential impacts from a given (wind) project to all the impacts from cell towers, traffic, hunting, etc?

The Migratory Bird Treaty Act stipulates that, if you kill any migratory birds, you are at risk of prosecution, even if you have reason to believe that the risk is small.

Population modeling is complex and challenging. If a species population is declining, how many fatalities will it take to push that population over the edge (so to speak)? How many fatalities for a given species or population before you affect a percentage of the population that is biologically significant? Although we lack many of the reproductive and survivorship parameters needed to run such models and it is hard to put confidence intervals on the results, population modeling issues are not insurmountable.

## *Al Manville, U.S. Fish and Wildlife Service*

We know now that, with the exception of Altamont Pass, wind impacts on avian populations appear to be low, based on projects assessed and data publicly released from the West, Midwest, and one project in the East. Wind energy is growing exponentially in the US, which raises concerns – as does the fact that 223 bird species (>26% of the 836 species USFWS is currently tasked by law to manage) are in trouble, and that we don't know the status of about one-third of the birds that we're managing.

We know that probably all birds succumb to human-induced threats. While USFWS can deal substantially with some of these threats – e.g., turbines, communication towers, and power lines – there is not much USFWS is able to do about other threats (such as pesticide

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poisoning and global climate change). Raptors are a greater collision concern in the West while songbirds and bats are more of a concern east of the Rocky Mountains. We know that grassland songbirds and prairie grouse – especially those lek-breeding species – are very sensitive to structures, disturbance, and habitat fragmentation. All prairie grouse are declining and some are in very serious shape. The current edition of *The Wildlife Society Bulletin* provides a detailed discussion of the fate of prairie grouse. We need to look very closely at the heights songbirds migrate particularly in the East, certainly in New York at the Flat Rock Project, based on preliminary findings by Cooper and Mabee (2000). We need to know much more about bird and bat use and migration along and over Appalachian ridge-tops. We know very little about bats, except that their populations are declining and Federally endangered species like the Indiana and Virginia big-eared bats, among others, are in serious trouble.

Regarding the question about what laws currently apply, we must look on both public and private lands. On public lands, Sections 7 and 9 of the Endangered Species Act (ESA) apply, as well as the National Environmental Policy Act (NEPA), the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (BGEPA), and Section 404 of the Clean Water Act (CWA; dealing with wetlands) all apply.

On private lands, Sections 9 and 10 of ESA apply, as do MBTA, BGEPA, and Section 404 CWA. Most of these acts address the issues of "takings" and may require permits.

With regard to population modeling, Richard Podolsky's Avian Rate of Collision modeling efforts are of interest and may be helpful in predicting risk from turbine collisions. Granger Hunt's Golden Eagle modeling at Altamont Pass regarding "floater" birds provides some very interesting insights, but raises questions about stability of the Golden Eagle population in the area. Overall, modeling anthropocentric causes of mortality is interesting but not particularly useful since there still are too many unknowns. Models, as such, may therefore not be that reliable.

Regarding the question of sources of mortality to include in cumulative impacts, there are several. Density-independent mortality such as natural catastrophes needs to be factored in. Density-dependent mortality by factors such as stress, starvation, predation, disease, and parasitism must also be included. These two types constitute natural mortality. Human-caused impacts are significant but hard to quantify. For example, anywhere from an estimated 300 million to more than 1 billion birds die per year in the US from structural impacts. Of these, anywhere from 98 to 980 million birds are estimated to strike windows and die each year in the US. Unfortunately, statistics such as these are not particularly useful because the ranges are so large. There is a major bias that must be considered. We are unable to factor behavioral impacts – issues like disturbance, disruption, and avoidance – into models. This is a major shortcoming. We need to work to quantify and factor in these variables if we can. The USFWS will do everything we can to reverse populations trends from human impacts, whether those impacts appear to be large or small, on public or private lands.

Which "straw" will eventually break the camel's back? Which "straws" can we deal with to reverse population trends? Hopefully, wind energy development is not the last straw, but

anywhere we can reverse mortality trends (or keep them low) that will help.

As for comparing impacts from different modes of energy generation – again, there are many unknowns. How do we quantify specific avian and bat impacts from global climate change? Acid precipitation? Mercury contamination? We can estimate bird mortality at oil pits and this issue is being resolved. How can we estimate habitat destruction from open-pit and mountaintop-mining? How can we estimate impacts from burning of fossil fuels?

On the issue of "beyond birds and bats," several thoughts come to mind. We next must address offshore wind issues. Habitat fragmentation is a critically important issue. Habituation is another issue requiring serious consideration. We need to look at the impacts of wind on insects, especially bees and butterflies. We need to address the issue of "good" versus "bad" places to site wind plants. Lastly, we need to seriously consider using an ecosystem approach to the analysis of impacts.

What is needed? More data are needed on bats, including migration routes, behavior, movement, breeding and wintering range, attraction, sonar use, and their population status. USFWS would like the opportunity to review, critique, and comment on consultants' monitoring protocols. We need an accepted definition of "cumulative impacts." Data need to be peer-reviewed and published in credible scientifically journals. The ideal scenario would include peer-reviewed or peer-refereed data published in credible ornithological and mammalian journals.

## References

Cooper, B.A. and T. J. Mabee. 2000. Bird migration near proposed wind turbine sites at Wethersfield and Harrisburg, New York. Unpublished report prepared for Niagara–Mohawk Power Corporation, Syracuse, NY, by ABR, Inc., Forest Grove, OR. 46 pp.

### *Bill Kendall, US Geological Service*[19]

How do we look at biological significance for other species? Ultimately, "biological significance" is in the eye of the beholder. We can consider levels of significance from the individual to family group to local population to breeding/wintering population. Usually, when we talk about "biological significance," we are talking about the latter two levels.

The basic equation for population modeling is:

$$N_{t+1} = N_t + \text{births} + \text{immigrants} - \text{deaths} - \text{emigrants}$$

Habitat disruption can affect mortality as well as reproduction rates. The significance of individual fatalities varies. "Value" factors for an animal include: sex, age, time of year,

[19] This presentation was a short version of a talk given by Bill Kendall and Doug Johnson in Fall, 2003

whether the population in question is at "carrying capacity" (in which case fatalities are not critical) or near "minimum viable population size" (in which case small numbers of individual fatalities may be critical for the population).

Whether population impacts are significant depends on what the management objectives are: To avoid extinction? To maintain a local population? It is important to define the "population" of interest. For example, in the case of the population study of Golden eagle in the Altamont Pass, the focus is limited to Golden eagles in the Altamont.

We cannot look at the impact of wind on birds without looking at it in context of other anthropogenic impacts. And given multiple factors in bird population impacts, which factor do you try to control?

### *Discussion, Questions and Answers*

*Comment/Question:* If there's no uniform definition of what's biologically significant – USFWS has 78 different Ecological Service Field Offices – we can't come up with a uniform vision and a roadmap. Ideally, the wind industry and its proponents would like to look at "build-out" scenarios (achieving the wind energy's potential capacity) and coming up with standards and a vision and a roadmap, as opposed to various agencies operating in a reactive mode.

*Response:* FWS guidance is a work-in-progress, whereas the Bald and Golden Eagle Protection and Migratory Bird Treaty Acts are well-established "strict liability" laws. What we're trying to do, for example, with the electric utility industry is come up with a guidance document for industry – an avian protection plan – to use with respect to avian mortality. Message to the industry is "work with us, provide feedback on our guidance."

*Comment:* We have been trying to deal with cumulative impacts for waste management in New York state, and the state doesn't deal with cumulative impacts very well.

*Response (Paul Kerlinger):* Each state's process is different. You have to look at how they've dealt with similar issues in the past.

*Follow-up on earlier discussion of biological significance: What about trying to set thresholds for birds?* The threshold would depend on each bird's status ("watch list," "sensitive," etc.) – depending on species, a take of x% may be sustainable or it may not. From this you could extrapolate mortality for wind build-out and see what kind of impact you might expect to see.

*Facilitator:* But would such a framework or modeling tool be used just for wind development, or for all kinds of development?

*Comment:* Ornithologists are looking at conservation plans, coming up with goals for different bird populations for individual states for planning purposes.

*Comment:* It is interesting that a panel on biological significance still comes back to

individual project impacts. It's important not to give up on big picture effort, to put project-based impacts in perspective.

*Response (Al Manville):* As I just mentioned, we're working with the electric power line industry to develop voluntary guidance; we're trying to work with the communication tower industry – doing this industry-wide, not just on a project-by-project basis.

Developers are just dealing with the margins; no one is looking at all the cumulative impact, just focusing on the marginal impact, no matter how small.

*Comment*: Salmon recovery in the PNW is a good example of trying to grapple with cumulative effects and biological significance. Look at what Daniel[20] is doing for a model.

*Comment*: If you want to try to establish a policy framework that optimizes energy choices from an environmental perspective, the direction has to come from higher up – e.g., from the state public utility infrastructure as well as at federal level. The trade-offs have to be made transparent.

*Response*: New sources always get regulated more than old sources. Coal and agriculture have and have had a tremendous impact. Bird deaths have driven the pesticide regulatory acts, resulting in a very strong infrastructure for this. It's impressive that the wind industry is here doing this, because nobody is going to change the Mining Act of 1872, but it's a fact of life that wind is being developed under much more stringent conditions.

*Comment/Question*: If we can't model because we don't have enough data inputs, we're left with the "tyranny of small decisions." But if we can determine what the national average is for bird and bat fatalities per turbine or per MW, why even consider building projects that are likely to exceed that average?

*Response*: There are national averages, but there are also regional averages.

*Response*: We know where to build projects that kill fewer v. more birds. (We have less information on bats.)

*Response*: The point is that we can bring down the mortality levels.

*Comment*: "Birds per turbine" is the wrong denominator. Birds (or whatever environmental impact) per unit of energy production is how we should be discussing this, because then the question then becomes how do you reduce environmental impact of energy production – and then you can compare impacts across energy resources.

NWCC has been wrestling with this. "Number of homes served" as a denominator makes it clearest to consumers. Mountaineer project kills one bird per every 105 (or so) homes

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served. This helps put things in perspective.

*Comment*: Keep in mind that highly productive organisms like prairie dogs can withstand a lot of fatalities. In such cases, if I want to think about biological significance, I think in terms of habitat rather than fatalities. If we can maintain adequate habitat for resilient species, we don't have to worry about losses in a particular location.

*Response (Al Manville)*: This is a good point; probably the greatest threat to all species is loss of habitat. An example would be the loss of over-wintering habitat for neotropical migratory songbirds in Latin America.

*Response*: We have to be more concerned about long-lived, less productive species.

*Comment:* Dale [Strickland]'s slide emphasizing European concern with habitat is important. Habitat is the real issue, especially for prairie grasslands and lekking areas.