A Review and Critique of Risk Assessments

Considered by the U.S. Fish and Wildlife Service

Regarding the Collision Risk for Whooping Cranes with NPPD's R-Project

January 30, 2019

To: Kevin Whalen, Unit Supervisor, U.S. Geological Survey Cooperative Research Units Program

From: David E Andersen, Leader, Minnesota Cooperative Fish and Wildlife Research Unit

RE: Review of the U.S. Fish and Wildlife Service Risk Assessment Regarding Collision Risk for Whooping Cranes with NPPD's R-Project

As per your request, I am providing my assessment of the U.S. Fish and Wildlife Service's risk assessment, referenced above. Your review instructions were to address the following: (1) is the white paper's take assessment and underlying assumptions based on best available science?; (2) do the final conclusions of the white paper match up with species biology and current scientific understanding of future species growth and threats?; and (3) what are (identify) the limitations and/or deficiencies with the Services' approach and assumptions in their conclusion on Whooping Crane risk to take?

To address this charge, I explicitly list each of the conclusions from the U.S. Fish and Wildlife Service's risk assessment, identify the assumptions associated with that conclusion, describe the science used to support that conclusion, and provide my assessment of whether the conclusions are reasonable, given that science. Following that assessment of each conclusion, I end my review by addressing each of your three instructions specifically.

Conclusions contained in the 30 January 2019 U.S. Fish and Wildlife Service White Paper:

(1) The Service concluded it is reasonable to assume that using BFDs could reduce collision risk within the range stated in the literature.
Assumption: Whooping cranes may demonstrate behavior comparable to that of other bird species for which behavioral responses to BFDs have been assessed.
Best available science: It has been demonstrated that some bird species exhibit avoidance behavior in respond to BFDs.

Review conclusion: The response by whooping cranes to BFDs affixed to newly constructed transmission lines is unknown. Likelihood of collision by whooping cranes *could* be reduced in the presence of BFDs, but whether that is the case and what the magnitude of the effect of BFCs might be is not known. It is logical to assume that whooping cranes are more likely to respond to BFDs as other bird species respond to BFDs than not to respond or to respond in a different manner, but there appear to be no data to evaluate that assumption.

(2) …the Service (2018c) demonstrated that if the assumptions and Service (2018b) analyses were applied to power lines across the entire range of whooping cranes, or at least the range in Nebraska, NEFO's quantitative analyses (and therefore their life-of-project projections) imply a level of effect two to four orders-of-magnitude greater in scale than the scale of the R-Project action, thus bringing into question the very plausibility of the NEFO projections (and by similar logic Ecosystem Advisors 2017). Therefore, the assumptions in and results of these analyses are highly suspect and not considered plausible.

Assumption: Useful models of interactions of birds with power lines used to project risk of power-line strikes should produce projections of the expected number of whooping crane mortalities commensurate with the magnitude of increase in exposure risk resulting from addition of transmission lines contemplated in the R-Line Project.

Best available science: Current estimates of whooping crane mortality are based on annual counts of wintering whooping cranes (Stehn and Haralson-Strobel 2014). The spatial and temporal distribution of whooping crane mortalities is also based on data from Stehn and Haralson-Strobel (2014), and has recently been augmented with telemetry data from Pearse et al. (2018). These two sources provide disparate estimates of the proportion of whooping crane mortality that occurs during migration, the period during which power-line strikes are most likely to occur. There appear to be no other data that are directly applicable to assess mortality rates of the migratory population of whooping cranes.

Review conclusion: Although there is high uncertainty associated with estimates of whooping crane mortality rates related to power-line collision (parameters that drive projections from models of power-line related whooping crane mortality), the projections resulting from the models developed by NEFO are not consistent (by orders of magnitude) with existing information about whooping crane population dynamics. In a subsequent assessment of the NEFO projections, the Service (2018c) identified several incorrect assumptions and calculation errors, which indicated that the model developed by NEFO (Service 2018b) had limited or no value in projecting estimates of whooping crane mortality associated with the life of the R-Line Project. Service (2018c) identified several flaws in Service (2018b), especially that strike rates used to produce projections were derived from the Grays Lake experimental population, which was weighted heavily toward juveniles. It is reasonable, therefore, to question the plausibility of these models, especially because projections from these models exceed by orders of magnitude possible mortality rates in the presence of an increasing whooping crane population.

(3) …the Service (2018c) analysis also conducted sensitivity tests to determine if inclusion of USGS telemetry data in the whooping crane risk analyses substantially changed the results; inclusion of this data did not greatly change estimates of collision risk, suggesting that this dataset is not determinative for analyses of whooping crane strikes with the R-Line. This exploration confirmed Davis' (2018) suggestion that inclusion of the USGS telemetry data would likely have little effect on collision risk results.
Assumptions: None. This was an assessment to evaluate whether considering USGS telemetry data would substantively change conclusions about whooping crane likelihood of collision with power lines from those derived based on existing estimates of mortality rates.
Best available science: These analyses compared mortality projections using the only relevant movement data from radio-marked whooping cranes with projections based on existing estimates of whooping crane mortality rates. USGS whooping crane telemetry data were used to estimate 50-year projections of whooping crane transmission line crossings, although it appears that the resolution of these data complicates their use in making such projections. Inherent in this approach is the need to estimate the number of crossings associated with whooping crane stopover sites, and there is not consensus about the potential radius of impact around stopover sites.
Review conclusion: The USGS telemetry data are limited in their spatial and temporal resolution, rendering them no more (and perhaps less) informative in projecting whooping crane mortalities than risk assessments that do not incorporate these data. The spatial extent of potential influence of power lines around stopover sites needs to be identified for this approach to be informative.

(4) …based partially on Davis (2018) and our analysis in Service (2018c), we conclude that the Ecosystems Advisors (2017) and Service (2018b) analyses are not reliable and did not incorporate the best available science.
Assumptions: Davis (2018) and Service (2018c) analyses are conducted correctly and demonstrate that the Ecosystems Advisors (2017) and Service (2018b) analyses are implausible. (NOTE: It Is beyond the scope of my review to verify the calculations in Davis [2018] and Service [2018c]).
Best available science: Information that any of these assessments is based on is limited, and largely derives from annual estimates of whooping crane mortality and how mortality is distributed across seasons (i.e., breeding, winter, and migration). There is limited information from which to derive these estimates, and there is a high level of imprecision associated with these estimates. Beyond estimates of mortality rates, the different assessments considered by the Service are based on different models and parameters in those models. Davis (2018) and Service (2018c) evaluate the Ecosystems Advisors (2017) and Service (2018b) assessments and refute some of the assumptions and data (e.g., the Grays Lake experimental population power-line strike rates, using sandhill cranes as surrogates, etc.) used to develop the models used in those assessments.
Review conclusion: Davis (2018) and Service (2018c) identify substantive issues with the assessments of Ecosystem Advisors (2017) and Service (2018b) that call into question whether the mortality projections resulting from the models in those assessments are

plausible. Combined with conclusion (3), above, the analyses of Ecosystems Advisors (2017) and Service (2018b) do not appear to provide reasonable projections of whooping crane mortality associated with the R-Line Project.

(5) …the Service has concluded that there is a low likelihood of whooping crane strikes with the R-Project over the 50-year project life. If one were to consider the effectiveness of BFD's the likelihood would be reduced even further. The Service therefore concludes that incidental take of whooping cranes with the R-Line Project is not reasonably certain to occur.

Assumptions: The projection of potential whooping crane mortality associated with the proposed R-Line Project derived from existing data related to whooping crane power-line strike rates is a reasonable estimate of expected whooping crane mortality. BFDs are likely to reduce projected whooping crane mortality.

Best available science: Related to projecting whooping crane mortalities associated with power-line strikes resulting from the R-Line Project, the Service (2018c) uses available information about length of power lines in the whooping crane migration corridor, estimates of mortality rates during migration, estimates of strike rates, and estimates of crossing rates to project mortality associated with power-line strikes. As pointed out by Davis (2018), there is considerable uncertainty associated with existing estimates of mortality rates and other parameters necessary to project expected mortalities from power-line strikes associated with the proposed R-Line Project. The Service (2018c) assesses the effect of high uncertainty of projections of whooping crane mortality. The Service (2018c) also evaluates the applicability of power-line strike data derived from the Grays Lake experimental population (Service 2018b Method One), and concludes that those data are not appropriate to apply to the Aransas-Wood Buffalo population. Related to BFDs, the Service concludes that they are likely to reduce whooping crane mortality risk (by reducing collision rate). However, there appear to be no data directly related to Aransas-Wood Buffalo population whooping cranes to inform that conclusion concerning BFDs.

Review conclusion: The Service concludes that incidental take of whooping cranes associated with the R-Line Project is not reasonably certain to occur (expected number of collisions for the life of the project is approximately 0.5, and lower if BFDs reduce collision rates). That conclusion is based on the best available science, which is limited and has high associated uncertainty. It is important to note that the underlying logic of this assessment is to estimate mortality rates associated with power-line strikes under the current conditions using the best available information, consider what increment to the total length of power lines the R-Line Project represents, and project mortality proportionately (i.e., addition of some length of power lines results in a proportional increase in the number of mortalities). This approach assigns average mortality risk to all power lines within the whooping crane core migration corridor. Whether strike rates along the proposed transmission lines contemplated as part of the R-Line Project will be substantively different than current strike rates across existing transmission lines is not known. Attempts to develop more complex models of mortality risk (e.g., the analysis of Ecosystems Advisors [2017]) are based on assumptions of how whooping cranes interact

with power lines on a local scale (i.e., the potential area of influence of power lines related to whooping crane stopover sites), which is an alternative approach to estimating risk. However, it does not appear that there are data available directly applicable to whooping cranes to inform those models, and there is disagreement about the values of important parameters (i.e., over what distance from stopover sites do power lines pose a risk to whooping cranes, and how does risk vary across that distance). Related to BFDs, there also appear to be no data directly applicable to whooping cranes.

(1) is the white paper's take assessment and underlying assumptions based on best available science?;

The White Paper's take assessment is based on the best available science. However, the best available science directly related to assessing risk of whooping crane collision with power lines is limited and has a high degree of uncertainty. A primary assumption of the white paper's take assessment is that an increase in the length of power lines in the whooping crane migration corridor results in a proportional increase in projections of whooping crane mortality resulting from power-line collision. That assumption is not clearly acknowledged, and seems to be at least some of the source of disagreement about projected whooping crane mortality between the Service (2018c) and other assessments (e.g., the projections from models in Ecosystems Advisors [2017]). It appears, however, that the data necessary to develop projections derived from more complex models do not currently exist, have such high uncertainty associated with them that projections are largely non-informative, or result in projections that are not plausible in light of current whooping crane mortality rates and population dynamics..

(2) do the final conclusions of the white paper match up with species biology and current scientific understanding of future species growth and threats?; and

The final conclusions of the White Paper rely on the best available information about whooping crane biology and projected population growth rates. However, data regarding whooping crane mortality associated with power-line strikes are sparse and there is disagreement about the temporal distribution of whooping crane mortality. Projections from models of whooping crane mortality associated with the R-Line Project have low precision. As noted above, these models also assume an increase in projected mortality proportional with an increase in the length of power lines in the whooping crane migration corridor. The conclusions of the White Paper do not explicitly address that assumption and address future threats indirectly by considering a range of population growth rates. However, under all population growth scenarios, projected mortality does not appear to regulate population size.

(3) what are (identify) the limitations and/or deficiencies with the Services' approach and assumptions in their conclusion on Whooping Crane risk to take?

As indicated above, an underlying assumption of the Services' approach is that there is an increase in projected mortality proportional with an increase in the length of power lines in the whooping crane migration corridor. This may be a reasonable assumption, but perhaps one that should be explicitly acknowledged and assessed. In addition, as pointed out in Service (2018c), more sophisticated models require information about the spatial extent and variation in power-line collision risk, and there is currently no consensus about those parameters. Finally, assumptions about whooping crane response to BFDs are based on responses of other species, and information about whether and to what extent BFDs reduce whooping crane collision risk with power lines would improve overall risk assessment.