Melissa Schmit

From: Gates, Natalie <natalie_gates@fws.gov>
Sent: Wednesday, December 06, 2017 10:04 AM
To: Leslie Tewinkel
Cc: Scott_Larson@fws.gov; Connie_Mueller@fws.gov; barbara_boyle@fws.gov; Kelly_Hogan@fws.gov; Melissa Schmit; Anderson, John M.; Brie Anderson; Kristin Lenz
Subject: Re: Crocker Avian Displacement Documents
Attachments: Loesch et al 2013 - wind and breeding waterfowl densities in prairie potholes.pdf; Hale_etal_Condor2014_displacementinbirds_Johnsoncriticism.pdf; Leddy et al. 1999 - effects of wind turbines on nesting birds CRP.pdf; Shaffer and Buhl 2016 - effects of wind energy on grassland birds.pdf; Drewitt and Langston 2006 - assessing impacts of wind farms on birds.pdf

Hello,

In response to the note below regarding avian avoidance of turbines, migratory birds are a USFWS trust resource and our recommendations is to first avoid, then minimize, and finally compensate for migratory bird impacts. Compensation is a last resort after all means have been employed to avoid/minimize.

The attached Loesch et al. (2013) and Shaffer and Buhl (2016) (which supplants Shaffer and Johnson 2009) papers describe the studies on which we have based our recommendations to compensate for avian avoidance of wind turbines. These studies are recent. Their study designs are rigorous (e.g. long term, good sample sizes, include reference sites to compare with impact sites, include data collection both before and after impacts). BACI (before/after and control/impact) studies are rare - Shaffer/Buhl 2016 is one such study. The research was conducted locally, i.e. in the prairie potholes of North and South Dakota, within the habitat types and including many of the same avian species that occur at the proposed Crocker project. And both studies clearly show that some grassland nesting birds and some waterfowl species avoid habitats in the vicinity of wind turbines. Note that neither study revealed 100% avoidance by any species, nor is FWS suggesting that 100% avoidance occurs.

Further details on Shaffer and Buhl (2016):

- Seven of nine species of grassland birds showed displacement within 300 meters of the turbines.
- Detection of statistical significance did vary somewhat across species, sites, distances, and time periods; however, trends were consistently negative for all 7 of the species.
- For the 33 immediate effects examined within 300 m for these 7 species, effects were negative for 76% of them.
- For the 51 delayed effects examined for the 7 species, effects were negative for 88% of them.
- Even though statistical significance could not always be detected, this consistent trend of negative effects indicates that displacement of the 7 species is occurring within 300 meters of the turbines.

Analysis of five species showed that the level of avoidance increased over time (data available out to 5 years post-construction). The table below demonstrates the post-construction percent displacement of grasshopper sparrows, western meadowlarks, bobolinks, chestnut collared longspurs

and clay colored sparrows averaged across species and across sites. Note the level reached as high as 70% by year 5.

Average across GRSP, WEME, BOBO, CCLO, and CCSP & across sites				
n years	<100 m	100-200 m	200-300 m	Avg.
1 yr post-trt	-23.32%	-9.88%	25.07%	-2.71%
2 yr post-trt	-23.28%	-29.36%	-24.37%	-25.67%
3 yr post-trt	-62.36%	-40.58%	-21.17%	-41.37%
4 yr post-trt	--	--	--	--
5 yr post-trt	-70.06%	-64.09%	-47.68%	-60.61%

When interpreting the delayed effects, it is important to understand that the 2-5 year effects are being compared to pre-turbine numbers. Therefore, these delayed effects represent a cumulative effect after the turbines have been in place for 2-5 years. For species such as the grasshopper sparrow, Western meadowlark, bobolink, and chestnut-collared longspur, the effects were usually greater in the 2-5-year time period than in the 1-year time period, indicating that effects of the turbines are continuing to accumulate over time. In other words, abundance within 300 meters of turbines increasingly declined compared to the reference sites. This effect is further demonstrated within the displacement rates in the 'Percent Displacement' table on Slide 16 in the presentation (provided above) "A method for estimating the impact of wind energy development on grassland birds in the Northern Great Plains." (powerpoint sent previously to Geronimo). The take-home message from this research is that the average displacement effect kept increasing, indicating that the effects continued to accumulate (i.e., get larger) throughout the time period evaluated during the study (i.e., 1-5 years post-construction).

Regarding the Loesch et al. (2013) paper

- The statement that mallard and blue-winged teal had the most "significant" impacts is misleading. Mallard and blue-winged teal did have a higher number of year:species:site combinations that were statistically significant, but all species had at least 2 of the combinations that were significant.

- 25 of the 30 point estimates were negative regardless of significance, which suggests avoidance as well.

- The statements regarding median values that focus on mallard and blue-winged teal are based on only a subset of the analysis and subsequent results. The results for those two species was presented in the manuscript to provide additional information on the methods of estimating pairs and developing estimates presented in Figures 2 and 3. In addition, the results in that section were also restricted to only one wetland class - seasonals. To focus on only those two species and one wetland class results in ignoring the impacts to other species.

- The most pertinent information is presented in Figures 2 and 3 (see attached Loesch paper, pgs 594-595): Figure 2 displays the statistical significance of the site:year comparisons for each species. The dot is the point estimate and the horizontal bars are the credible intervals (they can be thought of as error bars). To the left of the dashed line (0) is a negative effect (avoidance). If any of the credible interval touches the dashed line the point estimate is not significant. The majority (not all) of intervals are to the left (indicating avoidance). Figure 3 displays the proportional change in population estimates. A bar lower than the horizontal dotted line is a negative impact and the proportional change can be read off of the y-axis. Two of the most abundant species (mallard and blue-winged teal) are negatively impacted by up to 40% and northern pintail abundance (species of conservation concern) is negatively impacted more consistently (4 of 6 comparisons) by around 40-60%.

Regarding the other papers cited in the email below:

- Hale et al. (2013) received a rebuttal whereby Johnson (2016) disagreed with their statistical analysis and asserted that avian avoidance was indeed observed in Hale's study. Hale replied in 2016, yet USGS researchers maintain that Hale did not sufficiently refute Johnson's assertion: the authors did not provide definitive proof

that GRSP and DICK did not show displacement. Grasshopper sparrow is a species of particular focus as Johnson notes density of this species increases with distance from turbines. Sampling protocol appears flawed with the inability to separate the influence of distance from a fenceline in the study that occurred 301-400 m away. See attached.

- Raynor et al. (2017) did not analyze avian density and the study was not designed to detect avoidance by grassland birds. This study examined the assemblage of species singing near turbines and at reference sites. The paper itself notes: "Our approach was not designed to estimate abundance of individual species" rather it "did describe habitat-specific avian associations within intact and human-altered grasslands." Same types of singing birds were observed near turbines and at reference sites - this is not surprising. As noted above, there is not evidence of 100% avoidance by any species.

- Gue et al. is summarized appropriately, not much mortality was detected. However, inability to capture many females during the pre-nesting period when they would have been flying around and potentially encountering a turbine was a weakness in the study. Most birds were captured on nests. However, the Gue et al. publication is not very relevant to the recommendation to compensate for habitat loss due to avian avoidance. Gue et al. was a mortality study; the recommendation at Crocker is to offset habitat loss due to avian avoidance.

- AWWI (2017): this publication notes, as you said, that indirect impacts on birds from operating wind turbines due to displacement have been documented in a subset of the species studied, but these impacts have not been found consistently across studies. USFWS has not asserted that all species will avoid Crocker turbines; we do emphasize that the best available information we have (i.e. recent, rigorous, local, and highly relevant studies) indicate that some grassland nesting species and some waterfowl species are expected to avoid turbines at Crocker. Whether species that avoid turbines initially will habituate in the future is an unknown; the best trend information we have indicates avoidance of turbines by grassland birds increases over time (up to 5 years post-construction).

- I was not able to quickly locate Young et al. (2006), Erickson et al. (2004), Johnson et al. (2010), or Poulton (2010) in order to evaluate these studies - when I click on the link provided below, it appears to have been inactivated. However, the description provided below for most of these appears to reinforce the avian avoidance issue; with exception of Poulton (2010) (for which no description was provided), each study apparently reports some level of avian avoidance. The common thread in your description appears to be that the authors believe the impacts to be minor. As noted during our last conference call, the USFWS is reviewing the Crocker project at the scale of local impacts - not regional population declines - and level of impact is definitely related to scale. Please provide these papers if you would like additional feedback.

Missing from your list of studies below is Leddy et al. (1999) (attached). Like Loesch et al (2013) and Shaffer/Buhl (2015), this is local research, pertinent to evaluation of wind facility impacts in South Dakota. The Leddy et al. study was a relatively short-term project evaluating avoidance in Conservation Reserve Program (CRP) areas in SW MN, yet avian avoidance of turbines was detected in CRP within 80 m of turbines as compared to reference sites.

Also missing from your list of studies that reviewed other research is Drewitt and Langston (2006) (attached). This summarizes what was known at that time regarding avian avoidance. A few key quotes points from this paper: "The displacement of birds from areas within and surrounding wind farms due to visual intrusion and disturbance can amount effectively to habitat loss." "The scale and degree of disturbance will vary according to site- and species specific factors and must be assessed on a site-by-site basis." "Few studies of displacement due to disturbance are conclusive, often because of the lack of before-and-after and control-impact (BACI) assessments". As noted above Shaffer and Buhl 2016 is a recent BACI study. "Studies of breeding birds are also largely inconclusive or suggest lower disturbance distances *[compared to wintering waterfowl - NG]*(Winkelman 992d, Ketzenberg et al. 2002), though this apparent lack of effect may be due to the high site fidelity and long life-span of the breeding species studied." The trend data we have is up to 5 years, and idicates increasing levels of avoidance over time per Shaffer and Buhl (2016).

There are a number of other publications we could discuss. Some researchers have begun to analyze other effects of wind facilities such as impacts to reproductive success of nesting birds near wind farms. We continue to recommend avoidance, minimization and finally

compensation for indirect (habitat avoidance) impacts to migratory birds based on the best available (local, rigorous, and relevant) scientific information we have.

Regarding the USFWS recommendation to compensate for avoidance impacts relative to the Department of the Interior report entitled "Final Report: Review of the Department of the Interior Actions That Potentially Burden Domestic Energy" (November 2017), note that this project is unusual in that the USFWS is not solely providing recommendations to Geronimo or another federal agency facilitating the construction of Crocker, but we are the lead federal agency for the project. Thus, as you know, we must also comply with the National Environmental Policy Act. Based on information we have, and have provided to Geronimo, we believe our recommendations do "appropriately characterize the voluntary nature of compensatory mitigation for impacts to migratory bird habitat, and demonstrate a reasonable nexus between anticipated impacts and recommended mitigation". Future considerations and discussions with all parties involved will continue as we work our way through voluntary and legal requirements associated with this project.

Thank you.

-Natalie

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On Fri, Nov 10, 2017 at 1:37 PM, Leslie Tewinkel <ltewinkel@merjent.com> wrote:

All –

Please access this OneDrive link for documents related to potential indirect impacts via displacement of birds due to turbines:

[redacted]

The following is a summary of the documents and relevant findings related to our discussion on Wednesday. Overall, the research indicates that indirect impacts on birds due to displacement from turbines vary with location, species, distance from turbine, and year. One species highlighted in several of the studies, the grasshopper sparrow, appears to be impacted in most studies where it was present; however, the distance of displacement from the turbine varied from 50 to 300 m. Other species, such as the chestnut-collared longspur, showed inconsistent effects due to displacement among studies (see Shaffer and Buhl 2016 and Shaffer and Johnson 2009).

- Shaffer and Buhl 2016: Research by Shaffer and Buhl (2016) in the Dakotas showed that although 7 of 9 species of grassland birds showed displacement near turbines, these indirect impacts varied across years, species, sites, and distances from turbine. With the exception of the chestnut-collared longspur and grasshopper sparrow, inconsistences in indirect impacts for the other species confound conclusions regarding an impact. For the chestnut-collared longspur and grasshopper sparrow, there were significant delayed effects (but not immediate effects) up to

300 m at 3 of 3 sites for the sparrow and at 1 of 1 site for the longspur. Western meadowlark use showed a statistically significant decline at one site between 2-5 years after construction but no significant change at the other two sites.

- Shaffer and Johnson 2009: Shaffer and Johnson (2009) showed displacement up to 200 m from turbines for clay-colored sparrow and grasshopper sparrow at two wind facilities in the Great Plains. They found no indirect impacts on chestnut-collared longspur, western meadowlark, and killdeer. Killdeer appeared to be attracted to the areas surrounding the turbines.

- Hale et al. 2013: Hale et al. (2013) did not find evidence that breeding grassland birds were indirectly impacted within 500 to 750 m of wind turbines in the southern Great Plains. These researchers cautioned that research results related to displacement due to turbines may be correlated to other factors such as occurrence of fences, which grassland birds may also avoid.

- Raynor et al. 2017: Raynor et al. (2017) researched potential differences in the presence and singing behavior of nesting birds that were located less than and greater than 760 m from turbines using an acoustic complexity index; they did not observe differences at the assemblage level based on proximity to turbines.

- Young et al. 2006: This research suggests a relatively minor impact on grassland nesting passerines due to displacement from turbines. Among the species studied, the western meadowlark showed a significant decrease in use near turbine locations after construction. Overall, the authors indicated that other factors may have a greater effect on grassland nesting birds than turbines, such as vegetation type.

- Erickson et al. 2004: Erickson et al. (2004) showed that use of breeding grassland passerines declined in the first 50-m sub-segment, but was similar in the other sub-segments. Specifically, western meadowlarks and grasshopper sparrows had decreased use within the first 50 m of the turbines, but sample sizes for grasshopper sparrows were very low. Overall, the research suggests a relatively minor effect on grassland passerines due to displacement.

- Johnson et al. 2010: In this study, 7 of 22 species of grassland nesting birds showed some decrease in use in proximity to turbines, primarily within 100 m of the turbines. The authors concluded that declines in use related to wind facilities were relatively minor; they predicted that declines due to these indirect effects would not have an impact on regional populations. Risk due to avian collision may decrease as a results of decreased use near turbines. Johnson et al. (2000) also noted that decreased avian use near turbines post-construction may be related to in part to a reduction in detection rates when birds were being surveyed solely by sound.

- Loesch et al. 2013: Loesch et al. (2013) studied changes in densities of five species of breeding waterfowl at two wind facilities in the Missouri Coteau of North Dakota and South Dakota. In their research, approximately 50% of the site-year combinations showed no significant difference in breeding pair densities due to indirect impacts between the wind farm sites and reference sites. The median decreases in proportional change for the 2 species that experienced the most significant impacts were limited to 18% for blue-winged teal and 10% for mallard. Thus, although impacts to breeding ducks were evident in about 50% of the site-year combinations, actual decreases in densities were limited.

- Gue et al. 2013: At a wind farm in the Missouri Coteau of the Prairie Pothole Region on the border of North Dakota and South Dakota, Gue et al. (2013) documented one collision among 77 radio-tagged female mallards and no collisions among of 88 radio-tagged blue-winged teals during the 2009 and 2010 nesting seasons. In comparison, 8 female mallards and 15 female blue-winged teal were killed by predators during the same time period. Gue et al. (2013) concluded that mortality for female mallards and blue-winged teal due to collision with wind turbines was likely a limited threat.

- Poulton 2010: Pages 13 through 16 summarize studies related to grassland bird displacement due to wind turbines.

- American Wind Wildlife Institute (AWWI) 2017: In its report "A Summary of Research Results and Priority Questions" (June 2017), the AWWI summarizes information that is publicly available regarding impacts on wildlife from land-based wind facilities, focusing on research from peer-reviewed journals and publicly available reports that have received technical review from experts. In their 2017 report, the AWWI concluded that indirect impacts on birds from operating wind turbines due to displacement have been documented in a subset of the species studied, but these impacts have not been found consistently across studies. They further concluded that additional research is needed to determine if grassland species will habituate to turbines over time.

Additionally, on the related point regarding the need for Geronimo to provide additional mitigation for avoidance impacts we would like to point out that in the recently released report by the Department of the Interior entitled "Final Report: Review of the Department of the Interior Actions That Potentially Burden Domestic Energy" (November 2017) (p. 50548) it is noted that: "The FWS has the authority to recommend, but not require, mitigation for impacts to migratory bird habitat." "The FWS is developing Service-wide guidance to ensure the bureau is consistent, fair and objective, appropriately characterizes the voluntary nature of compensatory mitigation for impacts to migratory bird habitat, and demonstrates a reasonable nexus between anticipated impacts and recommended mitigation." Meaning that compensatory mitigation for migratory bird habitat may be requested by the FWS, but not required, and should be well justified by the impact. Geronimo continues to believe that the easement exchange and avoidance and minimization measures offered to date will offset the impacts of the proposed action (i.e. the construction and operation of the wind farm) and as a result additional mitigation is not warranted.

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