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August 8, 2011

Bob Bergstrom
Wind Capital Group LLC
via email to bbergstrom@windcapitalgroup.com

Re: Audubon comments on Pre-siting Surveys for Palm Beach County Wind Facility

Dear Mr. Bergstrom:

Please find, attached, Audubon's comments on the proposed Palm Beach County Wind Energy Facility to be sited in the Everglades Agricultural Area (EAA) by the Wind Capital Group. Audubon strongly supports wind as an alternative to carbon-based fuels. However, we also must ensure that facilities are appropriately sited and do not cause unacceptable collateral impacts to birds and other wildlife. The impacts of wind facilities have been studied extensively worldwide. However, few facilities have been constructed in the southeastern United States and none in Florida. This project location is in the midst of the Everglades which arguably hosts North America's largest diversity of large, slow-flying, imperiled and iconic birds. Specifically, the proposed location is surrounded by world-class natural areas including Lake Okeechobee, the Arthur R. Marshall Loxahatchee National Wildlife Refuge, 45,000 acres of Stormwater Treatment Areas (STAs), the Water Conservation Areas (WCAs) of the Everglades, and numerous wildlife management areas. All of these areas are populated with state and federally listed birds, many of which move between these areas via the EAA. As such, an abundance of caution is warranted in preconstruction monitoring to assess potential impacts.

Predicting the potential impact of wind farms on organisms, especially flying ones, is exceedingly difficult and Audubon commends Wind Capital Group and Normandeau Associates for your proactive efforts to monitor and predict effects. Your staff has made it clear that Wind Capital intends to provide a high standard of environmental protection during the siting, construction and operation of these turbines. We greatly appreciate your commitment, especially given Florida's regulatory inexperience with wind power, and the precedent that your project's permitting process will set for future projects in the state. These comments are provided to identify weaknesses in the monitoring protocols and recommend solutions. We do not believe the current protocols will provide sufficient rigor to adequately predict future impacts of this proposal. Additionally, the resources of this region are too important and vulnerable to proceed with implementation without sufficient information.

If you have questions or require clarification on any of the following comments, please don't hesitate to contact us at your convenience, at the numbers below.

Sincerely,

Julie Wraithmell
Director of Wildlife Conservation
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Dr. Paul Gray
Okeechobee Watershed Science Coordinator
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cc: USFWS; FWC; Normandeau Associates

Sampling Protocols: Concerns and Recommendations

Obviously the first parameter for vulnerability is the presence of an organism, which the point counts, skywatch, raptor and wading bird behavior and nest surveys, and nocturnal bird and bat surveys, are designed to detect. While these surveys likely sample many species fairly well, there are further sampling efforts needed. We offer the following recommendations to help your project achieve the biological monitoring rigor that we both mutually desire.

Nocturnal organisms

The counts for "nocturnal birds" are good and should be conducted, but more information is necessary on "diurnal" species that fly at night. Wading birds often are active at night, vulnerable to rotor impacts, and apparently show reduced avoidance to obstructions such as power lines, presumably due to poor visibility (Deng and Frederick 2001). Indeed, many species of night-flying birds in this region have a low probability of detection during the nocturnal surveys including waterfowl, shorebirds and others. Nocturnal migrants, especially passerines, can fly through rotor-swept zones during take-off, landing, and during inclement weather, but will not be detected with present protocols. As discussed below, while the total number of night-flying birds is uncertain, some certainly are present and should be accounted for. Radar studies have been indispensible in illuminating bird movements that cannot be witnessed by the human eye (Gauthreaux 1999, Gauthreaux and Belser 2003, Kunz et al. 2007, NRC 2007).

- **Recommendation: Radar studies should be conducted to detect night flying birds.**

Similarly, the bat sampling protocol only reaches a detection altitude of about 250 feet (Normandeau Associates 2011) but the rotor blades will reach 475 feet, leaving a large part of the rotor-swept zone unsampled. Bats have a history of mortality from wind facilities and might even be attracted to them (Cryan 2008, Kunz et al. 2007). Probably the most abundant bat in Florida is the Brazilian Free-tailed Bat (*Tadarida braziliensis*) (Marks and Marks 2006), which is a high-flying, far-traveling bat (Bellwood 1992), that can be expected in the rotor-swept zone. The Florida Department of Transportation checked bridges for bat roosts in Florida and found roosts in this region (Gore and Studenroth 2005). Because these bats routinely roost in buildings, there are possibly many roosts in the region. Bats have low fecundity (do not breed until several years old and have only one or two pups per year), giving them low resiliency to persistent mortality, even if that mortality rate is low (National Research Council 2007). Due to the occurrence of this bat, and potentially others in the region in unsampled parts of the rotor-swept zone, Audubon is concerned the sampling protocol will give a poor prediction of bat interaction with the wind farm.

- **Recommendation: Radar studies should be conducted to detect bats. The acoustic detection should be conducted throughout the rotor-swept zone if possible to identify species.**

Bat mortality appears to be greater on low wind nights than higher wind, possibly because the lower winds make better flying conditions at higher elevations for arthropods and bats. Recommendations to protect bats include operating turbines at higher cut-in speeds (Baerwald et al. 2009, Arnett et al. 2011). Therefore the plan of this site to operate wind turbines at lower cut-in rates to take advantage of Florida's lower wind speeds may heighten concern for bats.

- **Recommendation: Bat radar and species identification data should be matched with predicted turbine operating protocols to predict bat mortality at different cut-in speeds.**

Length of sampling period

Animal movements have extreme variability in numbers and timing, from moments to years. The variability occurs in response to myriad factors including population size, migration, food abundance, habitat conditions, breeding status, disturbance, and weather. As such, wind farm mortality events and tower kills have been episodic, with large mortalities occurring only occasionally (NRC 2007).

For annually occurring events such as migration, the combination of factors leading to a high mortality event may occur once every few years (e.g., fog banks or unfavorable winds leading to a fallout). In this case, a one-year sampling period has little chance to detect these risks and no ability to predict them. For example, the sampling protocol's Bat Monitoring Objective 2 is to address "migratory patterns," which simply is not possible in a one-year study (the sample size for spring or fall migration is 1).

Another source of year-to-year variability is hydrology. The region has been in a major drought and many habitats such as the WCAs and STAs have had virtually no water. Thus, while there may be relatively few movements of aquatic birds this year, in years with different hydrological patterns, there might be regular or intense movements (see Chimney and Gawlik 2007 and Gray et al. 2007 for a few of many reports on variable avian response to water conditions in the region). An additional wrinkle is whether there are traditional flying routes for species in the region (e.g., following land forms or between roosting and feeding habitats). If understood, turbines could be placed out of these pathways. But determining if such patterns exist would require more than one year of sampling (i.e., this year's pathway might not be next year's).

The USFWS draft wind guidelines (July 12, 2011) note that multiple years are needed to adequately determine risks for many questions and the local USFWS office comment letter (July 1, 2011) recommended at least three years of pre-construction data collection.

- **Recommendation: At least three years of data should be collected on regional animal movements before turbines are sited and installed to gain a reasonable understanding of risks.**

An additional source of variability in avian vulnerability is avian biology and habitat management in the EAA. Several parts of the discussion in the monitoring protocol do not accurately address these phenomena. For example, page 15 states that few raptors are expected, even though more than half the North American population of Swallow-tailed Kites stage in nearby Fisheating Creek during southward migration and forage in this region (Meyer 1995). Pearlstine et al. (2006) found 13 species of raptors in the EAA with densities averaging 1.13 individuals per kilometer (transect). Further, the caption on Figure 2 notes "…the agricultural habitats of the proposed project site and its immediate surroundings are an island of relatively low bird issues…" and page 23 notes a "…low passage rate of migrants through peninsular Florida…" without offering a citation or empirical evidence. Pages 26 predicts waterfowl and other water birds are, "unlikely to venture onto the agricultural habitats of the project site…" These statements are very strongly contradicted by literature which were not referenced in the protocols. Sykes and Hunter (1978) observed 22 species of shorebirds and 8 larids (maximum count of 59,174 individuals) in eight surveys in the EAA. Pearlstine et al (2004) surveyed five field types for six months and recorded 61 species, with the greatest densities and diversity in flooded habitats. Townsend et al. (2006) restricted surveys to rice fields and reported 41 species of water birds. Chimney and Gawlik (2007) surveyed STAs (several of which are in this area now, with more possibly on the way) and reported 139 species, 16 of which were state or federally listed, and distinct pulses of movement related to migratory patterns and water depth changes. More recently, Pearlstine and Mazzotti (2010) summarized many studies and tallied 164 species of birds in the EAA, which surpassed concomitant surveys in the Loxahatchee National Wildlife Refuge and WCAs during the period.

The Normandeau protocols included virtually no information on farming practices or land use in the EAA, which drive many of the bird use patterns noted above. Regular practices such as rice culture and fallow flooding for pest control should be examined and explicit monitoring protocols must be developed to sample these hotspots of bird activity (Chapter 12 of Izuno and Bottcher 1994 might be a good starting point). We note that the flooding moves to different fields depending on annual cropping practices and this mobility must be considered when assessing risk factors to birds.

- **Recommendation: A more detailed study of land use practices, especially flooding practices in the EAA, is needed to assess annual risk to birds and other animals. Monitoring protocols for animal movements within and between these "hotspots" (flooded rice or fallow fields, and STAs) must be developed and conducted.**

Zones of exclusion

Wind projects can impact wildlife through exclusion or avoidance, disrupting movement and habitat use, potentially creating greater impacts on populations than direct mortality (e.g., Kuvlesky et al. 2007). Studies in Europe have detected disturbance effects ranging from 75 m to 800 m to birds including shorebirds, waterfowl, waders and passerines (NRC 2007, p. 108). Grassland birds in the US have been similarly impacted (NRC 2007, Pruett et al. 2009). Such behaviors cannot be observed without turbines present thus cannot be empirically assessed in this pre-construction monitoring period.

- **Recommendation 1: An extensive literature review of exclusion effects is needed to develop hypotheses of these effects. These hypotheses should be tested as turbines are installed in a phased manner.**

- **Recommendation 2: Pre-construction monitoring must be of a fine enough scale and for sufficient duration to recognize flight patterns if they exist, and these data can be used to plan the locations of turbines to minimize exclusion issues.**

Impact of Proposed Project on Everglades Restoration

The purpose of the Comprehensive Everglades Restoration Plan (CERP) is to protect South Florida's treasured water resources and environment partially through water storage and treatment projects. Lying between Lake Okeechobee and the Water Conservation Areas, the EAA was part of the historic Everglades and is prime real estate for restoration. Already, there are approximately 45,000 acres of stormwater treatment areas east and west of the proposed project.

Moreover, the potential location of the Palm Beach County Wind Project in the EAA is surrounded by four corners of land that could potentially be in the footprint of additional Everglades restoration projects in the future. The South Florida Water Management District's US Sugar Purchase L8 Parcel, a piece of land to be used either for storage or treatment, abuts the wind project's potential location to the north. US Sugar Purchase option lands abut the project's footprint on both the east and west sides. Slightly southwest of the proposed project is the 16,000 acre A-1 reservoir site, a project that the SFWMD has slated for shallow storage and possibly water treatment. Additionally, water quality litigation in federal court will likely require more STAs in the EAA for water treatment. If and when new parcels are used for water storage or treatment, they will attract birds and other wildlife into the wind project's proposed location.

Other land use changes in the region should be planned for as well. For example, a 1,600-acre landfill, which would attract additional birds, is proposed between the project footprint and the Arthur R. Marshall Loxahatchee National Wildlife Refuge and remains on the planning map for Palm Beach County. Various proposals for rock mining in the region also are being vetted, which would create new areas of open water.

- **Recommendation: Assess future likely land use changes in the region and for each type and combination, reconcile possible changes in animal distribution and abundance in relation to possible wind farm impacts.**

Audubon mentioned to your staff that the proposed project's location may at some point overlap directly with proposed Everglades restoration projects. Normandeau staff replied that the turbines can be flooded and still continue to operate. While this may address the operation of the turbines from a functional perspective, the risk to wildlife directly under the turbines requires better understanding. For example, Snail Kites have nested in STAs and would be particularly vulnerable to turbines when soaring or doing their aerial courtship displays (Sykes et al. 1995).

- **Recommendation: Bird behavior and movements in and around STAs and flooded fields must be assessed to develop models of impacts from nearby turbines or those placed in flooded conditions.**

Cumulative Impacts on the Everglades Agricultural Area

Phase 1 of the project proposes 80 -100 wind turbines; subsequent phases would include an unknown number of additional turbines. This open-ended plan raises the question of whether a carrying capacity for wind projects in the EAA, and the larger region (we know of at least two other wind farm proposals) can be developed.

- **Recommendation: Inform stakeholders of the Wind Capital Group's complete plans for wind turbines in the EAA, including but not limited to all future phases. Develop a carrying capacity model for the EAA and surrounding regions considering the cumulative impacts on wildlife. The model should include a literature analysis of large wind turbine projects elsewhere in the world.**

Insects

Flying insects that are smashed on turbine blades can lower efficiency by as much as 50% (NRC 2007). The Everglades is famous for its mosquitoes, but also has extremely dense blooms of many other soft-bodied insects such as Chironomids (midges), Ephmeroptera (mayflies) and others which will occur at rotor-swept elevations and may be likely to get stuck on rotors. Warren et al. (1995) detected mean densities of Chironomidae of between 1,559 to 7,554 per meter-squared in Lake Okeechobee benthic sediments (that hatch into flying adults when mating), reflecting billions of organisms in the lake available for a bloom on a given date. Not only can insect events occur randomly, but rotors may attract insects due to lights, color, heat or noise, which could in turn attract bats or aerial-feeding birds.

- **Recommendation: Use radar studies to identify insect exposure in the rotor-swept zones. Sample insects for identification of radar signals.**

If insects do cause reduced efficiencies, we request an explanation of blade-cleaning technologies and frequencies, particularly if detergents, surfactants or other cleaning or coating substances are used that could contribute to water quality problems.

- **Recommendation: Develop and distribute Best Management Practices that describe insect avoidance and cleaning strategies.**

Species concerns: Swallow-tailed Kite

Audubon recommends that the Swallow-tailed Kite (STKI) be added to Section 3 on specific bird risk issues. The total population of STKI in North America probably is less than 5000 birds at the end of the breeding season (Meyer 1995), giving it a smaller population than many endangered species. More than half of the population appears to gather at Fisheating Creek in late summer to fatten before their trans-gulf migration (Meyer and Collopy 1996). STKI leaving the Fisheating Creek roost tend to leave toward the southeast (toward the EAA) and are seen foraging in the EAA. Due to the small population, high percent of the US population using this area, aerial feeding behavior, low reproductive potential, and previous reduction of population size and range, Audubon is extremely concerned about the impacts the wind farm could have on this iconic species.

- **Recommendation: A study must be conducted on the Fisheating Creek roost to determine how far STKIs forage from the roost and how many utilize the EAA.**

Species concerns: Everglade Snail Kite

Audubon was encouraged to see the emphasis placed in your assessment on the hazards to the Everglade Snail Kite (SNKI). As you are well aware, their population is in dire condition with fewer than 700 individuals thought to survive in Florida (Fig. 1, NRC 2010). The proposed project area is virtually surrounded by federally designated critical habitat for this species and is part of an historic dispersal route for young birds out of the WCAs. While sightings of SNKI in 2011 surveys may be infrequent, we posit that results from a severely reduced population size, and poor habitat conditions in the region. The Loxahatchee Refuge alone has historic counts of more than 100 individuals but underachieved this year, and in recent years, due to hydrologic problems (M. Kapsch, personal communication). Similarly, WCA3, the most important SNKI habitat in Florida, had very low SNKI use this year (both these areas are combined in "Glades" in Fig 2). When reviewing your survey results, the recorded occurrence of SNKI in the project area should be considered an extremely conservative predictor of occurrence in the future.

We caution that provision be made for the increased likelihood of occurrence in the project area as the SNKI population recovers. Similarly, as habitat conditions improve in Loxahatchee NWR, WCA2 and Lake Okeechobee, increased breeding and breeding success in these historic heartlands will likely increase the incidence of SNKI in the EAA, whose current breeding success is largely confined to areas north of Okeechobee (Fig. 2).

Figure 1. Everglade Snail Kites have declined precipitously in South Florida in the past decade. Any losses to this population would be significant and we question the potential for meaningful mitigation of these losses. Proposed mitigation options should be presented early for evaluation and discussion.

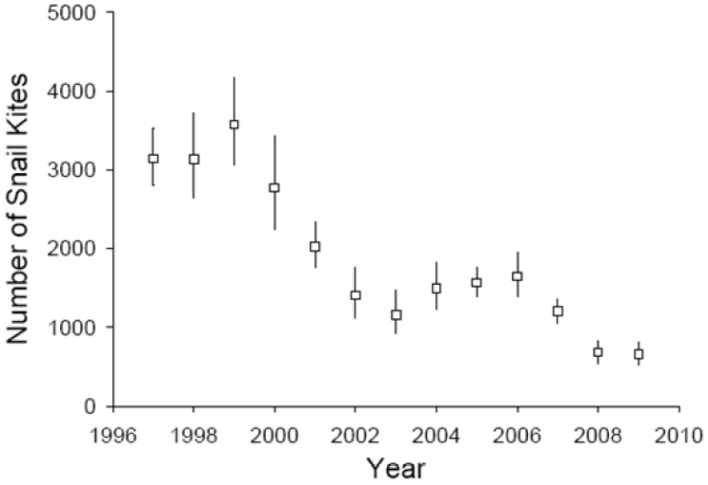

FIGURE 2-9 Annual estimates of snail kite population size in Florida and 95 percent confidence intervals
SOURCE: Cattau et al. (2008, 2009).

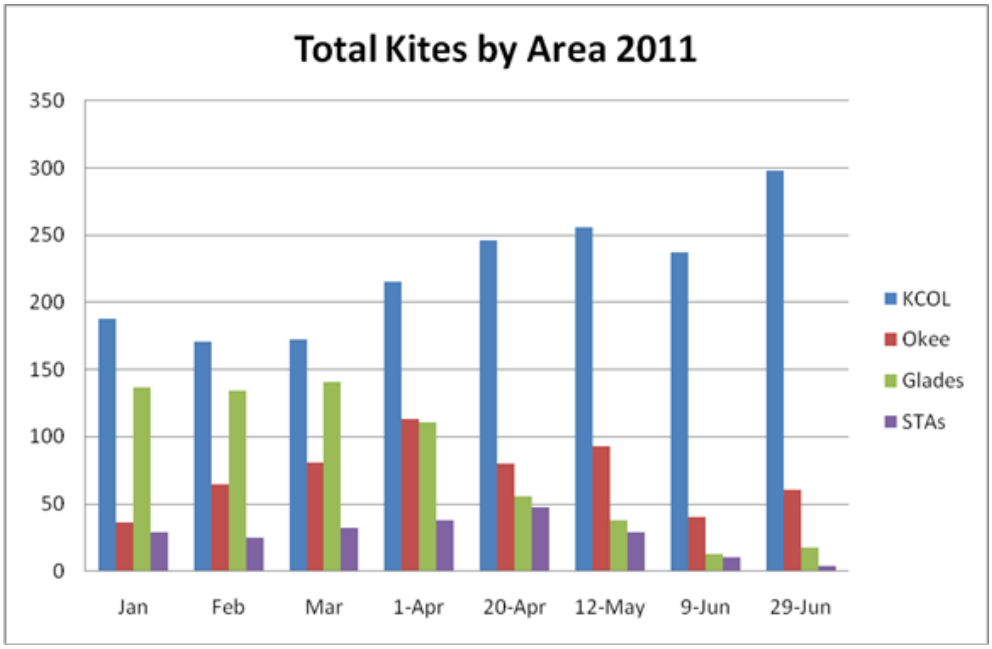

Figure 2. Everglade Snail Kite counts by region in 2011. In previous years, the Glades and Okeechobee held two to four times the numbers observed in 2011 (Graph by Z. Welch, FFWCC).

- **Recommendation: Place more weight on historic counts of Everglade Snail Kite numbers than those observed during this unfavorable period.**

Potential for Mitigation

In discussions with Wind Capital and Normandeau staff, we have appreciated your commitment to thoroughly mitigating losses and finding truly meaningful mitigation opportunities. Given the serious decline in the SNKI population and the complexity of that decline's causes, we are very concerned that anticipated SNKI losses could not be satisfactorily mitigated. If your group and the USFWS choose to pursue this avenue, we will be very interested in the solutions you propose.

- **Recommendation: Specific mitigation options for SNKI, and other animals, should be developed with ample time for review and discussion.**

Phased implementation

Due to the many uncertainties on impacts to wildlife, Audubon recommends that if this proposal progresses to construction, a phased construction plan should be employed where the initial installation includes fewer than 10 turbines, which are monitored for impacts before further turbines are added. This way, serious problems can be detected and addressed adaptively.

Summary of recommendations

1) Conduct radar studies to monitor movements of birds (especially at night), bats, and insects. Small marine radar probably would be suitable (Kunz et al. 2007). Acoustic sampling may be needed to differentiate birds and bat species.
2) Develop a clear model of cut-in speeds relating to bat exposure and energy generation.
3) Do multiple years (3) of pre-construction sampling to allow adequate predictive power of impacts.
4) Conduct a more extensive literature review on possible zones of exclusion effects and design monitoring to test these hypotheses during a phased construction period.
5) Bird movements within and around STAs as well as water storage areas should be rigorously assessed and models developed to predict future bird interactions with wind farms, especially in relation to future Everglades Restoration projects and other potential land use changes.
6) Develop specific sampling protocols for bird "hotspots,' including flooded fallow fields, rice fields, and STAs.
7) Conduct an extensive literature analysis of large wind turbine projects elsewhere in the world with more than 100 turbines in the vicinity of wetlands to look for evidence of cumulative impacts and possibilities for mitigating those impacts.
8) Add Swallow-tailed Kites as a focal species and conduct a special study on the Fisheating Creek/fall migratory period.
9) Place more weight on historic counts of Everglade Snail Kite numbers than those observed during this unfavorable period.
10) Specific mitigation options for SNKI, and other animals, should be developed with ample time for review and discussion.
11) If implementation proceeds, plan development of the wind farm in phases (ten or fewer turbines at first) accompanied by intense sampling.

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