GREAT LAKES WIND COLLABORATIVE

Great Lakes Pelagic Bird Stakeholder Engagement Workshop Summary

SUMMER 2014

A product of the Great Lakes Commission and the Great Lakes Wind Collaborative based on the workshop held May 29-30, 2014, in Ann Arbor, Michigan.

Great Lakes Wind Collaborative

Great Lakes Commission des Grands Lacs

Executive Summary

Overview

Organized by the Great Lakes Commission through the Great Lakes Wind Collaborative (GLWC), the *Great Lakes Pelagic Bird Stakeholder Engagement Workshop* took place on May 29-30, 2014, in Ann Arbor, Michigan. Primary funding support for the workshop came from the U.S. Fish and Wildlife Service. The workshop was designed to explore the state of the science in avian research and support offshore wind impact assessments and conservation management initiatives. Thirty stakeholders, comprised of avian researchers, federal and state resource managers, offshore wind developers and conservationists, met to achieve the following objectives:

1. Increase awareness among stakeholders of the Great Lakes Regional Pelagic Bird Surveys Project and resulting data, and put the project in context with other recent research studies.
2. Increase the usefulness of these data to conservation management activities in the Great Lakes region.
3. Assess the current state of the science in avian resources and the key research needs that would support an offshore wind energy impact assessment.
4. Share lessons learned from the Great Lakes Regional Pelagic Bird Surveys Project and other research efforts in regards to survey methodologies.

Recommendations

The workshop participants made the following recommendations toward developing an avian research agenda for offshore wind energy development in the Great Lakes:

1. Pursue studies that investigate the following avian behaviors to inform the determinations of species vulnerability: nighttime usage, flight height and foraging patterns.
2. To better understand the potential impacts of offshore wind in the Great Lakes, the following species were recommended for further study: Loons, Diving Ducks, Tundra Swans and Long-tailed Ducks. In addition to pelagic waterbirds, the following species were recommended for further study:
    - Passerines (concerns raised about using wind farms as resting areas during passage)
    - Falcons (observed crossing over the lakes)
    - Bald and Golden Eagles (observed present when there is ice on the lakes)
    - Shorebirds
    - Bats (observed present offshore, but not much is known about their behavior)
3. Identify and conduct more focused studies on particular vulnerable species to offshore wind based on the information and knowledge developed through recommendations 1 and 2. A regional group of avian and offshore wind development experts led by the Great Lakes Wind Collaborative could assist in identifying these focused studies.
4. Regional studies investigating the cumulative effects of both offshore and onshore wind energy on these avian populations should be pursued.
5. The Great Lakes Wind Collaborative should lead a forum among conservation and wind energy stakeholders to discuss and analyze the effects of terrestrial and offshore wind projects in contrast to other energy generation options and within the context of global climate change.
6. The conservation community should consider exploring the use of regional pelagic bird survey data to designate new or expand existing open water Important Bird Areas in the Great Lakes.

Introduction

The Great Lakes Wind Collaborative (GLWC) has been coordinating aerial pelagic bird surveys in selected offshore areas of the Great Lakes. The survey data will be used to inform siting and planning decisions for offshore wind energy development. Recognizing that there are other ongoing avian research efforts throughout the Great Lakes basin, the GLWC held a workshop to bring the researchers conducting those studies together. The workshop was designed to explore the state of the science in avian research and support offshore wind impact assessments and conservation management initiatives.

This document summarizes the discussions from the *Great Lakes Pelagic Bird Stakeholder Engagement Workshop*. Organized by the Great Lakes Commission through the GLWC, the workshop took place on May 29-30, 2014, in Ann Arbor, Michigan. Primary funding support for the workshop came from the U.S. Fish and Wildlife Service. Thirty stakeholders, comprised of avian researchers, federal and state resource managers, offshore wind developers and conservationists, met to achieve the following objectives:

1. Increase awareness among stakeholders of the Great Lakes Regional Pelagic Bird Surveys Project and resulting data, and put the project in context with other recent research studies.
2. Increase the usefulness of these data to conservation management activities in the Great Lakes region.
3. Assess the current state of the science in avian resources and the key research needs that would support an offshore wind energy impact assessment[1].
4. Share lessons learned from the Great Lakes Regional Pelagic Bird Surveys Project and other research efforts in regards to survey methodologies.

During the workshop experts reviewed and discussed how to assess avian risk to offshore wind energy development; researchers presented the preliminary results of their on-going avian studies; and in small groups, participants discussed avian research needs, cause and effect relationships between offshore wind energy development and its effects on avian life, the latest research methods and technology, and conservation management initiatives that could be informed by these data collection efforts. Refer to Appendix A for the workshop agenda and Appendix B for the list of attendees.

Section 2: The State of the Science

The current state of Great Lakes avian science is mixed; while there have been substantial efforts in long-term monitoring of colonial breeding birds (from the mid-1970s to present) and focused aerial surveys (from 2008-2014), how birds (and bats) use the open and near-shore waters of the Great Lakes is largely unknown.

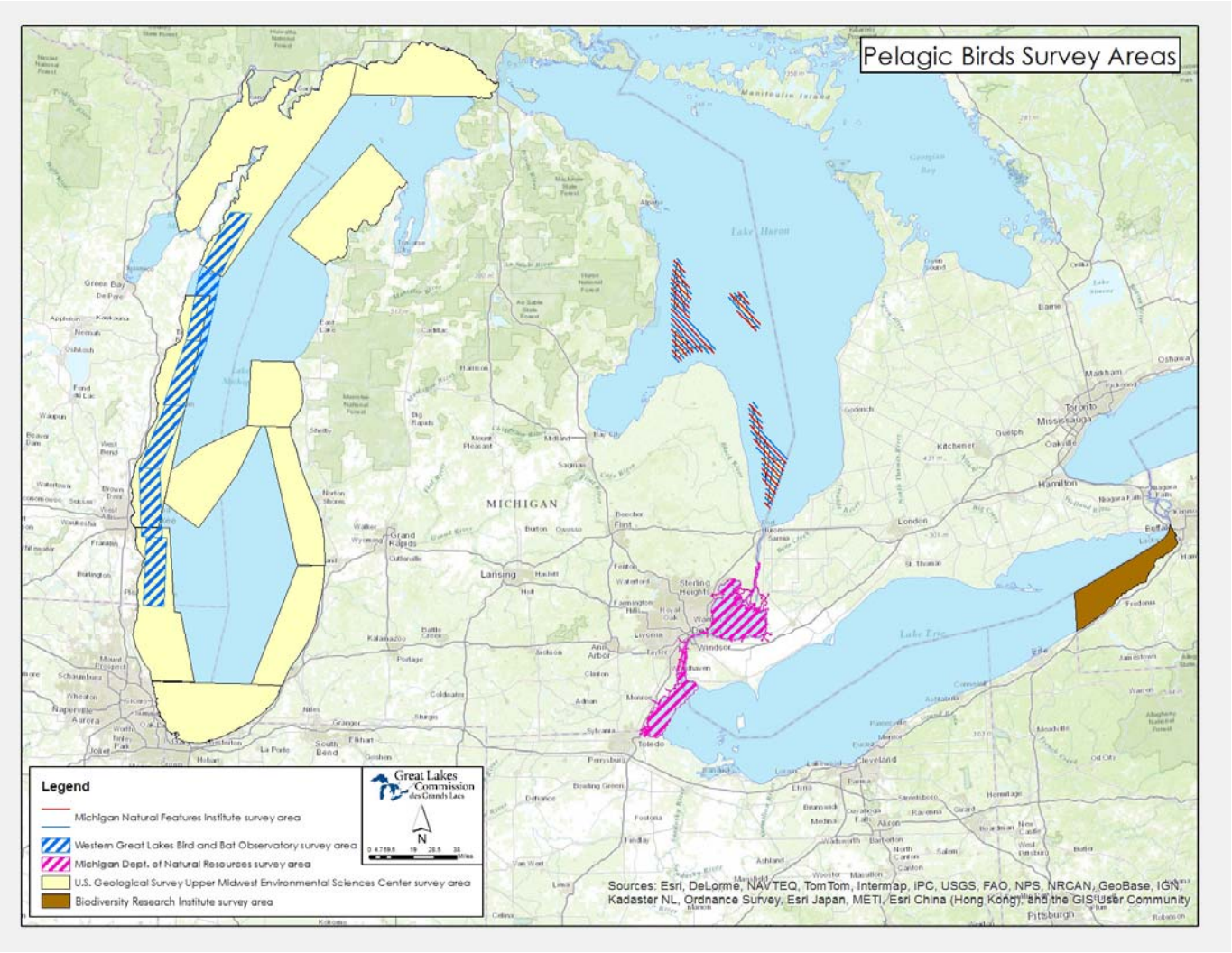
Great Lakes Pelagic Bird Surveys

The Great Lakes Commission, under the auspices of the Great Lakes Wind Collaborative and funded by the U.S. Fish and Wildlife Service, has been coordinating aerial pelagic bird surveys for two years (2012-2014; Figure 1). In the first year, e.g., Phase I, surveys were conducted during the 2012-2013 fall and spring migration and winter seasons. The second year, e.g., Phase II, includes surveys conducted during the 2013-2014 fall and spring migration and wintering seasons. Survey data have been digitized and uploaded into the Midwest Avian Data

[1] This assessment can be defined as a regional baseline assessment of waterbird populations and potential impacts from offshore development in the Great Lakes.

Center (http://data.prbo.org/partners/mwadc/), a node of the Avian Knowledge Network, as well as the Great Lakes Wind Atlas (http://maps.glin.net/projects/glwc/viewer.php).

Figure 1. Map of the pelagic bird survey areas



The table below summarizes the selected findings from the five surveys by geographic area. Presentation slides for each of the five surveys are in Appendix C.

Table 1. Summary of Great Lakes Regional Pelagic Bird Surveys.

Geographic Survey Area	Organization	Years of Study	Initial Findings	Lessons Learned
Western Lake Michigan	Western Great Lakes Bird and Bat Observatory	2009-2014	Species composition changes with distance from shore. Primarily mergansers, loons and long-tailed ducks further from shore. Top Species – Common Goldeneye, Common Merganser, Gulls, Greater Scaup, Long-tailed Duck, Merganser species, Red-breasted Merganser	Distribution changes dramatically from month to month.
Eastern and Southern Lake Michigan	U.S. Geological Survey	2009-2014	Long-tailed Ducks were most prevalent (50-60% of observations). Loons also common, but relatively few Red-Throated—mostly Common Loons.	In the process of developing a waterbird abundance model (model association of selected species to habitat and environmental conditions)
Lake Huron Wind Resource Areas	Michigan Natural Features Inventory	2010-2014	Sea Ducks (Goldeneye, Long-Tailed Duck, Eiders, Scoters) were most prevalent (89%), followed by Gulls, Swans, unknown ducks, and waterbirds.	Birds were widely distributed in low numbers with no obvious concentrations
Lake St. Clair, Detroit River and Western Lake Erie (MI)	Michigan Department of Natural Resources	1983-2014	Diving Ducks - Fall peak population = 600,000 (estimated 22.5 million diving duck use-days). An important area for Trumpeter Swans and possibly Sea Ducks	Lake St. Clair is a food-rich system where diving ducks have a reduced tolerance to risk (disturbance). Diving ducks may provide model species for assessing near shore and pelagic habitat loss
Eastern Lake Erie (NY)	Biodiversity Research Institute	2013-2014	Merganser, Scaup, Gulls, Bufflehead, Canada Goose, Canvasback were the most prevalent. Large groups of waterbirds were found closer to shore in winter months (mostly mergansers). Loons were distributed primarily offshore. Big seasonal variations in species composition and numbers of observations.	Additional years of surveys will be required to fully characterize the site

Workshop participants discussed the data analysis and research needed to determine high- and low- avian use areas offshore. The following research needs were identified during discussion of recent survey efforts:

- Develop hierarchical, waterbird species abundance models with respect to habitat features, including bathymetry.
- Conduct surveys at night using infrared imagery. Nocturnal distribution of waterbirds (and its relation to diurnal use areas) has implications for daily movement patterns. Current surveys only capture daytime avian distribution. Studies have shown that birds demonstrate lower macro-avoidance rates at night.
- Expand surveys to other relevant areas in the Great Lakes. For example, Pennsylvania Audubon is scoping out a survey initiative for Pennsylvania's portion of Lake Erie.
- Diving ducks may provide model species for assessing near shore and pelagic habitat loss due to displacement or activities associated with turbine placement and or maintenance.

Many participants agreed that distribution data from surveys, which are based on limited diurnal empirical observations, should be used in the development of life history models that can inform the predictions of potential impacts from offshore wind energy development. These models may involve: 1) combined data sets for joint analysis; 2) predictions of bird occurrence using explanatory variables; and 3) evaluation of influence of environmental conditions on detectability. Two factors, bathymetry and distance from shore, were thought to be useful factors in determining bird occurrence. While these two factors are often correlated, surveyors hypothesized that the location of offshore foraging areas may be related to bathymetry, and travel routes may be more affected by distance from shore.

Highlights of Other Great Lakes Avian Research

The Great Lakes Regional Pelagic Bird Surveys Project is one of several research initiatives that can inform the planning of offshore wind development. In the effort to assess the state of the science of Great Lakes avian research, a list of twelve current avian research studies was compiled (see Appendix D). The combined geographic scope of these studies includes all of the Great Lakes and parts of the St. Lawrence River, and spans both the United States and Canada. Three of these studies were highlighted at the workshop and are briefly described below. Presentation slides are available in Appendix E.

Breeding Colonial Waterbirds Study

Investigator: Francie Cuthbert

Description: Multiple colonial waterbird databases exist for Great Lakes. These studies include: the binational Great Lakes Colonial Waterbird database (since about 1970's), the priority census/conservation colony site database (since 2011; subset of Great Lakes Colonial Waterbird database), the Double-crested Cormorant biennial census (since 2005), the Great Lakes Piping Plover population database, and others.

Great Lakes Colonial Waterbird database identifies all colony locations up to one kilometer inland and estimates population size. Censuses are conducted every ten years, and each takes three years to complete. It includes 17 species from more than 2,000 sites. Ring-billed Gull, Herring Gull, Double-crested Cormorant, and Bonaparte's Gull are common nesting species. Breeding season begins in mid- to late April and continues into early August. For more information, contact Francie Cuthert at cuthb001@umn.edu

Modeling Great Lakes Migratory Bird Stopover Habitat

Investigators: August Froehlich and David Ewert, The Nature Conservancy

Description: To predict migratory bird hotspots, attributes of terrestrial stopover sites were identified and scored. Potential stopover habitats were mapped across the region (based on literature and available GIS layers), and rated by relative importance. It was very difficult to compare and rank habitats. Ranks were

developed by combining land cover (habitat) values with geographic values (neighborhood values). Related data and information are available at http://Glmigratorybirds.org.

U.S. Fish and Wildlife Service Radar Study

Investigator: Jeff Gosse, U.S. Fish and Wildlife Service

Description: Includes Merlin avian radar units (horizontal and vertical, normally vertical) and passive acoustics studies. Horizontal range is about 2 miles, although one FWS unit has an extended range of about 6 miles. Initial results suggest that migration is pulsed, and therefore monitoring needs to be conducted on a constant basis (e.g., surveying once a week provides only a low probability of observing the big peaks). This is even more true offshore. Related data and Information are available at http://fws.gov/radar.

Section 3: A Proposed Method to Assess Risk

The Biodiversity Research Institute (BRI) is assisting the Great Lakes Commission (GLC) with developing a research plan to understand waterbird populations in the Great Lakes and to inform offshore wind energy siting and general conservation planning. BRI presented a proposed, four-step approach to assess possible effects of offshore wind energy development on waterbirds. Refer to Appendix F for presentation slides. This approach was developed using a subset of species observed during Phase I surveys (i.e., surveys conducted during the fall 2012 migration season through the spring 2013 migration season) in the Great Lakes Regional Pelagic Bird Surveys Project, and as such is not comprehensive. While this approach should still be regarded as preliminary, it may provide useful guidance in how to approach a larger-scale risk assessment effort. Workshop attendees suggested several approaches to improve the scope and perceived accuracy of this risk assessment framework (see "Additional items to consider in the risk assessment," below). For more information on the proposed risk assessment framework, refer to the BRI report to the Great Lakes Commission, *Reducing the Adverse Effects of Offshore Wind Development on Waterbirds in the Great Lakes: A Four-Step Approach.*

Proposed Risk Assessment Method

Stage 1 – Determine Species Presence

To test this method, bird observation data collected through the Great Lakes Regional Pelagic Bird Surveys Project (See Section 2, above) formed the basis for determining the relative abundance of bird species that use the Great Lakes through the fall and spring migration and wintering seasons. Based on preliminary analysis of the Phase I survey data, BRI found that 8 species constituted 95 percent of all birds observed; most were diving ducks, dabbling ducks, sea ducks, swans and gulls. These species would likely have a high level of exposure to hazards posed by offshore wind in the Great Lakes. Other datasets, particularly those housed on the Avian Knowledge Network (http://www.avianknowledge.net/), could also be considered in determining species presence.

Stage 2 – Determine Species Vulnerability

Vulnerability factors include:

- Collision Risk: An estimate of the relative risk that a particular species might collide with offshore wind turbines in the Great Lakes. BRI developed a methodology for estimating this risk by species, building off of previously published vulnerability assessments in the eastern United States and Europe. In the preliminary assessment for migratory and wintering waterbirds, several small ducks and gulls ranked as most vulnerable; gulls also rank highly for collision risk in European assessments, as they often fly at rotor height.
- Displacement Risk: An estimate of the relative risk that a species will be displaced by offshore wind energy development, based on visible disturbance by human activity (e.g., boats, helicopters), their habitat requirements, and other metrics. Birds with a narrow niche, for example, may be more likely to be affected than more generalist species. Many sea ducks and other duck species were found to be vulnerable in the preliminary assessment. Red-throated Loon in Europe exhibit long-term displacement from the vicinity of wind turbines (at least five years post-construction).
- Species of Conservation Concern: A cumulative threat ranking based on species' status, continental and global threat rankings, global population size, and other metrics. Long-lived species with small population sizes, such as Tundra Swan, appeared to be most vulnerable under this category in the preliminary assessment.

Stage 3 – Identify Focused Studies

Identify focused studies on specific species of interest or on specific risk assessment metrics (for example, percentage of time spent in the rotor-swept zone) that are identified as important during the species vulnerability assessment process. Suggestions from the preliminary assessment included:

- Red-throated Loon, Common Loon (*migratory birds*): May have high displacement risk that could lead to effective habitat loss.
- Canvasback, Scaup spp., Redhead (*wintering birds*): Their greater relative abundance may lead to greater exposure.
- Common Tern, Bald Eagle (*breeding birds*): Not included in the preliminary assessment, but collision risk for the Common Tern, and the conservation status for both species, means that individual mortality could have population consequences.

Stage 4 – Identify Potential Mitigation Measures

Potential mitigation approaches could include:

- Avoidance – Site projects away from biological hotspots.
- Minimization – Time construction activities to minimize impacts, reduce lighting or conduct smart curtailment during peak migration. Studies are needed to determine how to best minimize impacts.
- Compensation – Protect and enhance habitat at breeding, stopover or wintering sites to increase adult survival and minimize anthropogenic stressors. Support a research collaborative to focus on understanding cause and effect relationships, population viability, and exploring minimization methods.

After being presented with this preliminary approach to risk assessment, workshop participants mentioned the following considerations:

- The risk assessment should be expanded beyond waterbirds to include breeding birds and passerines.
- Focal species should be determined and modeled in the various regions of the Great Lakes rather than for the Great Lakes as a whole.
- Because the Great Lakes are already a barrier and pose a challenge to migration, passerines that may be vulnerable to offshore wind impacts could also be focal species for study.
- Gulls should also be considered since they are widely distributed and would likely be affected anywhere.
- Other stressors on bird populations include:
    - General health of the bird population. For example, can lead poisoning or type-E botulism contribute to the vulnerability of waterbirds to offshore wind energy turbines?
    - Seasonal stress such as stochastic weather events/weather
    - Possible stochastic long-term population fluctuations. Exposure estimates may vary depending on the timing of the monitoring activity.
- Relative vulnerability of birds to offshore wind energy development should be compared with risks associated with other types of energy production and other stressors on bird populations.
- Long-tailed ducks and scoter species are considered high priority in terms of information needs for assessing conservation risk, and the Great Lakes (particularly lakes Michigan and Huron) are very important for wintering Long-tailed Ducks and scoters (particularly white-winged).
- A full risk assessment should examine distributions of likely offshore wind sites and identify the common species in those areas based on bird distribution data from distributed databases (e.g., Avian Knowledge Network).

Section 4: What Makes an Offshore Wind Project and Related Environmental Assessments

Eric Ritter, Communications Director at the Lake Erie Energy Development Company (LEEDCo), briefed workshop participants on how an offshore wind project is created and conducted from an engineering and operational perspective. LEEDCo is a non-profit, public-private partnership with the mission to build an offshore wind power industry in Northeast Ohio. In carrying out this mission, LEEDCo has been planning an offshore pilot project comprised of six 3-MW turbines, sited 6-9 miles from the Lake Erie shore. Preliminary risk assessments addressed the following potential effects: habitat loss, barrier effect, collision, mortality, sensitive species, and population impacts. This pilot, if fully developed, can inform responsible siting by implementing best practices and conducting rigorous post-construction monitoring. Presentation slides are available in Appendix G.

Section 5: Recommendations for the Avian Risk Assessment Approach

Offshore avian research is a young body of research, and new discoveries are emerging. In small group discussion, the workshop participants made observations and raised comments, suggestions and recommendations in applying the four-step risk assessment approach in the Great Lakes region. The discussion and recommendations are summarized below.

Stage 1 – Determine Species Presence

The presence of species varies seasonally as well as among the different Great Lakes. While it is important to know how these species use the Great Lakes overall, studies should focus on geographic areas that are considered favorable siting locations for offshore wind. Moreover, study designs that allow for evaluating gradients (distance from turbine) and changes through time are important.

Remote sensing, in particular the use of military grade satellite imagery, has the potential to replace actual surveys for avian distribution/abundance at some point in the future. With satellite imagery, we have the potential for a more random sampling design. Additionally, the use of remote sensing may open the opportunity to examine habitat variables like ice leads that affect bird distribution.

Stage 2 – Determine Species Vulnerability

The following species were thought to be vulnerable to potential offshore wind impacts:

- Waterbirds (in particular, those that use offshore areas rather than inshore areas, such as Long-tailed Ducks, other sea ducks, loons, grebes)
- Migratory birds (other than waterbirds)
- Colonial nesters
- There may be other species groups or individual species (e.g., Black Terns)

Understanding how these species use the Great Lakes will help researchers to determine the variances in vulnerability amongst differing species. For example, research has shown that Long-tailed Ducks use open water for foraging, movements between sites, and congregations. Some areas still need further research, however. For instance, current studies have focused on daytime movement and have therefore left a research gap regarding nighttime passage. Other research gaps include: 1) the use of airspace (e.g., flight height) and 2) foraging patterns.

The technologies and methods available to collect species-specific information related to flight height and bird movements are limited to individual tracking and acoustics. NanoTags, the smallest transmitters available for avian research, may serve as a good potential option to understand bird and bat movement. A regional network of NanoTag towers may be helpful in tracking avian movements. Radar is difficult to deploy offshore and does not provide species-specific information. Acoustic monitoring, on the other hand, can provide species-specific information, but it has limitations (as do observers, cameras, etc.). A combination of approaches may be required to provide the types of data necessary for determining species vulnerability. There is a continuing need for larger collaborations or networks to answer some questions and fund the necessary technologies (example: regional NanoTag network).

Recommendation 1: Pursue studies that investigate the following avian behaviors to inform the determinations of species vulnerability: nighttime usage, flight height and foraging patterns.

Stage 3 – Suggest Focused Studies

Based on the discussion summarized under Stages 1 and 2, the recommendations on focused studies listed below were made. Further thought should be made in designing a detailed research agenda based on these recommendations. Where possible the roles of stakeholders and experts in carrying the elements of the research agenda should be identified.

Workshop participants acknowledged that offshore wildlife studies, and particularly those that explore the cumulative effects of wind energy development, are complex, expensive and a challenge to design. Setting the proper limits to the analysis, such as defining the types of stressors, geographic boundaries and temporal boundaries, is a crucial component of the study design.

Recommendation 2: To better understand the potential impacts of offshore wind in the Great Lakes, the following species were recommended for further study: Loons, Diving Ducks, Tundra Swans and Long-tailed Ducks. In addition to pelagic waterbirds, the following species were recommended for further study:

- Passerines (concerns raised about using wind farms as resting areas during passage)
- Falcons (observed crossing over the lakes)
- Bald and Golden Eagles (observed present when there is ice on the lakes)
- Shorebirds
- Bats (observed present offshore, but not much is known about their behavior)

Recommendation 3: Identify and conduct more focused studies on particular vulnerable species to offshore wind based on the information and knowledge developed through recommendations 1 and 2. A regional group of avian and offshore wind development experts led by the Great Lakes Wind Collaborative could assist in identifying these focused studies.

Recommendation 4: Regional studies investigating the cumulative effects of both offshore and onshore wind energy on these avian populations should be pursued.

Stage 4 – Suggest Mitigation Measures

In order to identify effective mitigation approaches, more research is needed to identify potential hazards. A mitigation fund for research, larger studies, habitat mitigation and/or compensation could provide support for such studies. The following aspects of an offshore wind site may pose the greatest hazards to wildlife:

- Construction – desire and need to do 24-hour construction on site
- Operation – turbines and their airspace, overall physical area of the project
- Lighting – lack of communication and different requirements between FAA and Coast Guard

Potential adverse effects with the greatest impact are: 1) collision and injury and 2) displacement (e.g., the loss of feeding and foraging habitat). There was no consensus among workshop participants on whether collision or displacement is worse. This will vary by species, location and season.

To mitigate these adverse effects, avoidance (e.g., siting the project in the right place) was the most favored approach. Minimization techniques such as painting the turbines gray, and tactics to mitigate lighting stressors such as hoods on solid lights or blinking lights, were suggested but require further research prior to implementation.

Overall, the workshop participants acknowledged the need for open and honest dialogue among all stakeholders. From a big picture perspective, there are environmental, economic and social trade-offs for any type of energy generation technology, and in particular in the context of mitigating global climate change. This big picture perspective should be part of the discussion in future forums. Participants also noted the value of the Great Lakes Wind Collaborative for its role in fostering communication across jurisdictions and binationally. Similarly, further cooperation will allow researchers to answer important questions about wind development such as, “How effective

is curtailment for bats and songbirds?" Both the wildlife conservation and wind communities will benefit from continuing this type of collaboration in the future.

Recommendation 5: The Great Lakes Wind Collaborative should lead a forum among conservation and wind energy stakeholders to discuss and analyze the effects of terrestrial and offshore wind projects in contrast to other energy generation options and within the context of global climate change.

Section 6: From Data to Conservation Management

Related to conservation management, of regional pelagic bird survey data may help: 1) inform efforts to link important land areas to important open water areas, and 2) identify water areas to conserve in the form of Important Bird Areas (IBAs). Some IBAs in Illinois, Wisconsin, Michigan and Ohio do extend into the waters around them

Recommendation 6: The conservation community should consider exploring the use of regional pelagic bird survey data to designate new or expand existing open water Important Bird Areas in the Great Lakes.

Moving the Avian Research Agenda Forward

Our collective knowledge of avian behavior and use of the Great Lakes is highly variable by geographic area and type of use. In selective areas of the Great Lakes, we know a fair amount about the abundance of various species, but our understanding of how these birds behave in terms nocturnal movements, migration patterns and flight heights is limited. The proposed four-step risk assessment approach to determine offshore wind impacts to avian life provides a reasonable framework for identifying knowledge gaps and research priorities.

The workshop participants discussed these knowledge gaps and research priorities as a first step in moving the avian research agenda forward. An initiative to pull experts together to further outline a research agenda and to maintain interest among the research community for regional coordination and sharing of data is paramount. The six recommendations listed above are first steps towards developing such a research agenda. More data on species exposure, vulnerability, and potential mitigation approaches are needed in order to minimize impacts to Great Lakes bird populations as offshore wind energy development proceeds.