AMERICAN BIRD CONSERVANCY'S BIRD-SMART WIND ENERGY PROGRAM

Promoting Bird-friendly solutions for sustainable wind energy development

Contact: Holly Goyert, PhD, Bird-Smart Wind Energy Campaign Director,
American Bird Conservancy | Email: BirdSmartWindEnergy@abcbirds.org | Phone: 202-888-7471 | https://abcbirds.org/program/wind-energy-and-birds/

American Bird Conservancy's Bird-Smart Wind Energy Program promotes bird-friendly solutions to advance the sustainable development of wind energy, while minimizing impacts to bird life. Since 2010, we have worked to reduce risk to birds during planning stages, with a focus on pre-construction considerations.

American Bird Conservancy supports efforts across the USA to reach energy sustainability goals, combat climate change, and reduce our dependence on fossil fuels. However, wind turbines and their associated infrastructure can negatively affect bird populations, through direct collision and habitat loss. Given our mission to protect America's most threatened and endangered bird species and their habitats, our approach is to provide solutions for responsible renewable energy development, including "bird-smart" practices to minimize these impacts.

Photo credit: Wind turbines and birds by J Marjis, Shutterstock.

Sustainable wind energy sources in the US are rapidly increasing, both onshore and offshore. On land, there currently exist over 54,000 turbines operating in 41 states in the US, with approximately 90 GW of capacity (Fig. 1). The number of turbines are predicted to triple in the next three decades, by over 50,000 onshore and up to 50,000 offshore (DOE 2015, 2016).

Based on three studies from the last five years (Smallwood, 2014, Loss et al. 2014, Erickson 2015)[1], American Bird Conservancy estimates that approximately 1 million birds are killed annually from collisions with wind turbines in the US (Hutchins et al. 2016)[2]. This does not include impacts from collisions with associated infrastructure (e.g., power lines), habitat loss, displacement or other indirect impacts. Given projected onshore and offshore build-out (i.e., the expected growth of the wind energy industry), that figure is projected to increase to 3-5 million annually by 2050.

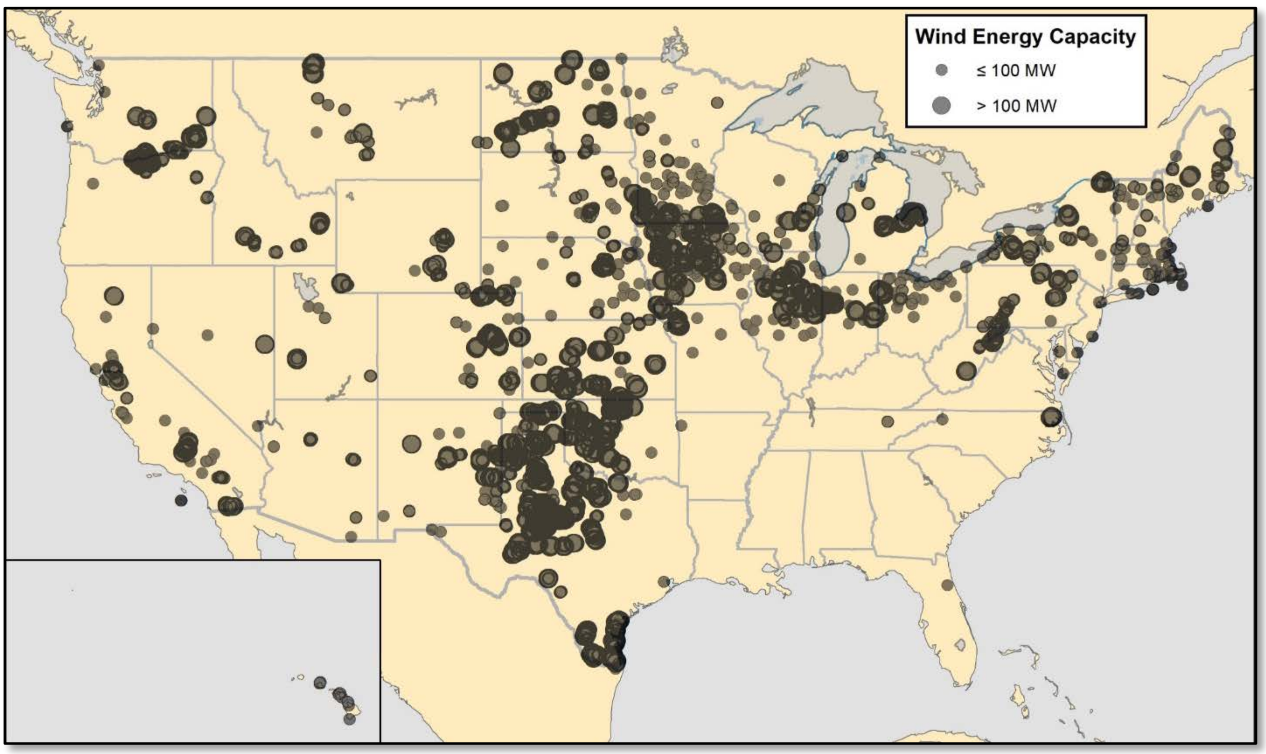

Figure 1. Currently, more than 54,000 turbines exist in the U.S with approximately a 90 GW energy capacity operating in 41 states, concentrated in the Midwest (American Wind Energy Association, AWEA). Turbine data shown here were sourced from the USGS Wind Turbine Database.

---

[1] See Johnson et al. 2016 for a comparison among studies

[2] Derived from the build-out since those three studies were conducted, and new techniques using canines to increase carcass detectability.

Birds contribute substantial ecological services to the environment, and bird-watching people contribute over $40 billion to the national economy (Carver 2013). American Bird Conservancy works to ensure that the benefits of wind energy outweigh its costs, by minimizing and mitigating its impacts on birds. Our wind energy policy provides a strategy to prioritize early decision-making steps in wind energy development: "avoid when planning, minimize while designing, reduce at construction, compensate during operation, and restore as part of decommissioning" (according to the "mitigation hierarchy", May 2017).

American Bird Conservancy supports wind power development when it is bird-smart, which means following six principles:

(1) proper siting of turbines away from high-bird-collision-risk areas;
(2) independent, transparent pre-and-post-construction monitoring of bird impacts;
(3) effective construction and operation minimization of bird mortality by wind energy facilities;
(4) mitigation to compensate for any unavoidable bird mortality and habitat loss;
(5) evaluation of wind energy as part of a complete analysis on all feasible renewable alternatives; and
(6) environmental compliance with a rigorous local, state, and federal regulatory framework.

American Bird Conservancy works with the government, industry, and conservation partners towards our goals to promote a science-based approach to bird-smart wind energy.

Photo credit: Wind turbines with flock by J Marjis, Shutterstock.

Bird-smart Principle 1: proper siting of turbines away from high-bird-collision-risk areas

Land-based Development

The first best practice step in wind energy planning, with regard to bird impacts, is to conduct an independent pre-construction risk assessment at the proposed site to carefully evaluate the exposure and vulnerability of birds to turbines and their associated infrastructure (Drewitt and Langston 2006). It is good practice to avoid developing areas in or near sites where birds concentrate, during migration or other times of year.

High risk areas include regions where birds are exposed to development, in part due to their distribution and abundance. For example, proper siting avoids avian hotspots, which are areas where a high abundance and diversity of resident and migratory birds congregate in ecologically important habitat. Other “no-go” zones are Important Bird Areas, Critical Habitat as designated under the Endangered Species Act (ESA), sensitive habitat (e.g., wetlands), reserves, migratory bottlenecks, the edges of ridges used by migrants, and breeding concentrations or movement corridors.

Photo credit: Wind turbine with flock by Bildagentur Zoonar GmbH, Shutterstock

To aid wind energy project developers, American Bird Conservancy has created a Wind Risk Assessment Map (Fig. 2) identifying levels of risk throughout the country. While well-sited wind facilities require extensive resource investment at an early stage, they help to ease the ensuing regulatory and decision-making process, as it relates to monitoring, minimization, and mitigation (see Bird-smart Principles 2-4 below).

Areas of moderate risk could include habitat that has been previously altered (e.g., urban environments), coldspots, and resilient habitat (e.g., agriculture). Developers may proceed with caution in areas of moderate risk, as long as they follow stringent monitoring, minimization, and mitigation requirements. For example, the design of movement corridors through or around wind energy arrays, via micro-siting, can help to enable turbine avoidance. Developers could also consider reducing turbine number and density, and selecting turbine sizes with a rotor swept zone that minimizes collision risk, based on at-risk species. There exists a tradeoff in energy output, where few, large turbines have equivalent capacity to a large matrix of small turbines. A reduction in turbine number and/or density may help to minimize collision or displacement risk, as long as the rotor zone remains outside the range of flight heights of at-risk species.

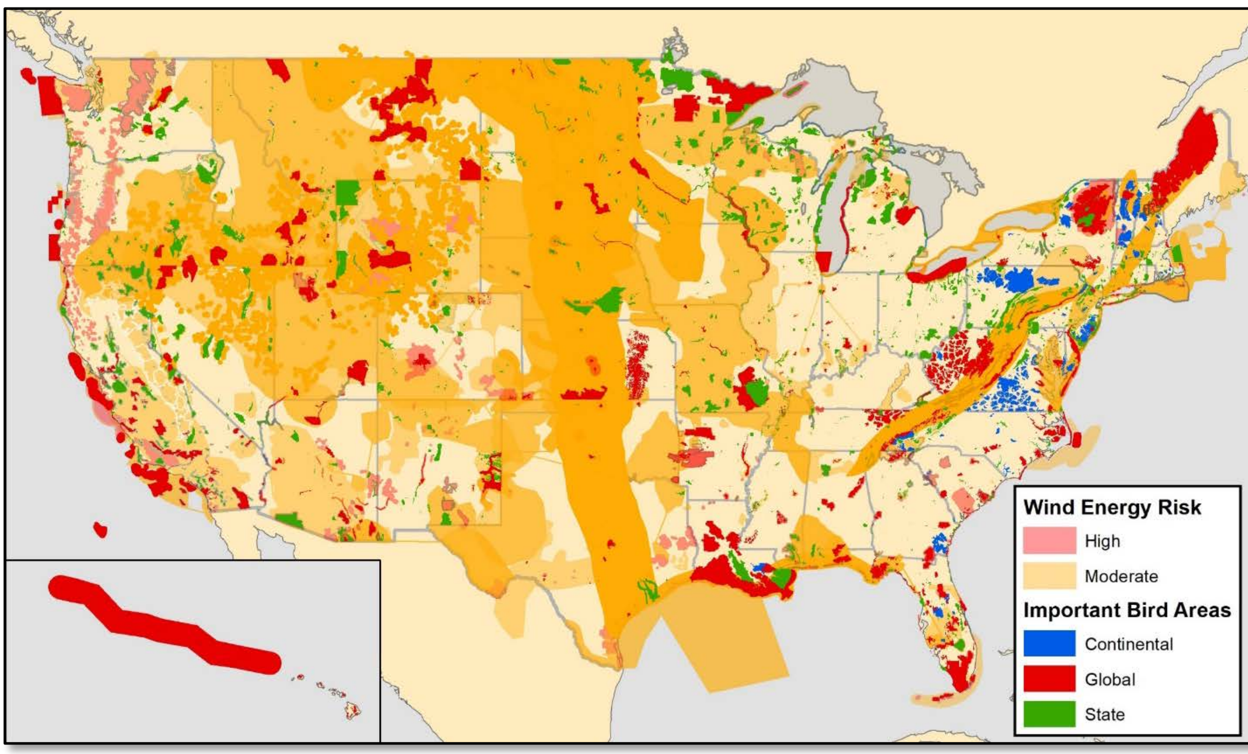

Figure 2. American Bird Conservancy's U.S. Wind Development Bird-Risk Assessment Map. Wind energy development should avoid high risk areas, indicated in red (where dark shades of red highlight Global Audubon Important Bird Areas (IBAs)). If developers choose to proceed in areas of moderate risk (orange on the map), they should follow stringent monitoring, minimization, and mitigation requirements. Continental IBAs are shown in blue, and state IBAs are in green.

Offshore Development

Offshore wind facilities should not be placed near populations of rare or endangered species, large breeding colonies, or in major migratory pathways. The definition of "near" may vary from species to species, as some birds travel long distances to forage. Special attention should be paid to avoid wind development near nesting islands, where seabirds could be at risk of collision when transiting between at-sea foraging grounds and their breeding sites.

American Bird Conservancy's Seabird Maps and Information for Fisheries ([SMIF]) tool provides a list and summary of the seabird species found across the world's oceans.

To inform the offshore siting process, Winship et al. (2018) modeled and mapped the relative density of marine birds on the Atlantic Outer Continental Shelf, using three decades of aerial and boat-based visual surveys at sea. However, the ocean is a characteristically dynamic habitat, where conditions can change rapidly over time and space (e.g., upwelling, forage resources), thus influencing the distribution and concentration of wildlife. Climate change is exacerbating such environmental volatility, and shifting the long-term distribution, persistence and predictability of hotspots. To fully evaluate risk during the time frame of 30-year wind energy leases, developers and regulators will need to consider long-term forecasts of seabird hotspots.

Offshore wind energy has been subject to structured regional planning, more so than terrestrial wind energy, which mostly operates within private lands (DOE 2016). This is in part because waters within 200 nautical miles (nm) of shore fall within US federal or state (less than 3nm offshore) jurisdiction. The US Bureau of Ocean Energy Management (BOEM) is the federal regulatory and leasing agency that manages federal waters. Over five years ago, they began the planning and leasing process for several wind energy areas on the Atlantic Outer Continental Shelf (Fig. 3).

Opportunities exist to encourage proper siting in the Atlantic and Pacific, but largely in state waters, where planning has begun more recently (Fig. 4). In the Atlantic, Massachusetts, New Jersey, New York, North Carolina, and South Carolina are planning the highest renewable energy capacity (Table 1). As part of the Atlantic Marine Bird Cooperative, American Bird Conservancy is leading a working group to incorporate birds into this marine spatial planning process.

In the Pacific, Hawaii has proposed the most ambitious goal of achieving 100% renewable energy by 2045. Consequently, it also has the highest number of endangered birds, which American Bird Conservancy's Oceans & Islands team actively works to protect. We have directly helped inform the planning process for proposed wind energy areas in both the Atlantic and Pacific (Rhode Island, Massachusetts, and California), and we plan to expand this effort as we continue to comment on other projects.

Photo credit: Wind in water by Sergey Galushko, Shutterstock

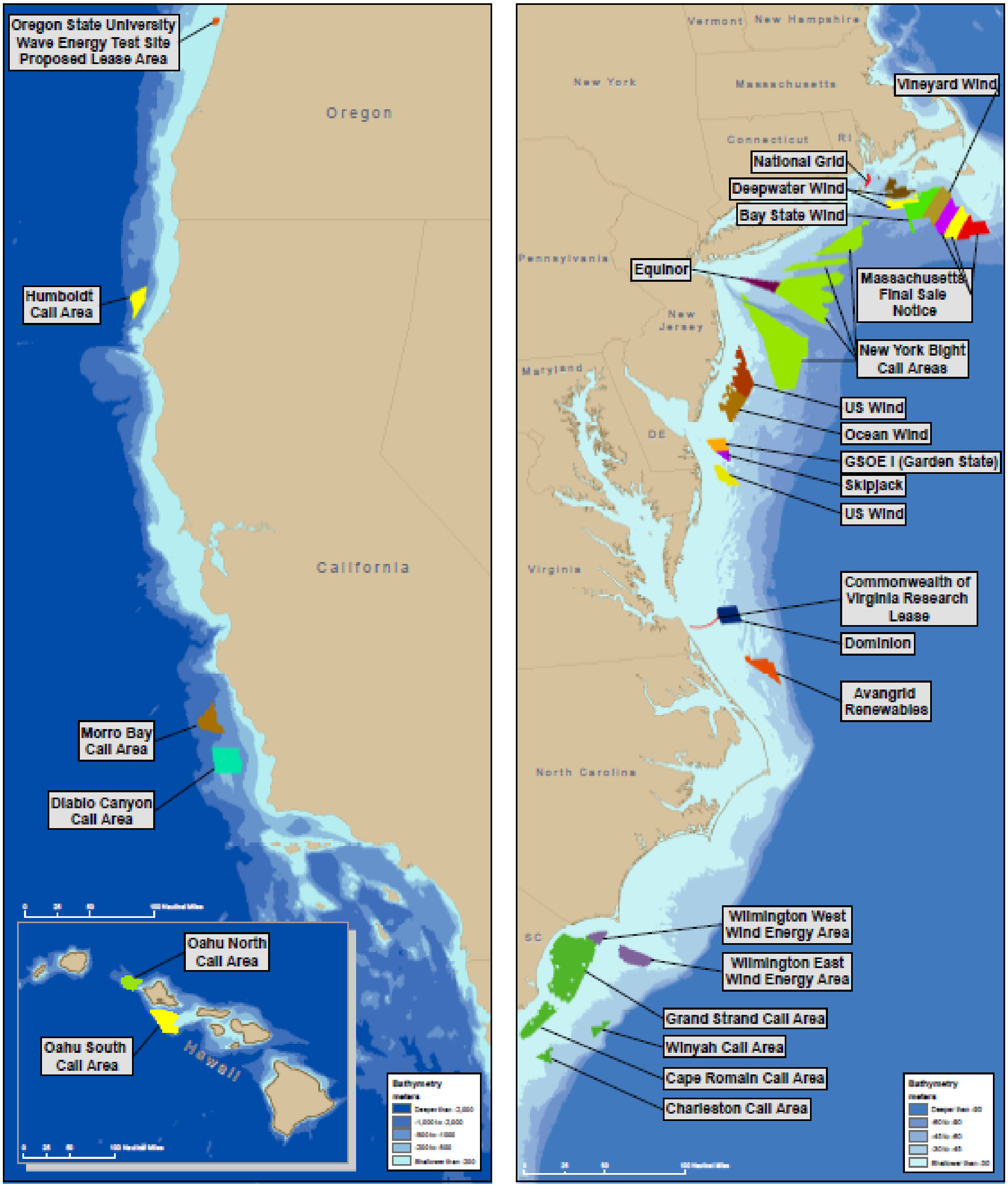

Figure 3. Wind energy areas managed by the federal Bureau of Ocean Energy Management (BOEM). Call Areas are in the early planning stage, while others are farther along into the leasing stage. From [https://www.boem.gov/All-States-Poster/.](https://www.boem.gov/All-States-Poster/)

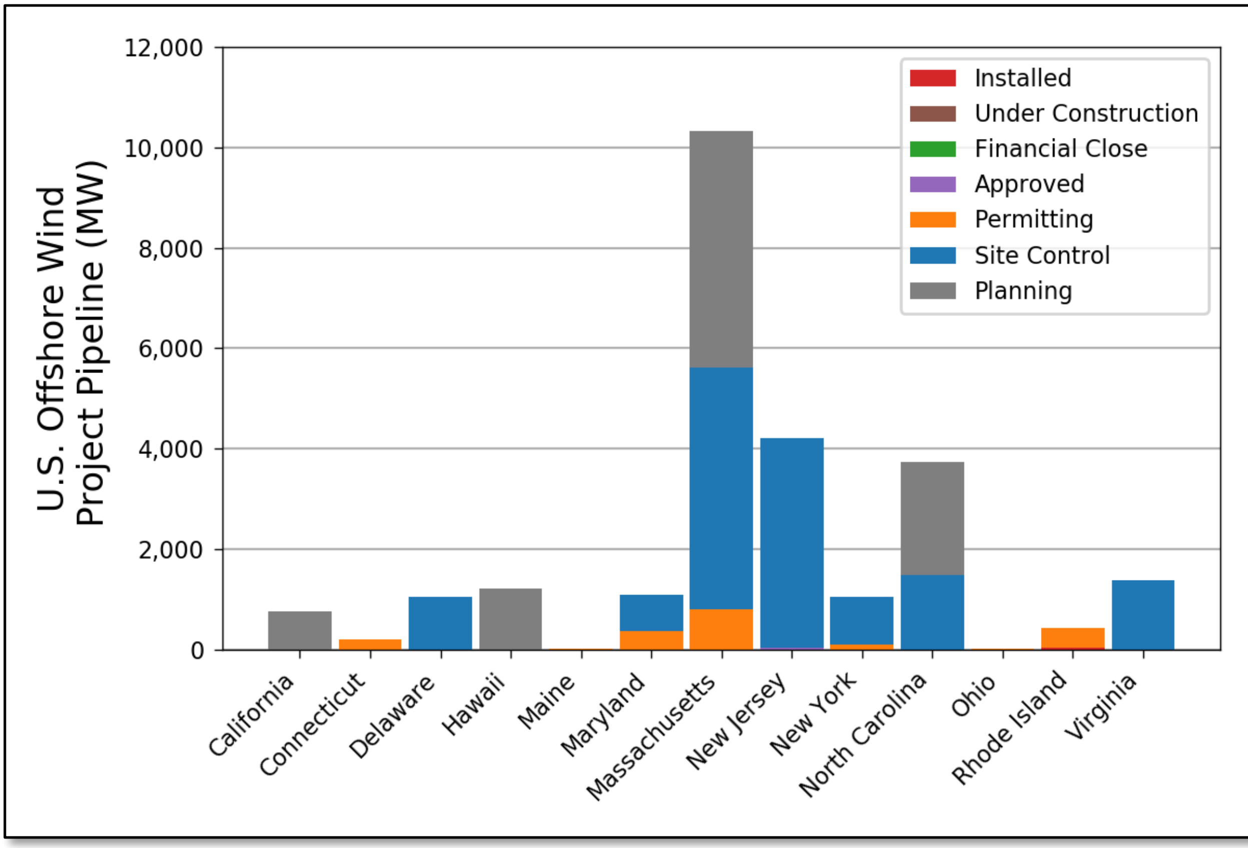

Figure 4. The planned offshore wind energy capacity for coastal states, from Beiter et al. 2018. For comparison, the first and only offshore wind farm in the U.S. is in Rhode Island state waters: the Block Island Wind Farm, which operates across 5 turbines (30 MW total capacity). The legend shows the stages of development, beginning with Planning and ending with Installed. Careful siting is most effective during the Planning stage.

Table 1. The planned offshore wind energy capacity and renewable energy goals for U.S. coastal states, adapted from Musial et al. 2017, Beiter et al. 2018, and the BOEM Renewable Energy Map Book 2018. New York (NY), South Carolina (SC), Massachusetts (MA), New Jersey (NJ), North Carolina (NC), Virginia (VA), Hawaii (HI), Maryland (MD), California (CA), Ohio (OH), Maine (ME), Rhode Island (RI), Delaware (DE), New Hampshire (NH). For comparison, the U.S. goal is 86 GW of offshore wind energy produced by 2050 (DOE 2016), which would represent 14,333 6 MW turbines, but this could change rapidly with shifting priorities and other factors.

	Planned		**Goal**			
	Capacity (MW)	**Area (km^2)**	**Capacity (GW)**	**by Year**	**% Renewable**	**by Year**
NY	22,029	7,343	2.4	2030	50	2030
SC	12,006	4,002				
MA	5,613	2,101	1.6	2027		
NJ	4,197	1,399	3.5	2028		
NC	3,735	1,245			12.5	2021
VA	1,383	463			15	2025
HI	1,200	399			100	2045
MD	1,086	322			25	2020
CA	765	275				
OH	21	10				
ME	12	9	5	2030		2030
RI	630		1	2020	38.5	2035
DE	600				25	2025
NH					25	2025

Bird-smart Principle 2: independent, transparent pre-and-post-construction monitoring of bird impacts

It is best practice to monitor the impacts of wind energy on birds using an independent body to assess pre-construction risk and post-construction injury to birds. This guideline removes conflicts of interest due to company self-reporting, and avoids perceived incentives for under-reporting. Any study should include consultation with avian experts that are not paid employees of wind energy companies, but who are intimately familiar with the local avifauna and their habitats. As described below (Bird-smart Principle 4), such independent studies can be supported through a mitigation fund. To allow for public oversight of study design and results, transparency is essential, as our nation's birds are a public trust resource.

Bird-smart wind power should employ a site-specific monitoring plan that is federally and state reviewed and approved (e.g., an Avian Protection Plan). A monitoring plan should be included in all Construction and Operation Plans, and reviewed during the National Environmental Policy Act (NEPA) process. An effective plan covers at least 5-10 years and requires independent, transparent, site-specific studies that use standard pre- and post-construction "Before, After – Control, Impact" (BACI) or "Before-After Gradient" (BAG) protocols. These methods set a comprehensive annual baseline against which post-construction studies can be evaluated, to quantify the cumulative impacts of wind turbines on birds.

With oversight from regulatory agencies, the plan should be modified on an annual basis, to inform the adaptive management process for improved operational minimization and mitigation. For example, at the first (and only) offshore wind farm in the US, located off the coast of Block Island, Rhode Island, Deepwater Wind reports the results of their monitoring plan to the US Army Corps of Engineers (USACE), USFWS, and Rhode Island Coastal Resource Management Council (CRMC). These organizations review the information biannually and modify the plan as appropriate.

Photo credit: Wind turbines at sea by Boscorelli, Shutterstock.

Pre-construction assessments should last at least two years and use all existing available bird study data, providing sufficient site-specific data to best account for detection probability, local environmental variability and bird movements at the appropriate spatial/temporal resolution.

Post-construction studies should run for at least five years (long enough to determine the efficacy of operational minimization measures and make needed revisions). Implementing a suite of methods is necessary to assess displacement sensitivity (e.g., boat and aerial surveys, with tracking studies), as well as collision vulnerability (e.g., radar combined with vibration/bioacoustics collision sensors). Together with life history factors, these contribute to population vulnerability, which is used to evaluate risk when combined with exposure to the hazard of wind turbines (bird abundance and distribution; Marques et al. 2014; Fox et al 2006).

Displacement

Avoidance behavior displayed by some birds around wind facilities suggests that, even if they don't collide with wind turbines, birds may experience habitat loss, particularly from large wind farms (Garthe et al. 2017, Mendel et al. 2019). Advancements in tracking technology have made it possible to identify behavioral avoidance of wind turbines by individual birds. For example, GPS tracking can be used on large birds (e.g., > 200g) to quantify fine- and macro-scale movements, with a special focus on altitudes within the rotor-swept zone. Alternatively, nanotags are miniaturized tracking devices attached on small birds that are detected by receiving towers throughout the Motus Wildlife Tracking System network. This tool uses automated digital telemetry to estimate the macro-exposure of birds to wind energy development, such as wind energy area crossings (Loring et al. 2018).

Surveys that assess avian exposure to wind energy development can also address displacement vulnerability (Kelsey et al. 2018). To estimate abundance at a micro-spatiotemporal scale, developers should deploy continuous turbine-mounted acoustic monitors to detect the calls of passing birds and bats. Radar, aerial surveys, and boat-based surveys (in the offshore realm) estimate the abundance and distribution of birds at a macro-spatial scale. Radar should be monitored on a continuous (daily) basis to detect large birds and flocks at altitudes within the rotor zone. Traditional (observer) aerial or high-resolution digital aerial surveys should be run on a monthly basis, and weekly during peak movement periods; digital aerial surveys can be used to estimate altitudes within the rotor zone. In the offshore realm, boat-based surveys have the advantage of detecting bird behaviors and should also operate on a monthly basis, weekly during peak movement.

Photo credit: Northern Gannet in flight by Dolores Harvey, Shutterstock

All site-specific avian exposure surveys should follow BACI or BAG protocols within the wind energy area (i.e., treatment) and a reference area (i.e., control plots). Careful selection of reference areas requires a representative sample of the wind energy area consistent with standard environmental variables – these variables differ depending on the habitat type (i.e., terrestrial versus offshore). For example, in the offshore realm, a control plot should represent the species assemblage affected by the wind energy area, through a range of habitat covariates that include water depth, productivity, and distance to shore. Mendel et al. (2019) used a BACI approach with 14 years of pre-construction data and 3 years of post-construction data from boat-based and aerial surveys. They showed that wind facilities in the North Sea caused a loss (i.e., reduction and redistribution) of available loon habitat, which could lead to indirect long-term effects on their populations.

Collisions

Flight height of a given species is considered the most important factor in determining that species' collision risk (Furness et al. 2013) and avoidance potential (Band 2012). A radar study around the Great Lakes conducted by the U.S. Fish and Wildlife Service (Bowden et al. 2015) suggests that many migratory birds often fly at lower levels than once thought.

For seabirds that use dynamic soaring, flight height and behavior are positively related to wind speed and direction. For example, albatrosses and petrels exhibit gliding flight behaviors, where their flight heights increase to within rotor height during high winds (Ainley et al. 2015). Gannets, gulls (including kittiwakes), and terns also fly within rotor height and have shown particularly high collision and displacement vulnerability scores (Willmott et al. 2013). Advancements in digital aerial survey technology (Johnston and Cook 2016) and the use of drones (Harwood et al. 2018) in the last couple of years have shown that boat surveys underestimate flight heights, therefore many collision and displacement vulnerability scores are likely to be even higher than estimated in these previous studies.

Photo credit: Birds surround a Chinese wind turbine by Changhua Coast Conservation Action, Flickr Creative Commons License

American Bird Conservancy encourages the USFWS, Department of Energy (DOE), BOEM, and other federal and state natural resource agencies to further study species-specific collision risk and avoidance potential. **Pre-construction** assessments should involve site-specific collision risk modeling, based on avian exposure to the wind energy area (i.e., abundance and distribution), hazards imposed by the turbine parameters (i.e., based on rotor zone), and vulnerability (i.e., based on life history parameters such as flight height and other bird behaviors, including foraging and migratory activity).

Post-construction studies should employ statistical models that best account for variations in local conditions and the relative difficulty of locating bird carcasses in different conditions, particularly due to scavenging by predators. Standardized mortality statistics should be calculated via the Generalized Fatality Estimator, GenEst. On land, the use of dogs within search radii > 105m is imperative to maximize the detection of carcasses. Smallwood 2018 states that "fatality rates are being underestimated because too often investigators and permitting agencies have assumed that disproportionate numbers of fatalities fall straight down or near the wind turbine. This common assumption has justified maximum search radii that fall far short of the area needed to adequately detect available carcasses of birds and bats. Even at the recent wind projects in the [Altamont Pass Wind Resource Area], the search radius of 105 m appears to be too short" (p. 13). Determining post-construction mortality for birds is even more difficult in the offshore realm than onshore, since carcasses are immediately lost in the water, thus precluding species identification and determination of actual numbers taken.

Given the low detectability of bird carcasses, American Bird Conservancy encourages research on new technologies that will test and verify accurate pre-construction risk assessment and post-construction mortality monitoring at offshore wind facilities. Several techniques used to monitor bird strikes with turbines are under development or in the testing stages (Dirksen 2017). Turbine-mounted systems include vibration/bioacoustics and multi-sensor (MUSE) wildlife detection systems; radar and infrared camera Thermal Animal Detection Systems (TADS); as well as accelerometers, microphones, and video cameras (WT-Bird). Rigorous metrics are needed to improve upon existing methods of pre-construction risk assessment and post-construction mortality studies, particularly offshore (Bailey et al. 2014).

Cumulative impacts

Estimating the potential impact of one wind energy facility in a site-specific study is very different from assessing the impact of several facilities in a strategic study of the same area (Busch et al. 2013). Site characterization and assessment studies need to follow BACI or BAG protocols (i.e., with appropriately-selected control plots adjacent to the lease area for comparison, as stated above).

In contrast, strategic surveys are larger-scale, longer-term, and set a baseline against which to compare the impacts of different wind energy areas. It falls to government regulators to develop a comprehensive decision-making process that involves both site-specific and strategic surveys to estimate the cumulative impacts of wind energy on birds (see Goodale and Milman 2014). Such studies should be transparent, independent from the leasing industry, and systematically designed to accurately and precisely quantify the collision and displacement vulnerability of protected birds to offshore wind energy development.

Bird-smart Principle 3: effective construction and operational minimization of bird mortality by wind energy facilities

Several cost-effective strategies can be taken to minimize bird mortalities, although further innovation and testing is needed (Bailey et al. 2015, Wang et al. 2015, Dirksen 2017). Improving existing methods is an important factor in taking a science-based approach to wind-energy development, since "technologies to minimize impacts at operational facilities for most species are either in early stages of development or simply do not exist" (DOE EERE 2014).

American Bird Conservancy encourages further research on ways to minimize the effects of wind turbines on birds, including measures to deter birds and to detect-and-cease wind turbine rotation (i.e., feather, curtail) when large numbers of birds are present (May et al. 2015). Until such approaches become reliable, a precautionary approach is necessary to compensate for the low detectability of bird mortality that results from inadequate monitoring and minimization technology.

Bird-smart wind power uses the best existing technology and management practices to avoid harm to birds. Cables that connect wind energy to the electrical grid can pose a significant risk to birds through collisions and electrocution (Manville 2005). Avian Power Line Interaction Committee (APLIC) standards are fundamental to minimizing these issues: above-ground transmission lines should be buried in high risk areas, and meteorological towers should be un-guyed.

Attractant removal is good practice, such as anti-perching devices and lighting that minimizes nighttime migratory bird collision mortality (such as flashing lights). Sonic and visual deterrents can also be effective, such as flight diverters, markers on associated infrastructure, or specialized light spectrum deterrent devices using UV or red/blue LED lights or lasers. Effective construction and operation minimization should be implemented as part of a monitoring plan to reduce bird fatalities.

During high risk times of year, operational curtailment is necessary (i.e., feathering, or shutting-down turbines), for example during poor visibility weather and peak movement periods (e.g., nocturnal, seasonal migration, or post-breeding season). Offshore marine environments are particularly dynamic and can change rapidly with changing weather conditions, such as strong wind and fog.

Photo credit: Roseate Tern by Luke Seitz

Measures need to be taken into account to accommodate changing distributions in bird hotspots, as a result of weather conditions and climate change. Existing detection-and-curtailment systems (e.g., IdentiFlight and DTBird) detect eagles and activate warning sounds prior to curtailment, which occurs within seconds. Further research is necessary to generalize this technology to other realms (e.g., offshore) and to other at-risk species, including solitary birds and large flocks.

Best practice involves adaptive management to maximize the efficacy of a monitoring and minimization plan. That means revising operational measures, such that when parameters are exceeded they trigger required remedies. For example, Greater Sage Grouse planning is updated when habitat loss is exceeded.

In the offshore realm, it may be possible to install floating turbines that can be re-located under circumstances where bird distributions shift dramatically (i.e., an adaptive post-construction matrix design). However, adaptive management requires a robust monitoring and minimization program involving independent, transparent reporting of bird injuries to regulatory agencies.

Bird-smart Principle 4: mitigation to compensate for any unavoidable bird mortality and habitat loss from wind energy development

Following efforts by developers to properly site wind energy facilities and minimize bird mortalities, further harm to birds can be unavoidable. In these situations, bird-smart wind power redresses the loss of any birds or habitat, to a net benefit standard. This means that developers must find ways to produce enough birds to offset the losses imposed by collisions, displacement, and the cumulative effects of wind turbines. Examples include predator control and post-construction/decommission restoration of disturbed habitat (e.g., replanting of native vegetation).

Best practice for developers is to buy into a mitigation fund, for example via an HCP or other memorandum of understanding (MOU) with a natural resource agency (e.g., USFWS). This can be used to support conservation and independent research on the vulnerability of birds to the wind energy facilities, improve monitoring and minimization through technology innovation, and offer other compensatory conservation actions.

Compensation should also include acquiring additional habitat for migratory birds, such as off-site habitat conservation projects at wintering grounds, National Wildlife Refuges, and/or marine protected areas. Under a Section 10 ESA consultation, the USFWS has clear authority to require compensatory mitigation (Wilkinson 2019). Landowners or developers can apply for Incidental Take Permits (ITP) to engage in Safe Harbor Agreements, Candidate Conservation Agreements, and HCPs (e.g., Great Plains Wind Energy HCP). Offshore wind energy involves Section 7 ESA consultation, meaning that an ITP could include restoration to breeding colonies, such as that which occurred at the Bird Island Roseate Tern colony in 2017 (MassWildlife 2017).

When compensatory mitigation results in no net impact to a protected species or habitat, it can save a lot of time for developers, by helping to shorten review time or altogether avoid formal Section 7 ESA consultation with the USFWS (Wilkinson 2019). American Bird Conservancy supports compensatory actions that help in the recovery trajectory for endangered or rare species, particularly when they produce a net benefit to birds that is otherwise not possible using minimization measures, alone.

Bird-smart Principle 5: evaluation of wind energy as part of a complete analysis on all feasible renewable alternatives

Given all of the aforementioned impacts of wind energy on birds, it is good practice that project developers conduct a complete feasibility analysis to determine whether other renewable alternatives may be more appropriate at their proposed sites. Alternative energy sources, such as distributed solar energy (i.e., photovoltaic panels on preexisting structures such as houses, parking lots, or other buildings), can require less infrastructure, such as power lines, and have less impact on birds.

In 2011, the Bureau of Land Management and the California Public Utilities Commission considered distributed solar as a feasible alternative to three energy projects in San Diego County (BLM/CPUC EIS). California is an example of a state that invested so heavily in solar that it is exporting its power to other states (Penn 2017). A complete feasibility analysis would determine the need and justification for additional energy capacity generated from other renewable sources, including wind energy.

Photo credit: Distributed solar panels and wind turbines along road by Djomas, Shutterstock

Bird-smart Principle 6: environmental compliance with a rigorous local, state, and federal regulatory framework

In the US, birds are protected federally from incidental take by wind turbines under the ESA, Bald and Golden Eagle Protection Act (BGEPA), and Migratory Bird Treaty Act (MBTA). Despite efforts to weaken the ESA and MBTA, these laws have a record of success, and their protections remain essential.

A recent interpretation of the MBTA exonerates developers from incidental take of migratory birds – this is extremely insufficient, under litigation, and opposed by several organizations and members of congress. American Bird Conservancy recommends a process of protecting migratory birds similar to the BGEPA. Additionally, we have been actively involved in the NEPA process to ensure that Environmental Assessments (EA) and Environmental Impact Statements (EIS) include adequate measures to monitor, minimize, and mitigate bird mortalities. American Bird Conservancy is particularly concerned about the effects of wind turbines on rare species, including those listed as Threatened and Endangered.

Photo credit: Bald Eagle and wind turbines by Louise Redcorn

American Bird Conservancy works with legislators to improve the existing policy and regulatory framework designed to protect birds. We also collaborate with state and federal agencies to provide guidelines for energy developers.

In 2011, the US Fish and Wildlife Service published voluntary guidelines for developing wind energy on land. American Bird Conservancy favors mandatory, rather than voluntary guidelines for wind energy that effectively protect our nation's native birds from this rapidly expanding industry, both on and offshore.

In 2015, American Bird Conservancy petitioned the Department of the Interior to develop a rulemaking process and mandatory permitting system – this was endorsed by several partner groups. Guidance for developing offshore wind energy is currently under review by the USFWS, which is a step in the right direction. We urge a precautionary approach when it comes to wind energy compliance with avian guidelines and regulations.

American Bird Conservancy encourages regional planning to guide leasing decisions, with state and federal oversight, as has occurred with the U.S. National Offshore Wind Strategy by the U.S. Departments of Energy and the Interior (DOE 2016). For Threatened and Endangered species, planning processes should involve a Habitat Conservation Plan (HCP) under a Section 10 ESA consultation. For example, the Great Plains Wind Energy HCP was developed to cover the Whooping Crane migratory corridor from North Dakota to Texas (orange on our Wind Risk Assessment Map, with stopover sites in red). Wind exclusion zones have been incorporated into Greater Sage Grouse planning, in the vicinity of known leks. Organization of an independent avian stakeholder advisory group is key to the regional planning process.

Photo credit: Birds and wind turbine sunset by NiekGoossen, Shutterstock

Build capacity

An independent avian stakeholder advisory group should be charged with a variety of tasks throughout the wind energy planning and operation process. This group makes informed decisions about the potential impacts of offshore wind energy development, contributes to the NEPA process, encourages regional planning, and establishes mandatory guidelines and best management practices. It also helps to identify knowledge/data gaps, interpret data, methods, and results from the monitoring plan, and assess cumulative impacts.

The group provides transparency by disseminating data and results to public, and also ensures multi-agency oversight. It should assess the need for incidental take permits, recommend adaptive management of operations, and help to develop and implement the mitigation fund. As an example, the New York State Energy Research and Development Authority (NYSERDA) has developed an Environmental Technical Working Group (ETWG) to pursue similar goals. Such existing groups may be used as a foundation to structure future groups dedicated to regional issues nationwide.

American Bird Conservancy is currently organizing a stakeholder working group to engage industry, government agencies, and other environmental NGOs in establishing and adhering to Best Management Practices for wind energy development in the Great Lakes. During spring and fall in the Great Lakes, vast numbers of birds and bats, many of which migrate at night, gather along the shorelines and eventually fly along or over the lakes during their annual migration to and from the boreal forests of Canada where they breed. Being tied to water, federally-protected Bald Eagles are likely to experience impacts from wind energy development in and around the Great Lakes.

The cumulative impact of the many existing and planned projects in the region is likely to be substantial. For example, the southwestern quadrant of Lake Erie (coastal Ohio) has been designated a Global IBA by the National Audubon Society. A Global IBA is defined by BirdLife International as a place of international significance for the conservation of birds and other biodiversity. American Bird Conservancy, in partnership with the Black Swamp Bird Observatory, successfully challenged a turbine in this IBA, at the Air National Guard's Camp Perry, OH. We continue to work proactively to ensure that the first offshore wind facility in the Great Lakes sets a rigorous precedent in the development of bird-smart wind energy.

Photo credit: Geese and wind turbines by J Marjis, Shutterstock., Shutterstock.

References

Ainley, D.G., Porzig, E., Zajanc, D. & Spear, L.B. 2015. Seabird flight behavior and height in response to altered wind strength and direction. Marine Ornithology 43: 25–36.

Bailey, H., Brookes, K.L., and Thompson, P.M. 2014. Assessing environmental impacts of offshore wind farms: Lessons learned and recommendations for the future. Aquatic Biosystems 10 (8)

Band, B. 2012. Using a collision risk model to assess bird collision risks for offshore wind farms. http://www.bto.org/sites/default/files/u28/downloads/Projects/Final_Report_SOSS02_Band1ModelGuidance.pdf

Beiter, P. C., Tian, T., Nunemaker, J., Musial, W. D., Lantz, E. J., Gevorgian, V., & Spitsen, P. 2018. 2017 Offshore Wind Technologies Market Update (No. NREL/TP-6A20-72464). National Renewable Energy Lab (NREL), Golden, CO. https://www.energy.gov/eere/wind/downloads/2017-offshore-wind-market-update

BOEM (Bureau of Ocean Energy Management). 2017. Outer Continental Shelf Renewable Energy Leases Map Book. https://www.boem.gov/Renewable-Energy-Lease-Map-Book/

Bowden, T. S., E. C. Olson, N. A. Rathbun, D. C. Nolfi, R. L. Horton, D. J. Larson, and Gosse, J.C. 2015. Great Lakes avian radar technical report Huron and Oceana Counties, Michigan. Biological Technical Publication BTP-R3011-2015. http://digitalmedia.fws.gov/cdm/ref/collection/document/id/2092

Brabant, R., Vanermen, N., Stienen, W.M., and Degraer, S. 2015. Towards a cumulative collision risk assessment of local and migrating birds in North Sea offshore wind farms. Hydrobiologica 756: 63-74.

Busch, M., Kannen, A., Garthe, S., and Jessup, M. 2013. Consequences of a cumulative perspective on marine environmental impacts: offshore wind farming and seabirds at North Sea scale in context of the EU Marine Strategy Framework Directive. Ocean and Coastal Management 71: 213-224.

Carver, E. 2013. Birding in the United States: A demographic and economic analysis. United States Fish and Wildlife Service (Report 2011-1). https://www.fws.gov/southeast/pdf/report/birding-in-the-united-states-a-demographic-and-economic-analysis.pdf

Dirksen, S. 2017. Review of Methods and Techniques for Field Validation of Collision Rates and Avoidance Amongst Birds and Bats at Offshore Wind Turbines. 47 p. https://tethys.pnnl.gov/sites/default/files/publications/Dirksen-2017.pdf

DOE. 2015. WindVision: A New Era for Wind Power in the United States. DOE/GO-102015-4557. DOE Office of Energy Efficiency and Renewable Energy. Washington, D.C. (US). http://www.energy.gov/sites/prod/files/WindVision_Report_final.pdf

DOE. 2016. A national offshore wind strategy: Facilitating the development of the offshore wind industry in the United States. Department of Energy, Washington, DC. https://www.boem.gov/National-Offshore-Wind-Strategy/

DOE EERE 2014. Request for information: Wind energy bat and eagle impact minimization technologies and field testing opportunities. Washington, DC: Department of Energy, Energy Efficiency and Renewable Energy. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwizl_Wjk4TfAhXuwVkKHdLADecQFjAAegQIChAC&url=https%3A%2F%2Feere-exchange.energy.gov%2FFileContent.aspx%3FFileID%3D4bb18490-9041-4409-9378-028cd90df273&usg=AOvVaw3IGx7OeCY7RXXHik6D_6Yf

Drewitt, A.L., and Langston, R.H.W. 2006. Assessing the impacts of wind farms on birds. Ibis 148: 29-42.

Erickson, W.P. , Wolfe, M.W., Bay, K.J., Johnson, D., and Gehring, J.L. 2015. A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions. Plos One 9(9): e107491

Flowers, J., Albertani, R., Harrison, T., Polagye, B., and Suryan, R. 2014. Design and initial component tests of an integrated avian and bat collision detection system for offshore wind turbines. Pp. 1-10 in Proc. Of the 2nd Marine Energy Tech. Symp., Seattle, WA, April 15-18, 2014.

Fox, A.D., Desholm, M., Kahlert, Christensen, T.J., and Petersen, I/K. 2006. Information needs to support environmental impact assessment of the effects of European marine offshore wind farms on birds. Ibis 148: 129-144.

Furness, R.W., Wade, H.M., and Masden, E.A. 2013. Assessing vulnerability of marine bird populations to offshore wind farms. Journal of Environmental Management 119: 56-66.

Garthe, S., Markones, N. & Corman, AM. 2017. Possible impacts of offshore wind farms on seabirds: a pilot study in Northern Gannets in the southern North Sea. J Ornithol. 158: 345

Goodale, W. and Milman, A. 2014. Cumulative adverse effects of offshore wind energy development on wildlife. Journal of Environmental Planning and Management. 59: 1-21.

Harwood, A. J., Perrow, M. R. and Berridge, R. J. (2018), Use of an optical rangefinder to assess the reliability of seabird flight heights from boat-based surveyors: implications for collision risk at offshore wind farms. J. Field Orn.

Hutchins, M., Parr, M., & Schroeder, D. 2016. ABC's Bird-Smart Wind Energy Campaign: protecting birds from poorly sited wind energy development. Human–Wildlife Interactions, 10(1): 71-80. https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1073&context=hwi

Johnson, D. H., Loss, S. R., Smallwood, K. S., & Erickson, W. P. (2016). Avian fatalities at wind energy facilities in North America: a comparison of recent approaches. Human–Wildlife

Interactions, 10(1): 7-18.
https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1067&context=hwi

Johnston, A., & Cook, S. C. P. (2016). How High Do Birds Fly? Development of Methods and Analysis of Digital Aerial Data of Seabird Flight Heights. British Trust for Ornithology, Report No. 676, 53pp. https://www.bto.org/research-data-services/publications/research-reports/2016/how-high-do-birds-fly-development-methods

Kelsey, E. C., Felis, J. J., Czapanskiy, M., Pereksta, D. M., & Adams, J. 2018. Collision and displacement vulnerability to offshore wind energy infrastructure among marine birds of the Pacific Outer Continental Shelf. Journal of Environmental Management, 227: 229-247.

Loring PH, McLaren JD, Smith PA, Niles LJ, Koch SL, Goyert HF, Bai H. 2018. Tracking movements of threatened migratory rufa Red Knots in U.S. Atlantic Outer Continental Shelf Waters. Sterling (VA): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2018-046. 145 p. https://espis.boem.gov/Final Reports/BOEM_2018-046.pdf

Loss, S., Will, T., and Marra, P. 2014. Estimates of bird collision mortality at wind facilities in the contiguous United States. Biological Conservation 168: 201–209.

Manville, A.M. 2005. Bird strikes and electrocutions at power lines, communication towers, and wind turbines: State of the art and state of the science-Next steps toward mitigation. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191: 1051-1064.

Marques, A.T., Batalha, H., Rodrigues, S., Costa, H., Ramo Pereira, M.J., Fonseca, C., Mascarenhas, M., and Bernardino, J. 2014. Understanding bird collisions at wind farms: An updated review of the causes and possible mitigation strategies. Biological Conservation 179: 40-52.

MassWildlife. 2017. Terning around Bird Island. https://www.mass.gov/service-details/masswildlife-monthly-july-2017

May, R., Reitan, O., Bevanger, K., Lorentsen, S. H., & Nygård, T. 2015. Mitigating wind-turbine induced avian mortality: sensory, aerodynamic and cognitive constraints and options. Renewable and Sustainable Energy Reviews, 42, 170-181.

May. R. 2017. Mitigation for birds in Perrow, M. (Ed.). Wildlife and Wind Farms-Conflicts and Solutions, Volume 2: Onshore: Monitoring and Mitigation. Pelagic Publishing Ltd. pp 124-144.

Musial W, Beiter P, Schwabe P, Tian T, Stehly T, Spitsen P, Robertson A, Gevorgian V. 2017. 2016 Offshore Wind Technologies Market Report (No. NREL/TP-5000-68587; DOE/GO-102017-5031). National Renewable Energy Laboratory (NREL), Golden, CO. https://energy.gov/sites/prod/files/2017/08/f35/2016%20Offshore%20Wind%20Technologies%20Market%20Report.pdf

Penn, I. 2017. California invested heavily in solar power. Now there's so much that other states are sometimes paid to take it. L.A. Times, 22 Jun. https://www.latimes.com/projects/la-fi-electricity-solar/

Smallwood, S. 2014. Comparing bird and bat fatality-rate estimates among North American wind-energy projects. Wildlife Society Bulletin 37(1): 19-33.

Smallwood, K.S., Bell, D., Standish, S. 2018. Skilled Dog Detections of Bat and Small Bird Carcasses in Wind Turbine Fatality Monitoring. Unpublished Report

Wang, S., Wang, S. and Smith, P. 2015. Ecological impacts of wind farms on birds: Questions, hypotheses, and research needs. Renewable and Sustainable Energy Reviews 44: 599-607.

Wilkinson, J., Scarlett, L., Tabas, P., and Keith, B. 2019. Solid ground: Using mitigation to achieve greater predictability, faster project approval, and better conservation outcomes. The Environmental Law Reporter. 49(1). Reprinted with permission by Environmental Law Institute. https://www.eli.org/sites/default/files/elr/featuredarticles/Jan19FA.pdf

Willmott, J. C. R., G. Forcey, and A. Kent. 2013. The Relative Vulnerability of Migratory Bird Species to Offshore Wind Energy Projects on the Atlantic Outer Continental Shelf: An Assessment Method and Database. Final Report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2013-207. 275 pp. https://www.boem.gov/ESPIS/5/5319.pdf

A.J. Winship, B.P. Kinlan, T.P. White, J.B. Leirness, and J. Christensen. 2018. Modeling At-Sea Density of Marine Birds to Support Atlantic Marine Renewable Energy Planning: Final Report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, VA. OCS Study BOEM 2018-010. https://coastalscience.noaa.gov/data_reports/modeling-at-sea-density-of-marine-birds-to-support-atlantic-marine-renewable-energy-planning-final-report/