

A Double-crested  
Cormorant passes  
transmission towers in  
Redwood City, CA.



Audubon

# **BIRDS AND TRANSMISSION**

Building the Grid Birds Need

Citation: Brooke L Bateman, Gary Moody, Jennifer Fuller, Lotem Taylor, Nat Seavy, Joanna Grand, Jon Belak, Garry George, Chad Wilsey, and Sarah Rose. (2023) *Audubon's Birds and Transmission Report: Building the Grid Birds Need*. National Audubon Society; New York

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# LETTER OF INTRODUCTION



*From my home in Fargo, North Dakota, I have personally witnessed the detrimental impacts of a warming climate on the birds I love. Over the course of my lifetime, the Prairie Pothole region—where half of North America’s ducks are born and fledge—has been transformed due to climate change. Sadly, these impacts are not restricted to my region. Our 2019 report, *Survival by Degrees: 389 Species on the Brink*, warned us that **two-thirds of bird species in North America will be vulnerable to extinction** unless we lower emissions and slow the rate of global temperature rise.*

Recently, the Intergovernmental Panel on Climate Change issued the final in a series of reports on the state of the climate crisis. While their findings were stark, there is still cause for hope. The window to slow the rate of global temperature rise is narrowing, but the window still exists. If we are to make the most of this waning opportunity, we need to act quickly.

High-voltage transmission lines carry power across high desert area near Green River in Wyoming. Photo: Noppadol Paothong

That's why the historic clean energy investments passed in the recent Inflation Reduction Act represent a crucial step in spurring a transition to clean energy and creating a better future for both people and wildlife. The act makes significant investments in clean energy, such as wind and solar power, which will reduce our dependence on fossil fuels and position the U.S. as a leader in slowing the warming of our planet. These investments are welcomed by Audubon as a critical down-payment on a clean energy future, but the work is not finished.

No matter how affordable and efficient clean energy becomes, it will not work unless we can connect it to an electricity grid that can move clean energy the often long distances from high resource areas to population centers. It is clear that to decarbonize our economy in time to avoid the worst impacts of climate change, we need to significantly upgrade the U.S. transmission grid. According to experts, the U.S. will need to add enough new transmission capacity to effectively double or even triple the transmission capacity of the current grid in order to safely and effectively connect the amounts of new renewables required to reach net-zero emissions.

As with any major infrastructure build-out, there will be challenges. Not only does Audubon understand the urgency of making the critical investments that will prepare the transmission grid to handle a clean energy future, we also understand how important it is to do it in the right way. How and where new transmission is constructed will have a tremendous impact on birds and our communities. Audubon needs to have a seat at the table. We are in a unique position to advocate for improving efficiency, making the best use of existing infrastructure corridors, and promoting new transmission infrastructure built in a way that maximizes clean energy development while minimizing negative impacts on birds, wildlife, and people.

I am happy to submit this report to you—the Audubon network and partners—to share the science, lessons learned, and the resulting policy framework that will guide us. We invite you to join in this work, to advance our knowledge and our commitment to meeting this very serious challenge. The stakes are higher than ever for birds, the places they need, and our own communities, but hope remains. By working together, we can ensure a sustainable and prosperous future for both people and birds.

Sincerely,



Marshall Johnson  
Chief Conservation Officer



Marshall Johnson. Photo:  
Mike Fernandez/Audubon

**“Not only does Audubon understand the urgency of making the critical investments that will prepare the transmission grid to handle a clean energy future, we also understand how important it is to do it in the right way”**



# EXECUTIVE SUMMARY



*To achieve climate change stabilization, the U.S. needs to rapidly build-out transmission and clean energy infrastructure. The current U.S. electric grid was not designed for a clean energy future and does not have sufficient capacity for a transition to 100% clean and renewable energy production. Furthermore, the current process for developing transmission takes too long and does not always provide adequate environmental and cultural protections. We must improve both. Conservation organizations and clean energy project developers will need to work together towards this mutual goal. This means collaborative planning efforts to minimize the risks of transmission construction and operation to biodiversity, and to speed the deployment of needed capacity additions that will enable clean power.*

While expanding transmission will enable us to support the more diverse and decentralized energy system needed to maximize a wider range of renewable resources across different geographical regions, it also requires large scale construction efforts. With this comes land clearing and creating access to remote

Crows flock above transmission lines. Photo: Wirestock/iStock

**“The current process for developing transmission takes too long and does not always provide adequate environmental and cultural protections”**

areas with heavy machinery, both of which can lead to disturbances and degradation of natural habitats. Once constructed, transmission lines may continue to pose a threat to a variety of species. This report acknowledges both the risks to birds from transmission lines (see section [How Do Transmission Lines Impact Birds?](#)) and the climate imperative to build a grid that enables climate stabilization (see section [Why We Care](#)). It examines how Audubon can best engage to ensure that we build the grid that birds need.

In the last decade, scientific research has advanced our understanding of transmission impacts on birds, and in this report we delve into the best practices grounded in science on how to abate these risks (see section [How Do We Minimize the Impacts of Transmission?](#)). This includes identifying and implementing effective bird-friendly solutions both proactively (during planning) and reactively (post-construction) for projects. It also includes mapping out the location of high priority areas for birds, where conservation organizations such as the National Audubon Society can engage site-specific project developers (see section [Knowing Where to Engage: High Priority Areas for Transmission Engagement](#)) to ensure practical bird-friendly solutions can be put in place where projects overlap with integral habitat for birds.

Audubon's goal is as always to protect birds and the places they need to thrive. **To address the dual crises of climate change and biodiversity loss it is clear that we need to proactively engage to accelerate the needed build-out of transmission capacity while mitigating unintended negative consequences for people and for wildlife.** Working together with other conservation organizations, decision makers, and project developers we can learn to do both at the same time.

**This report lays the foundation for Audubon's engagement in transmission planning, policy, and deployment. It first outlines the need for additional transmission capacity to minimize the impact of climate change on birds and people. Then we provide an overview of the current scientific understanding of the impacts of transmission infrastructure on birds as well as key bird-friendly solutions that can be implemented to help reduce negative consequences. We also identify and map areas of high priority for birds, both today and under a changing climate, that coincide with existing, planned, and potential transmission build-out. We found that roughly a third of existing, planned, and potential transmission lines coincide with areas that are important for birds. These priority areas for transmission engagement are where the work of Audubon and its supporters will be most integral as collaborators in the planning process. Grounding this work in science provides a foundation for how and where Audubon can meaningfully engage on transmission planning and project development. This report also highlights how we can translate this science into action using a case study about our work on the SunZia transmission line. Finally, we**



Top: Greater Prairie-Chicken.  
Photo: Ly Dang/Audubon  
Photography Awards

Bottom: Sandhill Crane.  
Photo: Stan Bysse/Audubon  
Photography Awards



**outline the transmission policy objectives, which will guide Audubon's work with policy makers and project developers moving forward. Reaching our clean energy goals and transmission needs will help provide a path towards a more stable climate, where bird species are better off, and where people and biodiversity can thrive.**

Climate change is the greatest threat to birds and people alike. We need urgent action on climate and a rapid build-out of clean energy as a key part of the solution. And although transmission build-out does pose risks, there are solutions that can be implemented to alleviate these. The alternative, where we don't meet our clean energy goals, is a world where two-thirds of bird species in North America face devastating range loss and potential extinction. Because of this, Audubon supports the responsible build-out of transmission, and emphasizes that this must be done in a way that both minimizes harm to birds via bird-friendly solutions while also providing a path forward for a more climate-stable future. To achieve both, we need to:

- Dramatically speed the pace of transmission deployment
- Shorten the timeline from planning to in-service
- Maximize the effectiveness of the existing grid and use of existing rights of way
- Improve the transmission planning process
- Establish a stronger transmission role for the Federal Energy Regulatory Commission (FERC)
- Secure federal transmission policy reforms
- Prepare states for the magnitude of transmission deployment
- Promote bird-friendly design and operation

It also means showing up and engaging with local transmission projects to ensure bird-friendly solutions and community needs are a part of the plan from the beginning. Audubon and its supporters will be vital during the planning process within high-priority areas for transmission project engagement. It is these locations that are both important for birds today and in a changing climate, but also integral for a successful clean energy path forward. Here, we need to show up and support responsibly-sited, bird-friendly transmission project implementation.

# WHY WE CARE

## The Need for Transmission Investment



*Climate change and biodiversity loss are two of the most pressing issues of our time. The U.S. and Canada have already lost nearly 3 billion birds, one out of four, since 1970<sup>1</sup>. To date, we are seeing reduced breeding success in many bird species as a result of climate change, indicating that increased temperatures will continue to impact bird populations if climate change is not stabilized<sup>2</sup>.*

Looking forward, we risk losing billions more birds if climate warming continues on its current upward trajectory, including two-thirds of bird species in North America at risk of range loss and potential extinction<sup>3</sup>. Clearly, the climate and biodiversity crises are deeply intertwined, and each will continue to exacerbate other conservation issues, like habitat loss and pollution, if we fail to act now. However, it's not too late. If we take meaningful action now to stabilize the climate, 76% of climate vulnerable bird species will experience less range loss<sup>4</sup>. Furthermore, birds and people will suffer fewer impacts from extreme weather events and sea level rise.

Transmission lines next to the Connecticut River in Massachusetts. Photo: Jerry and Marcy Monkman/Eco-Photography.com/Alamy

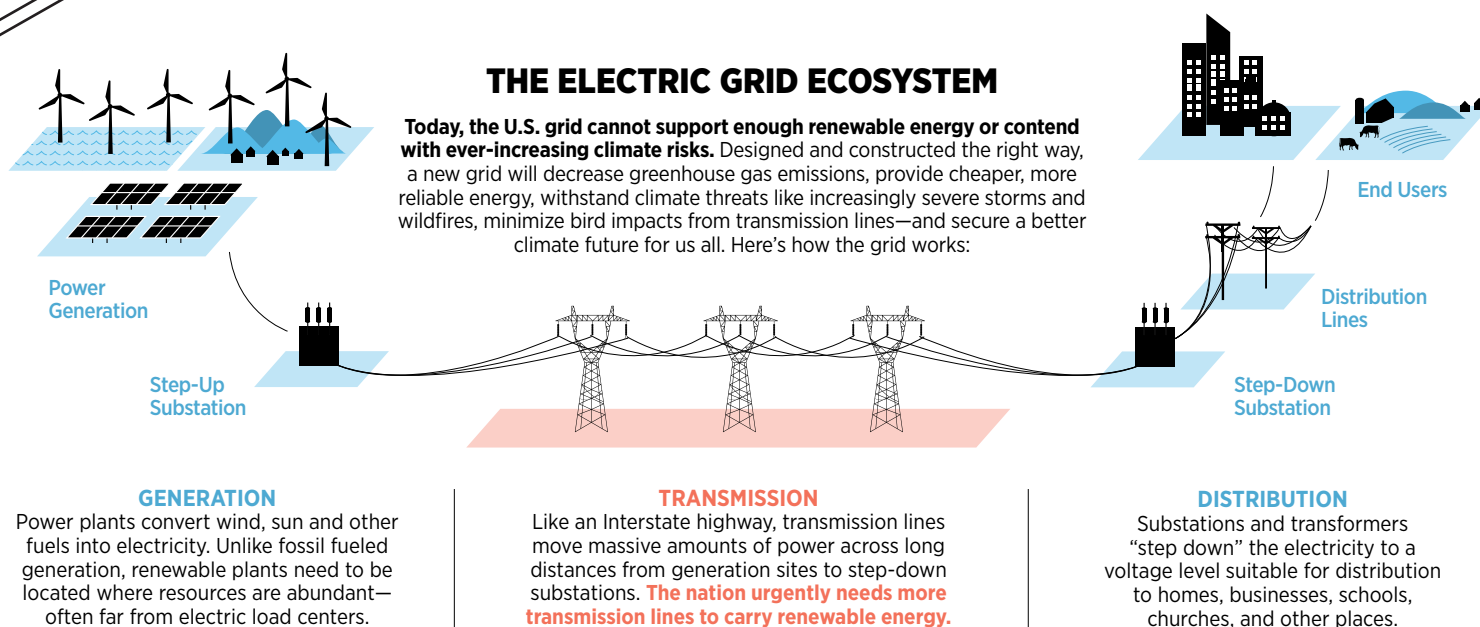
1 Rosenberg et al., 2019

2 Halupka et al., 2023

3 Bateman et al., 2020; Wilsey et al., 2019

4 Bateman et al., 2020; Wilsey et al., 2019





**FIGURE 1.** A visual depiction of the main components of our electric grid: generation, transmission and distribution. Graphic: Julie Rossman/Audubon.

The science is clear. To achieve a future where we avoid the most severe consequences of climate change for birds and people, we must stabilize climate change below 2°C globally<sup>5</sup>. Beyond this tipping point, changes in climate become self-perpetuating, irreversible, abrupt, and cascading<sup>6</sup>. These tipping points include the abrupt thaw of the Boreal permafrost releasing large amounts of carbon and methane greenhouse gasses (GHGs), collapse of ice sheets at the poles leading to increase sea level rise, and dieback of key forests like the Amazon Rainforest, resulting in the forest becoming a net source of GHGs<sup>7</sup>. These dramatic changes will not only further exacerbate climate change, but also translate to catastrophic consequences for biodiversity loss and human well-being. Avoiding these impacts will require global anthropogenic greenhouse gas emissions (GHGs) to approach net-zero by 2050<sup>8</sup>. This means balancing the amount of GHGs that are produced with how much are removed from the atmosphere. To stabilize the climate, we need to rapidly mitigate GHGs by reducing the burning of fossil fuels for energy, electrify much of the transportation and industrial sectors, elevate efficiency measures, and implement practices that absorb carbon dioxide from the atmosphere (e.g., carbon capture, natural climate solutions)<sup>9</sup>.

Deployment of clean and renewable energy solutions, such as wind and solar, is one of the major steps in decarbonizing the economy. However, because the areas that offer the greatest potential for these clean energy resources are often located far from large demand centers, like cities, additional transmission is often needed to ensure the reliable delivery of this energy. The amount of new clean energy needs to double so that nearly 65% of all global energy sources come from renewables by 2050, while also retiring existing carbon-emitting infrastructure<sup>10</sup>. The U.S. has made a recent push towards reaching net-zero carbon emissions through the Inflation Reduction Act (IRA) of 2022, which includes \$369 bil-

**“The amount of new clean energy needs to double so that nearly 65% of all global energy sources come from renewables by 2050, while also retiring existing carbon-emitting infrastructure.”**

5 Bateman et al., 2020; Saunders et al., 2023

6 Armstrong McKay et al., 2022

7 Armstrong McKay et al., 2022

8 Davis et al., 2018; Rogelj et al., 2015, 2018; Tong et al., 2019

9 Hawken, 2017

10 Davis et al., 2018; Tong et al., 2019; UNFCCC, 2015, 2018

lion in funding for energy security and climate change programs through 2025<sup>11</sup>. While there are indications that the IRA is already spurring additional renewable energy deployment, analysis shows **the law's emissions reduction potential falls by 80% if the pace of transmission deployment remains unchanged**<sup>12</sup>. This would greatly impair our ability to reach the U.S. goal for 80% of the nation's electricity to come from domestic renewable energy by 2035<sup>13</sup>.

Transmission is the backbone of the power grid. It is the “interstate highway” of electricity delivery. Transmission cables are designed to carry high-voltage electricity over long distances from the sites where power is generated to the substations where power is stepped down to lower voltage and distributed to homes, business, and industry. Americans enjoy universal electric service and high reliability from a vast network of power plants and transmission that delivers the energy where and when it is needed. Grid operators, regulators, and electric utility companies have done an admirable job of building and maintaining the grid. To accommodate the transition to renewable energy, changes and improvements are needed. Large parts of our current electricity grid were historically designed for generation facilities located near cities and run on fossil fuels. Because of this, the grid is not well equipped to reach renewable energy facilities that are often located in remote areas where renewable resources are abundant. Given that many of areas of high renewable energy potential are far from population centers, the construction of an extensive transmission network will be needed to effectively deliver the electricity that is produced from clean energy facilities to areas where it is needed most (e.g., high population centers). This will require not only maximizing the efficient use of existing high-voltage transmission lines but also building additional capacity through new transmission lines. Electrification further complicates the problem. As technologies like electric vehicles and heat pumps become more widespread, the increased demand for power will grow and could exceed the grid's ability to handle the loads required<sup>14</sup>.

11 Text - H.R.5376 - 117th Congress (2021-2022), 2022

12 Jenkins et al., 2022

13 Denholm et al., 2022

14 Blouin, 2023



Canada Geese fly above a transmission line. Photo: Mjsimage/Shutterstock



According to experts, the U.S. will need to add enough new transmission capacity to effectively double or even triple the transmission capacity of the current grid in order to safely and effectively connect the amount of new renewables needed to reach net-zero emissions, including an estimated 37,000 to 200,000 miles of new transmission lines<sup>15</sup>. In terms of capacity-miles—the voltage carrying capacity of a line multiplied by its length in miles—the U.S. would need to increase 60% to ~120,000 GW-mi (or, gigawatt-miles), although this ranges from 94,000 GW-mi to more than 813,000 GW-mi<sup>16</sup>. **This expansion would mean more than doubling the historical pace of transmission construction** from ~1.3%/year to ~2.9%/year, the equivalent of adding between 1,400 and 10,100 miles of additional transmission lines per year through 2035<sup>17</sup>. There is urgency, as failure to achieve this increased pace will seriously curtail the ability to connect more renewable energy facilities. If the U.S. is able to achieve deployment of ~2.3% transmission capacity growth per year, then the nation will be able to nearly double our wind and solar capacity<sup>18</sup>. Increasing the rate of transmission deployment will also allow the U.S. to keep pace with increasing energy demands as it moves towards a more electric energy focused future<sup>19</sup>. Lastly, increasing transmission will allow for the siting of clean energy in locations where sunshine and wind have the most energy potential, while also providing the flexibility and discretion needed in relation to siting near critical habitat for wildlife or near disadvantaged communities. By deploying transmission that is informed by multi-value and collective planning, and through sustained

### What is needed to reach net-zero emissions?

**2-3X**

current transmission capacity

**37,000-200,000 MILES**

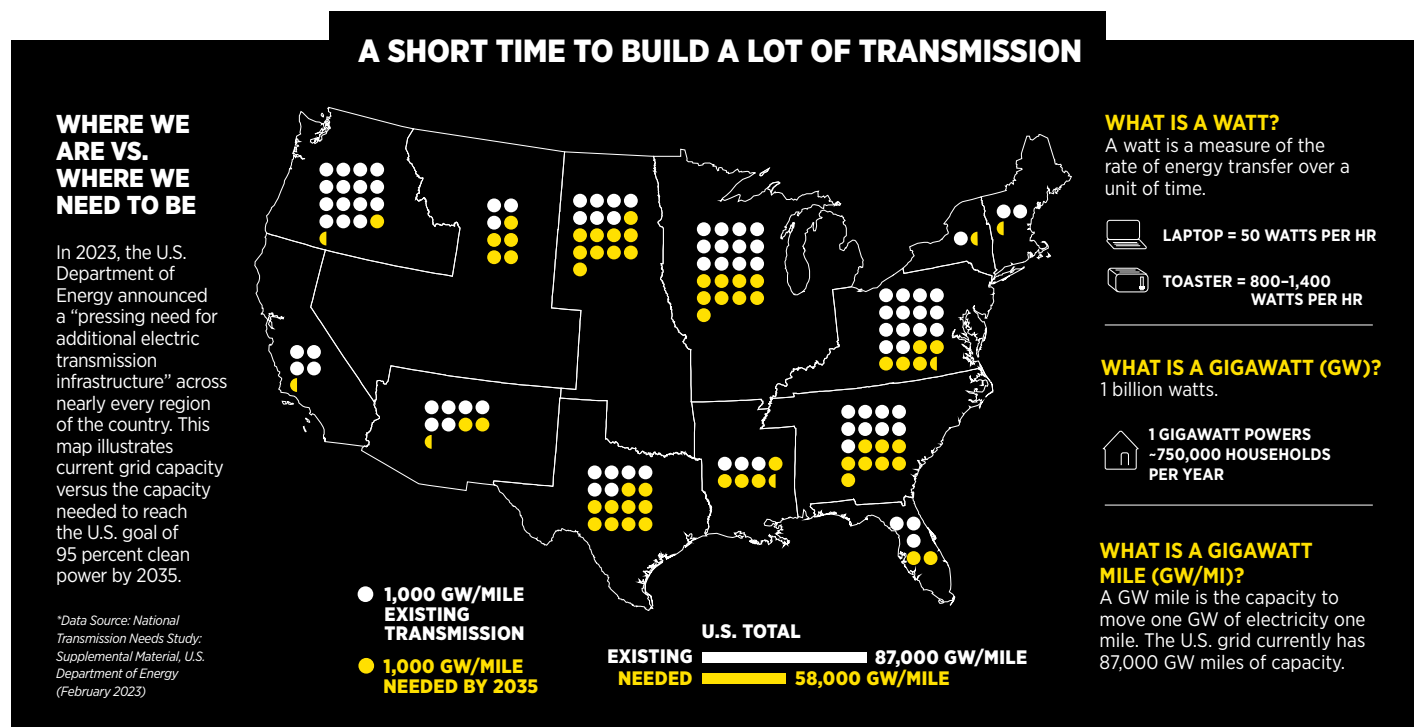
of new transmission lines

**60%**

increase of capacity-miles, to ~120,000 GW-mi

**1,400-10,100 MILES**

of additional transmission lines per year through 2035



**FIGURE 2.** Comparison based on 2023 DOE Transmission Needs study data of existing vs. new transmission needed by 2035 by region. Figures do not include estimates of additional interregional transmission needs. See Appendix A for detailed literature review. Graphic: Julie Rossman/Audubon

community involvement, the U.S. will be able to expand the transmission network in a way that allows for both people and wildlife to thrive while also achieving its climate goals<sup>20</sup>.

In addition to adding new transmission lines, the U.S. will also need to upgrade the current transmission infrastructure and integrate the grid across the country. **About 70% of transmission lines in the U.S. are over 25 years old<sup>21</sup>, with many built 40-80 years ago.** As transmission lines age they become vulnerable to extreme weather events such as storms, freezing cold, and wildfires. In the absence of line monitoring, they are more likely to see age-related line component failures<sup>22</sup>. These vulnerabilities can lead to failures that put the power grid at risk. This issue is exacerbated by the lack of integration of the grid. Currently, transmission lines across the U.S. are not a part of one unified system, and as such they have varying connectivity, and a mix of federal and state authority oversight which creates a complex patchwork network that is inefficient and vulnerable to interruptions. New infrastructure projects are not required to coordinate, which will lead to continued discontinuity.

What the U.S. needs is a more robust and flexible grid. One that is better connected and has greater responsiveness to energy needs across the country. By coordinating transmission across the country, the U.S. can increase grid efficiency and stability by sharing power across regions while also reducing the costs of transitioning to a carbon neutral system<sup>23</sup>. This would mean establishing direct links between three of the larger macro-grids in North America, the Eastern, Western, and Texas interconnections<sup>23</sup>.

Although integrations and upgrades are needed to achieve a more efficient power grid, we must also consider bird-friendly solutions that can be implemented reactively to reduce the impact that transmission lines have on birds (i.e., collisions). Retrofitting legacy transmission can thus be a key solution to improving both the stability of our electric system while simultaneously reducing the main driver of bird collision mortality. **It is clear that transmission build-out is needed to achieve a future where the climate is stabilized, and where both birds and people thrive.** This build-out must be done rapidly and include both deployment of new and updates of existing transmission. Without this, we will be limited in where we can site clean energy facilities including prioritizing areas of high sunshine and wind. Ideally, we want to optimize our clean energy facility siting to locations of the highest potential for clean energy production that also minimizes unnecessary exposure to birds and their key habitats. To achieve both, we will need to identify the important places for transmission expansion, as well as understand the risks transmission has for birds and how to deploy bird-friendly solutions to abate these risks.



Increased transmission capacity is needed to move energy from solar and wind farms to population centers. Photo: Ilona Seipp/Shutterstock

**“If the U.S. is able to achieve deployment of ~2.3% transmission capacity growth per year, then we will be able to nearly double our wind and solar capacity”**

15 Denholm et al., 2022; Larson et al., 2021

16 Larson et al., 2021

17 Denholm et al., 2022

18 Jenkins et al., 2022

19 Gates, 2023

20 Ung-Kono, 2023

21 The White House, 2022

22 Clifford, 2023;  
Brown et al., 2022

23 Brown & Botterud, 2021



# SCIENCE

## Our Current Understanding of Birds and Transmission



### How do transmission lines impact birds?

While the imperative for the rapid deployment of thousands of new miles of transmission lines to mitigate population level risks of climate change to birds is clear and compelling, we cannot ignore that transmission lines can pose significant risks to birds depending on how and where they are constructed. In contrast to the electrical distribution lines along our residential streets, transmission lines carry more voltage ( $>60\text{kV}$ , typically between  $115\text{kV}$  and  $765\text{kV}$ ), are located on taller poles or towers ( $>80$  feet for  $220\text{kV}$ , and up to  $250\text{ ft}$ ), and have lines spaced further apart from each other (roughly  $150$  feet for  $220\text{kV}$ ), based on location and terrain<sup>24</sup>. As a result, the impacts of transmission lines on birds are not the same as the impacts of distribution lines. Perhaps most importantly, because of the line spacing, there is minimal risk of electrocution. However, transmission lines can cause mortality when birds collide with transmission power lines, particularly the topmost, thinnest, and least visible shield wires required to protect conductors from lightning damage and faults. Additionally, the rights of way

At Rowe Sanctuary in Nebraska, a research technician peers outside of a blind towards the power line span crossing the river to count cranes traversing the lines. Photo: Nicole Mittman

24 NERC, California Public Utilities Commission



(ROWS; land underneath the power lines and structures) that must be maintained for transmission lines can range from 75 to 200 feet wide, and in some cases include a dirt road for access. Within these ROWs, the construction and maintenance of transmission lines can degrade habitat and create other disturbances. The magnitude of these risks varies across species and depends on several factors, including morphology, behavior, and environmental associations.

Below we briefly outline both direct (i.e., collisions) and indirect (i.e., habitat degradation and disturbance) impacts of transmission on birds. For more details on these impacts, please see [Appendix A](#).



## COLLISIONS

Each year, an estimated 1.8–5.4 billion bird deaths in the U.S. are attributed to human activities or infrastructure<sup>25</sup>. Of these, collisions with transmission lines are estimated to account for between 8 and 57 million deaths per year<sup>26</sup>. To put this in context, the upper end of the estimate (57 million) is below the lower end of the estimate of annual bird mortalities from bird collisions with building glass (365 million) or vehicles on roadways (89 million). Furthermore, the current estimate of transmission-related bird mortality was derived prior to the development and implementation of best practices to reduce collisions. Recent science has generated guidelines identifying species that are most vulnerable to collisions and how to reduce collision risk, creating an opportunity to build new transmission infrastructure that has a lower bird collision risk with proper planning and implementation of bird-safe designs<sup>25, 26</sup>.

Generally, collision-related mortality is related to morphological characteristics such as vision and flight, and behavioral characteristics, such as migration strategy, feeding and roosting, flocking behaviors, or hunting style (Table 1, see [Appendix A](#) for details on each). Specifically, collision involves flying into overhead wires, and largely affects strong, fast fliers with poor or restricted vision such as waterfowl and crane species (e.g. Sandhill Crane and the endangered Whooping Crane; Table 1)<sup>27</sup>. While North American estimates have not yet identified a noticeable effect of collision mortality on long-term population trends, it may place a subset of vulnerable species at a greater risk<sup>28</sup>. Furthermore, this effect will only become stronger if the pace of transmission construction doubles without bird-friendly design or on-site mitigation strategies.

**Great Egrets around transmission lines in Burnham Prairie, near Chicago, Illinois. Photo: Camilla Cerea/Audubon**

25 Loss et al., 2015


















26 Loss et al., 2014

27 Bernardino et al., 2018; Bevanger, 1994, 1998; D'Amico et al., 2018; Janss, 2000

28 Arnold & Zink, 2011; Travers et al., 2021



**TABLE 1.** Summary of morphological and behavioral transmission collision risk factors by bird group (taxonomic Order). See Appendix A for more details.

ORDER		MORPHOLOGY		BEHAVIOR				
		VISION	FLIGHT	MIGRANT	NOCTURNAL MIGRANT	FEEDING/ROOSTING TRIPS	FLOCKING	HUNTING
	CRANES, RAILS, COOTS, AND GALLINULES	✓	✓	✓	✓	✓	✓	
	WATERFOWL	✓	✓	✓	✓		✓	
	PELICANS, BITTERNS, HERONS, EGRETS, IBIS, SPOONBILLS	✓		✓	✓	✓	✓	
	SHOREBIRDS		✓	✓	✓	✓	✓	
	FALCONS	✓		✓		✓		✓
	PERCHING BIRDS	✓		✓	✓		✓	
	PIGEONS, DOVES		✓	✓			✓	
	LANDFOWL	✓	✓					
	GREBES		✓	✓				
	SWIFTS, HUMMINGBIRDS			✓			✓	
	LOONS		✓	✓				
	ANIS, CUCKOOS			✓	✓			
	OWLS			✓	✓			
	STORKS	✓		✓				
	NIGHTHAWKS, NIGHTJARS			✓	✓			
	FRIGATEBIRDS, BOOBIES, GANNETS, ANHINGAS, CORMORANTS		✓					
	ALBATROSS, PETRELS, SHEARWATERS							

## HABITAT DEGRADATION AND DISTURBANCE

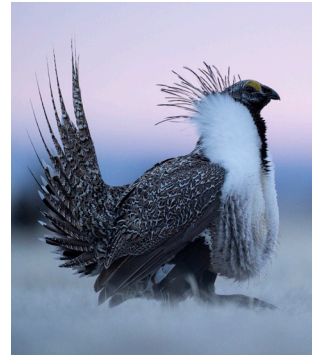
The construction and maintenance of transmission lines may also disturb and fragment habitat, attract predators, and cause displacement due to human activity, traffic, and roads. Transmission lines can heavily fragment and degrade habitats during and after construction<sup>29</sup>. In species such as grouse (e.g., Greater Sage-Grouse), transmission structures can be associated with risks such as disturbance (e.g., construction), increased predation mortality, displacement<sup>30</sup>, reduced courtship behavior, and reduced nest and brood success<sup>31</sup>. Conversely, transmission infrastructure can also provide nest sites for larger birds, increase food availability<sup>32</sup>, and may even create habitat for vulnerable, early successional songbirds when forest vegetation is cleared beneath the lines<sup>33</sup>. The population-level effects of habitat alteration are not well understood<sup>34</sup> and likely vary by species<sup>35</sup>. Since attributing causes of declines in a species population is difficult, one promising approach is to use ecological traits to identify species or places that would be vulnerable to population-level effects (Table 1)<sup>36</sup>. Next steps could be to conduct a systematic analysis assigning risk to individual species and locations based on known risk factors<sup>36</sup>. Such an analysis would provide more detailed guidance to apply at the level of the local transmission project.

## How do we minimize the impacts of transmission?

Because of the complex relationships between birds and transmission, and the pressing need for climate action, it is imperative that the expansion of clean energy and transmission is done thoughtfully. Planning should utilize the mitigation hierarchy of avoid, minimize, and compensate, in that order. Site-specific information should be considered for individual transmission projects, and the National Audubon Society is prepared to help facilitate these conversations. Here, we provide a roadmap for Audubon's strategy for supporting a transmission build-out that accounts for birds and the places they need. First, we outline bird-friendly solutions for mitigating the risk of collision-related mortality and the impacts of habitat degradation and disturbance. Second, we broadly identify areas across the contiguous U.S. that are high priority for transmission project engagement, and where implementing bird-friendly solutions should be prioritized based on where important habitat for birds across their full annual cycle—both today and under climate change—coincide with areas of current, future, or potential transmission.

## BIRD-FRIENDLY SOLUTIONS FOR MITIGATING RISK TO BIRDS

Audubon supports transmission that is sited and operated properly to effectively avoid, minimize, and mitigate the impacts on birds, other wildlife, and the places they need today and tomorrow. The scientific knowledge base on bird-friendly solutions around transmission and clean energy is well established and robust, with many potential options that can be implemented to reduce risk to birds. Bird-friendly solutions to reduce transmission-related risk largely fall into one of two categories: proactive or reactive<sup>37</sup> (Table 2). Proactive solutions should be implemented to avoid as many negative impacts as possible or to help minimize any impacts that cannot be avoided, whereas reactive solutions can be effective for mitigation of the remaining impacts.



Greater Sage-Grouse.  
Photo: Evan Barrientos/  
Audubon Rockies

**“For some species, such as grouse, transmission structures can cause reduced courtship behavior and reduced nest and brood success.”**

29 Bagli et al., 2011; Biasotto & Kindel, 2018

30 Gibson et al., 2018; Hovick et al., 2014; Lebeau et al., 2019

31 Hanowski et al., 2000; Harju et al., 2010; Kohl et al., 2019; Zeiler & Grünsachner-Berger, 2009

32 Kaiser & Lindell, 2007

33 Askins et al., 2012

34 Biasotto & Kindel, 2018

35 Askins et al., 2012; Rich et al., 1994

36 D'Amico et al., 2019

37 Jenkins et al., 2010



Proactive solutions are assessed pre-construction and require collective planning across multiple invested parties and well-informed foresight. Among the important proactive solutions that can be utilized to avoid and/or minimize as many impacts as possible is maximizing development of new transmission capacity within areas of previously disturbed habitat, such as existing ROWs for transmission, roads, rail, brownfields and other degraded lands, or other areas with co-locating opportunities<sup>38</sup>. Strategic route planning such as this avoids additional habitat degradation in new locations. Proactive solutions can also be preventative, such as burying cables underground in areas important for bird species with high-collision risk. Understanding local wildlife habitat use patterns, avian population distributions, movement, and behavior to predict and avoid high-risk areas can inform avoidance and minimization opportunities such as identifying where burying cable could be feasible and beneficial (e.g., over short distances, situated within migratory pathways). Another proactive solution that can avoid, or at minimum delay, the need to build a new line is to upgrade existing lines to increase the amount of power they can handle. Newer technologies such as advanced conductors and tower designs as well as dynamic flow controls and new operating approaches, such as flow based operations can be deployed to create significant new capacity without the need for additional wires or transmission corridors and attendant long-term habitat disturbance. These solutions should be fully considered in any transmission planning process. Indeed, upgrading existing lines or expanding within existing ROWs alone could meet up to half of all additional transmission needs<sup>39</sup>.

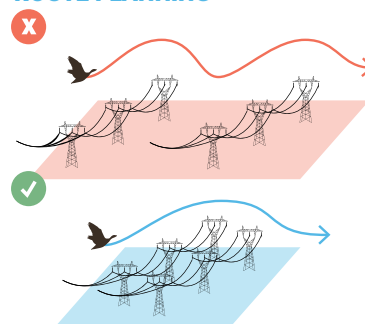
Reactive mitigation solutions take place post-power line construction, focusing on species' morphological vulnerabilities to improve visibility, thereby reducing exposure (Table 2). Solutions such as line marking devices or illumination with UV lights allow birds to more readily detect obstacles and reduce collision risk<sup>40</sup>. Another effective measure is removing the highest and thinnest shield wires<sup>41</sup> or replacing shield wires with lightning arresters<sup>42</sup>. In addition, habitat management can improve habitat conditions within ROWs for species such as early successional songbirds and pollinators<sup>43</sup>. Habitat management in ROWs, such as tree planting, planting of native low growing vegetation, and removing invasive species and other disturbances (Table 2) can provide areas for food, nesting, and shelter and are actions that may require permission of the landowner. Securing habitat management agreements that allow transmission developers to implement best-practices for wildlife should be considered during the planning process and agreed upon prior to construction.

While it can depend on the mitigation strategy, proactive solutions are generally the most effective. Therefore, we suggest that proactive solutions should be used for all new transmission and that reactive solutions be put in place to reduce the

**FIGURE 3.** Examples of proactive bird-friendly solutions that can be implemented in the pre-construction, planning stages of transmission development. Graphics: Julie Rossman/Audubon

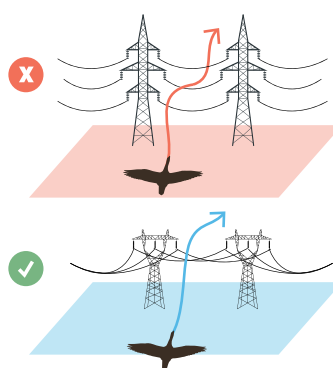
## PROACTIVE: BEFORE YOU BUILD

### ROUTE PLANNING



Building new transmissions lines on the same rights-of-way as existing lines minimizes the overall transmission footprint—leaving more habitat intact and reducing the chances of transmission line collisions.

### LINE CONFIGURATION



Orienting multiple transmission lines horizontally rather than vertically dramatically decreases the amount of space the lines take up—minimizing the potential for bird collisions.

38 APLIC, 2012; Jenkins et al., 2010

39 Wu et al., 2023

40 Baasch et al., 2022; Barrientos et al., 2011

41 Bevanger & Brøseth, 2001; W. M. Brown et al., 1987; A. R. Jenkins et al., 2010

42 APLIC, 2012

43 Askins et al., 2012; Russell et al., 2018; Wagner et al., 2019

**TABLE 2.** Summary of proactive and reactive bird-friendly solutions to avoid or minimize transmission related impacts. Please see Appendix A for more details on each mitigation strategy.

PROACTIVE		REACTIVE	
Pre-construction		Post-construction	
Route Planning	Bury cables underground, where environmental impacts are fully considered	Increase Visibility and Reduce Exposure	Install line-marking devices on conductors and shield wires
	Greater scrutiny of projects near high-use migration pathways, priority areas for birds or high conservation value (e.g., Climate Strongholds, Important Bird Areas, National Wildlife Refuges)		Illumination
	Upgrade existing transmission lines to higher capacity		Retrofitting with bird-friendly design
	Avoid high-use foraging areas or areas important for species of high risk (e.g., prairie chicken and grouse) or close to known flight areas (e.g., between key habitat areas like roosting and foraging areas) or high-use flight pathways		Removing shield wires
	Take advantage of existing linear pathways, ROWs, brownfields and other degraded lands		Replace shield wires with lightning arresters
	Avoid perpendicular crossing of lines		Burying lines, especially in high-risk areas, where feasible (e.g., over short-distances)
	Choose areas with shielding features		Line re-routing where feasible (e.g., areas important for high-risk species known to cause disturbance)
Bird-Friendly Design	Reduce the number of wire planes by grouping lines together in one plane (horizontal; see below)	Habitat Management	Early-successional habitat management, including decreasing herbicide use
	Implement horizontal wire planes to lower chances of collision and increase visibility		Management plan to minimize and manage invasive nonnative plants
	Increase wire visibility		Tree planting, planting of native, low growing vegetation
	Space out wires of different heights		Removing disturbances
	Wire spans short as possible		Habitat creation
			Alter agriculture practice timing
			Discourage industrial habitat use



impact of legacy transmission constructed without adequate consideration of bird impacts. See Table 2 for a summary of proactive and reactive bird-friendly solutions to avoid or minimize transmission-related mortality.

Once established, transmission also needs to have continued appropriate operational measures in place to avoid, minimize, and mitigate direct and indirect impacts to birds. These include:

- Following the guidelines established by the Avian Power Line Interaction Committee (APLIC) founded by Audubon, USFWS and utilities
- Preparing a voluntary Avian Protection Plan in consultation with the U.S. Fish and Wildlife Service
- Elevating the need to avoid impacts to federal birds of conservation concern
- Coordinating with state wildlife agencies to avoid impacts on state listed species and species identified in State Wildlife Action Plans as species of concern
- Applying for federal permits under the Endangered Species Act, Bald & Golden Eagle Protection Act, Migratory Bird Treaty Act, as necessary, and any state wildlife permits

### KNOWING WHERE TO ENGAGE: HIGH PRIORITY AREAS FOR TRANSMISSION ENGAGEMENT

We assessed ~185,400 miles of existing, ~12,400 miles of planned, and ~9,300 miles of potential transmission lines (i.e. based on known areas of potential for transmission projects, and do not include all future potential projects) across the lower 48 U.S. states (see [Appendix B](#) for Transmission Data Sources). We evaluated how these transmission lines coincide with priority areas for birds today and under future climate change. We define planned transmission as known upcoming transmission line projects and potential transmission lines as the BLM West-Wide Energy Corridors<sup>44</sup>. The total of ~21,700 miles of planned and potential transmission would approach the low range of 37,000 miles estimated as needed by 2035 to reach U.S. clean energy goals.

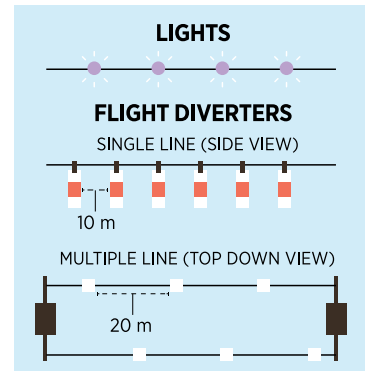
To define priority areas for resident and migratory birds throughout their full life cycle and under current and future climate conditions, we combined 19 multi-species spatial prioritizations across several ecosystems, including wetlands, urban/suburban systems, grasslands and rangelands, coasts, and forests, to determine the highest priority places for birds across the U.S., accounting for climate strongholds and full annual cycle priorities for migratory birds.

Climate strongholds are areas that are predicted to have high climate suitability and low human modification for bird species at present and under contemporary climate change scenarios in both breeding and non-breeding seasons. These areas capture critical habitat for representative bird species for each ecosystem<sup>45</sup>.

**FIGURE 4.** Examples of reactive solutions that can be used to reduce bird impacts on existing transmission lines, and be used in plans for future lines. Graphics: Julie Rossman/Audubon

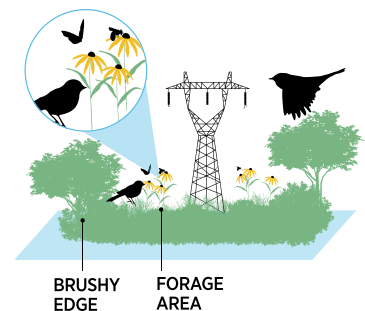
### REACTIVE: AFTER YOU BUILD

#### LINE MARKING



Birds can avoid only what they see. By adding markings or using infrared, ultraviolet, or LED lighting that make transmission lines more visible, collision risk can be lowered by as much as 90 percent.

#### HABITAT MANAGEMENT



Transmission line cutouts are narrow, but they're long—providing a prime opportunity to manage a lot of habitat in ways that benefit birds, such as filling these presently bare areas with the native vegetation birds need.

<sup>44</sup> Argonne National Lab, 2006

<sup>45</sup> Grand et al., 2019; Taylor et al., 2022

Full Annual Cycle (FAC) priorities are the most important places for migratory birds that breed in North America. They map priorities for breeding, stationary non-breeding, and spring and fall migration seasons and integrate the best available information from tracking, banding, migratory connectivity, and eBird Status abundance data<sup>46</sup>. We identified places that are important for multiple species across seasons, as well as locations that provide core habitat for any single species in any season<sup>47</sup>.

We integrated these climate strongholds and full annual cycle priorities into a single Integrated Bird Priorities map to identify priority areas for birds where Audubon would like to support clean energy sited with bird-friendly solutions (Figure 5).

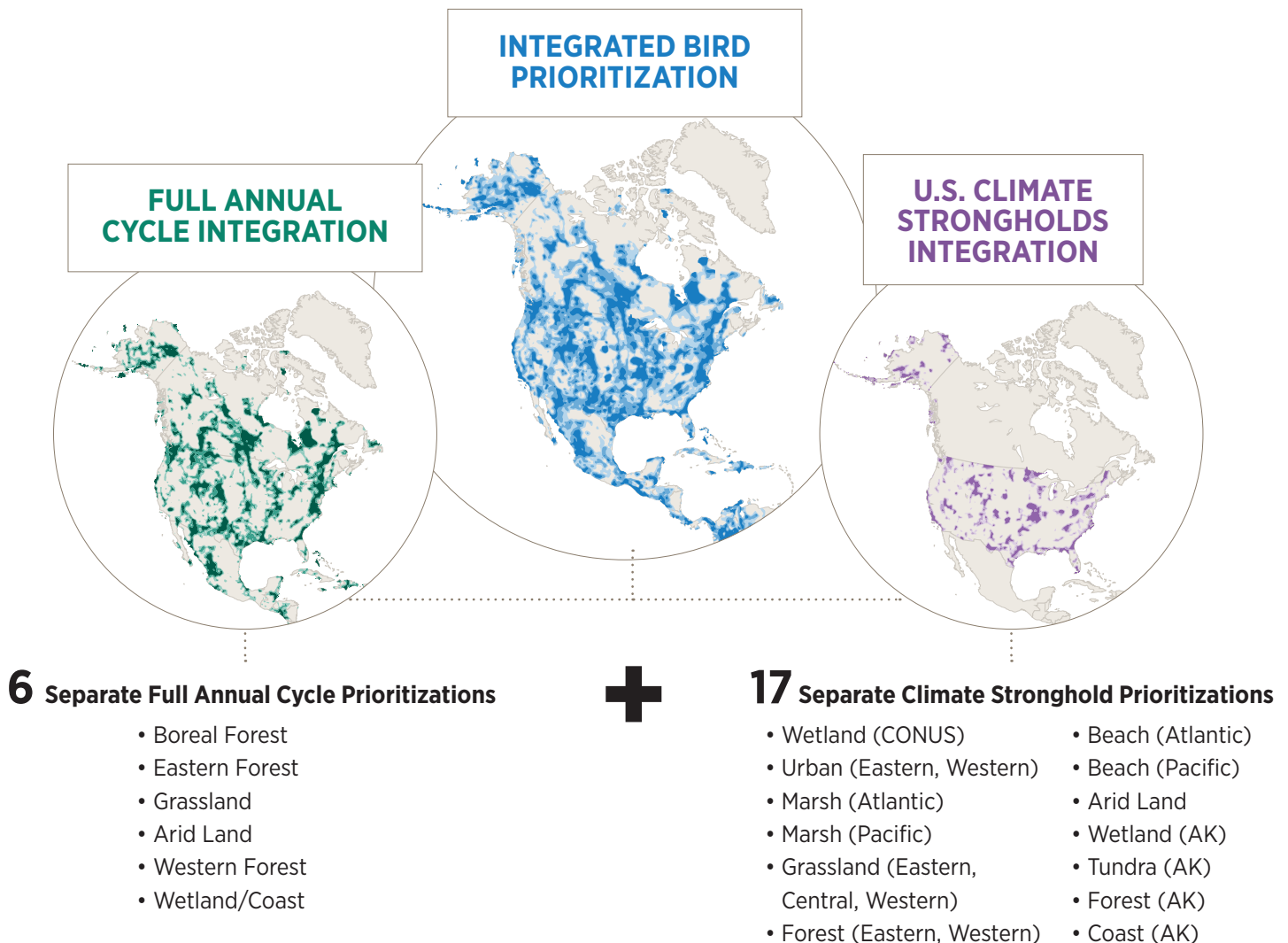
For each location or grid cell, the integration map takes the maximum value across all of the 23 input maps. Then, all maps are re-ranked from highest to lowest based on these maximums scores. The resulting integration highlights the

46 Grand et al., 2019; Taylor et al., 2022

47 Fink et al., 2021

48 DeLuca et al., 2023

**FIGURE 5.** Conceptual diagram of the integrated bird prioritization, developed from the integration of Climate Strongholds<sup>44</sup> and the Full Annual Cycle Priorities<sup>48</sup>. Maps: Joanna Grand/Audubon. Graphic: Julie Rossman/Audubon



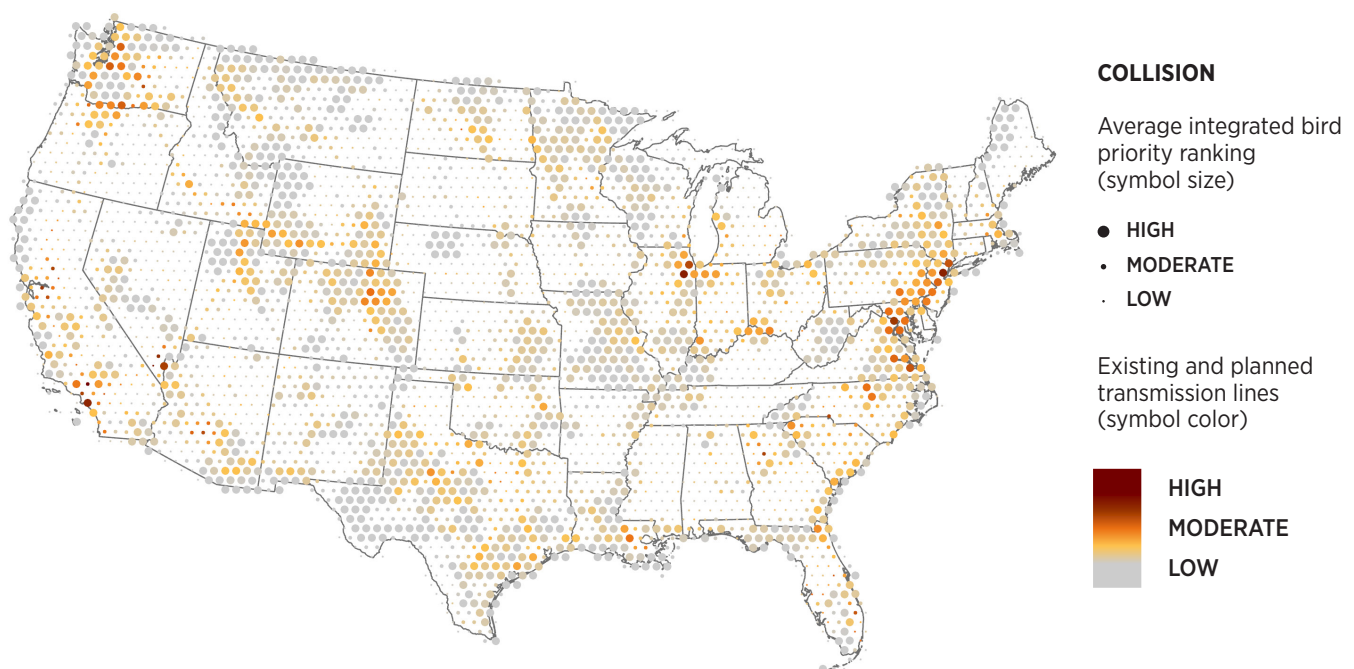
best locations across ecosystem types, climate strongholds and full annual cycle priorities. Below we map the co-occurrence of these high priority areas with two aspects of transmission lines that represent potential impact to birds: (1) collision and (2) habitat degradation and disturbance (risks outlined above, and in detail in the [Appendix A](#)).

### MAPPING COLLISION POTENTIAL

To identify areas of potential collision, we mapped the co-occurrence of priority areas for birds with existing and planned transmission lines. The 50-km resolution bivariate maps use symbology to display the overlap between the two variables of interest by highlighting areas of high co-occurrence with the largest circles and darkest color in Figure 2. A location with a large symbol will have a high average value from the Integrated Bird Priorities map. A location with a dark color will have the highest density of transmission lines (Figure 6).

Of the existing and planned transmission lines, 33% (~64,998 miles; 61,712 miles of existing and 3,286 miles of planned) fall within high priority areas for bird collisions (Figure 6). We identified these high priority areas as 50-km hexagon cells in the top 25th percentile of priority rank for birds AND in the top 25th percentile for total existing and planned transmission line density. Areas with the highest priority ranking for birds and high amounts of existing and planned transmission have high potential for bird collisions and are located throughout the country. For example, we identified parts of southern California and Nevada, the greater

**FIGURE 6.** Collision: Map of the priority areas for birds and where they co-occur with existing and planned transmission lines for all birds studied (within the integrated bird prioritization). Areas in darker colors and larger symbol size are where addressing the risk of bird collisions through reactive and proactive mitigation methods will be important. Map: Lotem Taylor/Audubon.





Chicago region, and the mid-Atlantic as being especially important for responsible transmission siting (Figure 6). These areas highlight locations where reactive measures can be implemented for existing transmission to help reduce collision risk for birds, and where proactive measures, such as underground cabling or bird-friendly design, can be implemented for new transmission lines (Table 2).

### MAPPING HABITAT DEGRADATION AND DISTURBANCE POTENTIAL

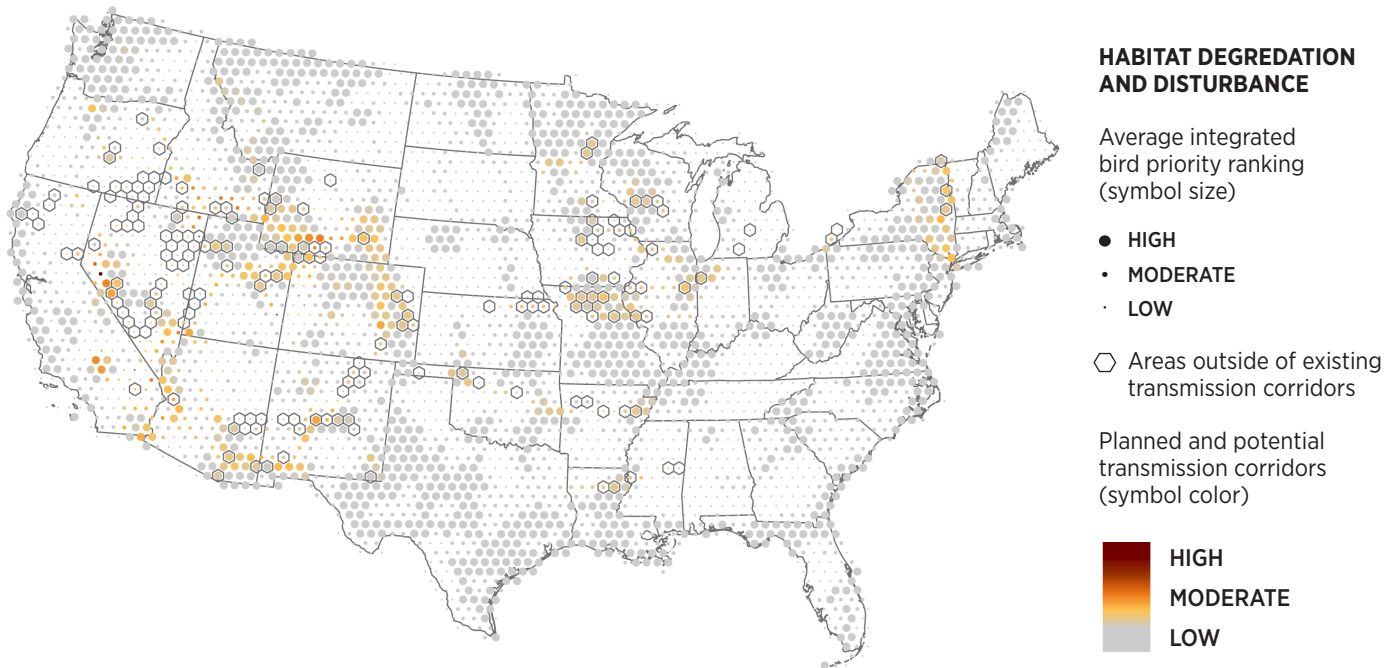
To identify areas of potential habitat degradation and disturbance, we mapped the co-occurrence of priority areas for birds in relation to planned and potential transmission corridors. As habitat degradation is most likely to occur during the construction and initial access to transmission lines, we have focused on transmission projects that are soon or yet to be built. The 50-km resolution bivariate maps use symbology to display the interaction between the two variables of interest, where a larger symbol size represents a higher average value from the Integrated Bird Priorities map, and a darker color represents a higher density of planned and potential transmission corridors. These corridors combine planned transmission lines, buffered to be 1-km wide to represent the ROWs, with the BLM West-Wide Energy Corridors, which are also approximately 1-km wide.

Of the planned and potential transmission lines that could lead to habitat degradation or disturbances, 27% (~5,941 miles; ~3,808 of planned and ~2,133 miles of potential) fall within high priority areas for birds (Figure 7). However, most of these priority areas are likely to occur within existing ROWs (Figure 7, symbols without outlines), indicating that many of these areas can support projects that will not lead to habitat degradation in new habitats, although disturbances may still occur. We identified these high priority areas as 50-km hexagon cells in the top 25th percentile of priority rank for birds AND in the top 25th percentile for total planned and potential transmission corridor areas. Areas of highest potential for bird exposure to habitat degradation from transmission are concentrated in the North Central/Rocky Mountain region, and especially in Southwest Nevada (Figure 7). These areas are prime for proactive measures, such as avoiding high-use foraging areas for high-risk species (Table 2), which are recommended for new transmission projects.

### HIGH PRIORITY AREAS FOR PROJECT ENGAGEMENT

This report has identified high priority areas in need of responsible transmission siting and management at a coarse, 50 km scale. These are places where priority areas for birds coincide with key locations for transmission build-out. It is within these areas that Audubon would like to help facilitate transmission projects that implement proactive and, in some cases, reactive mitigation measures to minimize the impact on birds. One key dataset we will rely on for planning within these 50 km areas is the U.S. Important Bird Areas database. Important Bird Areas are critical places for the long-term viability of threatened, endemic, and biome-restricted bird populations and careful planning will be essential in and around these locations. There are numerous mitigation measures (Table 2, [Appendix A](#)) known to lessen the impact of transmission on birds, and Audubon is poised to help identify and implement these measures at the project scale.

**“Of the existing and planned transmission lines, 33% fall within high priority areas for bird collisions.”**



**FIGURE 7.** Habitat Degradation and Disturbance: Map of the priority areas for birds and where they align with planned and potential transmission lines for all birds studied (within the integrated bird prioritization). Areas in darker colors and larger symbol size are where addressing the risk of habitat degradation and disturbance through reactive and proactive mitigation methods will be important. Areas that are outside of existing corridors and ROWs are highlighted in darker symbol outlines and identify areas where degradation risk may be higher than areas not highlighted. Note that potential transmission lines mapped here do not include all future potential projects. Map: Lotem Taylor/Audubon.

## NEXT STEPS FOR FUTURE RESEARCH

Increasing renewable energy and transmission lines is imperative to mitigate the worst effects of climate change<sup>49</sup>. As climate change exacerbates the most significant threats to birds (e.g., habitat loss and degradation, exploitation, invasive species), and particularly endangers migratory, polar, and tropical species<sup>50</sup>, birds will benefit from climate change mitigation. Indeed, Audubon's *Survival by Degrees Report* found that of the two-thirds of birds in North America at risk of range loss and potential extinction under unchecked climate change<sup>51</sup>, 76% would see less range loss and be better off if we stabilize climate change to the 1.5° C target of the Paris Agreement. The impacts of renewable energy are less than those of unmitigated climate change<sup>52</sup>. Nonetheless, **additional research to understand the tradeoffs between indirect benefits of expanded renewables versus the direct impacts of the build-out will help us refine and improve decision-making on where transmission and renewable energy projects are built**. These could be a counterfactual impact assessment, or a comprehensive evaluation of tradeoffs between renewables and climate change for bird populations<sup>52</sup>. These evaluations should also consider the benefits of thoughtful, proactive transmission route-planning and use of bird-friendly design, which is likely to substantially lower risk to bird populations as renewable energy grows.

49 IPCC, 2014; Pörtner et al., 2021

50 Lees et al., 2022; Rosenberg et al., 2019

51 Bateman et al., 2020; Wilsey et al., 2019

52 Katzner et al., 2022



# POLICY

## How to Put the Lessons of Science into Practice



### Translating Science to Action

Audubon has a successful history of working to mitigate the impacts of power lines on birds. In 1989, to address Whooping Crane collisions with power lines, Audubon worked with 10 utilities, Edison Electric Institute, and the U.S. Fish and Wildlife Service to form the Avian Power Line Interaction Committee (APLIC) to provide a collaborative forum to develop and study best practices. Since its inception, APLIC has expanded to address a variety of avian/power line interactions including electrocutions, collisions, and nesting impacts. APLIC membership now includes over 70 utilities, Edison Electric Institute, U.S. Fish and Wildlife Service, Electric Power Research Institute, National Rural Electrical Cooperative Association, and the Rural Utilities Service. APLIC has developed guidance documents identifying causes and minimization methods for avian electrocutions and collisions and has released national Avian Protection Plan Guidelines. APLIC hosts short courses and meetings each spring and fall throughout the U.S. and funds research related to avian/power line interactions and conservation.

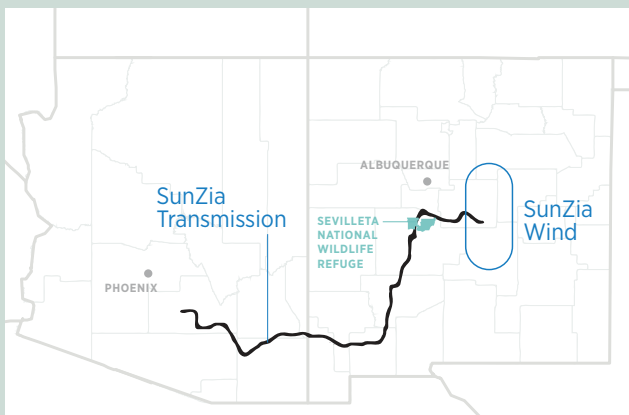
At Audubon's Rowe Sanctuary in Nebraska, utility workers mount an Avian Collision Avoidance System on transmission lines.  
Photo: James Dwyer



# CASE STUDY: SUNZIA TRANSMISSION LINE

A new transmission line in New Mexico and Arizona is an example of Audubon's collaboration with industry and others resulting in benefits for climate and conservation.

**IN 2018, AUDUBON LAUNCHED ITS CLEAN ENERGY INITIATIVE (CEI)** with a goal of contributing to 100% clean energy nationally, adding to gains in distributed energy (rooftop and parking lot solar, community solar, etc) by state policies, by focusing on advocacy for siting and operation of utility-scale on and offshore wind, solar, storage and transmission through science, research and practices that avoid, minimize and mitigate effectively for the impacts on birds. To realize success, the CEI team collaborates with developers, state and federal wildlife and permitting agencies, conservation partners and the Audubon Network on landscape-level planning, permitting under federal laws that protect birds, and on individual projects.



Once built, the 550-mile SunZia line will be one of the largest clean energy infrastructure projects in American history.



Sandhill Cranes are a species of concern for the SunZia Project. Photo: Vaughn Cott/Audubon Photography Awards

An early example of the beneficial impact of Audubon's direct engagement in transmission deployment is the SunZia transmission project. Once built, SunZia will be one of the largest clean energy infrastructure projects in American history, a 550-mile  $\pm$  525 kV high-voltage direct current (HVDC) transmission line between central New Mexico and south-central Arizona and western electricity markets with the capacity to transport more than 3 GW (3,000 MW) of renewable energy from wind projects in New Mexico. In 2006, it began a 17-year journey toward final permitting in 2023. Pattern Energy joined the project in 2018 and partnered with Audubon to initiate early and active engagement with project developers. This approach is essential to optimize mitigation for birds, ensure the best data and science are used, and make projects into long-term successes worthy of Audubon's support.

Pattern Energy's CEO and Audubon's CEO recently authored an article entitled "Conservationists and the Renewable Energy Industry Can and Must Work Together to Fight Climate Change." Our joint collaboration on the SunZia project exemplifies this relationship building and information sharing. For this project, Audubon Southwest and the Clean Energy Initiative convened an informal group of NGOs to meet regularly with Pattern to explore potential impacts of the proposed project on birds and habitat. Alternative crossings of the Rio Grande River were determined by innovative crane telemetry modeling with USFWS. The project also minimized impacts through, co-location of existing lines through an existing National Wildlife Refuge right-of-way, mitigation to protect Sandhill Crane and other species from transmission line collision mortality, and mitigation that would enhance habitat for the species to offset collision mortality.

Pattern has committed to using an ultraviolet light-based system, developed at Audubon's Rowe Sanctuary, which makes the transmission lines birds collide with most frequently more visible. At Rowe this technology has dramatically reduced Sandhill Crane collision mortality (Baasch et al., 2022). Impacts to endangered Rio Grande breeding bird species (Western Yellow-billed Cuckoo and Southwest Willow Flycatcher) have also been quantified, and a comparison of underground vs. above ground crossing impacts was presented that supported much higher impacts for an underground crossing of the Middle Rio Grande vs. an overhead crossing. Audubon has facilitated meetings with public agencies and other environmental NGOs with Pattern, coordinated with high-level agency staff tasked with approving the project, and reached out to our network in New Mexico and Arizona. In May 2023, the Department of Interior's Bureau of Land Management issued a Record of Decision approving the project route. Pending issuance of the Notice to Proceed from BLM, full construction is expected to begin in summer 2023.



Southwest Willow Flycatcher and Western Yellow-billed Cuckoo are endangered Rio Grande breeding bird species. Top photo: Becky Matsubara/Flickr (CC By 2.0) Bottom photo: Bill Gorum/Alamy

Visit [patternenergy.com/projects/sunzia/](https://patternenergy.com/projects/sunzia/) for more information.

 **Audubon** | SOUTHWEST

## Audubon Transmission Policy Priorities

In addition to working directly with transmission developers on bird-friendly siting and operations, Audubon recognizes that policy improvements to dramatically shorten the time frame to deploy new transmission infrastructure are required. It is imperative that the U.S. make a full transition to clean energy as quickly as possible, with the goal of reaching 100% clean energy by 2040. **There is not enough time to continue business as usual, where new transmission projects often take 10–20 years to build.** Thus, Audubon is actively engaged with other conservation organizations, decision makers, community organizers, utilities, and clean energy developers to promote the following policy priorities with the goal of quickly increasing bird-friendly transmission deployment:

### MAXIMIZE THE EFFECTIVENESS OF THE EXISTING GRID

The most bird-friendly way to quickly increase available transmission capacity is to maximize the efficiency and effectiveness of the existing grid. Audubon supports policies that increase transmission capacity without requiring new transmission infrastructure. This includes widescale deployment of grid enhancing technologies, utilization of dynamic line ratings, advanced power flow controls, re-conducting existing lines with advanced conductors, and maximizing non-wires solutions where available.

### MAXIMIZE THE USE OF EXISTING RIGHTS-OF-WAY

To the greatest extent possible, new transmission capacity should be planned and sited in areas with co-locating opportunities, to maximize use of existing rights-of-way that avoid negative community and environmental impacts, including rail, highway and pipeline rights-of-way, as it will minimize new habitat disruption and speed deployment. New transmission projects should also be right-sized for foreseeable future needs to promote the use of fewer, but higher capacity lines to make the most efficient use of right of way acreage.

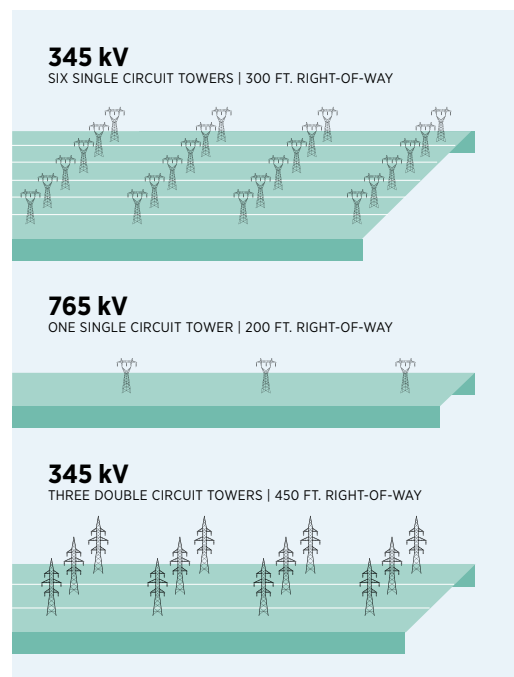
### IMPROVE TRANSMISSION PLANNING PROCESSES

The current regime of transmission planning processes is an inefficient, complex matrix of overlapping authorities that often stand in the way of timely and efficient transmission deployment. Therefore, Audubon supports robust transmission planning processes that employ sufficient (min. 20 years) planning time horizons, early and meaningful stakeholder input, public funding to support participation from impacted communities, and which appropriately balance habitat preservation and community impacts with the need to rapidly increase transmission capacity.

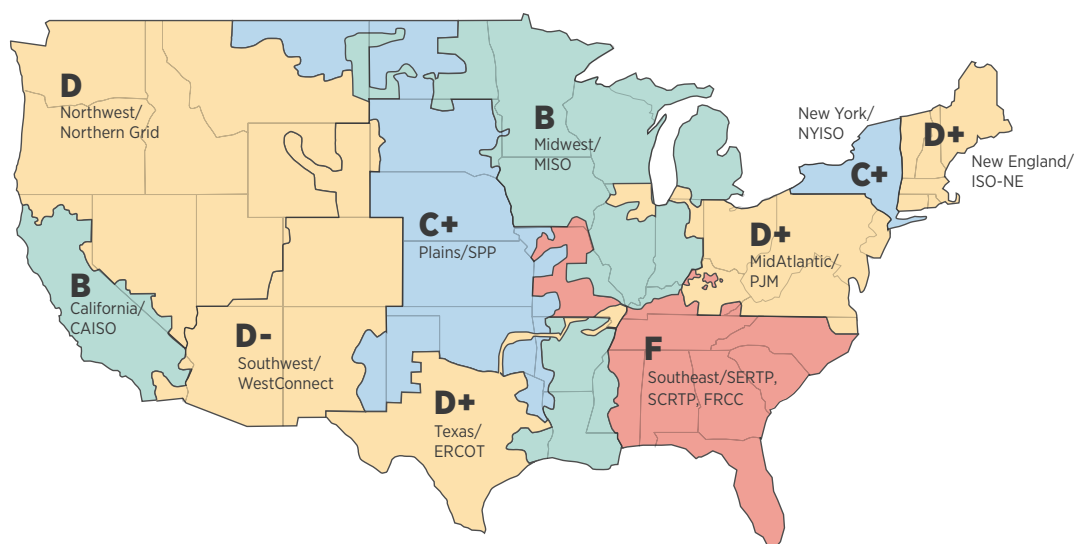
### A STRONGER TRANSMISSION ROLE FOR FERC

Audubon supports a stronger, proactive role for the Federal Energy Regulatory Commission (FERC) in transmission planning, siting, and permitting. **We believe that FERC's continued push for improved**

**FIGURE 8.** Planning for new transmission capacity should strive to build fewer, higher capacity lines to minimize the ROW acreage needs (and costs) by forecasting anticipated future needs rather than relying on 'just enough for now' planning. Graphic: Julie Rossman/Audubon







**FIGURE 9.** Grades for transmission planning by region as developed by Americans for a Clean energy Grid. Used with permission.<sup>53</sup>

**transmission planning requirements is critical to meet the scale and time constraints required to reach U.S. emission reduction goals and to create a safer, more resilient grid.** Audubon believes FERC should continue its emphasis on grid-enhancing technologies, complete the Regional Transmission Planning and Interconnection Queue reform rules, and move forward with the development of minimum interregional transfer capacity requirements and federal siting backstop authority.

### SECURE FEDERAL TRANSMISSION POLICY REFORMS

At the federal policy level, Audubon supports the Department of Energy (DOE), Department of the Interior (DOI), and Congress advancing policies that facilitate faster transmission deployment by leveraging federal investment, streamlining rules for federal siting, and encouraging private capital to move off the sidelines. Specific opportunities of interest include: streamlining duplicative agency review processes, the creation of a State Revolving Fund (SRF) for transmission infrastructure, support for federal and state-level green banks, creating a new investment tax credit for transmission infrastructure, expanding organized wholesale electricity markets, and the establishment of an incidental take permit under the Migratory Bird Treaty Act for transmission that incentivizes practices to avoid, minimize, and compensate for incidental take, while enhancing regulatory certainty.

### PREPARE STATES FOR THE MAGNITUDE OF TRANSMISSION DEPLOYMENT

Navigating the myriad state permitting and siting processes is a critical component of any transmission deployment strategy. Audubon recognizes that each

<sup>53</sup> Zimmerman, 2023

state is unique and differences in state energy policies will impact transmission deployment. However, as all states are likely to see increased needs to make critical transmission planning, siting, and deployment-related decisions at a historically unprecedented level, Audubon supports the creation of state transmission authorities, such as those in New Mexico and Colorado, and the full utilization of recently passed federal funding available through the Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA) to bolster state transmission studies and other siting processes.

### PROMOTE BIRD-FRIENDLY DESIGN AND OPERATION

Building on our work with transmission developers to encourage the voluntary adoption of siting and management best-practices that are beneficial for birds, Audubon will actively look for ways to build requirements and incentives for those practices into transmission policy when appropriate.



A solar-powered device fitted with ultraviolet lights that, when mounted on transmission poles, shine on the wires. By making the lines more visible to birds, these devices have been shown to reduce collisions by more than 90% as compared to unlit lines. Photo: James Dwyer

# CONCLUSIONS



This report highlights the urgent need for climate action, and why we need a rapid build-out of transmission as a critical part of the solution. Birds tell us that the time to act on climate is now, and they need us to rise to the challenge presented by the threat of climate change. While there is no single action to guarantee the worst impacts will be avoided, most experts agree that de-carbonization of our economy is an essential step. The alternative is a climate future where two-thirds of birds in North America will suffer dramatic range loss and extinction. Audubon recognizes the imperative that the U.S. transition to clean energy as quickly as possible, with the goal of reaching 100% clean energy by 2040. **The timeline is urgent and a rapid deployment of transmission is necessary to be able to scale up clean energy capacity in the U.S. and meet our emission reduction goals.** Doing this well will require finding equitable, bird-friendly, and environmentally sound ways to significantly speed the deployment of transmission infrastructure. We have to move faster to prevent the worst impacts of climate change on people and birds.

Sandhill Cranes fly past transmission lines in Texas. Photo: Melissa Groo



Our nation's transmission build-out can and should be done quickly, but it should also be done in a manner that minimizes harm to wildlife, key habitat, and people. We found that 33% of existing and planned transmission and 27% of planned and potential transmission coincide with priority areas for birds. These are areas that are important for many bird species and are also of high risk for bird collision and habitat degradation and disturbance. Given this, these locations are high priority areas for Audubon to engage in transmission projects to ensure bird-friendly solutions are implemented. Audubon is committed to the deployment of well-sited new transmission to connect renewable energy resources to human population centers and to improve interregional transfer capacity. **Although we do not delve into the implications of transmission on Indigenous Peoples and Local Communities (IPLCs) or Environmental Justice (EJ) communities in this report, Audubon urges that projects move forward in an equitable way that empowers communities and elevates their priorities.** Audubon will lean into existing recommendations on engaging IPLCs and EJ communities on transmission projects<sup>54</sup>, making sure that the impacts on these communities are also accounted for in project planning. We will also continually assess the science on the impacts of transmission on birds and the cutting-edge bird-friendly solutions to best mitigate those impacts. For example, as new transmission projects are planned or other high potential areas for clean energy and transmission build-out are identified, Audubon will re-assess our priority areas to engage in these processes. Finally, site-specific factors may outweigh the broad-scale assessment included in this report and so we will as a rule also integrate local scale habitat or species data with the information included in this report.

**With the release of this report, Audubon has launched our Transmission Initiative to improve transmission planning and policy.** We want to be a part of the conversations that speed the deployment of the many transmission projects we need to reach our climate goals, while simultaneously creating a more bird-friendly grid. We are eager and prepared to join those conversations as the voice for birds to help create a better climate future for all.

## Acknowledgments

*We thank all of our Audubon colleagues and our transmission consulting team who participated in the working groups that shepherded this report forward, especially Dan Devine, Robyn Shepherd, Adam Forrer, Justin Stokes, Ron Lehr, Karl Rabago, Ted Thomas, Jennifer Gardner, and Daly Edmunds for their contributions to this report. We also thank all of those who took the personal time to review this report and help us make it better: Kara Donohue, Misti Sporer, James Hewett, Anna Foglesong, and Curtis Seymour. Finally, we must note that this report would not have been possible without the generous support of Breakthrough Energy.*

**“Audubon is committed to the deployment of well-sited new transmission to connect renewable energy resources to human population centers and to improve interregional transfer capacity.”**

<sup>54</sup> Ung-Kono, 2023

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## [Appendices A and B](#)