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# PROTECTING BIRDS WHILE POWERING AMERICA: AN OVERVIEW OF EFFORTS BY THE ELECTRIC UTILITY INDUSTRY TO REDUCE BIRD MORTALITY AND IMPROVE POWER RELIABILITY

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*Abstract.* Efforts to document and reduce bird electrocutions and collisions with power lines have been ongoing in the United States since the 1970s. In habitats with prey concentrations and few natural perches, raptors and corvids may be attracted to power poles as perch or nest sites. If the poles are not configured for avian safety, electrocutions can occur. Electrocutions can be prevented by framing poles with sufficient spacing to accommodate large birds, or by covering exposed energized parts. Bird collisions with power lines can occur during low light or poor visibility, and often involve large, flocking species. Collisions can be reduced by conspicuously marking power lines with appropriate devices. Electric utilities can develop and implement Avian Protection Plans to minimize bird mortality risks while enhancing power reliability.

*Key Words*: Avian Protection Plan, collision, electrocution, power lines.

## PROTEGIENDO A LAS AVES MIENTRAS SE ENERGIZA A AMÉRICA: UN PANORAMA GENERAL DE LOS ESFUERZOS DE LA INDUSTRIA DE SERVICIOS ELÉCTRICOS PARA REDUCIR LA MORTALIDAD DE AVES Y MEJORAR LA CONFIABILIDAD DE LA ENERGÍA

*Resumen*. Varios esfuerzos se han venido realizando en Estados Unidos desde la década de 1970, en aras de documentar y reducir el número de electrocuciones y colisiones de aves, con líneas eléctricas en el país. En hábitats con alta concentración de presas y escasas perchas naturales, las aves rapaces y los córvidos son atraídos a los postes eléctricos por su posible empleo como perchas o nidos. Si los postes no están configurados para garantizar la seguridad aviar, las electrocuciones tienden a suceder. Estas electrocuciones podrían prevenirse diseñando postes con suficiente espacio para acomodar grandes aves ó cubriendo en estos sus partes energizadas expuestas. La colisión de aves con las líneas de energía suele ocurrir durante períodos de baja iluminación o mala visibilidad y a menudo implican a especies mayores que vuelan en bandadas. Estas colisiones pueden reducirse a través de un marcado notable o visible de las líneas eléctricas, utilizando dispositivos adecuados. Las empresas eléctricas pueden desarrollar y aplicar Planes de Protección Aviar, a fin de minimizar los riesgos de mortalidad aviar, a la par que aumentan la confiabilidad de la energía.

## INTRODUCTION

For over 30 years the electric utility industry and the U.S. Fish and Wildlife Service (USFWS) have worked together to reduce avian mortality associated with power lines. In the early 1970s an investigation of eagle mortalities in the western United States revealed that, while numerous birds were shot or poisoned, others had been electrocuted on power lines (Olendorff et al. 1981). This prompted a joint response by resource agencies, electric utilities, and conservation groups to identify the causes of raptor electrocutions and develop methods to prevent electrocution mortality. These early efforts have continued to evolve and expand over subsequent years, and provide the foundation for our current knowledge of the avian electrocution issue. Likewise, collisions of Whooping Cranes (*Grus americana*) with power lines in the 1980s led to increased awareness of bird-power line collisions, resulting in collaborative efforts among resource agencies, electric utilities, and conservation groups, and triggering the formation of the Avian Power Line Interaction Committee (APLIC).

APLIC is comprised of biologists, engineers, and other staff from rural electric cooperatives, federal power companies, investor-owned utilities, the Edison Electric Institute, the Electric Power Research Institute, the Rural Utilities

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Service, and USFWS. APLIC's mission is to lead the electric utility industry in protecting avian resources while enhancing reliable energy delivery, and to work in partnership with utilities, resource agencies, and the public to: develop and provide educational resources; identify and fund research; develop and provide cost-effective management options; and serve as the focal point for avian/electric utility issues.

Key resources developed by APLIC include guidance documents for minimizing electrocutions and collisions: Suggested Practices for Avian Protection on Power Lines: the State of the Art in 2006, and Mitigating Bird Collisions with Power Lines: the State of the Art in 1994 (note: as of this date, the collision manual is being updated). In addition, in 2005, APLIC and USFWS released national Avian Protection Plan Guidelines, which serve as a "toolbox" for utilities to use in the development and implementation of Avian Protection Plans (APPs). These guidance documents can be downloaded at the APLIC website (www.aplic.org).

APPs implemented by electric utilities have been effective in reducing avian mortality, improving service reliability, reducing long-term costs, enhancing environmental stewardship, and improving communication with regulatory agencies. Such plans can also serve as models for other industries whose activities may result in mortalities of migratory birds.

## ELECTROCUTIONS: CAUSES AND SOLUTIONS

Birds can be electrocuted when they simultaneously touch two energized lines or an energized line and a grounded line. Several factors, both engineering and biological, influence the risk of electrocution. Poles that are configured with closely-spaced lines or that have equipment, such as transformers, can pose an electrocution risk. High voltage transmission lines typically pose a very low electrocution risk due to their large separations, however, lower voltage lines (less than 34,500 volts) that distribute electricity to customers have closer separations that can be bridged by large birds.

Biological factors that can influence electrocution risk include species, size, season, habitat, prey abundance, nesting, courtship or territorial behavior, and age (APLIC 2006). While one factor alone may not pose a high risk, when several of these biological factors occur together in areas where poles are not configured for avian safety, electrocutions can occur.

Species that are more vulnerable to electrocution are typically those that have large wingspans, occur in open habitats, and perch or nest on power poles. Examples include: Great Blue Heron (*Ardea herodias*), Bald Eagle (*Haliaeetus leucocephalus*), Golden Eagle (*Aquila chrysaetos*), Osprey (*Pandion haliaetus*), Red-tailed Hawk (*Buteo jamaicensis*), Swainson's Hawk (*B. swainsoni*), Ferruginous Hawk (*B. regalis*), Rough-legged Hawk (*B. lagopus*), Harris's Hawk (*Parabuteo unicinctus*), Turkey Vulture (*Cathartes aura*), Great Horned Owl (*Bubo virginianus*), Barn Owl (*Tyto alba*), ravens, crows, and magpies. In addition, small birds such as doves, woodpeckers, and European starlings (*Sturnus vulgaris*) may be electrocuted on transformers or other equipment where there is very close spacing between electrical parts.

Seasonal variation in electrocution rates can occur among species, with increases during periods when birds more often occupy open habitats or perch on poles. In open habitats, including grasslands, agricultural lands, and sagebrush/shrub communities, where natural tall perches are scarce, raptors are more likely to perch on power poles than in forested habitats where natural perches are abundant. Concentrations of prey or other food sources, such as prairie dog towns or fish processing facilities, can attract raptors. Some birds, including Red-tailed Hawks, Ospreys, and Common Ravens (*Corvus corax*), frequently nest on power poles. Multiple birds on a pole together due to nesting activity can increase electrocution risk because the combined wingspans of several birds can make it easier to bridge the distance between energized lines. Likewise, birds engaged in courtship or territorial activity can bridge between energized lines.

Bird electrocutions on power lines can be minimized by implementing reactive, preventative, and proactive efforts simultaneously. Reactive efforts include responding to bird electrocutions by retrofitting poles with mortalities and nearby structures that pose similar risks. Preventative efforts involve applying avian-safe construction standards to new power lines or poles that are rebuilt or repaired. Proactive efforts require assessing electrocution risk over large geographic areas and implementing retrofitting efforts at poles that pose an increased electrocution risk because they exhibit several of the above biological and engineering factors.

By implementing reactive, preventative, and proactive efforts together, a utility can address both new pole construction and modification (retrofitting) of existing poles, many of which were built before bird protection was considered. When retrofitting poles, a variety of covers can be installed that prevent birds from contacting energized lines or equipment. Covers should be approved by utility engineers

to ensure that they meet the company's safety and reliability standards. Perch discouragers can also be used to manage where birds perch on a pole, dissuading them from perching in an electrocution-risk area and allowing them to perch on parts of the pole where there is no electrocution risk. Utilities should be cautious in the use of perch discouragers, as they may not be effective or, conversely, can push birds to non-avian-safe sites. Newly constructed power poles in areas with raptor populations are typically framed with adequate spacing to allow large birds such as eagles to use the poles without being able to bridge between lines.

## COLLISIONS: CAUSES AND SOLUTIONS

Like electrocutions, bird collisions with power lines are influenced by both engineering and biological factors (APLIC 1994). Collisions can occur with the static (neutral) line of transmission structures, which is typically the highest line and a narrower diameter, and therefore less visible than the energized lines below. Biological and environmental factors that influence collision risk include visibility, habitat, species, flocking behavior, courtship, hunting, and territorial behaviors, flight altitude, migration corridors, and land use.

Visibility is an important factor influencing collision risk. During low light at dawn and dusk, and during inclement weather, lines may be difficult to see. Habitats surrounding the power line can also influence collision risk, particularly if a power line bisects habitats used during daily activities. For example, if a flock of geese roosts in a marsh at night and crosses a power line each day to feed in a farm field, the birds would fly across the power line at least twice a day and possibly during low light at dawn and dusk. Power lines that cross wetlands and rivers can pose a collision risk to waterfowl, pelicans, or other birds that congregate in these habitats.

Species especially vulnerable to collisions include those that fly in flocks or are large and heavy-bodied with limited maneuverability, such as pelicans, swans, geese, cranes, and California Condor (*Gymnogyps californianus*). Birds in large flocks may not have enough time to see and avoid power lines. Social interactions related to courtship or territorial behaviors can distract birds, preventing them from seeing a power line. Likewise, raptors occasionally collide with lines while in pursuit of prey. Power lines located in migration corridors may pose a greater risk than those outside of migratory corridors or stopovers. Land uses near power lines may attract birds and human activities near lines can flush birds into lines.

Bird collisions with power lines can be reduced by siting new power lines in low risk areas and avoiding areas where high collision risk factors occur. Additionally, marking devices are often installed on spans of existing lines where collisions occur. Several high visibility devices are available that either coil or clamp onto the wires. Some products increase the visible diameter of the line where they are installed, while others have glow-in-the dark, movement, color, or reflective properties that enhance the visibility of the line. Effectiveness studies of different marking devices have been conducted (see APLIC 1994) and others are currently underway.

Although marking devices do not completely eliminate collisions, they can significantly reduce collision risk (APLIC 1994). Burying, reconfiguring, or re-routing existing power lines may be done as a last resort to reduce unresolved significant collision problems. Because modifying existing lines can be extremely costly and may not be feasible with higher voltages, siting new lines to avoid collision risks is recommended.

## BIRD NESTS ON POWER LINES

A variety of birds may nest on power poles, including Canada Geese (*Branta canadensis*), Great Blue Herons, cormorants, eagles, hawks, falcons, owls, ravens, and kingbirds (APLIC 2006). Nests located on distribution poles or transmission towers that do not pose a safety, reliability, fire, or electrocution risk are typically left in place. However, nests that do pose these risks may be removed or relocated to nest platforms (with applicable permits). Nest platforms may be installed on the existing power pole or set on a pole without electrical facilities. The latter is often preferable, as it prevents debris from the nest or prey remains from contacting energized lines.

## AVIAN PROTECTION PLANS

Utilities can both reduce avian mortality and increase power reliability by implementing an Avian Protection Plan (APP). Protected bird mortalities associated with power lines are considered "takes" under the Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act (BGEPA), and Endangered Species Act (ESA). Although there are no provisions under MBTA or BGEPA that authorize "take", the USFWS recognizes that some bird mortalities will occur even if reasonable preventative measures are taken. While USFWS cannot absolve individuals or companies for "take" of migratory birds, they can use enforcement discretion

to focus on those who "take" migratory birds without regard for their actions (or inaction) and the law (APLIC and USFWS 2005). The development and implementation of an APP can help a utility reduce their "take" of protected birds.

The voluntary APP Guidelines developed by APLIC and USFWS provide guidance on developing such a plan for a utility and highlight 12 components that may be included in a utility's APP. Each utility's APP will be different depending on the geographic area, species, risk, and other factors specific to that utility. However, all APPs are intended to be living documents with a common goal: to reduce bird mortality and improve service reliability. The 12 APP principles are:

1. Corporate policy: a policy should identify the company's commitment, roles, and responsibilities.
2. Training: appropriate personnel should be adequately trained on reporting/documentation, avian-safe construction and bird protection products, nest management, and other procedures related to company bird program.
3. Permit compliance: utilities should identify, obtain, and comply with required federal and state permits for nest management, salvage, and temporary possession of carcasses of protected species.
4. Construction design standards: utilities should implement avian-safe construction standards that meet or exceed those recommended by APLIC.
5. Nest management: procedures should be developed that address nest management, including nest relocation, removal, monitoring, and protection.
6. Avian reporting system: a reporting system can be used to track bird mortalities, outages, nests, and bird protection efforts. The USFWS has an online reporting system for utilities to track and report bird mortalities associated with power lines (https://birdreport.fws.gov).
7. Risk assessment methodology: this is a component of a proactive effort, in which areas that pose a high electrocution or collision risk are identified.
8. Mortality reduction measures: these efforts can be used in conjunction with the risk assessment to implement remedial actions at locations of high bird mortality risk.
9. Avian enhancement options: utilities can implement measures to aid bird populations through habitat improvement, partnerships with agencies or bird conservation organizations, or installation of nest boxes/platforms.
10. Quality control: a utility should periodically assess its APP to evaluate if it is achieving desired results and continually improve its efforts as needed.
11. Public awareness: utilities can educate the public on avian/power line issues and gain positive recognition for their bird protection efforts.
12. Key resources: utilities should identify experts, both internally and externally, that can contribute to a successful APP.

Management support and funding are key components to a successful APP. In addition, all company employees that are involved in developing and implementing an APP should be properly trained and accountable for their roles and responsibilities. A utility developing an APP should also consult with USFWS and state agencies to ensure that they are adequately identifying bird risk areas and implementing appropriate efforts to reduce bird mortality. An active APP can be an effective tool that identifies problems, implements solutions, reduces impacts to migratory birds, improves reliability and customer service, and fosters cooperation among utilities and natural resource agencies.

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