Possibility of eagle take at proposed Cap-X 2020 river crossings
US Fish and Wildlife Service
Minnesota Valley Wildlife Refuge
Twin Cities Ecological Services Field Office
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Summary: The best available scientific literature available suggests that while many species of eagles have a relatively low incidence of utility line (transmission and distribution) collision, the possibility of such a collision is enough to warrant special consideration during infrastructure development. This document outlines collision risk of eagles with overhead utility lines, including a literature review. Additionally, the Service examined the literature reviewed by Great River Energy regarding eagle collision risk. The avoidable take of even one eagle requires a permit. The US Fish and Wildlife Service (the Service) would like to work with the CapX 2020 project to select a line crossing that will limit the collision danger to eagles. If undergrounding the line across a river is not feasible, the Service recommends the river crossing of Belle Plaine, MN. Additionally, the Service would like to work with the CapX project to develop minimization measures, most likely in the form of an Avian Protection Plan.

Collisions

The major issue addressed here is whether bald eagles are at risk for collision with high-voltage transmission lines. If this risk is found to be substantial, it may be necessary for the project proponents to apply for a permit for non-intentional take of bald eagles.
Bird mortalities from collisions with power lines are conservatively placed at tens of thousands – 174 million (Erikson et al. 2001, APLIC 2006). Bird collisions with transmission lines can cause impact to local populations in areas of biological significance, such as concentration or nesting areas (APLIC 2006). We believe the Minnesota River Valley to be one of those places. Raptor collisions with wind turbines (another form of lethal infrastructure) increased when lethal infrastructure was near likely foraging areas (Erikson et al. 2001). Estimating collision rates is difficult due to crippling injuries, scavenging, and lack of carcass searches. The difficulty of finding carcasses compounds when utility lines cross rivers. Collisions are thought to increase with an increase in the number of vertical wires, and are correlated with tree height (Bevanger and Brøseth 2001, 2004, APLIC 1994). Estimates of mortality vary widely, and are often based on extrapolations. However, because so little of the power grid is being studied, current limited studies are not always meaningful (Manville 2005). Risk increases when transmission lines are placed in IBA (Important Bird Areas), such as the Minnesota River Valley (Bayle 1999).

In the May 13, 2010 letter to the US Fish and Wildlife Service, Great River Energy (GRE) stated electrocutions of bald eagles are most associated with low-voltage distribution lines (less than 69 kV). The GRE letter also stated bald eagle collisions are rare and typically associated with distribution lines. However, Janss and Ferrer (1998) found no statistical difference in the rate of bird/line collisions between transmission and distribution lines. Many studies also combine electrocution with collision mortalities due to an uncertain cause of death. Additionally, many studies do not differentiate between distribution and transmission lines. Much of the reporting on collisions with power lines is in the form of unpublished (non-peer reviewed) reports. We present here known evidence of eagle collisions with utilities lines, and note whether the type of line was identified.

__**Review of Eagle Collision Literature**__

Olendorff and Lehman 1986. 88 raptor collisions with utility lines were documented in 21 years: Peregrine Falcons 27%, Bald Eagles 17%, Golden Eagles 10%, Osprey 8%, Red-tailed Hawk 8%. 26 of these collisions were with transmission lines

Faanes 1987. 81% of collision mortalities occurred during fall migration, indicating mortality increases when birds are concentrated together, such as in a foraging area. He also noted that crippling bias makes strike counts an underestimation. This study found 10 dead raptors in a 2 year period. While this was a low number compared to the rest of the birds recovered in his study, he noted bald eagles should be given special consideration. Wintering eagles moving from foraging areas to night roosts are typically low fliers. "The greatest risk for [bald eagle] collisions with power lines exists in the mid-span area where power lines cross open expanses of river". Because raptors are so long-lived and slow to reproduce, these losses are ecologically significant. This study exclusively looked at transmission lines.

Real and Manosa 1997. 41% of dead Bonelli's eagles (*Hieraaetus fasciatus*) were found to have been killed by power lines (type not specified) by both electrocution and collision. Eagles and other large raptors tend to be more prone to electrocution than collision. However, collision is not unheard of for these raptors.

Bevanger 1998. While eagles tend to be more susceptible to electrocution, collisions are possible. In a review of 16 studies (1972-1993), 7 collisions were noted for Accipitridae (hawks, vultures, and eagles), and 7 collisions for Falconidae (falcons and allies). There was insufficient data for judging power line mortality effect on populations. Line type not specified.

Bayle 1999. Mortalities from collisions with transmission lines have been documented for both Spanish Imperial Eagles (*Aquila heliaca adalberti*) and Bonelli's Eagles. Other studies in Europe document mortalities of Short-toed Eagle (*Circaetugs allicus*), Bonelli's Eagle (*Hieraaetus fasdatus*), Booted Eagle (*Hieraaetus pennatus*), Golden Eagle (*Aquila chrysaetos*), Spanish Imperial Eagle (*Aquila (heliaca) adalberti*) with utility lines. In some studies collision and electrocution numbers were combined, but collision was identified (Bevanger 1994, Bayle 1999, Janss 2000, Real et al. 2001). For many studies, distribution and transmission lines were not differentiated. However, when carcasses are found under a transmission line, collision is likely (APLIC 2006).

Janss 2000. This study classified Spanish Imperial Eagle, Golden Eagle, Bonelli's Eagle, Booted Eagle, and osprey (*Pandion haliaetus*) as forming a group of mixed cause mortality – species vulnerable to both electrocution and collision. Line type not specified.

Real et al. 2001. In a study from 1990-1998, 209 endangered Bonelli's Eagles were documented killed by power lines, 12 of those were due to line collisions. Line type not specified.

Harron 2003. This study found thirty-five 'birds of prey' of 22 species have collided with transmission lines (Harron included ravens, ptarmigans, and turkeys in his birds of prey category). He also listed the critical factors that determine collision mortality are:

- Number of birds present
- Visibility
- Bird Physiology
- Bird Species Behavior
- Temporal Factors
- Disturbance

-Familiarity
-Location of transmission line
-Habitat

Fox et al. 2004. Reviews Wedge-tailed eagle mortality, including collision with overhead utility lines. This paper models population decline due to unnatural mortalities. Line type not specified.

Threatened Tasmanian Eagles Recovery Plan. 2006. Reviews causes of Tasmanian eagles (Wedge-tailed and White-bellied Sea Eagles) mortality, including collision with overhead utility lines. Line type not specified.

Műller 2007. Most common cause of injuries to White-tailed Sea Eagles (*Haliaeetus albicilla*) admitted to a raptor rehabilitation center in Germany was due to collision with anthropogenic structures. During an 8-year period, 41% of all admissions were trauma. Out of 49 eagles admitted, 3 (6%) had collided with power lines. Two additional eagles were found under power lines, but cause of injury could not be established. It should be noted that only live eagles (crippling injuries) were examined. Line type not specified.

Mojica, 2009. When distribution lines were between communal roosts in, at least 21 of the 77 injured or killed bald eagles were from line collisions. Higher mortality in lines located closer to shorelines and places of no vegetation cover. Theses collisions still occurred even with added visibility to lines.

Bekessy et al. 2009. Wedge-tailed eagles (*Aquila audax fleayi*) documented colliding with overhead utility lines. This form of unnatural mortality coupled with habitat loss could cause population declines. Type of line not specified.

Rodriguez et al. 2010. The most frequent cause of admission to a raptor rehabilitation center (42%) was collisions (vehicle and power line combined). 65% of the collision admissions were not releasable. Line type not specified.

Electrocution

Cap-X project proponents have asserted that electrocution on new transmission lines is not likely an issue, due to the wide spacing between lines. APLIC (2006) cites that bald eagles account for less than 5% of all avian electrocutions. This study states that annual electrocutions are in the "thousands". If that number is 1,000-10,000, this would put the bald eagle mortalities from electrocutions at 50-5000 eagles. Because the mortality of a single eagle can result in a violation of the Bald and Golden Eagle protection Act, we recommend continued attention to prevention of electrocutions. These recommendations were made in the US Fish and Wildlife Service February 8, 2010 letter.

Response to Great River Energy Eagle Collision Research

Bevanger 1998. Reviewed above. States raptor collisions are less common than other strikes, however, they were documented.

Barrett and Weseloh 2008. Study looked at waterfowl and colonial waterbirds. No dead raptors were found in this study. However, population surveys were not conducted in this study; it is unclear if any raptors inhabited this area. The conclusion of this paper was *not* that raptors-transmission collisions are rare; raptors were not a focus of this paper.

Crowder and Rhodes 2002. This study reported no raptors killed by transmission lines. However, during field observations of birds crossing the transmission lines, only 3 Northern Harriers and 2 "raptorial species" were observed. The total number of birds observed flying across transmission lines was 7993, making the 5 observed raptors only 0.0006% of the birds available to collide with the transmission lines.

Janss 2000. Reviewed above. Article states eagles comprise a group of mixed-cause mortality; species vulnerable to both electrocution and collision.

Brookings County-Hampton 345 kV Transmission Line Project Migratory Bird Treaty Act/Eagle Nest Survey report, April 19, 2010 (Graham Environmental Services, Inc.): In this report provided to Office of Energy Security and the Service, it was reported that no nests (active or inactive) were found in the vicinity of the Belle Plaine crossing. On June 8, 2010, field technicians from the Minnesota Valley Wildlife Refuge located a historic nest (Belle Plaine Wayside West nest). This nest was confirmed active with two nestlings.

Recommended Minimization Measures

Collision
Line markings should be frequent, and construction plans should to include frequent monitoring of lines to make sure collision markers are still in good working order (Bevanger 1994). Most studies recommend frequent markings on lines, and marking or removal of groundwires. However, even with line markings, collision is still a possibility. (Faanes 1987, Alonso 1994, Bevanger 1994, Savereno et al. 1996, Bevanger and Brøseth. 2001)

Because much information is unknown about the effect of utility lines on eagle mortalities, we recommend that on-going research where transmission lines are near eagle-use areas. Bird Strike Indicators are effective at detecting bird strikes, allowing for more effective ground searches (Murphy et al. 2009). Raptor effigies were found to not be effective in reducing raptor collisions (Janss et al. 1999).

Electrocution
The US Fish and Wildlife Service would like the CapX 2020 project to ensure that electrocution is not going to be an issue.

Conclusions
- Eagles are killed by utility lines, and collision is a possibility.
- Collision is a risk with both transmission lines and distribution lines
- Probability of bird strike increases are the height of a structure increases.
- Literature is not complete – many studies do not differentiate between collision and electrocution or do not differentiate between transmission and distribution lines.
- Evidence points to a relatively low number of eagles being ‘taken’ by transmission lines. However, even the take of one eagle requires a permit.

Recommendations
- Choose a river crossing that has the lowest impact to eagles (in this case, Belle Plaine)
- Develop a project-specific avian protection plan (APP) with Advanced Conservation Practices (ACPs). If a permit is eventually needed, these ACPs will be the basis for a programmatic permit.
- The Service recommends extensive line monitoring, including using Bird Strike Indicators and Bird Activity Monitors (EPRI et al 2003, Pandey et al. 2007). These will help evaluate the efficacy of line markers and flight diverters.
- Work with USFWS to develop best applications of diverters and markers on lines.

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