Introduction

Rapidly expanding bald eagle populations in the Upper Midwest are a conservation success story but present a unique challenge when wind farms or other high voltage transmission lines (HVTLs) are located near bald eagle nests. The number of active nesting territories in Minnesota has grown from around 100 in the mid-1970s to over 1,300 during the most recent statewide survey (Baker and Monstad, 2005). Breeding bald eagles are now reported in 75 of 87 Minnesota counties (USFWS, 2012; Minnesota Breeding Bird Atlas Project 2012) and the Iowa Department of Natural Resources now recognizes over 250 breeding territories in 88 of Iowa’s 95 counties (IA DNR, 2010). Part of this range expansion is into flat and open agricultural landscapes, where wind conditions are favorable to commercial wind development.

This overlap between commercial wind facilities and nesting bald eagle territories has raised concerns about impacts to this iconic species, resulting from direct collision or disturbance activities. It can also present routing challenges for high voltage transmission lines, especially at river crossings. Though the Bald Eagle was recently delisted as an endangered species, it is still protected under the Bald and Golden Eagle Protection Act (1940) which prohibits the “take” of the species. The act defines “take” beyond fatal or harmful physical harm to include disturbance. Disturbance includes activities resulting in the loss of breeding productivity or nest abandonment. While obtaining an official “take” permit is not required for all wind projects, stick nest surveys often need to be conducted to assess the risk to breeding bald eagles.

Commercial wind farms and HVTLs can cover large areas with a wide range of habitat, and as a result an efficient survey methodology was needed to focus field efforts on key habitat. To address this, HDR developed a Bald Eagle breeding habitat model for use within the Upper Midwest. The original target area for the model was the Prairie Parkland ecoregion, which covers southern and western Minnesota, but later development demonstrated wider applicability in neighboring and similar ecoregions dominated by agriculture. By narrowing search areas to potentially suitable habitat, the model reduces field efforts required to review areas for eagle nests and allows users to concentrate their time in areas where eagles are more likely to be present.

Methodology

The habitat model is based on scientifically documented positive bald eagle nest locations, primarily proximity to open water and the presence of forested habitat (Buehler 2000, Quinn 2004). Open water was identified using the National Hydrography Dataset of lakes and rivers (USGS, 2012) and forested habitat was identified using the National Land Cover Database 2001 tree canopy layer (USGS, 2001). The model utilized ArcGIS to identify an initial layer of forested habitat within one mile of open water and a second layer of forested habitat within 160 meters of open water. These features were then assigned a score between zero (low) and three (high), to identify potentially suitable nesting habitat in the target area.

To generate this score, all forested habitat was given a score of one. Forested areas within one mile of open water were assigned a value of two and areas within 150 meters of open water were assigned a value of three. Buehler (2000) notes that most nests are located less than 2 kilometers (km) from water; so those habitats located within 1.6 km (1 mile) of open water are considered moderate quality (score of 2). High quality (score of 3) habitat is based on the findings of Grier & Quinn (2003) which reviewed the habitat conditions of 128 active bald eagle nests in Minnesota and found a mean distance to water of 160 meters.

Future development is the species’ proximity to local bald eagle population dynamics. For example, growing eagle populations in Minnesota may limit the attractive potential nesting habitat for bald eagles.

Results

At the Paynesville Wind Farm in central Minnesota, five of six (83%) of bald eagle nests were within areas identified as high or moderate quality breeding habitat with the remaining nests in areas scored a two. Two nests (one at Paynesville, one at Dry Creek) are located in areas greater than one mile from open water.

Discussion

This model was applied to successfully locate bald eagle nests in project areas of various sizes, some of which were hundreds or even thousands of square miles in total area. As with all models, the key to producing an accurate output is good base data. The greatest limitation of the current habitat model is the forest cover, which is based on the National Land Cover Forest Canopy Dataset (2011). This dataset is old, and based on a 30 meter resolution. This coarse resolution is sometimes unable to depict narrow tree rows present along some water bodies in the agricultural landscapes in the Upper Midwest. Nests in areas scored as a zero by the habitat model can be attributed to this coarse resolution.

If available, more detailed tree canopy data could enhance the output of the model. A possible source for more detailed tree canopy data would be to generate a custom classification using contemporary LandSat images. While still limited to a 30 meter resolution, they would reflect current target area conditions. Another benefit could be to include small-scale wetlands, which can include small stands of suitable nesting trees otherwise not captured by the coarse resolution.

This model was designed to identify habitat in the upper Midwest, and may need modification to reflect nesting habitat preferences in other regions. The source and abundance of open water to base the model on will need to be considered in the context of local bald eagle population dynamics. For example, growing eagle populations in Minnesota may limit the amount of available habitat along large bodies of water, pushing eagles to establish new territories in areas along smaller water bodies. Therefore, an effort was made to include these features in the model. To apply this model in other areas, it may also be appropriate to incorporate alternative food sources, such as waterfowl, upland game birds or agricultural waste which could influence habitat selection (Buehler 2000, Manderbach et al. 2012).

Works Cited


Iowa Department of Natural Resources. 2010. Bald Eagles in Iowa. Boone, IA.


Wildlife Program. St. Paul, Minnesota: Minnesota Department of Natural Resources.