

# Minnesota Department of Natural Resources Guidance for Commercial Wind Energy Projects



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## Introduction

Commercial scale wind farms provide important renewable energy sources for our state and have a positive impact on Minnesota's economy. Wind energy conversion systems do not pose the same kind of environmental challenges that other sources do, prompting less concern about air and water pollution and the release of greenhouse gases. However, the turbines, access roads, transmission lines, and substations do have the potential to impact natural, recreational, and cultural resources. This guide outlines the Minnesota Department of Natural Resources (DNR) role in the wind project review process and explains issues to be considered during project development. The DNR must balance its threefold mission of facilitating the state's economic development, providing Minnesotans with high-quality outdoor recreation, and protecting and enhancing valued habitat for future generations.

The DNR has jurisdiction over wildlife in the state of Minnesota according to Minnesota Statutes, section 84.027, subdivision 2 and administers the Minnesota Outdoor Recreation System (Minnesota Statutes, chapter 86A). The Minnesota Outdoor Recreation System managed by the DNR includes: Wildlife Management Areas, Scientific and Natural Areas, State Parks, State Forests, State Recreation Areas, and other DNR managed lands. The DNR reviews and comments on proposed wind farms to meet statutory obligations that have been developed to ensure natural, recreational, and cultural resources are protected for the enjoyment of all Minnesota residents and our visitors.

The *Minnesota Department of Natural Resources Guidance for Commercial Wind Energy Projects* applies to Large Wind Energy Conversion Systems (LWECS) (projects > 5 megawatts) or any turbine that has a height greater than or equal to 200 feet to the top of blade. The document includes discussion of both DNR regulated (by Minnesota Statute or DNR issued permits) resources and resources managed, but not regulated by, the DNR. Pertinent statutes and permits are included within the text to clarify resources that are regulated by the DNR. The DNR participates in several review activities associated with LWECS. The DNR provides prospective project developers with information and guidance during early coordination that can help them site and develop a potential project.

The DNR also manages lands that it owns, and has regulatory responsibilities over species designated as threatened or endangered, public waters, and utility crossings. DNR recommendations, not specifically tied to Minnesota Statute or DNR issued permits, are provided to the Energy Environmental Review and Analysis (EERA) unit of the Department of Commerce and to the Public Utilities Commission (PUC) during the environmental review and site permitting phase. The EERA provides staffing for wind energy permitting and conducts permitting and environmental review activities on behalf of the PUC. At their discretion, the EERA/PUC may include the recommendations as permit conditions. The PUC issues the site permit for LWECS, except for those delegated to a county. The DNR also encourages implementation of DNR recommendations by other applicable regulators, such as counties.

Wind projects pose a unique set of potential impacts to natural resources due to their height, spinning blades, and widespread turbine layouts over large project areas. Turbines, transmission lines, access roads, and substations have been shown to reduce available habitat, kill birds and bats, cause some species to avoid habitat near turbines, and disrupt animal behavior. Recreational activities may be degraded due to the change in viewshed, noise, increased vehicle traffic, and safety concerns for trail users.

The mission of the DNR is to work with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life. The DNR goal relative to wind energy development is to support responsible development of the state's wind resource while ensuring that Minnesota's natural, scenic and cultural resources are protected. The DNR provides technical assistance during the early planning stages of

project development and during the EERA and PUC energy facility environmental review and site permitting process. Detailed information about the [siting and permitting process for wind projects](#) can be accessed from the Wind Turbines tab on the Department of Commerce website. The DNR also provides technical assistance to other applicable regulators and reviewers, such as county, city, or federal environmental reviewers.

DNR technical assistance helps to ensure natural resource impacts are considered during the planning, environmental review and permitting, construction, and post-construction phases of the project. The DNR will provide recommendations and consultations during the pre-application period to proactively and collaboratively identify potential issues prior to company submittal of a site application to the PUC. DNR recommendations are designed to identify high value natural resources, help proposers avoid, minimize, and propose mitigation for impacts to those resources, and to recommend wildlife surveys to quantify potential impacts of specific projects. The DNR will work with the project developer and other appropriate agencies to address natural resource issues prior to submission of the site application to the PUC or a county. Agency recommendations (e.g., resolution of rare feature concerns, avoidance areas, and pre- or post-construction wildlife studies) can then be considered during the PUC site application process.

## Early Coordination

The DNR encourages all wind energy developers to start the initial planning process by sending project information (cover page, map of project area, and GIS shapefiles of the project boundary) directly to the DNR Regional Environmental Assessment Ecologist, Division of Ecological & Water Resources. These same materials should also be submitted to the Endangered Species Review Coordinator along with the Natural Heritage Information System Data Request Form. Early coordination with the DNR benefits the wind industry by identifying potential issues needing resolution early in the process. The DNR provides insight on where high value habitat is within a project area so the site proponent can consider this as they develop their project and pursue wind easements. In addition, the DNR may be pursuing land acquisitions or conservation easements in the project area that could affect the wind project. Early coordination may result in fewer modifications during the official PUC site application process and a smoother path to obtaining a permit. The DNR also encourages the applicant to coordinate with the EERA/PUC permitting staff and other state or federal agencies as appropriate.

Counties that have been delegated by the PUC to issue Conditional Use Permits for projects from 5-25 megawatts should directly contact the DNR Regional Environmental Assessment Ecologist to review the project for potential conflicts with DNR administered lands, public waters, and other regulated activities. Counties should also coordinate directly with the United States Fish and Wildlife Service (USFWS).

The [USFWS Land-Based Wind Energy Guidelines](#) (USFWS Guidelines) include an iterative decision making process including five “tiers” of wildlife and habitat impact assessment. The wind industry is encouraged to review and consider the USFWS Guidelines during early project development. The *Minnesota Department of Natural Resources Guidance for Commercial Wind Energy Projects* provides recommendations specific to Minnesota species and habitats and considers existing processes used in Minnesota. Appendix A, Early Coordination Checklist, provides a brief summary of steps to complete in the very earliest stages of project development.

## Identification of High Value Resources

Identification of high value resources early in the process allows the company and DNR to work together to avoid and minimize potential impacts. Examples of potential impacts include direct habitat loss, fragmentation, habitat avoidance, bird and bat fatalities, and recreational or viewshed degradation.

Assessment of high value resources would fall into Tier 1 of the USFWS Guidelines. Tier 1 includes the preliminary evaluation or screening of potential sites. The main question to be considered in Tier 1 is the suitability of the site for a wind project, with suitable sites proceeding to Tier 2 and unsuitable sites being dropped. The high value resources are further refined and clarified in Tier 2 – Site Characterization.

The DNR has identified the following high value resources that may be within a project site and should be considered during preliminary project development, the EERA pre-application and site application process for LWECS, and for county permitted projects.

### Rare Species and Native Plant Communities

The Natural Heritage Information System (NHIS) is a collection of databases that identifies known occurrences of state-listed species, rare native plant communities, and other rare features. To receive information regarding potential impacts to rare features and species in the vicinity of the proposed project, submit a completed [NHIS Data Request Form](#). This information will be useful for planning purposes and should be requested early in the planning process. Please contact the Endangered Species Review Coordinator at 651-259-5109 for more information on the NHIS review process.

Minnesota endangered species law (Minnesota Statutes, section 84.0895) and associated rules (Minnesota Rules, parts 6212.1800 to 6212.2300 and 6134) prohibit the taking of endangered or threatened species without a permit. Surveys for rare species may be required to determine if the proposed project would result in a taking. Project planning should take into account that some species can only be surveyed at specific times of the year.

Please note that some NHIS data layers are publicly available and can be downloaded at no cost from the [Minnesota Geospatial Commons](#). These include Minnesota Biological Survey (MBS) Sites of Biodiversity Significance, DNR Native Plant Communities, and MBS Railroad Rights-of-Way Prairies. The DNR recommends avoidance of MBS sites and rare native plant communities and encourages the use of this data as early as possible in the process to identify areas within a project boundary that would not be appropriate for development.

### Native Prairie

Given the rarity of native prairies and the potential for state-listed species to occur within native prairie habitat, the DNR recommends avoidance of all native prairie remnants. If avoidance is not feasible, rare species surveys may be required and will need to be coordinated with the Endangered Species Review Coordinator (651-259-5109). The DNR may also recommend setbacks from native prairie remnants on a case-by-case basis depending on the quality of the resource and potential impacts. The PUC may require a native prairie protection and management plan that describes the measures taken to avoid impacts and to mitigate unavoidable impacts. The USFWS should also be contacted for their recommendations regarding native prairie.

Native prairie is grassland that has never been plowed and contains floristic qualities representative of prairie habitats. In the mid-1800s, eighteen million acres of prairie covered Minnesota. Since then, more than 99% of native prairie has been destroyed and the 1% that remains consists mostly of widely scattered fragments that are surrounded by agriculture and development. Due to the loss of this once widespread habitat, many prairie-obligate species have become rare. More than one-third of Minnesota's endangered, threatened, and special concern species are dependent on the remaining small fragments of Minnesota's prairie ecosystem. The construction and operation of wind farms can affect these rare species by causing fatalities due to collision, displacement due to disturbance, further fragmentation of remaining habitat, degradation of habitat due to the spread of invasive species, and direct loss of habitat.

As mentioned above, project proposers are encouraged to use the NHIS data layers that are available from the [Minnesota Geospatial Commons](#) as an initial screen to identify known locations of native prairie. However, because this information is not based on a comprehensive inventory, there is the potential for native prairie to exist in the project area that is not included in these data sets. To better understand the potential impacts to native prairie and state-listed species, all grasslands or pasturelands within the project boundary that have not been previously plowed and that could be slated for development, including access roads and utilities, should be assessed by a qualified botanist or plant ecologist for the existence of remnant prairie. The DNR maintains a list of surveyors (available from the Endangered Species Review Coordinator) who are considered qualified to perform rare species surveys in Minnesota. Having a plant surveyor from this list perform the native prairie assessment will ensure that the surveyor will be able to obtain a collection permit if rare plant surveys are also needed.

### Public Conservation and Recreation Lands

The DNR currently has a limited ability to accommodate turbines, substations, access roads, or meteorological towers being placed on Minnesota Recreation System Units. However, this position is subject to change if the DNR establishes policy or rulemaking that would consider allowing wind project infrastructure on certain types of Minnesota Recreation System Units. Public lands provide a multitude of recreational opportunities such as: fishing, hunting, hiking, biking, bird watching, camping, boating, swimming, and educational opportunities. The public lands also provide a wide diversity of habitat that supports hundreds of species ranging from birds, bats, amphibians, insects, and plants. To protect the recreational, educational, and biological integrity of these lands, they need to be identified early in the development process.

During the early project development stage, federal, state, and local government lands in and within one mile of the project area boundary should be identified using existing geographical information from the DNR, USFWS, and local governments. Minnesota Recreation System Units that include state parks, state recreation areas, state trails, state Scientific and Natural Areas, state wilderness areas, state forests, state wild & scenic rivers, state water access sites, state wildlife management areas, state aquatic management areas, and other units including small craft harbors should be identified. Federal Waterfowl Production Areas and refuges, national parks, county trails and parks, and other public lands should also be identified.

It is the DNR's responsibility to seek avoidance, minimization, and mitigation for potential impacts to Minnesota Recreation System Units (Minnesota Statutes, chapter 86A) from tower construction, transmission lines, substations, or road networks associated with a wind project. The wind resource of state lands is protected from encroachment through the wind access buffer of 5 rotor diameters (prevailing wind direction) and 3 rotor diameters (non-prevailing wind direction) that has been established by the PUC to protect non-participating landowners' wind rights. In addition, the DNR recommends considering further avoidance to further minimize wildlife and recreational impacts. Additional areas of avoidance may be specifically recommended for site-specific natural resources. Increased distance may reduce wildlife impacts such as fatalities, disruption to flight paths, and habitat avoidance. Recreational impacts can be minimized by reducing noise levels, shadow flicker, and viewshed impacts. The DNR may provide additional recommendations concerning wildlife or recreational resources near DNR administered lands based on a site-by-site review. State, federal, and non-profit conservation groups have expended a considerable amount of time and money to acquire and manage these properties for the conservation of natural resources and recreational use by the public. The [Minnesota Geospatial Commons](#) contains numerous GIS layers that can be downloaded including: Scientific and Natural Area Boundaries, State Wildlife Management Area Boundaries, State Forest Boundaries, DNR Administered State Trails, and National Wetland Inventory Polygons.



The DNR also recommends temporary meteorological towers (MET) be located a minimum of 250 feet from the boundary with DNR administered lands. Permanent MET towers should be located a minimum of 250 feet, as typically required by PUC site permit decisions, and preferably 500 feet or greater from DNR administered lands. The DNR preference for the greater distance helps to minimize potential impacts to sensitive resources associated with DNR administrative lands.

A viewshed analysis may be recommended by the DNR to determine if potential impacts would occur to state parks, Scientific and Natural Areas, National Historic Districts, or National Historic Landmark Districts. The Division of Parks and Trails wholly or in part administers nine types of units in the state's Outdoor Recreation System (Minnesota Statutes, chapter 86A) including state historic sites that have specific language to preserve, perpetuate and restore scenic and historic features. Included are 62 National Historic Districts or National Historic Landmark Districts as well as several scenic locations. Preservation of the cultural landscape, which includes the geographic area associated with an historic event, person or activity, may be a critical component of protecting the integrity of the cultural feature. The DNR will consider recommending a viewshed analysis if the area has outstanding cultural, historical, or recreational attributes and if infrastructure for the wind farm is within 5 miles of the property. The analysis involves the development of a map or model that depicts how the viewshed may be altered and to what extent the viewshed may change. Based on the viewshed analysis, the DNR may recommend a greater setback than the standard wind access buffer of 5 x 3 rotor diameters.

### State Owned Minerals

Some minerals located beneath privately owned land are owned by the state of Minnesota. The DNR encourages land uses that are compatible with possible future use of publically owned mineral rights. When researching land ownership during project planning, mineral ownership should also be reviewed to the extent possible. If there is an indication of state mineral ownership, or for additional information, contact the DNR Division of Lands and Minerals.

### State Trails and Recreational Trail Corridors

Recommended setbacks for state trails are evaluated on a site-by-site basis due to the wide diversity of locations of the trails. Minnesota State Trails have numerous user groups including hiking, biking, skiing, and horseback riding. Over 21,000 miles of grant-in-aid snowmobile trails are networked throughout Minnesota. The DNR provides grants to local governments for the maintenance and grooming of grant-in-aid trails. State trails and grant-in-aid snowmobile trails occur in both very remote areas and highly developed parts of the state, and the quality of the area in terms of existing disturbance and recreational uses varies substantially. The safety of trail users, and possible risk from ice throw, will be key components of a DNR review. Review of effects to visual resources may also be considered for state trails on a site-by-site basis. Further information on Minnesota State Trails and snowmobile trails can be obtained from the [Minnesota Geospatial Commons](#).

### Properties in Government Programs or with Conservation Easements

Turbines are prohibited in Reinvest in Minnesota easement areas and DNR Native Prairie Bank easements. The easement language prohibits the development of new structures within the area under easement. USFWS or private conservation easements may also have prohibitions on structures and should be reviewed with the holder of the easement. Statewide GIS (shapefiles) information on the location of [Native Prairie Bank](#) easements in relation to your project boundary can be requested from the [Scientific and Natural Areas Program](#).

## Designated Wildlife Lakes

[Designated Wildlife Lakes](#) within or immediately adjacent to the wind project boundary should be identified. The DNR administers Designated Wildlife Lakes, which restrict the use of motorized boats as a mechanism to reduce disturbance to waterfowl. These lakes were designated by the DNR Commissioner, as set forth by Minnesota Statutes, section 97A.101, subdivision 2. The limited disturbance on these lakes is designed to increase the number of birds using the area. Designated Wildlife Lakes can also be bordered by forest, grassland, wetlands, floodplain, or stream corridors that can increase the number of birds or bats using the area. The DNR may recommend setbacks from Designated Wildlife Lakes and their associated habitat to reduce potential fatalities and avoidance of the lakes by avian species. To download Designated Wildlife Lakes data, visit the [Minnesota Geospatial Commons](#).

## Migratory Waterfowl Feeding and Resting Areas

[Migratory Waterfowl Feeding and Resting Areas](#) (MWFRA) within or immediately adjacent to the wind project boundary should be identified. The DNR administers MWFRA, which protect waterfowl from disturbance on selected water bodies in Minnesota. Motors are prohibited during the waterfowl season. MWFRA were first authorized by the state legislature in 1969 (Minnesota Statutes, section 97A.095, subdivision 2). MWFRA are nominated by a petition process and approved or denied by the DNR after public input is received. Limiting disturbance on the lakes is intended to increase the number of birds using these areas. The DNR may seek setbacks from the MWFRA and their associated habitat to reduce potential fatalities and avoidance of the lakes by avian species. The associated habitat includes natural habitat such as forest, grassland, wetlands, floodplain, or stream corridors. To download MWFRA data, visit the [Minnesota Geospatial Commons](#).

## State Game Refuge

[State Game Refuges](#) within or immediately adjacent to the wind project boundary should be identified. Hunting or trapping of some or all wild animals within State Game Refuges is prohibited (Minnesota Statutes, section 97A.085). State Game Refuges are designated by the DNR commissioner based on public support and public meetings. Information on locations of State Game Refuges is not readily available, so the project proponent should be alert for signs posted within the wind project boundary. In many instances refuges are associated with, or adjacent to, Wildlife Management Areas or other high value habitats. State Game Refuges have the potential to result in high concentrations of ducks and geese in the area. The DNR Wildlife Area Manager and other technical staff provide input concerning use of the area by waterfowl during the initial project area review.

## Working Lands Initiative

[Working Lands Initiative](#) (WLI) target areas within the wind project boundary that should be identified. The WLI is a partnership with the USFWS and non-profit conservation groups such as Pheasants Forever, Ducks Unlimited, and The Nature Conservancy. Under this initiative, state and federal agencies work with conservation groups to identify, map, and protect the most productive wetland and grassland areas in the most effective manner. In many instances the state and federal governments have already made a significant investment in land purchases, easements, and habitat enhancements in these areas and have plans to build upon the existing core habitat in the area. The WLI is part of the state's broader conservation agenda. The DNR recommends that project proposers consider the effects to habitat associated with Working Lands Initiative target areas during project development. To download WLI data, visit the [Minnesota Geospatial Commons](#).



## Lakes, Wetlands, Streams and Rivers in the Project Area

[Minnesota's Wild, Scenic & Recreational Rivers](#) (WSR) are protected by a zoning district, established under Minnesota Rules, chapter 6105. Commercial uses are not allowed within the river district, including wind turbines, unless an exception is provided within the rules specific to the six designated rivers. Also, the entire length of the Saint Croix River is a federally designated Wild & Scenic River. The lower 25 miles of the Lower St. Croix National Scenic Riverway is jointly managed by the states of Minnesota and Wisconsin under a cooperative agreement, while the National Park Service manages the upper 27 miles. Project developers should coordinate with the USFWS and National Park Service for projects near this watercourse. Though not required under rule, the DNR recommends considering effects to the viewshed associated with Wild & Scenic Rivers, as the original regulations did not account for high concentrations of very tall structures like wind turbines.

Statewide and local government shoreland standards provide for the orderly development and protection of Minnesota's shoreland areas (lakes and rivers). Under current Shoreland Rules (Minnesota Rules, parts 6120.2500 - 3900) wind turbines are conditionally allowed in shoreland districts. The local governmental unit and EERA need to be contacted regarding local shoreland ordinances and their application to a proposed wind energy development.

The DNR recommends appropriate setbacks be established around wetlands that are large enough to provide a significant amount of habitat that would attract birds or bats to the area. Locating turbines or other infrastructure near these wetlands may result in avian avoidance of the habitat or may increase avian and bat fatalities. Avian avoidance of wetlands occurs when birds are stressed due to the turbine height, noise, shadow flicker, or use of an access road and they no longer use the habitat for resting, feeding, or nesting. Avian and bat fatalities occur when they strike the turbine or by barotrauma (Baerwald et. al. 2008). Buffalo Ridge fatality studies indicated turbines with avian fatality were significantly closer to wetlands (1430.45 feet) than turbines without avian fatality (1,948.82 feet) (Johnson et al. 2000). Vonhoff (2002) recommends turbine placement at least 1,640 feet from bodies of water, riparian habitats, and forest edges. The presence of rare species will also be considered by the DNR when making avoidance area or setback recommendations. These setbacks may be reevaluated as the PUC permitting process proceeds if more information on sensitive resources associated with the area becomes available or as the project becomes more defined.

Project developers crossing (over, under, or across) any state land or public water with any utility (power lines, including feeder lines) need to secure a [DNR License to Cross Public Lands and Waters](#) (Minnesota Statutes, section 84.415). For detailed information on where the Public Waters are located in a project area, visit the [Public Waters Inventory \(PWI\) Maps](#) website and click on the [PWI maps download link](#) on the left side of the page.

Under Minnesota Statutes, section 103G.245, subdivision 1, a [DNR Public Waters Work Permit](#) is needed to change or diminish the course, current, or cross section of public waters by filling, excavating, or placing materials in or on the bed of public waters.

Karst topography and springs should be identified and avoided as unidentified fens can result in problems during construction that can increase costs and delay project completion. Developers should review the turbine locations for these issues and adhere to the PUC requirements for karst geology investigations.

Calcareous fens need to be identified within the project area so they are avoided. The developer is responsible for identifying existing and previously unidentified calcareous fens within and immediately adjacent to the project boundary. A Calcareous Fen Survey Report is required to document avoidance of

calcareous fens. If any infrastructure (turbines, access roads, collector lines, transmission lines, etc.) is proposed within 500 feet of a calcareous fen, then coordination is required with the DNR to determine if impacts may occur.

The DNR supports the following calcareous fen language that has been included in recent PUC site permits: “Should any calcareous fens be identified within the project area, the Permittee must work with the DNR to determine if any impacts will occur during any phase of the Project. If project impacts to any calcareous fens are anticipated the Permittee must develop a Calcareous Fen Management Plan in coordination with the DNR, as specified in Minn. Stat. 103G.223. Should a Calcareous Fen Management Plan be required, the approved plan must be submitted to the Commission 30 days prior to submittal of the site plan as required in the Permit.”

## Important Bird Areas

[Important Bird Areas](#) (IBA) within and adjacent to wind project boundaries should be identified. Audubon Minnesota has designated IBAs across the state in partnership with the DNR. An IBA is a site that provides essential habitat for one or more breeding, wintering, and migrating species of birds. The IBA Technical Committee has developed the criteria and nomination process for an area to be adopted as an IBA. The Technical Committee consists of bird experts and conservationists from Audubon, birding groups, and state and federal agencies. IBAs serve as a catalyst for educating the public about habitat areas most important for the long-term survival of birds. The DNR recommends considering effects to habitat associated with IBAs during project development.

## Avian Flight Paths

The DNR will identify potential flight paths during the preliminary project review based on habitat present and information provided from wildlife area managers. Common flight paths may exist between wetlands or streams and along raptor migration routes associated with streams or areas with thermal updrafts. Potential exists for increased fatalities from greater interactions among the species and turbines. Turbine placement outside of the defined flight path is a mechanism to reduce fatalities and maintain travel corridors.

## Large Block Habitats

Large blocks of habitat (grassland or forest) can provide an increased diversity of species, stabilization or increase of species populations, and an increased web of life. A large block of habitat is a function of increased acres and shape of the patch. Larger rounder or square blocks provide interior habitat that is more isolated from noise, pollution, parasitic birds, and predators associated with edges of fragmented habitat. Area sensitive species require large blocks of intact and contiguous habitat to successfully reproduce. Direct habitat loss and fragmentation occurs when locating access roads and turbines in large blocks of forested or grassland habitat.

Idle grassland habitat in the project area greater than 40 acres in size should be identified. Grassland habitat that is greater than 40 acres has been shown to have an increased diversity of species and provide habitat for area sensitive species (Herkert 1994, Jones 2000, NPWRC 2006, NRCS 1999, Smith 1992, Vickery 1994, Walk, 1999). Area sensitive species select larger blocks of habitat for nesting, and when that habitat is fragmented by turbines, access roads, or substations it may result in species avoiding the area or lower nesting success. In addition, fatality from operational turbines is likely to increase when turbines are constructed near large blocks of grassland habitat that have concentrated bird and bat activity. Consideration should also be given to complexes of smaller-sized grassland patches close to each other that when combined provide suitable habitat for colonization by grassland birds (Herkert 1998). In many instances, blocks of grassland habitat will be in the Conservation Reserve Program, Conservation Reserve

Enhancement Program, Reinvest in Minnesota, restored prairie, or another easement program. The DNR recommends avoiding large blocks of grassland habitat and establishing an appropriate setback to avoid and minimize impacts.

Forest interior habitat should be identified during project development. Forest interior habitat supports nesting and migratory stopover areas for area sensitive species. Research suggests that area sensitive species tend to use forested areas at least 330 feet from the edge of the patch (Rosenberg et. al. 1999, Forman 2000). Fragmenting forest interior can result in a loss of habitat for forest interior species and an increase in habitat for generalist species. The edge of the patch is where a break in the forest occurs due to roads, transmission lines, or clearing of trees for turbine construction. The deforested area and extended fragmentation effects result in less desirable plant communities, increased levels of invasive species, avian and predator species composition and population changes, nest parasitism, and behavior changes. Consideration should be given to fragmentation effects that may occur with projects in forested areas.

As recommended in the USFWS [Northern Long-Eared Bat Interim Planning Guidance](#), all turbines should be sited more than 305 meters (1,000 feet) from the edge of connected patches of forested habitat to avoid potential impacts to bats, including northern long-eared bats. Locating turbines at least 1,000 feet from forested areas will reduce bat fatalities.

### Habitat Complex

Habitat complexes should be identified during initial project development. Habitat complexes are a combination of various resources, which may not be significant in their own, but that form a habitat complex that concentrates birds or bats. The combination of resources could be streams, riparian zones, wetlands, grassland, forest, or other smaller habitat patches that are close to each other. The DNR may ask for avoidance or additional setbacks in these areas based on known data, professional judgment, or a site visit. Setbacks are established to reduce the risk of fatality, disruptions to nesting activity, and avoidance of the area by sensitive species.

### Habitat Scarcity

Habitat that is scarce in the project area, and if impacted could result in the loss in diversity of species found in the area, should be identified. Habitat should be considered scarce if it supports species that would rapidly decline or disappear if that habitat were negatively impacted. Scarce habitats could be forested or grassland blocks, large trees for nesting raptors, conifer stands, wetlands or any other scarce resource. Habitat scarcity should be considered during project development.

## Avoidance Areas

Based on review of project specific data, field visits, and staff comments, the DNR may recommend avoidance of areas within the proposed project boundary containing high value resources, or where the placement of turbines or other infrastructure may cause wildlife impacts. The identification of avoidance areas is done on a site-by-site basis, based on habitat, species present, and areas protected from development by regulations. DNR comment letters will include the resources present or potential wildlife impacts used as a basis for an avoidance area. DNR-recommended avoidance areas or setbacks may be reevaluated if more information on sensitive resources associated with the area becomes available or as the project becomes more defined as the PUC permitting process proceeds. The new information could include wildlife surveys conducted as part of the project or new records of rare species.

## Biological Field Surveys

In many cases, there are substantial gaps in the knowledge needed to fully evaluate the potential impact of wind development on natural resources. The DNR may recommend to developers, PUC/EERA, or other regulatory agencies that biological field surveys be conducted for some sites. Survey sites typically contain habitat for state-listed species or high value habitats that, when impacted, have an increased potential to cause negative impacts to birds or bats. The surveys are used to better characterize the resource or resources used by wildlife within the project area and to further assess potential impacts. The DNR may seek avoiding placement of turbines in areas where surveys identify potential conflicts with wildlife.

Fatality estimates for birds and bats from operational turbines in Minnesota vary from project to project depending on site conditions. Modern turbines are taller, with a greater rotor swept area, and operate under different wind conditions than traditional wind turbines. Turbines are being located in many different ecological regions with varying habitats, migratory corridors, species, and species populations. Fatality surveys are needed to understand fatalities associated with turbines under varying ecological conditions and to understand how turbine siting can be improved to minimize impacts. Generally speaking, the DNR supports the use of fewer turbines of higher megawatts than increased numbers of lower-megawatt turbines. The reduced number of turbines results in decreased distance of access roads, less interruption to flyways, and minimizes habitat fragmentation.

The DNR will work with project developers, USFWS, and PUC/EERA to coordinate potential pre- or post-construction surveys. For LWECS, the DNR may recommend fatality surveys or other site specific studies (e.g., avian point counts, flight path, acoustic, avian avoidance, rare species surveys, and telemetry) to determine the potential effect of turbines on wildlife or to facilitate turbine siting. The various studies will be recommended on a project-by-project basis based on wildlife habitat and species found within or adjacent to the project area. The survey methods should be reviewed and agreed upon with the DNR and EERA as early in the process as possible. Companies conducting early baseline wildlife surveys should coordinate with the DNR and EERA, prior to conducting field work, in order to focus the surveys on species or habitat issues specific to the project. In some instances, standard baseline surveys are being conducted by developers that would not be recommended by the DNR or that need to be designed to address specific concerns.

Species surveys fall into Tier 3 or Tier 4 of the USFWS Guidelines. Tier 3 studies are field studies to document site wildlife conditions and predict project impacts. Tier 4 surveys are post-construction fatality studies to evaluate direct fatality impacts. The survey information can be used to determine avoidance areas, turbine placement, and avoidance, minimization, or mitigation actions. Due to the seasonality of pre-construction surveys, it is highly recommended the surveys are reviewed and agreed upon with PUC/EERA and DNR early during project development. Conducting surveys during later stages of project development may result in project delays due to seasonality of surveys, unbudgeted survey costs, and alterations of turbine and access road layouts.

The DNR and Minnesota Department of Commerce have developed the [Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota](#). Using standardized pre- and post-construction survey methods for use in individual project assessment are intended to provide for more efficient agency coordination and project development, assist in providing a more robust record for decision makers, reduce uncertainty in project development, and provide for more comparable and broad application of results.

Following is a brief description of various methods the DNR may recommend:

**Bat and Avian Fatality Monitoring** should be conducted using DNR recommended protocols in order to have a reliable fatality estimate, achieve positive species identifications, and to collect data in the same manner from project to project. The DNR will recommend fatality studies based on the risk assessment for the project area. The recommendations for high risk sites would be more robust, with a greater number of search days, while recommendations for moderate risk sites would include a reduced effort with a lower number of search days. Fatality data is used to determine under what conditions fatalities increase and how future project turbine siting or operations could be modified to reduce fatalities. When fatalities are exceptionally high, or listed species are killed, the potential exists to reopen the PUC permit and add new conditions to reduce fatalities. A Special Permit (Scientific Research - Salvage) is required from the DNR to handle and possess carcasses. Fatality monitoring needs to be conducted by independent third party consultants to ensure validity of the data.

**Avian Surveys** may be recommended when sufficient habitat is available to draw a diversity of species into the area or support high populations of a particular species. Avian surveys can be targeted for grassland, wetland, or forest dwelling species. Avian surveys can be used to compile a species list, potentially locate rare or listed species, or identify area-sensitive species. Species-specific methods may be needed, in some cases, to determine presence during the nesting season. This information can then be used to improve turbine siting, establish risk levels, or determine if additional surveys may be recommended.

**Avian Grassland Surveys** are used to gather information on species presence and relative abundance within or immediately adjacent to the project area during the nesting season. Habitat identification for surveys is based on past records of occurrence, habitat patch size(s), association among patches, and relation of the patch(s) to the project boundary.

**Avian Wetland Use Surveys** of large lakes or wetlands, with an open water component, are used to establish the presence and relative numbers of avian species within or near the project area. The surveys are designed to identify listed species (state or federal), avian concentrations, species not identified during other survey efforts, and to assist with determining project risk level to avian species.

**Avian Flight Characteristics** help determine if avian species are concentrating their activities into a narrow corridor or habitat. Typical corridors may exist between wetlands, larger stream systems, forested or grassland habitat, colonial bird nesting areas, or raptor nests such as bald eagles. This information may help with siting turbines or transmission lines away from a high use area.

**Avian Habitat Avoidance Studies** require pre- and post-construction surveys to determine the location of raptor nests or population estimates of species that can be compared to post-construction surveys. Pre- and post-construction survey data can be used to determine if a species is avoiding habitat that close to the newly constructed turbines. If avoidance is occurring, then future turbine siting could be modified to avoid and minimize impacts to the species.

**Greater Prairie Chicken and Sharp-tailed Grouse Surveys** may be necessary to determine impacts to their traditional breeding grounds (leks), nesting habitat, or travel corridors. The pre- and post-construction surveys are geared toward habitat identification, determining direct habitat loss, potential lek abandonment, or displacement from nesting habitat.

**Bat data collection** during pre-construction has been used on numerous projects across the country to gather information to inform the process. Bat detectors are used to record echolocation calls that can be identified by using a call library of known vocalizations. Data is used to identify species and relative

numbers of bat passes per detector night within a project area. Hibernacula can be surveyed with the use of harp traps or winter surveys. Mist nets can be used to capture and identify bat species within the project area. Telemetry can be used to track bats from a hibernaculum to determine where the maternity trees are located in relation to the project.

**Native Prairie Surveys** are necessary to identify their locations so impacts can be avoided. More than 99% of the prairie that was present in the state before settlement has been destroyed, and more than one-third of Minnesota's endangered, threatened, and species of special concern are now dependent on the remaining small fragments. A botanical survey may be required if prairie may be impacted. The DNR should be contacted to discuss potential surveyors, survey protocol, and other requirements before any work is initiated. If applicable, the native prairie protection and management plan required by the PUC site permit should be provided to the DNR. The plan should include measures to avoid impacts to native prairie and measures to mitigate for unavoidable impacts.

## Best Management Practices

Best Management Practices (BMPs) can further reduce impacts resulting from the development of a wind farm. The [USFWS Land-Based Wind Energy Guidelines](#) has a chapter on best management practices that can be used to avoid and minimize impacts.

The DNR supports the following language that the PUC has included in recently issued site permits: "The Permittee shall operate all facility turbines so that all turbines are locked, or feathered, up to the manufacturer's standard cut-in speed from one-half hour before sunset to one-half hour after sunrise of the following day, from April 1 to October 31 of each year of operation. All operating turbines at the facility must be equipped with operational software that is capable of allowing for adjustment of turbine cut-in speeds." Feathering below the manufacturers recommended cut-in speed is anticipated to reduce bat fatalities by 25-35%. This standard should also be applied to existing projects that are being repowered.

The developer should include numerous (4-10) alternate turbine locations in the site layout. Alternate turbines allow flexibility in the site layout as issues arise with turbine locations. During review of the turbine layout the DNR will provide recommendations on turbine locations that should not be used because they are likely to increase avian and bat fatalities or they have other natural resource impacts.

Wind projects disturb soils, surface water, and associated ground cover. These disturbances create openings for invasive species that quickly colonize sites, putting adjoining lands and habitat at risk. In addition, these disturbances can cause erosion and transport of sediment into adjacent waters. The DNR, Soil and Water Conservation District, Minnesota Pollution Control Agency, or the Minnesota Department of Agriculture may recommend BMPs for different areas of the project. The BMPs are implemented to minimize construction and maintenance impacts to soil, water, and existing ground cover. The BMPs also may provide site restoration recommendations.

## Questions?

Please contact the [DNR Regional Environmental Assessment Ecologist](#) (REAE), Division of Ecological and Water Resources, to further discuss this document's contents or review of specific projects. Refer to the [DNR's Administrative Regions map](#) to identify the counties within each region.



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These guidelines are based on the current science and best available information and will periodically be revised as new information becomes available.

## **Equal Opportunity Statement**

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Alternative Format Available Upon Request.

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## References

- Baerwald, E.F. G.H. D'Amours, B.J. Klug, and R.M.R. Barclay. 2008. Barotrauma is a significant cause of bat fatalities at wind turbines. *Current Biology* 18:16.
- Forman, R.T., R.D. Deblinger. 2000. The ecological road-effect zone of a Massachusetts (U.S.A.) suburban highway. *Conservation Biology* 14:36-46.
- Herkert, J.R. 2003. Effects of management practices on grassland birds: Henslow's Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. 15 pp.
- Herkert, J.R. 1994. The effects of habitat fragmentation on Midwestern grassland bird communities. *Ecological Applications* 4:461-471.
- Herkert, J. R. 1994. Breeding bird communities of Midwestern prairie fragments: the effects of prescribed burning and habitat-area. *Natural Areas Journal* 14:128-135.
- Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, and D.A. Shepherd. 2000. Final Report: Avian Monitoring Studies At the Buffalo Ridge, Minnesota Wind Resource Area: Results of A 4-Year Study. Western EcoSystems Technology, Inc.
- Jones, A.L. and P.D. Vickery. 2000. Conserving grassland birds; managing large grasslands including conservation lands, airports, and landfills over 75 acres for grassland birds. 17 pp. Grassland Conservation Program, Massachusetts Audubon Society, Lincoln, MA.
- Jones, A.L. and P.D. Vickery. 2000. Conserving grassland birds; managing agricultural lands including hayfield, crop fields, and pastures for grassland birds. 17 pp. Grassland Conservation Program, Massachusetts Audubon Society, Lincoln, MA.
- Mixon, K. L., J. Schrenzel, R. Doneen, L. Joyal, N. Kestner, M. Doperalski, J. Schladweiler. 2011. Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota. Minnesota Department of Natural Resources. New Ulm, Minnesota. 38pp.
- Natural Resource Conservation Service (NRCS). 1999. [Grassland Birds. 12 pp.](https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_009930.pdf)  
([https://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs143\\_009930.pdf](https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_009930.pdf))
- Northern Prairie Wildlife Research Center (NPWRC). 2006. Habitat Establishment, Enhancement and Management for Forest and Grassland Birds in Illinois. Area Requirements of Forest and Grassland Birds. 4 pp.
- Rosenberg, K.V., R.W. Rohrbaugh Jr., S.F. Barker, R.S. Homes, J.D. Lowe, and A.A. Dhandt. 1999. A land manager's guide to improving habitat for scarlet tanagers and other forest interior birds. The Cornell Lab of Ornithology.
- Smith, D.J. and C.R. Smith, 1992. Henslow's Sparrow and Grasshopper Sparrow: a comparison of habitat use in Finger Lakes National Forest, New York. *Bird Observer* 20:187-194.
- Vickery, P.D., M. L. Hunter, and S. M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. *Conservation Biology* 8:1087-1907.

Vonhoff, M. 2002. Handbook of Inventory Methods and Standard Protocols for Surveying Bats in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Division, Edmonton, Alberta. Revised 2005.

Walk, J. W. and R. E. Warner. 1999. Effects of habitat area on the occurrence of grassland birds in Illinois. American Midland Naturalist 141:339-344.

## Hyperlink Resources

Siting and permitting process for wind projects (Wind Turbines tab): <https://mn.gov/commerce/energyfacilities/>

USFWS Land-Based Guidelines: [https://www.fws.gov/ecological-services/es-library/pdfs/WEG\\_final.pdf](https://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf)

NHIS Data Request Form: [http://files.dnr.state.mn.us/eco/nhnrp/nhis\\_data\\_request.pdf](http://files.dnr.state.mn.us/eco/nhnrp/nhis_data_request.pdf)

Minnesota Geospatial Commons: <https://gisdata.mn.gov/>

Native Prairie Bank: <https://www.dnr.state.mn.us/prairierestoration/prairiebank.html>

Scientific and Natural Areas Program: <https://www.dnr.state.mn.us/snap/index.html>

Designated Wildlife Lakes: <http://www.dnr.state.mn.us/wildlife/shallowlakes/designation.html>

Migratory Waterfowl Feeding and Resting Areas: <http://www.dnr.state.mn.us/wildlife/shallowlakes/mwfra.html>

Minnesota State Game Refuges: <http://www.dnr.state.mn.us/wildlife/shallowlakes/refuges.html>

Working Lands Initiative: <http://files.dnr.state.mn.us/assistance/backyard/privatelandhabitat/working-lands-ini.pdf>

Wild, Scenic & Recreational Rivers: [http://www.dnr.state.mn.us/waters/watermgmt\\_section/wild\\_scenic/ws\\_rivers/rivers.html](http://www.dnr.state.mn.us/waters/watermgmt_section/wild_scenic/ws_rivers/rivers.html)

Utility License Information: [http://www.dnr.state.mn.us/permits/utility\\_crossing/index.html](http://www.dnr.state.mn.us/permits/utility_crossing/index.html)

Public Waters Inventory (PWI) Maps: [http://www.dnr.state.mn.us/waters/watermgmt\\_section/pwi/maps.html](http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html)

PWI maps download link: [https://www.dnr.state.mn.us/waters/watermgmt\\_section/pwi/download.html](https://www.dnr.state.mn.us/waters/watermgmt_section/pwi/download.html)

Public Waters Work Permit:

[http://www.dnr.state.mn.us/waters/watermgmt\\_section/pwpermits/requirements.html](http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/requirements.html)

Important Bird Areas (IBAs): <http://dnr.state.mn.us/iba/index.html>

U.S. Fish & Wildlife Service Northern Long-Eared Bat Interim Planning Guidance:

<https://www.fws.gov/northeast/virginiafield/pdf/NLEBinterimGuidance6Jan2014.pdf>

Avian & Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota:

<http://files.dnr.state.mn.us/eco/ereview/avian-bat-protocols.pdf>

DNR Regional Staff Contacts: [http://www.dnr.state.mn.us/eco/ereview/erp\\_regioncontacts.html](http://www.dnr.state.mn.us/eco/ereview/erp_regioncontacts.html)

Map of DNR Administrative Regions: [https://files.dnr.state.mn.us/aboutdnr/dnr\\_regions.pdf](https://files.dnr.state.mn.us/aboutdnr/dnr_regions.pdf)

## Appendix A

### Minnesota Department of Natural Resources Commercial Wind Energy Early Coordination Checklist

- \_\_\_\_ Send GIS shapefiles (NAD83) and project information to the DNR Regional Environmental Assessment Ecologist. The DNR will respond with a preliminary project review letter.
- \_\_\_\_ Send Natural Heritage Information System Data Request Form & GIS shapefiles (NAD83) to Endangered Species Review Coordinator in St. Paul.
- \_\_\_\_ Identify and map High Value Resources based on DNR Guidance document, preliminary project review letter, and NHIS letter.
- \_\_\_\_ Provide draft pre-construction wildlife survey plans (avian, bat, listed species, prairie) in consideration of the DNR preliminary project review letter.
- \_\_\_\_ Meet with the DNR, EERA, and USFWS to facilitate early coordination on all of the above issues.