

Wildlife Guidelines for Alberta Wind Energy Projects

Introduction

Wind power is the fastest growing energy industry in the world. While it is a source of renewable clean energy, wind power does have impacts on the landscape, and is a cause of bird and bat mortality (1, 5). Wind farms can also result in wildlife disturbance, habitat degradation and affect regional ecological integrity. Wind energy projects, like other development projects with potential environmental impact, need to be well planned in order to avoid or mitigate these impacts. Additionally, there is a need to monitor impacts at each wind farm, because of the unique landscape and wildlife populations found at each site. Post-construction monitoring programs will help to determine the effectiveness of mitigation techniques.

This document summarizes potential wildlife issues associated with new wind energy developments in Alberta, and provides guidelines for minimizing impacts of such projects on wildlife. It is designed to guide Alberta Sustainable Resource Development (ASRD) - Fish and Wildlife Division (FWD) staff in their advisory role to wind energy developers seeking consultation, in responding to stakeholder inquiries related to regulatory applications, and to help standardize their responses to wind energy applications submitted to the Alberta Energy Utilities Board. The document will also serve as a resource for the wind energy industry, their wildlife consultants, and the general public.

As our understanding of the impacts of wind energy projects on Alberta's wildlife improves, so too will our abilities to manage these impacts. This document should be considered a "living document" with amendments likely to be proposed and adopted over time. These guidelines will be applied to projects and therefore periodic reviews will provide insight into their effectiveness, suitability, and necessity. ASRD - FWD is committed to consulting with industry, government, and other stakeholders as part of this review process. Check the Alberta Fish and Wildlife "Guidelines and Research" web page <http://www.srd.gov.ab.ca/fw/guidres/index.html> for the most current version of these guidelines.

Scope and Application

The various species of wildlife in Alberta fall under the jurisdiction of several federal and provincial acts and regulations. Alberta's *Wildlife Act* designates wildlife on private and public lands as a provincial jurisdiction (outside National Parks and other federal lands). In addition to being addressed by this provincial legislation, many species of birds are also protected by the federal government under the *Migratory Birds Convention Act*, while fish are covered under the *Canada Fisheries Act*.

"Species at Risk" is a phrase commonly used to describe a suite of wildlife species that require special management and are identified through federal and provincial status processes, and in many cases through legislation. "Species at Risk" includes "provincial"

species and “federal” species. The federal *Species at Risk Act* (SARA) applies to species listed as Endangered or Threatened on federal lands (such as National Parks and Military Reserves). SARA is also applicable to “federal” species where they occur on provincial lands and in provincial waters. *The Accord for the Protection of Species at Risk* outlines the joint responsibilities of the federal and provincial governments for species at risk.

Appendix 1 provides a summary of “federal” and “provincial” jurisdictions for priority wildlife likely to occur in or near wind energy projects in Alberta. *Wildlife Guidelines for Alberta Wind Energy Projects* addresses all Alberta wildlife, regardless of whether “federal” or “provincial” species. However, for “federal” species on Alberta lands, or for all wildlife on federal lands, there are additional requirements of federal government departments. These can be identified by contacting Natural Resources Canada (NRCan), which is the responsible agency for wind power development within the Federal Government.

At the time of preparation of this document all of the Alberta wind energy project applications were in the southern prairie and foothills landscapes. Therefore the document *Wildlife Guidelines for Alberta Wind Energy Projects* has been designed for application on those landscapes. Should wind energy developments be proposed in other landscapes (eg. west-central Alberta forested foothills, central Alberta parkland, or high mountain ridges and passes), it may become necessary to revise this document.

Wildlife Issues Related to Wind Energy Projects

Wildlife-related issues of wind energy projects in Alberta can be categorized as follows:

1. ***Direct mortality of wildlife*** resulting from collisions with wind turbines and associated structures (e.g. power lines). Modern turbines operate at 15-30 rpm and have blade tip speeds of up to 250 kilometres per hour (2). Birds may be unable to recognize blade presence at rotor tips (the “smear effect”) during high blade speed (5). Mortality is increased for nocturnal species by the installation of certain types of lights and their operation on wind turbines and buildings. The likelihood of mortality of birds of prey (hawks, owls, eagles) and bats may be increased or decreased by changes in prey populations (small mammals, insects) near the developments, which may serve as an attractant. Many collisions reported at wind farms involve migrating birds, as more fatalities tend to be reported during spring and fall migration (2). Waterfowl have been observed to generally avoid flying close to wind turbines, increasing flight altitude or flying around end turbines (2, 4). Shorebirds tend to fly at high altitudes and descend or ascend rapidly when approaching or leaving feeding areas. These observations may explain low collision rates recorded for both shorebirds and waterfowl (2). Raptors, on the other hand, often fly at altitudes within the blade sweep area (2). There is greater collision risk for bird species with aerial courtship displays, such as horned lark, vesper sparrow, long-billed curlew, and bobolink (2). While it is possible that a bird of any species may collide with a wind turbine, in Alberta concerns are primarily with the following species/species groups:

- a. Raptors during migration, nesting, and rearing/feeding periods
 - b. Over-wintering birds, particularly raptors, especially in relatively snow-free Chinook zones.
 - c. Migrating and resident bats.
 - d. Migrating songbirds.
 - e. Resident prairie grouse (greater sage grouse, sharp-tailed grouse).
 - f. Breeding grassland birds (including several “species at risk” and several species with aerial flight displays, such as long-billed curlew, Sprague’s pipit, horned lark, lark bunting).
2. **Habitat loss and degradation** resulting from wind farm infrastructure. This may include the loss of native grasslands and other important habitats for wildlife. Direct loss of plant communities may also directly impact rare plant species or unique vegetation communities. Related to this, there is the potential for further impacts on vegetation communities through introduction and spread of exotic/invasive plants along roads and at construction sites.
3. **Disturbance of wildlife** (including “species at risk”). Disturbance may be caused by increased human activity at wind farms and possibly by the movements of rotor blades. This may result in decreased productivity and wildlife avoidance of habitat in the area. Some references describe prairie grouse as exhibiting extreme avoidance of vertical features and being disturbed by operating wind turbines and recommend that particular care be taken in planning wind energy facilities (1,5). However, some recent unpublished monitoring in Alberta suggests little effect of wind turbines on sharp-tailed grouse. . Grassland birds occurred in reduced densities within 100 metres of turbines in Minnesota(3). Bird Studies Canada states: “it is possible that the greatest adverse effect that wind energy facilities may have on birds is disturbance to breeding and wintering birds.....the potential should be considered at all sites...this is especially important in areas where species at risk are present ...in prairie habitat where certain susceptible bird species are found breeding” (2). Herons and other colonial water birds do not appear to be particularly susceptible to collisions with turbines, but there is potential for disturbance at their nesting colonies if turbines are located close enough (2).

Some of the issues, such as bird mortality due to collisions at some wind farms, are well documented. However, many other issues, such as the disturbance effect of rotor blade rotations on grassland birds nesting nearby, are poorly understood.

Wildlife Guidelines

Wildlife guidelines for wind energy projects in Alberta address pre-development planning and surveys, site selection, mitigation, post construction wildlife monitoring, and reclamation of projects.

Pre-development Planning and Surveys

Local differences in wildlife populations and movement patterns, habitats, area topography, facility design, and weather, result in each proposed development site being unique and requiring detailed individual evaluation (6). Data on wildlife use and mortality at one wind energy facility are not necessarily applicable to others (5). Detailed pre-construction planning and surveys will identify potential problems and how they may be mitigated before a project is constructed (2). The following planning steps should be followed.

1. A baseline search of conservation databases should be completed to help determine potential resource concerns. This should be carried out for the project area including a 1 kilometre buffer zone surrounding all development sites. The buffer zone is based upon the maximum setback distance likely to be recommended for important wildlife habitats. Applicants should request the appropriate SRD-Wildlife Biologist to search the Fish and Wildlife Management Information System (FWMIS) database for wildlife data previously collected in the locale. A request should also be made to the Alberta Natural Heritage Information Centre (ANHIC) for data on rare plant occurrences and the presence of rare plant communities.
2. Maps and air photos should be reviewed to determine any significant landscape features that may act as an attractant for wildlife. Data searches, literature searches, and interviews should be carried out to evaluate the significance of the proposed development area to migrating birds and bats.
3. Field investigations should be carried out by the applicant to determine the presence and extent of native grasslands and other important natural habitats (e.g. wetlands, riparian habitats). If development is being considered on native grasslands, then consideration should be given to the feasibility of restoration of the native grassland. SRD- Lands Division should be consulted if part or the entire project is within Alberta Public Lands, as provincial policy may affect the feasibility of such projects.
4. Following consultation with the SRD-Wildlife Biologist, pre-construction wildlife surveys (including the buffer zone) and rare plant surveys should be done within project areas. In all areas of suitable habitat, surveys should be done for “species at risk” or other species of management concern, as identified by the SRD-Wildlife Biologist. Other surveys that may be applicable, depending upon the species of interest and site specific features, include:
 - a) Spring and fall migration surveys at dawn and dusk for songbirds; three surveys each season – early, mid and late migrants.
 - b) Breeding bird surveys (two surveys) early species (e.g. May 1-Jun 15) and late species (e.g. Jun 16-Jul 15). Depending upon findings, these may need to be followed by monitoring of nesting/rearing/fledging success of identified nests of species of concern.

- c) Spring and fall migration surveys mid-day for raptors; three surveys each season – early, mid and late migrants.
- d) Early spring surveys of Richardson’s ground squirrels, which are an important raptor prey, and which act to attract raptors to the area.
- e) Spring surveys for sharp-tailed grouse and greater sage grouse.
- f) Wintering bird surveys (two surveys) – early (e.g. Dec 1-Jan 15) and late (e.g. Jan 16-Feb 28).
- g) Bat surveys using protocols acceptable to the Alberta Bat Action Team (ABAT). These protocols are available on the Fish and Wildlife web site <http://srd.alberta.ca/fishwildlife/guidelinesresearch/inventoryguidelines.aspx>.
- h) Surveys to determine the presence of rare plant communities.

Surveys should be conducted using established Sustainable Resource Development departmental survey protocols or other acceptable techniques (such as those recommended by Canadian Wildlife Service (CWS)), as agreed to between the ASRD-FWD Wildlife Biologist and the company’s wildlife biologist. Harmonizing between provincial and federal protocol recommendations is desirable and efforts will be made to collaborate with industry and federal regulators to achieve this. These surveys should be designed and carried out by biologists who are qualified and experienced in surveying for the species concerned. Where sensitive species are identified, timing and setback distances should be applied. Data collected on these and other surveys should be submitted to ASRD-FWD in the appropriate format for entry to FWMIS (and to ANHIC for rare plants).

Site Selection

Appropriate site selection is a key factor in preventing potential significant negative impacts on wildlife (2).

1. Landscape features that attract or “funnel” birds/bats should be avoided. These may include passes, peninsulas, prominent ridges, the tops of steep river valley “breaks”, riparian areas along streams, wetlands, sites between closely spaced wetlands, and small mammal colonies (1,5). Where these cannot be avoided, mitigation measures to minimize collision-related mortalities should be incorporated into wind farm design, and intensive mortality monitoring programs should be followed. Where site assessment shows a very high potential for collision-related mortality of wildlife (e.g. high bird/bat use, natural attractants at site), and little opportunity for mitigation, another location should be chosen.
2. Native grasslands and other important natural habitats (both private and public land), including Environmentally Sensitive Areas (see ANHIC Website), should be avoided wherever possible. Where a mosaic of native grasslands and cultivated areas occurs, wind turbines should be diverted to the cultivated areas. When construction on native grasslands cannot be avoided, discussions should occur with the SRD-Wildlife Biologist, as well as potentially with other parties such as conservation organizations, landowners, and SRD-Public Lands Division (if public land) in regard to mitigation/reclamation measures and to explore potential measures of enhancement

and protection of natural habitats on site or nearby. Where native grasslands with “species at risk” are identified another location should be selected.

3. Habitats of high importance to prairie grouse (greater sage grouse, sharp-tailed grouse) should not be developed for wind farms (5). This may include leks (“dancing/strutting” grounds) and/or nesting/foraging/wintering habitats. United States Fish and Wildlife Service (USFWS) recommend avoiding placement of turbines within 5 miles of known leks (5). In Alberta this setback may be appropriate for greater sage grouse, which is a federally and provincially legislated Endangered species. Wind farm development proposals in or near greater sage grouse habitat should be discussed at an early stage with the SRD-Wildlife Biologist. SRD-FWD will only recommend approval of applications in greater sage grouse habitat in exceptional circumstances. Sharp-tailed grouse leks should be protected by a minimum 500 metre setback, a distance which is consistent with that recommended for other industrial developments. It is suggested that a greater setback may be warranted on some landscapes, and therefore placement of wind turbines within 1 km of sharp-tailed grouse leks should include monitoring of the leks over several years.
4. Habitats of high importance to other federally and provincially legislated Endangered and Threatened species (e.g. burrowing owl, ferruginous hawk, loggerhead shrike), and other “species at risk” (e.g. long-billed curlew) should be avoided. The SRD-Fish and Wildlife Division guidelines for timing and setback distances from key habitats (e.g. nests, dens) for Endangered, Threatened, and other “species at risk” should be used. These are outlined in the document “Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat Within Grassland and Parkland Natural Regions of Alberta”.
5. The current land use guidelines address primarily species at risk, but other species, particularly raptors, are also vulnerable to mortality due to collisions with turbines. Areas within 1 km of projects should be searched for raptor nests; if found, nests of species such as Swainson’s hawk and red-tailed hawk may need to be protected by specific setbacks, generally in the range of 500 metres.
6. Wind turbines should not be constructed within 100 metres of any permanent or temporary (ephemeral) wetland. For major wetlands providing habitat for large numbers of migrating or breeding waterfowl, the set-back may need to be greater (to be determined with the SRD-Wildlife Biologist).
7. Areas near known bat hibernacula, breeding and nursery colonies, bat migration corridors, or in flight paths between colonies and feeding areas, should be avoided (5).
8. An assessment should be done of local weather conditions to help evaluate possible bird collision risk due to fog and low clouds.

9. On landscapes that provide important wildlife habitats, but on which there are a large number or high density of developments, the addition of the proposed wind farm may exceed thresholds identified in a cumulative impact assessment. In such cases, the size of the development should be reduced, or in some situations, another location chosen.

Mitigation

Mitigation, as needed, should be incorporated into the design of all wind turbine installations. Appropriate mitigation should be determined site-specifically, but a summary of potential mitigation measures is provided here.

- a) Minimize roads, fences, and other infrastructure; align roads to avoid habitat destruction and wildlife disturbance (5).
- b) Implement measures (e.g. automation) to minimize human disturbance at sites once construction is complete (2).
- c) Use tubular towers rather than lattice towers to minimize bird perching and nesting opportunities (5).
- d) When required by Transport Canada to install lights for aviation safety, the minimal number of lights and synchronized flashes per minute with minimum flash duration should be incorporated. Lighting for on-ground facilities should be reduced and down-shielded and controlled by proximity sensors wherever possible (5).
- e) Where height of the rotor-swept area creates risk for wildlife, adjust tower heights to reduce risk of strikes (5).
- f) Reduce above ground power lines to avoid strikes and electrocution of birds (2, 5). Where this is impractical or undesirable, lines should be properly designed to reduce the potential of electrocution of large birds.
- g) In areas of high seasonal bird or bat use, where monitoring shows a high incidence of bird strikes, problematic turbines may need to be shut down during periods of high concentration (5).
- h) Turbines should be spaced so as not to inhibit bird movement, generally 200 metres or more (2).
- i) Where there are high numbers of raptors, discourage use of the immediate project area by locating turbines away from perching opportunities, and away from areas of high concentrations of prey (eg. ground squirrel colonies) (2).

Post-construction Wildlife Monitoring

SRD-Fish and Wildlife Division recommends that post construction monitoring be carried out at all wind energy sites to identify any wildlife impacts. This monitoring should be conducted and/or supervised by a qualified and experienced wildlife biologist. Wildlife Research Permits are required for wildlife research activities in Alberta, and for any projects involving handling of wildlife a Collection Licence is required. Attempts will be made to harmonize the federal and provincial monitoring requirements.

1. Wildlife carcass collection surveys should be carried out following construction of wind farms. A minimum of one year of carcass collection surveys is recommended,

however, there can be high variability of many factors from year to year (eg. weather). This seasonal variation can influence timing and location of wildlife migration routes, selection of habitat, and population densities, and therefore, in most cases, more than one year of wildlife carcass collection surveys is recommended. Industry and ASRD-FWD should develop site-specific monitoring protocols for individual projects. The extent (sub-sample or complete sample of wind farm), frequency (e.g. weekly, biweekly), seasonality (e.g. year-round, spring and fall migration), and duration (number of years), will be determined through consultation between the wind energy company, wildlife consultant and the SRD-Wildlife Biologist. These decisions will be influenced by site characteristics, bird population levels, size of the wind farm, and the assessed likelihood that the particular wind farm is likely to cause high collision-related mortalities. Carcass surveys should include the area within a radius at least equal to the height of the turbine and additional areas where deemed appropriate (e.g. further downwind). Results of carcass surveys should be reported to SRD-Fish and Wildlife Division annually, in a standardized format, including raw data, quantification of search effort, and estimates of efficiency. A rate of kill estimate such as number of carcasses per turbine per year should be calculated. Carcasses should be collected and identified, and where not severely decomposed, should be frozen, labeled, and submitted to an SRD – Alberta Fish and Wildlife Division District office. These activities should be covered under a provincial Wildlife Research Permit and Collection License. Alternate uses of the carcasses (eg. research, education) may be identified in the research permit application. The collection of carcasses will also help to remove attractants for raptors and scavengers.

2. Where significant wildlife resources have been identified through pre-construction planning and surveys, ongoing wildlife surveys may be recommended. Post-construction monitoring requirements will be site specific and will be based on an adaptive management approach to local wildlife issues. Ongoing requirements may include monitoring of the presence, abundance and distribution of local breeding populations or migrating birds and bats. Methods may require infrared, thermal imagery, radar, and acoustical monitoring equipment to assess bird and bat movements. Some suggestions on bird survey design at wind farms have been provided by Bird Studies Canada (2). Bat monitoring should follow the recommendations and protocol of the Alberta Bat Action Team “ABAT”. Proponents are expected to discuss proposed study methods with ASRD - FWD and CWS during all stages of pre and post construction monitoring.

Decisions on how much effort and time should be put into pre-development surveys and post-construction monitoring may be based on several considerations such as the abundance and suitability of habitat for “species at risk” and other wildlife, physical attributes of the site, importance of the area to migrating birds and bats, and size of the wind farm and number of turbines proposed. It is strongly recommended that proponents contact SRD-FWD early in the project planning process to facilitate discussions on site selection and pre-development monitoring requirements.

Reclamation and Restoration

A habitat reclamation plan that emphasizes restoration of natural habitats (e.g. native grasslands) should be developed for each site. Non-permanent roads constructed for the developments should be re-contoured and re-vegetated. Permanent access roads should be minimized. A development and reclamation plan should be provided as part of the site assessment.

Literature Cited

1. Erickson, W.P., G.D. Johnson, M.D. Strickland, D.P. Young, K.J. Sernka and R.E. Good. 2001. Avian collisions with wind turbines: a summary of existing studies and comparisons to other sources of avian collision mortality in the United States. National Wind Coordinating Committee Resource Document. 62 pp.
2. Kingsley, A., and B. Whittam. 2003. Wind turbines and birds, a guidance document for environmental assessment. Phase 3 draft report prepared by Bird Studies Canada for Canadian Wildlife Service, Gatineau, Quebec. 79pp.
3. Leddy, K.L., K.E. Higgins, and D.E. Naugle. 1999. Effects of wind turbines on upland nesting birds in Conservation Reserve Program grasslands. *Wilson Bulletin*. 111(1): 100-104
4. Mossop, D.H. 1998. Five years of monitoring bird strike potential at a mountain-top wind turbine, Yukon Territory. Prepared for CANMET Energy Technology Centre, Natural Resources Canada.
5. United States Fish and Wildlife Service. 2003. Interim guidelines to avoid and minimize wildlife impacts from wind turbines. USDI, Fish and Wildlife Service. Washington, D.C. 55pp.
6. United States Fish and Wildlife Service. 2003. Memorandum on Service interim guidance on avoiding and minimizing wildlife impacts from wind turbines. From Deputy Director to Regional Directors, May 13, 2003.

Web Sites

Alberta's Wildlife Act: <http://www.srd.gov.ab.ca/law.html>

Federal-Provincial Accord for the Protection of Species at Risk:

http://www.speciesatrisk.gc.ca/recovery/accord_e.cfm

Species at Risk Act: http://www.sararegistry.gc.ca/the_act/default_e.cfm

ANHIC: <http://www.cd.gov.ab.ca/preserving/parks/ahic/flashindex.asp>

Wildlife Land Use Guidelines: <http://www.srd.gov.ab.ca/fw/landuse/index.html>

Wildlife Research Permits: <http://www.srd.gov.ab.ca/fw/guidres/respermapp.html>

Appendix 1: “Provincial” and “Federal” Wildlife Jurisdiction in Alberta (on provincial private and public land unless otherwise designated).

| Species Group | Federal | Provincial | (Applicable Act) |
|---|----------------|-------------------|---|
| Mammals | | X | Alberta’s Wildlife Act (WA) |
| Amphibians | | X | WA |
| Reptiles | | X | WA |
| Fish | X | | Canada Fisheries Act |
| Raptors (birds of prey) | | X | WA |
| Upland Game Birds (eg. grouse) | | X | WA |
| Waterfowl (ducks, geese, swans) | X | | Migratory Birds Convention Act (MBCA), WA |
| Passerines (songbirds) | X | | MBCA, WA |
| Shorebirds | X | | MBCA, WA |
| Cranes, coots, rails, bitterns, gulls, terns, herons, loons, grebes | X | | MBCA, WA |
| Endangered or Threatened Plants | | X | WA |
| Endangered or Threatened Invertebrates | | X | WA |
| Endangered and Threatened “provincial” species on provincial land | | X | WA |
| Endangered and Threatened “federal” species on provincial land | X | | Species at Risk Act (SARA), WA |
| All Endangered and Threatened wildlife on federal lands | X | | SARA, National Parks Act |