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A Jurisdictional Review: Wildlife and Wind Energy Development

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**A Jurisdictional Review: Wildlife and Wind Energy
Development**

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Background

The Alberta Climate Leadership Plan has a goal of “by 2030, renewable sources like wind and solar will account for up to 30% of electricity generation.” To meet this goal there will be an increase in large scale wind energy projects. As with any new development, there will be impacts on wildlife and wildlife habitat. Alberta Environment and Parks (AEP) Fish and Wildlife Policy Division is in the process of developing wildlife directives for Alberta wind energy projects. The directive will be focused on wildlife and wildlife habitat and will apply to all wind energy projects that require AUC approval. The directive has been designed to assist industry in minimizing impacts to wildlife and habitat.

To support the development of this directive AEP is seeking to understand how other jurisdictions have considered wildlife populations and wildlife habitats relative to wind energy developments. Of particular interest (and a present gap) is in relation to pre-construction surveys and how the data gathered prior to construction can be related to population level impacts and/or inform mitigation in the post-construction (operational) period.

Methods

AEP identified a number of areas where a jurisdictional review would be helpful in understanding how different jurisdictions regulate wind, establish project and turbine siting, undertake pre-construction and post-construction surveys that can be shared on wildlife and wind development. AEP staff from Fish and Wildlife Policy Division developed a list of questions for each area of interest (Appendix A).

To determine appropriate jurisdictions to review a web search highlighted the top producing wind states and provinces in North America. Jurisdictions were contacted to request an interview. AEP reviewed the list of jurisdictions willing to participate. Ontario, British Columbia and New Brunswick were selected in addition two international jurisdictions, Australia and Scotland. For Australia, interviews focused on projects from Tasmania (a state within Australia). Phone interviews were set up with each participant and one hour interviews were completed (see Appendix B for a detailed contact list). Some jurisdictions required discussions with more than one person. Phone calls with interviewees were recorded and

transcribed and findings were summarized in tables. In addition, supporting documents were reviewed to address gaps in information.

All jurisdictions interviewed have some wind energy development and all have set targets to increase renewable energy. Table 1 highlights the number of megawatts (MW) from each jurisdiction included in the review in comparison to Alberta.

Table1: MW of energy produced from wind

Province ¹	MW produced (2015)
Ontario	3,927
Alberta	1,471
British Columbia	489
New Brunswick	294
International	
Scotland ²	5390
Australia ³	4187

1

http://www.miningandenergy.ca/energyinsider/article/top_ten_wind_energy_producing_provinces_in_canada1/

2

http://www.miningandenergy.ca/energyinsider/article/top_ten_wind_energy_producing_provinces_in_canada1/

³ https://en.wikipedia.org/wiki/Wind_power_in_Australia

Tasmania, the jurisdiction in Australia we interviewed currently has 308 MW.

<https://www.tasnetworks.com.au/our-network/planning-and-development/wind-generation-in-tasmania/>

Summary of Findings

A summary of common elements from each section is provided as a high level overview of the jurisdictional review.

Legislation

- Industries have to develop under the same conditions in most jurisdictions, with any differences being due to risks associated with the operation of the wind facilities (i.e. bat and bird mortality).
- Regulation tends to fall under one jurisdiction in Ontario and New Brunswick, but in the other three jurisdictions there are two streams, larger projects and smaller projects (<50MW for British Columbia and Scotland, >30MW for Australia), and smaller projects were handled by a different regulator, typically a local decision maker.
- Wind development occurs on public land in all jurisdictions, in New Brunswick wind only occurs on public land.

Project and Turbine Siting

- All jurisdictions have no-go areas, the most common were national parks, world heritage sites and other types of parks and protected areas.
- Most jurisdictions have identified habitat features where avoidance is recommended and/or there are development constraints, such as species at risk, sensitive habitat features (i.e. bat hibernacula) and wetlands.
- All jurisdictions have established setbacks (outlined in guiding documents), many noted that implementation is usually assessed on a project by project basis. For example, Ontario has 120m buffer for sensitive habitat (i.e. bat habitat) and species such as wetlands, woodlands and species at risk habitat. Proponents requesting wind energy development within this setback are subjected to more intensive pre-construction monitoring.
- Setbacks tend to be represented in meters, and there is not consistency in guidelines between jurisdictions. For example, bat hibernacula varied from 300m (British Columbia), 1000m (Ontario) to 5km (New Brunswick). In New Brunswick the setback does not represent a no-go area, extra surveys are required if there is a bat hibernacula identified in the species at risk database

or if there is a cave or abandoned mine within 5km of the proposed development.

Pre-Construction Surveys

- All jurisdictions have developed guidelines for pre-construction surveys, but the type of features surveyed depends on location of wind development in relation to recommended avoidance areas, such as species at risk and other habitat features.
- Typically, the length of pre-construction survey varies depending on the location, but in general between 1-2 years was recommended, with exception of Scotland, which recommended 6-12 months.
- If a species at risk is on-site pre-construction surveys may need to be extended depending on established protocols.
- There were no metrics or thresholds provided for stopping wind development based on pre-construction surveys for birds and bats. Instead, jurisdictions assess on a project by project basis.
 - New Brunswick noted that proponents have been willing to move turbines when pre-construction surveys identified development was in a high risk area for collisions with birds and bats.
 - Tasmania noted issues with trying to scientifically defend a threshold value that would stop development and instead works with proponent on placement of turbines in area that are not high risk
- Recommended expiry dates on bird and bat survey data in pre-construction surveys are not consistent with Australia recommending 2 years and Scotland 2-3 years., Ontario, New Brunswick, and British Columbia did not explicitly state an expiry date.

Post-construction Surveys and Mitigation

- All review jurisdictions have developed post-construction survey guidelines for bats and birds (Scotland's will be released after Christmas 2016)
- Post-construction survey recommended time periods depends on the level of risk to bats and birds determined in pre-construction surveys. Typically, one year for low risk sites and two-three years for high risk sites.

- For survey area, all jurisdictions recommend if there are less than 10 turbines that all turbines are surveyed, and if greater than 10, 30-50% of sites are surveyed. In addition, selection of turbines to survey within a developed site should include different habitats and landscape features.
- Most common metric for reporting bat and bird fatalities is number of fatalities/per wind turbine/per year.
- Ontario is the only jurisdiction with set thresholds for birds and bat mortality which when crossed trigger mitigation action. British Columbia has developed guiding thresholds, but decisions are based on a project by project basis.
- The most common mitigation action is adjustment in operations, usually reduced speed at specified times of high collision risk.

Focus Section: Post-construction Monitoring and Mitigation

The jurisdictions reviewed rely on post-construction surveys to understand impacts on birds and bats. Survey specifics are informed on by recommendations in the approval phase of the project. For some species specific guidelines have been developed. For example, post-construction survey guidelines to assess the impacts of wind turbines on bats and birds can be found for many jurisdictions. Guidelines for post-construction bat surveys provide guidance on survey season, acoustic survey methodology, bat fatality methodology, number of turbines to search, selecting the turbines to search, how often to search, accounting for search effort and analysis of fatality data to estimate number of collisions (Barclay and Baerwald 2015; Craig and Holroyd 2016; Environment Canada: Canadian Wildlife Service 2007b; Environment Canada: Canadian Wildlife Service 2007a; New Brunswick Fish and Wildlife Branch 2011; Ontario Ministry of Natural Resources 2011b; Ontario Ministry of Natural Resources 2011a; Scottish Natural Heritage 2014; U.S. Fish and Wildlife Service 2012).

Here we look specifically at key questions of concern for AEP around post-construction surveys in relation to bats and birds and how findings are linked to mitigation actions. Research studies have found that pre-construction surveys do not always correlate with post-construction conditions, highlighting the importance of monitoring post-construction even for areas identified as low risk in pre-

construction monitoring (Schuster, Bulling, and Köppel 2015). Although research into wildlife impacts on birds and bats in on the increase, there are still knowledge gaps in relation to understanding how wind energy development contributes to population level impacts (Schuster, Bulling, and Köppel 2015; Arnett and Baerwald 2013).

Very few wildlife studies have focused on population level impacts due specifically to wind energy development. There are a few examples where researches have assessed impacts on endangered species, where any mortality of the species is of high risk to the population. For example, LeBeau et al. (2014) studied impacts of wind energy (including associated infrastructure) on Greater sage grouse. Greater sage grouse are experiencing reduced fitness due to poor brood success and female mortality relating to the cumulative impacts of anthropogenic features on the landscape. Researchers found that wind energy development did not increase female mortality, but recommended wind projects needs to consider impacts on nest and brood failure on Greater sage grouse survival.

Length of Survey

The duration of post-construction monitoring should be adequate to determine if pre-construction estimates of impacts to birds or bats were accurate and to determine if turbines are causing unanticipated fatalities that require mitigation actions (California Energy Commission (CEC) and California Department of Fish and Game (CDFG) 2007). All jurisdictions reviewed had identified post-construction monitoring time periods, including:

- British Columbia recommending three years of post-construction surveys (Craig and Holroyd 2016);
- New Brunswick and United States Fish and Wildlife Service (USFWS) recommend post-construction time frame depending on the level of risk assessed in the pre-construction surveys. Lower risk sites can be monitored for one year, while higher risk sites should be monitored for two-three years (New Brunswick Fish and Wildlife Branch 2011; Wyoming Ecological Services Field Office 2010)
- Ontario requires three years of post-construction surveys for all wind power projects. An additional 3 years of monitoring is further required if the bat/bird mortality thresholds are reached during the initial monitoring period (Ontario Ministry of Natural Resources 2011a) and
- Tasmania recommends 6-12 months depending on the species present. Timing of the surveys depends on species of concern, for example bat

surveys are recommended during the breeding season of October to February, while wedge tailed eagle are not allowed during breeding season (August to January) because of sensitives.

Survey Area

Craig and Holroyd (2016), suggest that the number of wind turbines to search should be decided based on pre-construction data, site conditions, and the size of the development. There is agreement from most jurisdictions that if the project contains fewer than 10 turbines, all turbines in the area of interest should be surveyed (U.S. Fish and Wildlife Service 2012; New Brunswick Fish and Wildlife Branch 2011; Ontario Ministry of Natural Resources 2011a; Ontario Ministry of Natural Resources 2011b; Craig and Holroyd 2016)(U.S. Fish and Wildlife Service 2012).

If there are greater than 10 turbines the following guidelines are recommended per jurisdiction:

- In New Brunswick, 1/3 of all turbines should be surveyed;
- In Ontario, 30% of all turbines (minimum 10) should be surveyed; and
- In British Columbia, 33-50% of all turbines (minimum 10) should be surveyed (bat fatality surveys).

In addition, USFW and Alberta guidelines recommended by researchers document the importance of considering which turbines are selected, and recommend selection is representative of different habitat types (e.g., native pasture, cultivated cropland) and topographical features (e.g., ridge lines, proximity to coulees, open/low-lying areas), and cover the geographic distribution of the wind farm (Barclay and Baerwald 2015; U.S. Fish and Wildlife Service 2012).

Bird and Bat Fatality Metric

The jurisdictions reviewed reported fatality results as the number of bats/birds killed per turbine over a known period of time (expressed as bats/turbine/time) (New Brunswick Fish and Wildlife Branch 2011). The USFWS has expressed concern that turbines vary greatly in size, and their risk to birds and bats can vary significantly, making cross comparisons between projects and turbines challenging. To address this concern, the Service recommends that bird and bat fatalities are reported per turbine and per MW (U.S. Fish and Wildlife Service 2012).

Thresholds

The majority of jurisdictions have not explicitly developed thresholds which would trigger mitigation actions. Instead most jurisdictions will assess the post-construction survey results to determine if mitigation actions are needed on a project by project basis. British Columbia has developed recommended thresholds of:

- Any individual turbine with >10 bat fatalities/survey year, the fatality of any bat species-at-risk, an overall average fatality rate for the development of ≥ 7 bats/turbine/year, or exceeding any of the above thresholds for three consecutive years merits consideration of mitigation options; and
- The overall estimate of the number of fatalities for the development corrected for searcher efficiency, scavengers, search plot area etc. is >350 bats killed in one survey year, calculated at the end of the survey year.

The exception is Ontario where clearly defined thresholds are defined which trigger mitigation actions. The thresholds defined by Ontario for birds and bat collisions include:

- 14 birds/ turbine/ year at individual turbines or turbine groups;
- 0.2 raptors/ turbine/ year (all raptors) across a wind power project;
- 0.1 raptors/ turbine/ year (provincially tracked raptors) across a wind power project; and/or
- 2 raptors/wind power project (<10 turbines)
- In addition single event (one survey date) thresholds are developed, including 10 birds at one turbine or 33 or more birds (including raptors) at multiple locations;
- 10 bats/turbine/year at individual turbines

Government of Ontario staff we interviewed identified the establishment of solid thresholds as an advantage over project by project assessments, because it creates policy consistency across the province.

Options for mitigation

A mitigation hierarchy is a common approach that can be applied to wind development. The hierarchy involves avoidance of high risk sites; most jurisdictions reviewed had avoidance of sensitive wildlife habitat in planning/permitting phase. This is followed by minimizing impacts during operations. Mitigation should therefore be part of the lifecycle of the wind development project. Added complications include effectiveness of mitigation measures are often site and species specific and for many species there are significant data gaps to help us understand population level impacts from wind development (Arnett and May 2016).

If post-construction surveys indicate bird and bat collisions are deemed to be of concern or they cross an established threshold the proponent works with appropriate government agency to mitigate bird and/or bat collisions. Currently mitigation options are somewhat limited to curtailment of operations during predictable high risk periods when the greatest number of fatalities occur (Hein, Gruver, and Arnett 2013). Indeed for bats this may be the only option for reducing bat fatalities (Arnett and May 2016). All jurisdictions suggested operational adjustments as a first step, including periodic shut-down of turbines during peak periods of high risk; and/or adjusting turbine cut in speeds or feathering turbine blades (Government of Ontario 2017; Craig and Holroyd 2016; California Energy Commission (CEC) and California Department of Fish and Game (CDFG) 2007). Details on seasonal and temporal adjustments of wind turbine operations are specific to local species and context of the project. If operational adjustments are not effective, jurisdictions described actions such as, but not limited to, turning a turbine off, removing turbines and/or repowering turbines.

Mitigation measures explored in the literature include:

- Lighting regimes, turbines with flashing red lights produced the lowest bird mortality rates of any FAA-approved design, yielding bird mortality levels indistinguishable from turbines with no lights (Willmott et al. 2012);
- Repowering turbines, replacing several small turbines with a few large ones can reduce collision percentages (Smallwood and Karas 2009);
- Curtailing Operations: In the United States and Canada, most curtailment studies report at least a 50% reduction in bat fatalities when turbine cut-in speed was increased by >1.5 m/s above the manufacturer's recommended cut-in speed, with up to a 93% reduction in bat fatalities in one study (Arnett and Baerwald 2013).
- Other ideas have not proven to be effective and are likely species specific, such as blade painting, and ultra-sonic and audible deterrents (Arnett and Baerwald 2013; Willmott et al. 2012).

Lessons Learned

A few jurisdictions shared lessons learned in relation to developing wind energy and impacts on wildlife:

- In Ontario, the establishment of solid thresholds was a positive approach over a project-by-project review because it has resulted in policy consistency across the province.
- In New Brunswick, requests from wind proponents to vary survey protocols has resulted in increased workload and time for government staff, not currently a major issue but could be if number of projects increase.
- In Scotland, wind development has not commonly occurred on sensitive wildlife habitat and features reducing conflict with wildlife and the need for mitigation. Working closely with the wind industry has helped to ensure best placement of projects and turbines to reduce wildlife impacts.
- In Tasmania, there is concern that wind development is often proposed in areas where birds migrate or in sensitive wildlife habitat. These types of areas should be avoided to reduce impacts on wildlife.

Jurisdictional Findings

Six tables were developed representing jurisdictional responses to key questions in relation to:

- Regulation of wind energy development (Table 2); to provide an understanding of legislative tools that protected wildlife and wildlife habitat as well as an understanding regulations relating to compliance and reclamation;
- Site selection and turbine siting (Table 3); to provide an understanding of recommended features to avoid, no-go areas, tools to help identify critical and established setbacks for significant ecological features;
- Pre-construction surveys (Table 4); to provide an understanding of ,what is surveyed for and when, where and how pre-construction surveys are undertaken and if there are metrics that would constrain or prevent development;

- Post-construction surveys (Table 5); to provide an understanding of what is surveyed for, and when, where and how post-construction surveys are undertaken and appropriate survey length;
- Thresholds and mitigation (Table 6); to provide an understanding of thresholds relating bat and bird mortality and types of mitigation options implemented; and
- Lessons learned (Table 7), to provide an understanding of successes and challenges relating to wildlife and wind energy development.

To help the users an acronym list has been developed in Appendix C.

Table 2: Regulation of wind energy development						
Jurisdiction	Regulator	Tools to help guide protection of wildlife	Compliance	Public Lands	Reclamation Requirements	Sources
Ontario	<ul style="list-style-type: none"> Ministry of the Environment and Climate Change (MOECC) NOTE: If permits are required beyond the Renewable Energy Approval (e.g., a permit from a local conservation authority) then those regulators would apply as well. 	<ul style="list-style-type: none"> The following legislative tools protect wildlife and habitat in association with wind development: <ul style="list-style-type: none"> Ontario Wildlife Protection Act Endangered Species Act <ul style="list-style-type: none"> MOECC website has documents related to endangered species guidance Endangered species approval is a separate regulatory process from the renewable energy approval (MNRF is responsible) Fish and Wildlife Act Provincial Parks and Conservation Reserves Act, 2006 Local “Development, Interference with Wetlands and Alterations to Shorelines and Watercourses” regulations formed under Section 28 of the Conservation Authorities Act (if applicable). This regulation would generally only apply to wetlands, shorelines, watercourses, and floodplains Wind development project must undergo Renewable Energy Approval. These approvals are required under: <ul style="list-style-type: none"> The Green Energy and Economy Act – amended other legislation to create the Renewable Energy Approval Renewable Energy Approval - Regulation 359 of the Environmental Protection Act Ministry of Natural Resources and Forestry department (MNRF) has developed a policy document that outlines how MNRF manages renewable energy development on crown land. 	<ul style="list-style-type: none"> MOECC MNRF and the Ministry of Tourism, Culture and Sport have a role in reviewing certain parts of the applications to ensure that their specific legislation is met as well. MOECC has compliance inspectors who inspect based on the terms and conditions of the renewable energy approvals. If they determine non-compliance it is sent to the investigation and enforcement branch of MOECC. NOTE: If permits are required beyond the Renewable Energy Approval (e.g., a permit from a local conservation authority, or under the Endangered Species Act) then other regulatory compliance regimes would apply as well. Compliance is effective 	<ul style="list-style-type: none"> Renewables can be located on public lands MNRF has developed a policy document that outlines how MNRF manages renewable energy development on crown land.- https://www.ontario.ca/document/renewable-energy-crown-land-policy Regulatory regime is the same (in regards to fish and wildlife) 	<ul style="list-style-type: none"> Yes there are reclamation requirements built in to the approval process that MOECC conducts. May be linked to wildlife objectives if species is identified in Ontario’s Endangered Species Act 	(Government of Ontario 2016e; Government of Ontario 2016d; Government of Ontario 2016c; Government of Ontario 2016b; Government of Ontario 2016a)
Scotland	Regulator depends on the size of the wind project	Legislative tools that guide decisions relating to wildlife and wind development include:	Compliance is shared between the Planning Authority, Scottish	Renewables can be located on public lands	Planning Permission gives requirements (conditions) for	

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Jurisdiction	Regulator	Tools to help guide protection of wildlife	Compliance	Public Lands	Reclamation Requirements	Sources
	<ul style="list-style-type: none"> ○ Over 50mW installed capacity - the regulator (consent and permitting) is the Scottish government, Local Energy and Consent department ○ Under 50mW is regulated (consent and permitting) by the local authority (Scotland is divided into 32 local authorities based on population size) ○ Electricity Act states where you get permission from for your project. ○ Scottish Natural Heritage (SNH) are advisors to the government on natural heritage. SNH is a consultee in the planning process. SNH is not a government department, but they are a government agency and are fully funded by the Scottish government. ○ Planning is guided by the Scottish Planning Policy (SPP) which is written by the Scottish government with the aid of organizations such as SNH and public consultation - steers planning for all development across all of Scotland including renewables. ○ The Local Authority has authority to oppose a wind farm development but Scotland has developed no-go areas and those would be the only areas where wind can't be developed. Developers can still submit a proposal in the no-go areas but it will be met 	<ul style="list-style-type: none"> ○ Scottish planning system – conditions are informed by the Environmental Impact Assessment (EIA) regulations ○ Environmental Impact Assessment (EIA) ○ Legislation from Europe <ul style="list-style-type: none"> ○ Protects species and habitats ○ Scotland Wildlife and Countryside Act <ul style="list-style-type: none"> ○ Ensure Habitats are viable for the future ○ Rare and sensitive species, maintain viable population ○ Guides National protected areas policy ○ Sites of special scientific interest ○ Endangered species are covered in various sections of legislation 	<ul style="list-style-type: none"> Environment Protection Agency (SPEA), and Scottish Natural Heritage (SNH). ○ SNH ensures that wildlife conditions are met but rarely does the inspections ○ Inspections are conducted by the Planning Authority, SEPA, and the local authority to ensure development and planning conditions are being met. ○ Compliance is effective. Over time there has been a decline in wildlife crime. There are enforcement departments within the local authorities to enforce planning conditions for the benefit of the environment and natural heritage. Police are employing more wildlife officers and pursuing wildlife crime to a greater degree. Raptor persecution has been an issue but it is now declining. 	<ul style="list-style-type: none"> ○ Regulations are the same for private and public lands 	<ul style="list-style-type: none"> reclamation and restoration of land. Two Phases: <ul style="list-style-type: none"> ○ Construction reclamation and ○ Decommissioning or repowering. ○ BMP construction techniques to minimize amount of reclamation needed (guidance documents from SNH) ○ During operation there is ongoing maintenance and habitat improvement guided by Habitat Management Plan Compensation Plan. ○ National Peatland Plan, aims to improve peatland across Scotland, they work with wind farms to get habitat management plans to help restore peatland conditions. ○ Repowering turbines – not able to reuse the base so it either has to be left in the ground or removed. In some environments leaving it in the ground can have huge impacts on the environment. ○ Decommission condition example: All above ground infrastructure to be removed down to 1m below ground (all associated buildings such as substations, bathrooms, etc.) and turbines removed down to foundation level and covered with soil and replanted for habitat restoration. Drainage 	

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	with a lot of scrutiny and will likely be objected against. Local authority can challenge the SPP but it's not in their best interest and they usually try to work it out with Scottish government.				pathways need to be remade. Ground restored to as it was or better before the wind farm.	
New Brunswick	<ul style="list-style-type: none"> o Department of Energy and Resource Development (Government department) 	<ul style="list-style-type: none"> o Department of Environment and Local Government using following legislation: <ul style="list-style-type: none"> o Clean water Act <ul style="list-style-type: none"> ▪ Activities defined under the Act as alterations in or near watercourse or wetlands require a permit under the Watercourse and Wetland Alteration Regulation. These include changes to existing structures, operation of machinery, deposit or removal of materials, disturbance of the ground, and removal of vegetation or trees. o Clean Environment Act, EIA Regulation <ul style="list-style-type: none"> ▪ Applies to undertakings listed in Schedule A of the Act, including all enterprises, activities, projects, structures, works or programs affecting any unique, rare or endangered feature of the environment. o Fish and Wildlife Act – Protects vertebrates o Species at Risk Act – Protects species at risk, that are in Schedule A of Regulation 2013-39, under the SARA. o Migratory Birds Convention Act - Federal legislation, but still considered. o Crown land review done first and then an EIA is usually done. 	<ul style="list-style-type: none"> o The following all ensure Compliance: <ul style="list-style-type: none"> o Department of Environment and local government both have inspectors o Department of Energy and Resource development - check waterways, and has conservation officers o Department of Health – deals with water quality o Municipalities also have a say in compliance. They can ensure companies are complying with the rules set out in approval process. o Non-compliance mechanism and enforcement: <ul style="list-style-type: none"> o Inspections identify non-compliance o They are guided by a compliance and enforcement policy: http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Publications/ComplianceEnforcementPolicy.pdf o Yes, compliance is effective 	<ul style="list-style-type: none"> o Most of the wind projects in New Brunswick are on public land (crown land). o Wind developers apply for a License of Occupation for crown land o Regulations are the same for private and public lands 	<ul style="list-style-type: none"> o Yes there are reclamation requirements o A rehabilitation plan must accompany the development plan when wind developers apply, outlining the removal of towers, outbuildings, guy wires, etc... o Wind Turbines and Birds (A guidance document) – outlines reclamation requirements: http://publications.gc.ca/collections/collection_2013/ec/CW66-363-2007-eng.pdf o Reclamation requirements are linked to habitat in general o Wetland compensation, if alterations to wetlands are unavoidable. New Brunswick has a no net loss policy. 	(Environment Canada: Canadian Wildlife Service 2007b; Government of New Brunswick: Department of Natural Resources 2012; Government of New Brunswick: Department of Environment 2010)
British Columbia	<ul style="list-style-type: none"> o As background, wind projects in Northeast BC will fall under one of two review processes, depending on whether or not the project meets the definition of a 'reviewable 	<ul style="list-style-type: none"> o There are several pieces of provincial legislation that help to protect and manage wildlife habitat, including, but not limited to, the <i>Wildlife Act</i>, <i>Land Act</i>, <i>Park Act</i>, <i>Water Sustainability Act</i>, and the <i>Forest and Range Practices Act</i>. Federal legislation is also considered (e.g. <i>Species at Risk Act</i>, <i>Federal</i> 	<ul style="list-style-type: none"> o The agency ensuring compliance depends on the legislation under which permits/authorizations were granted. Can involve a variety of government 	<ul style="list-style-type: none"> o Wind development can occur on public lands. o <i>Wind development Policy on Public Lands</i> - http://www2.gov.bc.ca/assets/gov/farming-natural-resources- 	<ul style="list-style-type: none"> o Reclamation requirements are project and value specific and typically addressed during the application (whether that be EAO or sub-threshold projects) review process. 	(Government of British Columbia 2013; Government of British

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Jurisdiction	Regulator	Tools to help guide protection of wildlife	Compliance	Public Lands	Reclamation Requirements	Sources
	<p>project’ as per the Reviewable Projects Regulation of the <i>Environmental Assessment Act</i> - regulation available at: http://www.bcclaws.ca/civix/document/id/loo79/loo79/13370_2002.</p> <ul style="list-style-type: none"> ○ The Ministry of Forests, Lands and Natural Resource Operations (FLNRO) is the lead agency for the regulatory review of Crown land wind power project proposals below 50 megawatts (MW). Application process and requirements available at: http://www2.gov.bc.ca/gov/content/industry/natural-resource-use/land-use/crown-land/crown-land-uses/clean-energy/wind-power. ○ The Environmental Assessment Office (EAO) leads the review for projects that exceed the 50MW as per the Reviewable Projects Regulation. Details of the EAO review process available at: http://www.eao.gov.bc.ca/ea_process.html. ○ The Decision Maker on the project depends on the review process and Act that the decision falls under. <ul style="list-style-type: none"> ○ For sub-threshold major projects there could be several Decision Makers given the permits required from a variety of business lines (e.g. <i>Land Act</i> - Director of Authorizations, <i>Wildlife Act</i> - Director of 	<p><i>Fisheries Act</i>).</p> <ul style="list-style-type: none"> ○ More specific examples from the Northeast Region, of tools to help guide wildlife protection include, but are not limited to: <ul style="list-style-type: none"> ○ Government Actions Regulation (GAR) under <i>FRPA</i> – designations include identifying and mapping specific areas for which legal orders can be developed for species at risk, regionally important wildlife and ungulate species. <ul style="list-style-type: none"> ▪ <i>Wildlife Habitat Area (WHA)</i> - http://www.env.gov.bc.ca/wld/frpa/iwms/index.html. ▪ <i>Ungulate Winter Range (UWR)</i> - http://www.env.gov.bc.ca/wld/frpa/uwr/index.html ▪ <i>Fisheries Sensitive Watershed (FSW)</i> - http://www.env.gov.bc.ca/wld/frpa/fsw/index.html ○ Implementation Plan for the Ongoing Management of South Peace Northern Caribou in British Columbia (and associated direction i.e. South Peace Northern Caribou Mitigation and Monitoring Plan Guidance); documents accessible at: http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/wildlife/wildlife-conservation/caribou/central-mountain-caribou. ○ Motor Vehicle Closures (these closure areas are established for the protection of high elevation habitats under the <i>Wildlife Act</i>). ○ Old Growth Management Areas (OGMA) (legally established under the <i>Land Act</i> in the South Peace to maintain old growth biodiversity values over time; intrusion thresholds exists as a means to ensure ecological integrity and functionality of the OGMA). ○ Non - administered Conservation Lands (these map reserves are established under the <i>Land Act</i> with the goal being to conserve and manage important habitat for the benefit of regionally or internationally significant fish and 	<p>agencies/business lines (e.g. Conservation Officer Service for <i>Wildlife Act</i> matters, FLNRO Compliance and Enforcement staff for <i>FRPA</i> issues etc.).</p> <ul style="list-style-type: none"> ○ The Environmental Assessment Office has its own Compliance and Enforcement Staff that are dedicated to the EAO certificate conditions specifically. 	<p>and-industry/natural-resource-use/land-water-use/crown-land/windpower.pdf</p>		<p>Columbia 2016a; Government of British Columbia 2017; Government of British Columbia 2004)</p>

Table 2: Regulation of wind energy development

Jurisdiction	Regulator	Tools to help guide protection of wildlife	Compliance	Public Lands	Reclamation Requirements	Sources
	<p>Resource Management, FRPA - District Manager etc.).</p> <ul style="list-style-type: none"> The provincial Minister of the Environment and another minister responsible for that category of reviewable project are the Decision Makers on EAO Certificates. 	<p>wildlife species).</p> <ul style="list-style-type: none"> Environmental Mitigation Policy. Regional and Provincial BMP's. 				
Tasmania, Australia	<ul style="list-style-type: none"> Environment Protection Authority (EPA) Tasmania, under the Tasmanian legislation (Environmental Management and Pollution Control Act 1994), is responsible for the assessment and regulation of wind farms with a maximum generating capacity of 30 MW or greater (smaller wind generating activities are generally regulated by local Council). Tasmania currently has three operating wind farms that are regulated by EPA Tasmania. In addition to environmental approval, wind farms generally require approval from the local planning authority (Council). Regulator is: EPA, Department of Primary Industries, Parks, Water and Environment (DPIPWE), Local government, depending on the project. (See the compliance section for further detail) The staff that work for the EPA work for a government department <ul style="list-style-type: none"> The DPIPWE is a 	<ul style="list-style-type: none"> Assessment and Approval Process done for all wind projects. This includes wildlife surveys. <ul style="list-style-type: none"> EPA generally regulates pollution control (emissions to air, water, and land) DPIPWE incorporates advice from their threatened species specialists regarding birds and wildlife impacts. They can either incorporate conditions into their permits or the separate threatened species legislation can be triggered as well. It's a collaborative approach to threatened species. Environmental Management and Pollution Control Act 1994: Where there are matters of national environmental significance which may be impacted (usually relating to threatened species), approval under the Commonwealth legislation (Environment Protection and Biodiversity Conservation Act 1999) may also be required in addition to the state's requirements. National Strategy for the Conservation of Australia's Biological Diversity, Draft Tasmania's Nature Conservation Strategy Threatened Species Strategy for Tasmania The Draft National Wind Farm Development Guidelines by The Environment Protection and Heritage Council (EPHC) Example of the Low Head Wind Farm Guidelines: http://epa.tas.gov.au/Documents/Low%20Head%20Final%20-%20DPEMP%20Guidelines.pdf 	<ul style="list-style-type: none"> Environment Protection Authority (EPA) Tasmania, under the Tasmanian legislation (<i>Environmental Management and Pollution Control Act 1994</i>), is responsible for the assessment and regulation of wind farms with a maximum generating capacity of 30 MW or greater (EPA can regulate smaller projects as well) Smaller wind generating activities are generally regulated by local Councils with advice from the state based agency Department of Primary Industries, Parks, Water, and Environment (DPIPWE) <ul style="list-style-type: none"> DPIPWE has: threatened species specialists, staff who administer particular flora and fauna conservation legislation. EPA has an independent board that manages environmental compliance Management is conducted in combination by both the EPA and DPIPWE EPA is separate from the DPIPWE but is related. When a wind farm is 	<ul style="list-style-type: none"> Wind development occurs on public lands, there are two types: <ul style="list-style-type: none"> Crown lands (state land) <ul style="list-style-type: none"> proponent needs Crown permission to operate on the public land, permission given through an assessment and permit process A lot of the approval comes through the EPA's (DPIPWE's) assessment process. Part of the Environmental assessment process is ensuring that the land owners give permission for use of their land. If the project is on crown land it needs to go through the above permitting process, otherwise everything else is the same. Very little federal land in Australia. Most of it is military bases or similar. 	<ul style="list-style-type: none"> As part of the assessment and approval process they need to identify a general plan for 20-25 years down the road when decommissioning is expected to occur. This can be broad at the time and needs to be completed in more detail later on. As part of the conditions for the approval there is a requirement to prepare a decommissioning plan at a certain period of time before decommissioning is to expected to commence. This plan is submitted to the DPIPWE for review and approval before decommissioning can commence. <ul style="list-style-type: none"> Ex. The plan may be to erect new turbines and undergo a new assessment and approval process, or the plan may be to completely decommission the site and return it to the land owner. Most of the turbines are on private land so there are usually compensation agreements in place with the land owners. 	<ul style="list-style-type: none">

Table 2: Regulation of wind energy development

Jurisdiction	Regulator	Tools to help guide protection of wildlife	Compliance	Public Lands	Reclamation Requirements	Sources
	<p>government department under the umbrella of EPA</p> <ul style="list-style-type: none"> ○ The DPIPWE staff work as public service employees and sends information to the board for the board to make their decisions. ○ EPA also has an independent board, they are at arm's length from the government in that the General Manager of the EPA sits on the board but the other board members are completely independently appointed. ○ Decisions for approval are made by this independent board, not by a minister. ○ A summary of how the EPA and the Department of Primary Industries, Parks, Water and Environment interact/relate in Tasmania: http://epa.tas.gov.au/Pages/About-Us.aspx 		<p>approved it comes with approval conditions, including wildlife conditions</p> <ul style="list-style-type: none"> ▪ Permit conditions example from Cattle Hill: If there is non-compliance, ex. A turbine kills a certain number of birds, an investigation happens to understand why that occurred. They may be required to do more surveying or more work on the issue and ultimately they can be prosecuted ○ Compliance is considered effective. <ul style="list-style-type: none"> ○ Prosecution in Tasmania is rare. ○ The main focus is trying to work through the problem and cause to try to prevent it before it has to go to enforcement, infringement notices, and prosecution (those enforcement options are available to the department) ○ It is difficult to gather enough evidence and information to support a court case ○ They try to work through the conditions and get compliance with those conditions through a cooperative approach instead of using enforcement. Ultimately if that doesn't work they do have enforcement provisions. ○ Sometimes this can lead to a variation in the 			

Jurisdiction	Regulator	Tools to help guide protection of wildlife	Compliance	Public Lands	Reclamation Requirements	Sources
			conditions. If things aren't working out with the conditions, they can be varied to require more work to be done or to have more stringent conditions placed on them.			

Jurisdiction	Features to Avoid	Absolute 'No-Go' Areas	Tools of High-risk Areas	Avoidance Areas for Other Industries (same or different)	Are there setbacks for features (wetland, species...)	Sources
Ontario	<ul style="list-style-type: none"> Significant natural features (e.g., provincially significant wetlands, woodlands, Species of Concern Habitat etc.) and their associated setbacks (see setbacks column) NOTE: Criteria for identifying these features is outlined in the Natural Heritage Assessment Guide for Renewable Energy Projects https://dr6j45jk9xcmk.cloウドfront.net/documents/2716/stdprod-101413.pdf <ul style="list-style-type: none"> Waterbodies floodplains, and associated setbacks (as per section 39, 40, 44, and 45 of the REA regulation) Fish and wildlife habitat as per the Fish and Wildlife Act Endangered species habitat as per the 	<ul style="list-style-type: none"> Within Provincial Parks and Conservation Reserves with some exceptions in the Provincial Parks and Conservation Reserves Act, 2006 	<ul style="list-style-type: none"> Renewable Energy Atlas (REA) - https://canadianqis.com/ontarios-renewable-energy-atlas-and-maps.php Additional data of importance at: <ul style="list-style-type: none"> Land Information Ontario (LIO) - https://www.javacoeap.p.lrc.gov.on.ca/geonet/work/srv/en/main.home Natural Resource Value Information System (NRVIS) - http://www.geography.network.ca/ 	<ul style="list-style-type: none"> Avoidance areas are not different between industries No industry can build in protected area with the exception of a transmission corridor, which triggers a Parks and Protected Area Class EA (MNRF). 	<ul style="list-style-type: none"> Setbacks are based on significant natural features that are identified through the required submission of a Natural Heritage Assessment (NHA). Documents that outline setbacks: <ul style="list-style-type: none"> Technical Guide to Renewable Energy Approvals (MOECC) Natural Heritage Assessment Guide for Renewable Energy Projects - https://www.ontario.ca/document/natural-heritage-assessment-renewable-energy-projects Birds and Bird Habitats: Guidelines for wind power projects - https://www.ontario.ca/document/birds-and-bird-habitats-guidelines-windpower-projects Bat and Bat Habitats: Guidelines for Wind Power Projects – https://www.ontario.ca/document/bats-and-bat-habitats-guidelines-wind-power-projects Examples: <ul style="list-style-type: none"> 120 m setback for significant wildlife habitat (SWH) and natural heritage features (provincially significant wetlands, woodlands, areas of natural and scientific interest). <ul style="list-style-type: none"> Wildlife habitat is considered significant where it is: ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or Natural Heritage System. - https://www.ontario.ca/document/guide-significant-wildlife-habitat 1000m setback on bat hibernacula, 120m for bat SWH In addition to the setbacks required as a part of the Renewable 	(Ontario Ministry of Natural Resources 2009; Ontario Ministry of Natural Resources 2011a; Ontario Ministry of Natural Resources 2011b; Ontario Ministry of Natural Resources 2012)

Table 3: Project and Turbine Siting						
Jurisdiction	Features to Avoid	Absolute 'No-Go' Areas	Tools of High-risk Areas	Avoidance Areas for Other Industries (same or different)	Are there setbacks for features (wetland, species...)	Sources
	Endangered Species Act, 2007				Energy Approval (REA) review, additional setbacks and requirements may also be associated with other legislation including Endangered Species Act, 2007, local legislation under the Conservation Authorities Act, etc.	
Scotland	<p>The following area are avoided:</p> <ul style="list-style-type: none"> ○ Top level European protected areas – ex. Golden eagle ranges, woodlands of a certain type, wetlands of the certain type; usually underpinned by sites of special scientific interest. If you want to develop in these areas you need to do an appraisal and show beyond scientific doubt that your development won't affect the integrity of that site and the conservation objectives of that site. Appraisal is done by the developer, the local authority assesses the appraisal and then the assessment is reviewed by SNH. ○ SPP - Spatial framework 3 tiers <ul style="list-style-type: none"> ○ Tier 1 - National Parks and National scenic areas (No-Go areas) ○ Tier 2 – grouped areas of significant protection (would require a lot of scrutiny and an EIA)- including world heritage sites, sites of special scientific interest, national nature reserves. Visual impact 	<p>No-go areas are guided by SPP - Spatial framework and include Tier 1 ladled National Parks and National scenic areas.</p> <ul style="list-style-type: none"> ○ However for Scotland's two National Parks; and National Scenic Areas, developers can still put in a proposal. 	<ul style="list-style-type: none"> ○ The SNH has developed numerous guidance documents available: http://www.snh.gov.uk/docs/A1666404.pdf ○ Local authority development plan (Province equivalent) – provide maps of constraints for wind farm developments including: <ul style="list-style-type: none"> ○ Protected areas ○ Historic areas ○ Cultural areas ○ Map of Wild land areas (outside of urban area) – protected by policy not legislation - On SNH website ○ Map of protected peatland areas, priority peatland areas - protected by policy not legislation - On SNH website ○ Map of bird sensitivity Area – On SNH website: http://www.rspb.org.uk/our-work/rspb-news/news/details.aspx?id=tc:m:9-179628 ○ The Scottish Natural Heritage Collision Risk Model 	<ul style="list-style-type: none"> ○ Constraints are the same for all industries. ○ Everything is grouped together as development management, requiring planning permission. ○ Scottish planning policy (SPP) sets out what criteria need to be assessed. 	<ul style="list-style-type: none"> ○ Up to each local authority to determine setbacks ○ No over-arching setback areas ○ All of Scotland has been assessed for its landscape character <ul style="list-style-type: none"> ○ Detailed Character Description of a particular area across all of Scotland ○ Tool used to evaluate specific sites regarding landscape and visual impact assessment. Developer could submit a photo of the area with superimposed turbines and the SNH landscape advisors can compare it to the area description (landscape character) to determine impacts to that specific area. ○ Wildlife and Countryside Act protect nest structures. Features like these are taking into consideration in the planning permission process and are mitigated appropriately, ex. Construction timing. 	

Table 3: Project and Turbine Siting						
Jurisdiction	Features to Avoid	Absolute 'No-Go' Areas	Tools of High-risk Areas	Avoidance Areas for Other Industries (same or different)	Are there setbacks for features (wetland, species...)	Sources
	for communities.					
New Brunswick	<ul style="list-style-type: none"> ○ Crown land with wind development is guided by criteria set out in the "Allocation of Crown Lands for Wind Power Policy" http://www2.gnb.ca/content/dam/gnb/Departments/nr-rn/pdf/en/Publications/CLM0172005.pdf ○ Area recommended to avoid include coast lines, major waterbodies (lakes and rivers), bat hibernacula (i.e. cave, abandoned mine), forested ridge habitat. ○ If they can't avoid these features, the developer will be asked to do additional surveys in these areas. ○ Site selection considerations are found in the document "Wind Turbines and Birds – A Guidance document for Environmental Assessment (Environment Canada: Canadian Wildlife Service 2007b)". On page 17 there is a table that mentions some of the areas to avoid. This is used in conjunction with facility size and special considerations (SAR presence) to determine the "level of concern category". The level of concern determines the length of post-construction surveys. Figure 2 illustrates this well 	<ul style="list-style-type: none"> ○ No-go areas include all Protected Natural Areas, park lands (provincial and federal), operational quarries or mining sites, economically viable peat lands, deer wintering areas, old forest communities and habitats, Eastern habitat joint venture (EHJV) sites, RAMSAR sites, International Shorebird Reserves, ○ Other sites that are specific to bird, fish, wildlife and environmental concerns identified during the review process may also be no-go areas. 	GIS website GeoNB mapping tool, shows wetlands: http://www.snb.ca/geonb1/e/index-E.asp	Yes, avoidance areas may be different depending on the industry and risks associated with each project.	<p>Yes there are setbacks outlined in following documents:</p> <ul style="list-style-type: none"> • "Allocation of Crown Lands for Wind Power Projects" http://www2.gnb.ca/content/dam/gnb/Departments/nr-rn/pdf/en/Publications/CLM0172005.pdf • "Forest Management Manual for New Brunswick Crown Land: Interim Manual" http://www2.gnb.ca/content/dam/gnb/Departments/nr-rn/pdf/en/Publications/ForestManagementManual.pdf <p>Some examples include:</p> <ul style="list-style-type: none"> ○ Lakes, watercourses, wetlands, protected natural areas. 150 m or 1.5x the height of turbine, whichever is greater. ○ Coastal features (coastal wetlands, estuaries, beaches and dunes). 500 m ○ Endangered species habitat, National Wildlife Areas, Migratory Bird Sanctuary. 500 m. ○ Important migratory bird nesting sites and migration routes, important water-bird breeding colonies. 1000 m. ○ Bat migration routes or hibernacula. 5km ○ Stick nests. 3 buffer widths, a harvest-type constraint zone, a non-breeding season harvest zone, and a no-road zone. 100, 200 and 400 m (Note there are some species that have a smaller buffer, but generally it is 100, 200, 400 m.) (New Brunswick Department of Natural Resources 2004) 	(Environment Canada: Canadian Wildlife Service 2007b; New Brunswick Department of Natural Resources 2004; Government of New Brunswick: Department of Natural Resources 2012)

Table 3: Project and Turbine Siting						
Jurisdiction	Features to Avoid	Absolute 'No-Go' Areas	Tools of High-risk Areas	Avoidance Areas for Other Industries (same or different)	Are there setbacks for features (wetland, species...)	Sources
	(p.9).					
British Columbia	<ul style="list-style-type: none"> Wildlife habitat features. There are areas within the Northeast Region where the Province has implemented designations on the land base that may constrain development opportunities, including but not limited to: <ul style="list-style-type: none"> Motor Vehicle Closure Areas. High Elevation Winter Range (HEWR) (and possibly other important habitat types for caribou e.g. Low Elevation Winter Range (LEWR)). Legally established GAR polygons. Conservation Lands. 	<ul style="list-style-type: none"> Parks and Protected Areas. 	<ul style="list-style-type: none"> Provincial Geographic Data and Services, more specifically BC Geographic Warehouse and iMapBC, which are accessible at: http://www2.gov.bc.ca/gov/content/governments/about-the-bc-government/databc/geographic-data-and-services?WT.svl=LeftNav. 	<ul style="list-style-type: none"> Similar, but avoidance areas may have different operational setbacks, timing restrictions and management objectives depending on the sector. 	<ul style="list-style-type: none"> Several regional and provincial Best Management Practices documents offer insight in this regard - document entitled "A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia – Interim Guidance," is particularly useful – document accessible at: http://www.env.gov.bc.ca/wld/BMP/bmpintro.html#third <ul style="list-style-type: none"> Example Birds: 50m song birds, 100m waterfowl, 50m swallow colonies and 500m trumpeter swan habitat. Example Bats: Hibernacula 300m. Operational setbacks are often project and value specific and are addressed in the various mitigation plans that get produced e.g. Environmental Management Plan, Wildlife Management Plan etc. Insight from Qualified Professionals is critical in determining the appropriateness of setbacks proposed for a specific project and/or value. Proponents are required to implement Riparian Management Area setbacks from watercourses and waterbodies, as identified under FRPA. 	(Craig and Holroyd 2016; Government of British Columbia 2004)
Tasmania, Australia	<ul style="list-style-type: none"> There has not been much strategic top assessment done in Tasmania for wind. Evaluated on a case by case basis. The proponent comes to DPIPWE with a location (in a proposal) and has to justify the location. They have to justify: <ul style="list-style-type: none"> Why it's a good location for a wind farm Why it's not going to have negative impacts on particular species, in particular the wedge-tailed eagle (Threatened) DPIPWE finds that a lot of these wind turbines are 	No-go area include: <ul style="list-style-type: none"> Areas that would affect species at risk, World Heritage Area (whole SW of Tasmania) National Parks 	<ul style="list-style-type: none"> Online, publically accessible GIS tool: ListMap <ul style="list-style-type: none"> Reserves: Public Reserves, National Parks, Conservation Areas, etc. Threatened species mapping, observations The LIST – Land Information System Tasmania – click on 'LISTmap' and it takes you through to the mapping tool, there is a little tab in the top right hand side where you can add layers to the map – natural values information, cadastral information, eagle nests, geology, soils, climate 	<ul style="list-style-type: none"> No, avoidance areas are the same for all industries. No in regards to national parks and world heritage areas. Other big industries in Tasmania are Mining and agriculture and they are not allowed in national parks or world heritage areas either. 	<ul style="list-style-type: none"> Species at Risk requirement for wedge-tailed eagles and associated features for wind turbines. There are setbacks but this is determined by the research/surveys done by the developers. The research goes back to DPIPWE and they make a decision regarding setbacks of features like nests or an active eagle area. Other features that have setbacks (wetlands, rivers) are assessed on a case by case basis, in addition DPIPWE would recommend not developing on the sensitive feature (i.e. wetland) and then they would determine what the setback should be. 	<ul style="list-style-type: none">

Jurisdiction	Features to Avoid	Absolute 'No-Go' Areas	Tools of High-risk Areas	Avoidance Areas for Other Industries (same or different)	Are there setbacks for features (wetland, species...)	Sources
	<p>located close to coastal areas and good habitat for the eagles (occupied habitat). This is a bit of an issue.</p> <ul style="list-style-type: none"> o Tasmania has almost saturated wind renewables for the time being in regards to good locations and adequate connections to the grid 		<p>change risk maps, a whole range of really useful information for the general public, developers, and government:</p> <p>https://www.thelist.tas.gov.au/app/content/home</p>			

Jurisdiction	Survey Protocols/ Requirements	Length of Surveys (year)	Species/Habitat Surveyed for	How reported back	Risk to wildlife – Metric and Thresholds	Data Expiry Date	Sources
Ontario	<ul style="list-style-type: none"> o Yes there are protocols involved in the Renewable Energy Approval o Natural Heritage Assessment (NHA) is required. The NHA identifies significant natural heritage features, species of special concern habitats, and associated setbacks surrounding the proposed development. If the significance of the feature is unevaluated an assessment of significance is required. o If the wind development is not within a significant feature and/or its setback (as outlined in documented from previous table), then no additional pre-construction surveys are needed. o If project is within outlined setbacks (e.g.120m for SWH) or the significant feature itself then an Environment Impact Study (EIS) needs to be incorporated into the NHA report to determine how any potential negative environmental impacts can be avoided or mitigated. <ul style="list-style-type: none"> o An Environmental Effects Monitoring Plan (EEMP) may also need to be incorporated to monitor and address negative environmental effects on certain species. o Procedures for the NHA, (including the EIS, and EEMP submissions) are outlined in the Natural Heritage Assessment Guide for Renewable Energy Projects - 	<ul style="list-style-type: none"> o Within the NHA the length of survey is dependent on feature and/or species being evaluated as different protocols have been created for different features. <ul style="list-style-type: none"> • e.g. If an evaluation of significances is required then specific survey lengths are required depending on the region (see http://www.ontariocanada.com/registry/view.do?postingId=8403) o Additional survey requirements and lengths may be required under other legislation (e.g., Endangered Species Act, 2007, local legislation under the Conservation Authorities Act) if applicable. 	<ul style="list-style-type: none"> o Significant Wildlife habitat o Example: Bat SWH includes bat hibernacula; bat maternity colonies; and bat migratory stopover areas. o For each bat SWH feature survey protocols are outlined for survey stations, survey period and effort, weather conditions and survey equipment. o Natural Features and their significance o Endangered Species and their habitat if applicable 	<ul style="list-style-type: none"> o NHA Report for REA o Other reports may be require on a site by site basis dependent on the applicable legislation 	<p>Risks to wildlife have been identified then this is to be determined through review EEMP</p>	<ul style="list-style-type: none"> o Applications and approvals occur on a tight deadline. As such there has not been a need to set a data expiration date. o No wind projects have been encountered with data older than 2 years. 	

Table 4: Pre-Construction Surveys

Jurisdiction	Survey Protocols/ Requirements	Length of Surveys (year)	Species/Habitat Surveyed for	How reported back	Risk to wildlife – Metric and Thresholds	Data Expiry Date	Sources
	<p>https://dr6j45jk9xcmk.cloudfront.net/documents/2716/st_dprod-101413.pdf</p> <ul style="list-style-type: none"> o EIS reporting includes record search, site investigation, evaluation of significance, and mitigation measures o Additional survey and study requirements may also be required under other legislation such as the Endangered Species Act, 2007. 						
Scotland	<p>Yes there are protocols developed for pre-construction surveys:</p> <ul style="list-style-type: none"> o Environmental Impact Assessment (EIA) <ul style="list-style-type: none"> o For a development that meets certain criteria and will affect a sensitive area the proponent needs to undertake an Environmental Impact Assessment o An EIA is conducted when there is either: <ul style="list-style-type: none"> ▪ 2 wind turbines or, ▪ a turbine greater than 50m in height o EIA can range from desktop study work to a two year field study/surveys for bird, bats, vegetation, habitat, fresh water, depending on the sensitive receptors for that area. o EIA can either be a massive undertaking or small depending scale of project and the sensitivities around it. o EIA's are undertaken by consultants hired by the developer. o EIA – SNH is the authority for this and outlines what needs to be done. Developers are expected to follow SNH's survey guidance. There is general agreement amongst developers and local authorities that if you follow SNH's guidelines for assessments and surveys you will be consistent and can move forward more easily. o Pre-construction survey guidance protocols are designed specifically for: <ul style="list-style-type: none"> ▪ Birds and landscape impacts, risk of collision and impacts on the landscape character. ▪ Bats (coming soon, not currently available), Peatlands, vegetation and habitats, fresh water, landscape characteristics ▪ Guidance for collision risk, displacement, connectivity to designated European level protected areas. 	<p>Protected Species and Habitat Surveys (flora and fauna) require 6-12 months depending on monitoring parameters. http://www.snh.gov.uk/docs/A1168678.pdf</p>	<p>Example: Habitat surveys should include:</p> <ul style="list-style-type: none"> o Phase 1 survey for all terrestrial habitats likely to be affected by the development. o National Vegetation Classification (NVC) survey of habitats listed on Annex 1 of the EC Habitats Directive and UKBAP Priority Habitats: http://jncc.defra.gov.uk/page o Records of any rare and scarce plant species o Where peat is present, peat probing at proposed locations of turbines, tracks and other infrastructure, in line with Scottish Government guidance http://www.scotland.gov.uk/Topics/Business o An assessment of impacts of hydrological changes (particularly related to groundwater) on habitats should also be included. o For more information see SNH general pre-application/scoping advice to developers of onshore wind farms http://www.snh.gov.uk/docs/A1150291.pdf 	<p>Proponent through the completed EIA</p>	<p>There is no metric used to determine risk level to birds or bats. It occurs on a project by project basis. Justification: For birds the information is based on scientific knowledge of the population and sensitivity of specific species, local population and migratory species in the area, population trends, flight pattern, roosting and brooding sites.</p>	<ul style="list-style-type: none"> o There is an expiry date, of 2-3 years based on habitat and species o Currently there are discussions on how to include pre-construction survey data for proposals to repower 1st generation wind farms, (8-20 years old) 	

Table 4: Pre-Construction Surveys

Jurisdiction	Survey Protocols/ Requirements	Length of Surveys (year)	Species/Habitat Surveyed for	How reported back	Risk to wildlife – Metric and Thresholds	Data Expiry Date	Sources
New Brunswick	<p>Yes, there are three protocol documents to guide pre-construction surveys:</p> <ul style="list-style-type: none"> o “Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds” (Environment Canada: Canadian Wildlife Service 2007a) http://publications.gc.ca/collections/collection_2013/ec/CW66-364-2007-eng.pdf o “Wind Turbines and Birds – A Guidance document for Environmental Assessment” (Environment Canada: Canadian Wildlife Service 2007b) http://publications.gc.ca/collections/collection_2013/ec/CW66-363-2007-eng.pdf o “Pre-Construction Bat Survey Guidelines for Wind Farm Development in NB” (New Brunswick Fish and Wildlife 2009) http://www2.gnb.ca/content/dam/gnb/Departments/nr-rn/pdf/en/ForestsCrownLands/BATS_PreConstructionBatSurveyGuidelinesForWindFarmDevelopmentInNB.pdf 	<ul style="list-style-type: none"> o Minimum of 1 year- lower risk area. o Higher risk areas or if they find a species at risk present (in the first year of surveys) they might be required to conduct a complimentary survey the following season for that species of risk to see where they are located within the project area, the type of habitat they are using, and to see if there is any risk to of collision with a blade. 	Any wildlife and potential wildlife habitat in the different habitat types mostly focused on birds and bats. Breeding bird surveys are often used to get a baseline of how habitat in the area is being used.	Survey data is reported through the plan in the Environmental Impact Assessment (EIA).	<ul style="list-style-type: none"> o There is no metric used to determine risk level to birds or bats from pre-construction survey data. o Risk is based on size of the area and if there are species at risk present, or if there is other sensitive habitat present o There are no thresholds developed where risk is too high to proceed. o But what has happened so far is proponents have been willing to move turbine locations if they find high risk areas. For example: If Raptors are using a ridge-line during their migration in the area where they want to develop. o Justification: The Unacceptable risk to a species is based on best available science. 	<ul style="list-style-type: none"> o No explicit cut-off data has been outlined, but tend to not want to use data that’s over 10 years. o If the survey is around 10 years old we recommend that another survey should be done. o The situation is different if they are adding into an existing wind farm the proponent can supply data on how the existing wind farm is affecting the bird and bat populations. This changes the ability to use older data as they will now have post-construction data specific to that area to use instead. 	(Environment Canada: Canadian Wildlife Service 2007b; New Brunswick Fish and Wildlife 2009; Environment Canada: Canadian Wildlife Service 2007a)
British Columbia	<ul style="list-style-type: none"> o Proponents are recommended to conduct surveys as per the following guidelines and standards: <ul style="list-style-type: none"> o Resource Inventory Standards Committee: https://www.for.gov.bc.ca/hts/risc/. o Compendium of Wildlife Guidelines for Industrial 	<ul style="list-style-type: none"> o The time frame is dependent on the values at the site, the existing baseline data available, the sampling effort being proposed, and the time 	<ul style="list-style-type: none"> o In the Northeast, this could include a wide range of wildlife species and habitats but historically focus has been on bats, migratory birds and caribou. 	<ul style="list-style-type: none"> o Through the Environmental Assessme 	<ul style="list-style-type: none"> o There is no metric used to determine risk level to birds or bats from pre-construction survey data. Decisions are made on a 	<ul style="list-style-type: none"> o No explicit cut-off date outlined. 	(Government of British Columbia 2016b; Craig and Holroyd 2016)

Table 4: Pre-Construction Surveys

Jurisdiction	Survey Protocols/ Requirements	Length of Surveys (year)	Species/Habitat Surveyed for	How reported back	Risk to wildlife – Metric and Thresholds	Data Expiry Date	Sources
	<p>Development Projects in the North Area, British Columbia: http://professionalbiology.com/pdfs/2015Conference_Compndium_Wildlife_Guidelines.pdf .</p> <ul style="list-style-type: none"> MOE Provincial Guidelines: http://www.env.gov.bc.ca/wld/BMP/bmpintro.html#second . NE Regional Guidelines and BMPs: http://www2.gov.bc.ca/gov/content?id=1A3AF3AE6C2045E2A3E266F136445C89. Clean Energy Projects Development Plan Information Requirements: http://www2.gov.bc.ca/gov/content/industry/natural-resource-use/land-use/crown-land/crown-land-uses/clean-energy/wind-power. 	<p>frame over which the surveys were conducted. Decisions around these pieces are influenced by the Qualified Professionals retained to complete the work.</p> <ul style="list-style-type: none"> When data gaps are identified, Provincial review staff make recommendations to have identified surveys completed; these recommendations are considered by the Decision Maker, and may become a condition of the projects certificate/permits. It is preferred to see multiple seasons of survey effort, wherever appropriate and practicable. <ul style="list-style-type: none"> Example Bat surveys: Where possible, conducting acoustic bat surveys for 2+ years prior to construction. 	<p>Valued component selections for EA projects are partly informed by working group participants which include government staff, First Nations and other stakeholders. Insight from regional biologists would help inform the values to consider for sub-threshold projects (during pre-application conversations).</p> <p>Example from Bat guidelines:</p> <ul style="list-style-type: none"> The assessment area should include the entire project site, and an area of influence that extends for 1 km from the project perimeter The goal of pre-construction monitoring is to identify sites, or areas within a site, where bat activity data and/or the presence of specific habitat features indicate that the area might be significant to bats. 	<p>nt or Developm ent Plan.</p>	<p>project by project basis.</p>		
Tasmania, Australia	<ul style="list-style-type: none"> Yes, they have a set of policies and guidelines. DPIPWE has guidance documents of minimum survey requirements. There are some species specific survey guidelines and general natural values survey guidelines <ul style="list-style-type: none"> Have targeted species survey guidelines and board survey guidelines to predict what is occurring in the area Deviation from guidelines needs to be justified. <ul style="list-style-type: none"> Ex. Ecologist conduct a survey in a particular way, the ecologist will need to discuss the survey protocol with the specialists at DPIPWE Survey guidelines for development assessments in Tasmania can be found here: http://dPIPWE.tas.gov.au/conservation/publications-forms-and-permits/forms-and-permits/development-planning-conservation-assessment-guidelines 	<ul style="list-style-type: none"> 2 years preferred, recommend two years. This is to get a good idea of any seasonal issues or change from year to year, particularly with the wedge-tailed eagle so they can look at breeding success. Developers want to only do 1 year of surveys. Sometimes 1 year is adequate but the threatened species specialists at DPIPWE review this and makes a decision if 1 year is adequate based on the information gathered and the detail of the surveys. 	<ul style="list-style-type: none"> Bird, bats, and terrestrial mammals Wedge-tailed eagle is an endangered species, Tasmanian sub-species <ul style="list-style-type: none"> Any impact on a breeding pair is thought to have a population wide impact Threatened, listed at the state and commonwealth level so some commonwealth legislation gets triggered and would require approval at the commonwealth level and state level If DPIPWE is aware of an eagle nest in the vicinity of the proposed area the developer 	<ul style="list-style-type: none"> Through the Assessment and Approval process. Pre-construction and Pre-development data is reported to DPIPWE and becomes part of 	<ul style="list-style-type: none"> There is no metric used to determine risk level to birds or bats Generally, professional judgement is used to determine a threshold on a case by case basis. This was considered in one proposal in that if you kill X number of birds you will need to stop operating your wind turbines. This has become part of the conditions. Not sure if this has been tested or if the threshold has been met. 	<ul style="list-style-type: none"> Surveys of more than 2 years old are considered to be too old Depending on the site, DPIPWE may give the developers another year on that data if the developer goes out and does some basic checks to support the existing more 	<ul style="list-style-type: none">

Table 4: Pre-Construction Surveys

Jurisdiction	Survey Protocols/ Requirements	Length of Surveys (year)	Species/Habitat Surveyed for	How reported back	Risk to wildlife – Metric and Thresholds	Data Expiry Date	Sources
			<p>will need to do a detailed and lengthy study on utilization to show where the eagles are, what they are doing, and where they are moving around</p> <ul style="list-style-type: none"> ○ General nest checks (entire area of site and an area around the site) for eagles as well as other birds ○ Particular species surveys ○ Migratory birds, they can sometimes be an issue. They are surveyed at particular times of the year to see if they are flying through the project area. ○ On ground Flora and Fauna surveys ○ Generally during the construction period there are issues with roadkill risk, particularly for the Tasmanian devil, which is a listed species, and for other listed mammal species <ul style="list-style-type: none"> ○ Survey for Tasmanian devil as they exist over most parts of the state and is generally considered to be at risk from roadkill ○ Tasmania Devil habitat is also surveyed for (ex. Den) ○ Often survey for an animal that is associated with the Tasmanian devil, the Quoll, which is also a listed species. They sometimes use the Devil’s habitat and dens. There will often be a survey that targets both species at the same time to see if there is any activity for either of the species in the area. ○ Bats are an issue but none of 	<p>the public document that is advertised for public comment and circulated to various agencies for review.</p> <ul style="list-style-type: none"> ○ Conditions of approval are developed based on these reports and the comments the DPIPWE received. Issues can be raised. Often reports come back with recommendations from other agency’s ecologists ○ Reports with the raw data can also be input into the 	<ul style="list-style-type: none"> ○ Since subsequent approvals, putting a number on these things is difficult to justify what an appropriate number would be. ○ For the wedge-tailed eagle, any loss is significant and potentially considered a loss to the population. Developers are very strongly encouraged to keep their turbines well away from areas that have shown to have high utilization of the eagles. ○ Justification: professional judgement evaluated case by case, but tries to be scientifically based 	<p>detailed surveys they have already conducted.</p>	

Table 4: Pre-Construction Surveys

Jurisdiction	Survey Protocols/ Requirements	Length of Surveys (year)	Species/Habitat Surveyed for	How reported back	Risk to wildlife – Metric and Thresholds	Data Expiry Date	Sources
			<ul style="list-style-type: none"> they are listed as endangered. One species may be listed as vulnerable. Bat surveys are conducted anyway. oAny species at risk 	mapping service as well.			

Table 5: Post-construction Surveys

Jurisdiction	Survey Protocols/ Requirements	Length of Surveys (year)	Survey Area	Surveys Conducted by:	Sources
Ontario	<ul style="list-style-type: none"> oUnder REA, yes, specific protocols developed for birds and bats oAdditional protocols have been developed for other legislation and may apply dependent on site conditions 	<ul style="list-style-type: none"> oUnder REA, every project has to do a minimum of 3 years post-construction monitoring for impacts to birds and bats (May – October) <ul style="list-style-type: none"> o An additional 3 years of monitoring is required if initial monitoring reveals bat/bird mortality thresholds have been reached. oOther requirements may also apply depending on applicable legislation 	<ul style="list-style-type: none"> o Bats: If > 10 turbines at least 30% of turbines at the facility must be monitored with a minimum of 10 turbines. If < 10 turbines then all turbines need to be surveyed o Birds: The sub-sample of wind turbines that are monitored should include all habitat types and any significant wildlife habitat present at the site, and should cover the spatial distribution of the wind o Birds and bats: At sampled wind turbines - Within this 50 meter radius, the search area should be examined using transects 5.0 – 6.0 meters apart allowing for a visual search of 2.5 – 3.0 meters on each side. o Other requirements may also apply depending on applicable legislation 	<ul style="list-style-type: none"> oWildlife consultant/environmental professional oOther requirements may also apply depending on applicable legislation 	(Ontario Ministry of Natural Resources 2011a; Ontario Ministry of Natural Resources 2011b)
Scotland	<p>Yes they have protocols developed for post-construction surveys:</p> <ul style="list-style-type: none"> oThis information is decided and planned in the Environmental Impact Assessment. Data collected in pre-construction surveys or desktop review on sensitive receptors of the area would be looked at to determine if post-construction surveys are needed. oPost-construction monitoring may be needed if there is potential for risk to change over time. This would result in a need for long-term monitoring. oPost-construction surveys have mostly been a data collection exercise, they have not had to force mitigation, such as shutting-down of a turbine because of the collision risk modelling done before construction oRepowering aspects need to be considered as well 	Post-construction surveys are conducted based on project by project basis (guided by EIA)	Example: for birds, survey area and design must cover the entire study area – 500 m buffer beyond the planning development boundary http://www.snh.gov.uk/docs/C278917.pdf	Guidance states that they should be qualified Ecologists or Landscape Advisors (Association of ecological clerks of work, chartered institute of environmental managers, etc.) but there is nothing in law to say this has to be done by a qualified person.	(Scottish Natural Heritage 2015; Scottish Natural Heritage 2014)

Table 5: Post-construction Surveys					
Jurisdiction	Survey Protocols/ Requirements	Length of Surveys (year)	Survey Area	Surveys Conducted by:	Sources
New Brunswick	<p>Yes, there are two protocol documents to post-construction surveys: :</p> <ul style="list-style-type: none"> ○ “Post-construction Bat and Bird Mortality Survey Guidelines for Wind Farm Development in New Brunswick” (New Brunswick Fish and Wildlife Branch 2011) http://www2.qnb.ca/content/dam/qnb/Departments/nr-rn/pdf/en/Wildlife/WindPower-PostConstructionBatAndBirdMortalitySurveyGuidelinesForWindFarmDevelopment.pdf ○ “Wind Turbines and Birds: A Guidance Document for Environmental Assessment” (Environment Canada: Canadian Wildlife Service 2007b) http://publications.gc.ca/collections/collection_2013/ec/CW66-363-2007-eng.pdf 	<p>Post-construction surveys are required for 1 year in low sensitivity locations with small project size, and up to 3 years in locations with very high sensitivity and large project size.</p>	<p>Bat mortality surveys should occur at all turbines at small wind power developments (i.e. < 10 turbines). For larger sites, a sub-sample of turbines is to be selected to cover representative habitats and spatial extent of the development area, with a minimum of 1/3 the turbines on site being sampled.</p>	<p>Third party experienced biologists (wildlife techs) hired by the wind company</p>	<p>(Environment Canada: Canadian Wildlife Service 2007b; New Brunswick Fish and Wildlife Branch 2011)</p>
British Columbia	<ul style="list-style-type: none"> ○ Protocols would be project-specific, discussions of which would begin during the application review phase. Monitoring surveys may be identified in the project conditions. Wind projects in NE BC generally have a Technical Advisory Committee (TAC) that continues meeting post-certificate, which is made up of the proponent and regional, provincial and federal specialists. The TAC meet on a semi-annual basis to discuss post-construction monitoring methods, results, and adaptive management. Protocols discussed generally include methods such as bird fatality monitoring, carcass persistence trials, and searcher efficiency trials, as well as definition of thresholds and fatality events. 	<p>Bat Example:</p> <ul style="list-style-type: none"> ○ Conduct post-construction fatality surveys for a minimum of three years post-construction, and a minimum of three years post-mitigation. 	<p>Bat Example:</p> <ul style="list-style-type: none"> ○ For wind facilities with 10 or fewer turbines in the project area (small developments), the recommendation is to monitor all of the turbines; ○ If greater than 10, a base recommendation is to monitor at least 33-50% of all installed turbines, with a minimum of 10 turbines monitored. Always round up to the next whole number – e.g., for an array of 55 turbines, monitor 19-28 turbines. 	<p>Qualified Environmental Professional.</p>	<p>(Craig and Holroyd 2016; U.S. Fish and Wildlife Service 2012)</p>
Tasmania, Australia	<ul style="list-style-type: none"> ○ Yes but developed case by case based on the information from the pre-construction baseline surveys. Very site specific issues seem to arise. ○ On-going surveys during operation of the wind farm are required through the conditions. ○ If things change, like DPIPWE is not getting enough information to determine if there are impacts, then the conditions can be varied to ask the developer to do more frequent surveys. <ul style="list-style-type: none"> ○ DPIPWE often finds the conditions need to be varied as they are not really working or they are too onerous and it is not really necessary to be doing surveys that frequently. The conditions will be adapted to the information that is fed through. It’s always based on the information that is being provided by the developer. If they are providing the DPIPWE with a lot information then the DPIPWE have a lot of data to base their decisions on. ○ Review the conditions themselves for the different wind farms 	<ul style="list-style-type: none"> ○ Case by case but at least 2 years minimum, sometimes up to 5 years. ○ One site (seen as a test site by the developer) had been actively researching thoroughly for 8-10 years and has done a lot of research associated with that site. This site is in the NW - Studland bay and Bluff Point. <ul style="list-style-type: none"> ○ Developers were Hyrdo Tasmania – the utility company 	<ul style="list-style-type: none"> ○ Broad survey of the entire area. ○ Detailed Survey (flora) of the specific area where the turbine is to go, hardstand (base of turbine), and 100m radius around that. ○ Birds – survey whole site, targeted areas such as areas near wetlands that could have water or wading birds. Targeted areas with an additional distance to go out (survey radius) ○ Case by case depending on the risks that have been evaluated for the particular site. <ul style="list-style-type: none"> ○ Ex. Some of the wind farms have a fairly high percentage of turbines that need to be surveyed around the base every two weeks. The Radius was 200m out from the base of the turbine in this case but this depends on the size of the turbines and such and there are different calculations to determine the radius to assess for 	<p>Ecologists contracted by the developers</p>	

Table 5: Post-construction Surveys

Jurisdiction	Survey Protocols/ Requirements	Length of Surveys (year)	Survey Area	Surveys Conducted by:	Sources
	for protocols. Conditions outline the requirements of the particular operations. o Compare the different wind farms' conditions to find differences in the requirements.		bird strike.		

Table 6: Mitigation

Jurisdiction	Mortality Unit	Mitigation Thresholds Related to Mortality	Justification of Threshold	When is Mitigation Applied	Options for Mitigation	Sources
Ontario	o Mortality is reported per turbine/year based on results from representative surveying samples o Additional monitoring may be required as per the EEMP o Other monitoring may be required on a site by site basis dependent on applicable legislation (e.g., if the Endangered Species Act, 2007 applies)	o Birds: Annual average <ul style="list-style-type: none"> • 14 birds/ turbine/ year at individual turbines or turbine groups • 0.2 raptors/ turbine/ year (all raptors) across a wind power project; • 0.1 raptors/ turbine/ year (provincially tracked raptors) across a wind power project; and/or • 2 raptors/wind power project (<10 turbines) o Single event (one survey date) <ul style="list-style-type: none"> • 10 birds at one turbine • 33 or more birds (including raptors) at multiple locations o Bats: <ul style="list-style-type: none"> • 10 bats/ turbine/ year. NOTE: Other thresholds may apply if the project is subject to other permitting requirements (e.g., Endangered Species Threshold is considered 1)	REA Thresholds: <ul style="list-style-type: none"> o Birds - Bird mortality thresholds have been established based on the range of bird mortality at wind power projects in Ontario and in comparison with jurisdictions across North America. The annual bird mortality threshold of 14 birds/ turbine/ year is below the 95th percentile of bird mortality rates in Ontario. Establishing the bird mortality threshold below the 95th percentile requires outlier turbines with significant bird mortality to be addressed through mitigation and/or additional scoped monitoring. o Bat – Bat mortality thresholds have been established based on the range of bat mortality at wind power projects in Ontario and in comparison with jurisdictions across North America 	Under the REA <ul style="list-style-type: none"> o Mandatory mitigation applied when the threshold is reached. The mortality number is averaged over turbines at site. o After mandatory mitigation is implemented monitoring needs to occur for an additional 3 years. o If thresholds still continue to be passed then site specific mitigation measures will need to be negotiated with MNRF. o NOTE: Other mitigation requirements may apply if the project is subject to other permitting requirements 	Under the REA <ul style="list-style-type: none"> o Bats: <ul style="list-style-type: none"> • Operational mitigation - consists of changing the wind turbine cut-in speed to 5.5 m/s (measured at hub height), or feathering of wind turbine blades when wind speeds are below 5.5 m/s. • Operational monitoring will be implemented across the wind power project (i.e. at all turbines) from sunset to sunrise, from July 15 to September 30. • Contingency Plan –if mitigation not effective then agreement with MNRF on other mitigation measures. • Other mitigation options may also be considered on a case by case basis o Birds <ul style="list-style-type: none"> • Operational mitigation techniques may include periodic shut-down of select turbines and/ or blade feathering at specific times of the year when mortality risks to the affected bird species is particularly high (e.g. migration). • Contingency Plan - if mitigation not effective then agreement with MNRF on other mitigation measures. 	(Ontario Ministry of Natural Resources 2011a; Ontario Ministry of Natural Resources 2011b)
Scotland	Not explicitly stated	o No set triggers for birds or bats. o Evaluated on a case by case basis determined by the sensitivity of the receptors around it. Based on	o Justified scientifically	o Mitigation would be applied if there is serious risk to a species. o Discussion with the developer in the planning stages can result in	Mitigation may include: <ul style="list-style-type: none"> o Removing a wind turbine, permanently or seasonally. o Repowering wind turbines – may need to redesign turbines or relocate. 	

Table 6: Mitigation

Jurisdiction	Mortality Unit	Mitigation Thresholds Related to Mortality	Justification of Threshold	When is Mitigation Applied	Options for Mitigation	Sources
		<p>specific species that occur there or if there are protected areas for a certain species in close proximity to the proposed development.</p> <ul style="list-style-type: none"> ○ Bat mortality level is species and area specific ○ Bird mortality level is species and area specific 		<p>mitigation being implemented but forced mitigation has not needed to be applied yet.</p>	<ul style="list-style-type: none"> ○ Lowering height, relocate turbine. ○ Powering down certain turbines in relation for timing of bats in regards to certain times of day or certain times of the year when bat activity is high (Bat guidance document coming soon). 	
New Brunswick	Mortality is reported as the number of fatalities per turbine	<p>What level of mortality triggers mitigation?</p> <ul style="list-style-type: none"> ○ This is evaluated on a case by case basis. ○ So far NB has not needed mitigation <p>Bat Mortality level:</p> <ul style="list-style-type: none"> ○ A low number of bat mortalities is significant. ○ Resident bats (i.e. little brown bat) were recently emergency listed under SARA due to white-nose syndrome. ○ Post-construction mitigation may be necessary if a wind power facility is found to be causing significant bat mortality during the post-construction monitoring. ○ Significant bat mortality is measured based on <ul style="list-style-type: none"> • unanticipated increased levels of mortality in comparison to other bat mortality surveys throughout North America; or • best professional judgment, given the general lack of population level information. <p>Bird Mortality Level:</p> <ul style="list-style-type: none"> ○ No thresholds developed ○ Compare to other national surveys, where by if bird mortality is significantly higher than the National average action would be considered. 	<p>Used other jurisdictions and expert knowledge as science is lacking to inform development of thresholds for NB.</p>	<p>Mitigation is applied when you cross thresholds, but these have not explicitly been defined, so at discretion of agency</p>	<p>The following mitigation options are possible:</p> <ul style="list-style-type: none"> ○ During migration period turn off specific turbines completely (for birds and bats), especially for those turbines that have more mortalities than others. ○ Post-construction mitigation may include selective operational shut-down of turbines during periods of high bat activity/concentrations (e.g., swarming, late summer/fall migration) or under certain weather conditions (e.g., during periods of low wind when power generation is low and bat activity levels are high) when mortality cannot be mitigated by other means (e.g., possibility of emerging bat aversion technologies or other innovative measures). ○ Looking into bat aversion technologies but nothing has been implemented to date. 	<p>(New Brunswick Fish and Wildlife Branch 2011)</p>
British Columbia	○ Mortality is	○ Note that these levels would be	○ Not explicitly stated.	○ Mitigation is applied when	○ Mitigation options for bats include:	(Craig and Holroyd

Table 6: Mitigation

Jurisdiction	Mortality Unit	Mitigation Thresholds Related to Mortality	Justification of Threshold	When is Mitigation Applied	Options for Mitigation	Sources
	reported as the number of fatalities per turbine.	<p>defined on a project by project basis. The region is learning from the existing operational wind projects, and taking an adaptive management approach in regards to mortality triggers at this time.</p> <ul style="list-style-type: none"> ○ Example Bat thresholds recommended: <ul style="list-style-type: none"> ● Mitigation requirements are based on fatality rates ● Any individual turbine with >10 bat fatalities/survey year, the fatality of any bat species-at-risk, an overall average fatality rate for the development of ≥7 bats/turbine/year, or exceeding any of the above thresholds for three consecutive years merits consideration of mitigation options ● The overall estimate of the number of fatalities for the development corrected for searcher efficiency, scavengers, search plot area etc. is >350 bats killed in one survey year, calculated at the end of the survey year. 		thresholds are crossed.	<ul style="list-style-type: none"> ○ Curtailment of rotor speed from 30 minutes before sunset to 30 minutes after sunrise. ○ Implement proactive deterrent mechanisms. ○ Shutting down turbines. 	2016)
Tasmania, Australia	Mortality is reported as the number of fatalities per turbine	<ul style="list-style-type: none"> ○ What level of mortality triggers mitigation? <ul style="list-style-type: none"> ○ Depends on the conditions for the wind project. ○ Example: One site had conditions that if a turbine killed 2 birds within 6 months the turbine had to be shut down. There was one particular turbine that was considered to be a very high risk turbine therefore fairly strict conditions were placed on that particular turbine. 	<ul style="list-style-type: none"> ○ Science based, based on the data DPIPWE is receiving and evaluating. ○ There is pressure from the developers to be given leeway on particular projects, particularly renewables as they don't get a lot of support from the government so the developer often pressures that there needs to be a certain number of turbines operating for it to be viable. 	<ul style="list-style-type: none"> ○ Through the operation of the wind farm and through the reporting mechanisms required under the conditions, if there is bird or bat mortality with a turbine or set of turbines then decisions would be made on what needs to happen to deal with the issues or avoid further impact. ○ Inspections are done. Part of the compliance side of things, they go through regular compliance audits, which are part of the reporting they are required to do for 	<ul style="list-style-type: none"> ○ Mitigation comes from the conditions <ul style="list-style-type: none"> ○ Case by case, there are no general outlines for mitigation ○ Types of mitigations can include: <ul style="list-style-type: none"> ● Turning off a turbine(s) ● Turning off a turbine(s) in certain times of the year, ex. during breeding season ● DPIPWE director can direct the developer to do whatever needs to be done to deal with that specific impact. 	

Jurisdiction	Mortality Unit	Mitigation Thresholds Related to Mortality	Justification of Threshold	When is Mitigation Applied	Options for Mitigation	Sources
		<ul style="list-style-type: none"> ○What is the bat mortality level? ○ None developed for bats but mortality still needs to be reported, depending on the project, when surveys are conducted around the base of the turbines. Anything that's killed has to be reported. In some cases the carcasses need to be sent to labs to determine what killed it. ○What is the bird mortality level? ○ Depends on the conditions for the wind project. 	<ul style="list-style-type: none"> ○Because the EPA is an independent board, there is very little political influence on the decision making. ○In terms of the conditions themselves, they are developed at the department level (DPIPWE), officer level, and then put up through the various review processes that exist within the department. ○Science based decisions. 	<p>DPIPWE. This is a risk based thing. If facilities are considered high risk then it will get more frequent visits and more detailed scrutiny, particularly in the beginning of operations. This may change as time goes on. In a few years time sometimes the conditions need to be changed as they are no longer appropriate or they are not capturing what they need to capture.</p>		

Jurisdiction	Successes	Failures/Challenges
Ontario	<ul style="list-style-type: none"> ○Solid Thresholds has been a positive approach as it allows for policy consistency across the province. ○On Crown Lands MNRF has encouraged wind projects to have economic benefits for First Nation's communities. This policy has helped wind projects move forward on public lands with less opposition. 	<ul style="list-style-type: none"> ○When developing Ontario's original feed-in-tariff for renewable energy, Ontario first employed a "first come first serve" policy for Crown Lands. This caused significant implementation issues due to high numbers of applications for Crown Land. Ontario therefore transitioned to a procurement process instead
Scotland	<ul style="list-style-type: none"> ○Success in the way they have worked with the industry and that wind has been developed in the appropriate areas. They have avoided the more sensitive areas in Scotland. ○Working with industry is very important - Scottish Renewables represent and are spokesperson for the renewables industry. Working with Scottish Renewables, informing them of guidance, consulting with them, listening to industry issues, has been really useful for how Scotland has developed their approach to renewables. ○In Scotland there are 4,000 – 5,000 wind turbines, and over 200 wind farms <ul style="list-style-type: none"> ○ There are not many that they didn't want to happen ○ Only a few cases where the decision maker has objected to a project. They have been appealed and won ○ SNH works with the developer and the decision maker to ensure the wind projects are sited directly. 	<ul style="list-style-type: none"> ○Failure is when projects get rejected and appealed. Then it goes to public local inquiry, assessed by an independent reporter. If it gets to this stage that means that communication or mitigation has failed and that a wind project is still being proposed that will have significant negative effects if the project still moves forward. This doesn't happen very often, just a handful per year compared to the number of proposals they get yearly, which is a good thing. The state of the environment report is important for telling SNH how the bird populations are doing and thus how SNH are doing. <ul style="list-style-type: none"> ○ Appealed projects <ul style="list-style-type: none"> ▪ Ministers need to decide if SNH and local authority don't agree. Independent reporter reviews the case for the ministers. Appeals are sometimes granted in the developers favour or sometimes granted to the objection favour. ○Challenge in enforcement of conditions. Planning authority has an enforcement unit that will go out. They have stop notices to taking them to court that they can use. Remote sites are hard to get to (and take a long time to get to) and with small resources (staff and time) for enforcement it makes pursuing a case and following a case through to completion in these situations difficult to obtain. The whole planning system in Scotland is being reviewed so this may be addressed shortly.
New Brunswick	<p>None to date. Wind is very new and emerging in NB so they don't have any major successes to share yet.</p>	<ul style="list-style-type: none"> ○Nothing major. ○Wind companies often try to decrease the number of surveys they need to do in an attempt to streamline their process. This creates extra work for government because they then need to do a lot of site specific evaluations for specific sites where they might make exceptions to normal survey protocol. This "one off" approach takes additional

Table 7: Lessons Learned		
Jurisdiction	Successes	Failures/Challenges
		<p>time. This is not a major issue.</p> <ul style="list-style-type: none"> ○The decline in bats has happened drastically and, with so few bats left, proponents have questioned the need for bat surveys.
British Columbia	<ul style="list-style-type: none"> ○Nothing to share at this time. 	<ul style="list-style-type: none"> ○Nothing to share at this time.
Tasmania, Australia	<ul style="list-style-type: none"> ○A lot of information from research of wind farms in the NW <ul style="list-style-type: none"> ○ Lots of literature produced on impacts on large birds such as eagles 	<ul style="list-style-type: none"> ○People proposing to put wind turbines in areas where there is high bird utilization, this should be avoided. ○An issue detected in one of the assessments is the use of modeling the risk of collision to the turbines was really problematic with the eagles <ul style="list-style-type: none"> ○ For a subsequent development application DPIPWE stayed away from requiring the proponent to do collision risk modelling as it became too difficult <ul style="list-style-type: none"> ▪ It was difficult to get the proponent to provide the data so the data could be validated ▪ It didn't tell DPIPWE anything so they reverted back to using raw utilization data, lines on a map where the birds were usually hanging-out. The raw data became more useful than any modelling information. ○ Collision risk modelling used to be heavily relied on in Tasmania but it turned into a huge problem. <ul style="list-style-type: none"> ▪ Part of the problem was that the people doing the modelling didn't want to hand-over the data, so DPIPWE couldn't get an independent statistician to review it, which they really wanted to do. ▪ They decided to go back to the raw data and raw information and see what parts of the environment the eagles were using. ○Unexpected impacts on particular birds come up. This leads to management actions down the track which could be increased surveys or requiring them to turn off turbines at certain times of the year. You can try and foresee these impacts as much as you can through pre-construction work but once you put the turbines up and see what happens adaptation may be needed.

References

- Arnett, E. B., and E.F. Baerwald. 2013. "Impacts of Wind Energy Development on Bats: Implications for Conservation." In *Bat Evolution, Ecology, and Conservation.*, edited by R.A. Adams and S. C. Peterson, 435–56. New York, US: Springer Science Press, New York, New York, USA.
- Arnett, E.B., and R.F. May. 2016. "Mitigating Wind Energy Impacts on Wildlife: approaches for Multiple Taxa." *Human-Wildlife Interactions* 10 (1): 28–41. <http://www.scopemed.org/?jft=3&ft=3-1430519766>.
- Barclay, Robert, and Erin Baerwald. 2015. "Post-Construction Wind Energy Protocol for Bats." Calgary, AB.
- California Energy Commission (CEC), and California Department of Fish and Game (CDFG). 2007. "California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report." *Cec-700-2007-008-Cmf*, no. October: 137 pp. <http://www.energy.ca.gov/windguidelines/>.
- Craig, V., and S. Holroyd. 2016. "Best Management Practices Guidebook for Bats in British Columbia, Chapter 4: Wind Power Developments." Victoria, BC. [http://www.env.gov.bc.ca/esd/distdata/Peace_Region_Wildlife_Values/Industrial_Sectors/Best_Management_Practices/Raptor BMPs for British Columbia.pdf](http://www.env.gov.bc.ca/esd/distdata/Peace_Region_Wildlife_Values/Industrial_Sectors/Best_Management_Practices/Raptor_BMPs_for_British_Columbia.pdf).
- Environment Canada: Canadian Wildlife Service. 2007a. "Recommended Protocols for Monitoring Impacts of Winds Turbines on Birds." http://publications.gc.ca/collections/collection_2013/ec/CW66-364-2007-eng.pdf.
- . 2007b. "Wind Turbines and Birds: A Guidance Document for Environmental Assessment." *Canadian Wildlife Service*. Gatineau, Quebec. http://publications.gc.ca/collections/collection_2013/ec/CW66-363-2007-eng.pdf.
- Government of British Columbia. 2004. "Forest and Range Practices Act: Government Actions Regulation." Victoria, BC. http://www.bclaws.ca/civix/document/id/complete/statreg/582_2004.
- . 2013. "Wildlife Act: [RSBC 1996] Chapter 488." Victoria, BC. http://www.bclaws.ca/civix/document/id/consol24/consol24/00_96488_01.

- . 2016a. "Environmental Assessment Act: Reviewable Projects Regulation." Victoria, BC.
http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/13_370_2002.
- . 2016b. "Forest Practices Code of British Columbia Act: [RSBC 1996] Chapter 159." Victoria, BC.
http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96159_01.
- . 2017. "Forest and Range Practices Act: [SBC 2002] Chapter 69." Victoria, BC.
http://www.bclaws.ca/civix/document/id/complete/statreg/02069_01.
- Government of New Brunswick: Department of Environment. 2010. "Compliance and Enforcement Policy." Fredericton, NB.
doi:10.1093/acprof:oso/9780199674619.003.0007.
- Government of New Brunswick: Department of Natural Resources. 2012. "Allocation of Crown Lands for Wind Power Projects Policy." Fredericton, NB.
<http://www2.gnb.ca/content/dam/gnb/Departments/nr-rn/pdf/en/Publications/CLM0172005.pdf>.
- Government of Ontario. 2016a. *Endangered Species Act, 2007*.
<https://www.ontario.ca/laws/statute/07e06>.
- . 2016b. "Get a Renewable Energy Project Approved." *Queen's Printer for Ontario, 2012-16*. <https://www.ontario.ca/page/get-renewable-energy-project-approved>.
- . 2016c. *Green Energy Act, 2009*. Ontario Ministry of Energy.
<http://www.energy.gov.on.ca/en/green-energy-act/>.
- . 2016d. "Ministry of Natural Resources and Forestry." *Queen's Printer for Ontario, 2012-16*. <https://www.ontario.ca/page/ministry-natural-resources-and-forestry>.
- . 2016e. "Wildlife Management." <https://www.ontario.ca/page/wildlife-management>.
- . 2017. "Fish and Wildlife Conservation Act, 1997." Queen's Printer for Ontario.
<https://www.ontario.ca/laws/statute/97f41>.
- Hein, Cris D., Jeffrey Gruver, and Edward B. Arnett. 2013. "Relating Pre-Construction

Bat Activity and Post- Construction Bat Fatality To Predict Risk At Wind Energy Facilities: A Synthesis." Austin, TX.

New Brunswick Department of Natural Resources. 2004. "Forest Management Manual for New Brunswick Crown Land: Interim Manual."

<http://www2.gnb.ca/content/dam/gnb/Departments/nr-rn/pdf/en/Publications/ForestManagementManual.pdf>.

New Brunswick Fish and Wildlife. 2009. "Pre-Construction Bat Survey Guidelines for Wind Farm Development in NB*."

New Brunswick Fish and Wildlife Branch. 2011. "Post-Construction Bat and Bird Mortality Survey Guidelines for Wind Farm Development in New Brunswick."

New Brunswick Department of Natural Resources. Fredericton, NB.

<http://www2.gnb.ca/content/dam/gnb/Departments/nr-rn/pdf/en/Wildlife/WindPower-PostConstructionBatAndBirdMortalitySurveyGuidelinesForWindFarmDevelopment.pdf>.

Ontario Ministry of Natural Resources. 2009. "Approval and Permitting Requirements Document for Renewable Energy Projects." Ontario.

<https://www.ontario.ca/document/renewable-energy-project-approval-and-permit-requirements>.

———. 2011a. "Bats and Bat Habitats: Guidelines for Wind Power Projects." Ontario. <http://mhk.pnl.gov/publications/bats-and-bat-habitats-guidelines-wind-power-projects>.

———. 2012. "Natural Heritage Assessment Guide for Renewable Energy Projects." Ontario. <http://www.ontario.ca/environment-and-energy/natural-heritage-assessment-guide-renewable-energy-projects-second-edition-november-2012>.

Schuster, Eva, Lea Bulling, and Johann Köppel. 2015. "Consolidating the State of Knowledge: A Synoptical Review of Wind Energy's Wildlife Effects."

Environmental Management 56 (2). Springer US: 300–331. doi:10.1007/s00267-015-0501-5.

Scottish Natural Heritage. 2014. "Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms." doi:10.1016/S0022-

3913(12)00047-9.

———. 2015. "Spatial Planning for Onshore Wind Turbines – Natural Heritage

Considerations Guidance.”

Smallwood, Shawn, and Brian Karas. 2009. “Avian and Bat Fatality Rates at Old-Generation and Repowered Wind Turbines in California.” *Journal of Wildlife Management* 73 (7): 1062–71. doi:10.2193/2008-464.

U.S. Fish and Wildlife Service. 2012. “U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines.” https://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf.

Willmott, Julia, E. Allison Costello, Caleb Gordon, Greg Forcey, Sean Casto, Genevieve Beaulac, and Ernani Pilla. 2012. “Bird and Bat Collision Risks & Wind Energy Facilities.” *Discussion Paper No. IDB-DP-354. Inter-American Development Bank*. <https://publications.iadb.org/handle/11319/6518?locale-attribute=en>.

Wyoming Ecological Services Field Office. 2010. “USFWS Guidance for Wind Energy Development in Wyoming: Draft V9.0.” Cheyenne, Wyoming.

Appendix A: Standardized Interview questions

Legislative (Process Details – most likely a resource)

1. Legislatively, what **tools** does your jurisdiction have to guide the protection of wildlife and wildlife habitat when reviewing wind energy project proposals?
2. What agency ensures **compliance** with wildlife conditions?
 - a. If there is non-compliance, what is the **mechanism** to ensure enforcement actions are taken?
 - b. Is the compliance effective?
3. In other jurisdictions, who is the decision maker (regulator)?
 - a. Is it a government department or an arms-length organization?
 - b. If non-government, how are they linked/directed by government?
4. If renewables are located on **public lands** – are there specific changes to what proponents need to **comply** with in order to operate on public lands?
5. What are the reclamation requirements? If there are reclamation requirements, are they linked to wildlife habitat objectives?

Project and Turbine Siting (Protocols)

1. What high-level features are proponents asked to **avoid** when choosing a project location (i.e., valleys, large lakes, eastern slopes or mountain ranges).
 - a. Are there areas where development would not be permitted (i.e., **no-go areas**)
2. Are there tools available to the public or proponent that help to identify **areas of higher risk** – i.e., risk maps, online tool, shared shape files, etc.?
3. Are avoidance areas different in comparison to other industries operating in that jurisdiction (ex. oil and gas)?
 - a. If so, what is the justification for the differences?
4. Are there setbacks for turbines used for the following features? (if so, what is the setback, is there a document that outlines these setbacks?):
 - a. Wetlands (Class I, II, III, IV, V, VI)
 - b. Named Lakes
 - c. Nest structures

- d. Species at Risk features (house, nest or den)
- e. Any other setbacks related to wildlife or wildlife habitat

Pre-Construction Surveys (Protocols)

1. Do you have protocols developed for pre-construction wildlife or wildlife habitat surveys?
 - a. If pre-construction surveys are required: what are the survey protocols/requirements?
 - b. How long are the pre-construction surveys required to be conducted for (i.e., 1 year of surveys, 2 years, etc.)?
 - c. What species/habitat features are surveyed for?
 - d. How is the survey data reported back to the responsible jurisdiction?
 - e. Is there a **metric** used to determine **risk level to birds or bats** from pre-construction survey data
 - i. What is the **threshold** that would be considered too high risk for development to proceed?
 - ii. What is the **justification** for the use of this metric and threshold?
 - f. Is there an expiry date to the wildlife data that is to be used to make an application?

Post-construction Surveys (Protocols)

1. Do you have protocols developed for post-construction wildlife or wildlife habitat surveys?
 - a. How many years are post-construction surveys conducted for?
 - b. How large of an area is surveyed? (i.e. 20% of turbines)
 - c. Who conducts the surveys (Third Party, Government, Experienced biologists, or Project maintenance crew)?

Mitigation (Protocols)

1. Is mortality reported as a per turbine number, or per MW or something else?
2. What level of mortality triggers mitigation?
 - a. What is the bat mortality level?
 - b. What is the bird mortality level?
 - c. How this is defined and justified (science based threshold, agreed to jurisdictional threshold or other)?

3. When is mitigation applied?
4. What options exist for mitigation? Or what do you most typically use for mitigation?

Lessons Learned

1. Do you have any major successes to share?
2. Do you have any major failures or challenges that should be avoided?

General Questions

1. Can we share your name and contact information with Government of Alberta staff?
2. Are there other jurisdictions that you recommend we talk to?
3. Who should we talk to about solar and geothermal projects and wildlife

Appendix B: Contact list

Jurisdiction	Name	Title	Contact Information	Comments
British Columbia	Kerry Harvey	Senior Ecosystems Biologist, Northeast Region, Ministry of Forests, Lands and Natural Resource Operations, Government of British Columbia	Kerry.Harvey@gov.bc.ca 250-787-3204	Primary contact
	Linda Takahashi	Ecosystems Biologist, Northeast Region, Ministry of Forests, Lands and Natural Resource Operations, Government of British Columbia	Linda.Takahashi@gov.bc.ca 250-787-3508	Secondary contact, wind portfolio focal for Northeast Region, Ministry of Forests, Lands and Natural Resource Operations
Ontario	Hal Leadlay	Coordinator, Resources Development Section, Ministry of Natural Resources and Forestry	Hal.Leadlay@Ontario.ca 705-755-1827	Primary Contact
New Brunswick	Hubert Askanas	Biologist Species At Risk, Fish and Wildlife Branch, Energy and Resource Development, Government of New Brunswick	Hubert.Askanas@gnb.ca 506-453-5873	Phone interview participant and primary contact
Scotland	Kenny Taylor	Renewable Energy Policy and Advice, Scottish Natural Heritage Stirling, Scotland	Kenny.Taylor@snh.gov.uk 01786-435387 07901008450	Phone interview participant and primary contact
Tasmania, Australia	Kate Düttmer	Senior Environmental Officer, EPA Tasmania, Department of Primary Industries, Parks, Water and Environment	Kate.Duttmer@environmen t.tas.gov.au 03 6165 4534	Primary contact and phone and email interview participant

Appendix C: Jurisdictional Review Acronym List

British Columbia

EAO: Environmental Assessment Office

FLNRO: Ministry of Forests, Lands and Natural Resource Operations

FRPA: Forest and Range Practices Act

GAR: Government Actions Regulation

HEWR: High Elevation Winter Range

LEWR: Low Elevation Winter Range

TAC: Technical Advisory Committee

Ontario

EEMP: Environmental Effects Monitoring Plan

EIS: Environment Impact Study

ERT: Environmental Review Tribunal

LOI: Land Information Ontario

MNR: Ministry of Natural Resources and Forestry department

MOECC: Ministry of the Environment and Climate Change

HNA: Natural Heritage Assessment

NRVIS: Natural Resource Value Information System

SWH: significant wildlife habitat

REA: Renewable Energy Approval

New Brunswick

EHJV: Eastern habitat joint venture

SAR: Species at Risk

Scotland

EIA: Environmental Impact Assessment

NVC: National Vegetation classification

SNH: Scottish Natural Heritage

SPEA: Scotland Environment Protection Agency

SPP: Scottish Planning Policy

UKBAP: United Kingdom Biodiversity Action Plan

Tasmania, Australia

DPIPWE: Department of Primary Industries, Parks, Water and Environment

EPA: Environmental Protection Agency

EPHC: The Environment Protection and Heritage Council