

Examples of State and International Guidance for Duration and Intensity of Pre-construction and Post-construction Monitoring

The duration of monitoring both before, during and after construction is crucial to establishing complete, accurate and reliable information regarding the behavior and population dynamics of the species on site throughout the year. Good monitoring data are exceedingly important as they are the basis on which decisions will be made to minimize the level of impact from development to each species. However, there is often a tendency to sacrifice both duration and intensity of surveys due to cost and/or time constraints. This can jeopardize the integrity of data, and may result in impacts to species or populations. As countries strive to minimize environmental impacts to wildlife in concert with the rapidly growing wind industry both in the U.S. and abroad, the establishment of best practice procedures for monitoring is becoming the focus of research efforts worldwide. These findings are slowly becoming the basis of new and improved monitoring recommendations.

Examples of research and development for best practice recommendations for wind energy development are prevalent in Europe. For example, the Collaborative Offshore Wind Research into the Environment (COWRIE) is a steering committee comprised of experts from the offshore wind industry, which was established to conduct research in order to facilitate best practice guidance for wind energy development projects in the United Kingdom (UK). Since its establishment in 2001, COWRIE has developed several documents related to monitoring and surveying procedures and techniques. Many of these documents can be accessed on COWRIE's website (NOTE: only periodically available) at:

<http://www.offshorewind.co.uk/Pages/Publications/>. While these are designed for offshore research, many of the principles apply on land. France has been conducting studies to establish information on best practice pre-construction monitoring. In 2006, a 4-year study was initiated to analyze the impact of a series of six proposed wind facilities in the Beauce Region of France. The monitoring program will thoroughly address habitat and behavioral impacts to birds and bats, and is intended to demonstrate how to carry out a scientifically valid monitoring program to help guide the further development of wind energy in that region. The initial Environmental Assessments (EAs) found little or no impacts to wildlife. However, if the findings of the extensive monitoring show additional impacts beyond the EA findings, this may help support the value of longer, more extensive monitoring (European Commission 2010). Denmark, one of the leading countries for offshore wind development, has also undertaken several studies revealing clear avoidance behavior from various bird species. In addition, Denmark has been working to develop and utilize improved monitoring techniques including advanced radar and infra-red video monitoring technologies (European Commission 2010).

In conjunction with increasing research, guidance for wind energy development aimed at minimizing impacts to wildlife is also quickly being developed worldwide. Within the past decade, some form of guidance has been developed in Canada, Australia, Belgium, Greece, Poland, Luxembourg, Spain, Italy, Sweden, Finland, France, Ireland, Scotland and Germany (European Commission 2010). In the United States, the Service released its 2003 *Interim Guidelines to Avoid and Minimize Wildlife Impact from Wind Turbines*, available at:

<http://www.fws.gov/habitatconservation/wind.pdf>, and is working to release its final draft guidelines in 2011 for public review and comment, with final guidelines available sometime in 2011. Aside from the Service guidance, the following states have also created their own individual guidance on this issue including: New York, California, Colorado, Arizona, Kansas (very short, based on the NWCC Permitting of Wind Energy Facilities Handbook), Massachusetts (but limited on wildlife related recommendations), Michigan (very short and references USFWS interim guidelines), New Mexico (based on USFWS interim guidelines), Oregon, South Dakota, Vermont, Washington and Wisconsin (short and used in conjunction with USFWS interim guidelines) and Wyoming. North Dakota, Nevada, Montana and Oklahoma use the USFWS interim guidelines and/or guidelines from other states; and several other states are currently in the process of creating their own guidelines (Association of Fish and Wildlife Agencies 2007).

The following are some examples of pre- and post- construction monitoring recommendations (including frequency and duration of study) and process matrices that have been developed to guide decisions-making regarding monitoring timelines through guidance both state-side and abroad. Many of the suggested timelines vary, but generally agree that a minimum of 1 year of preliminary baseline preconstruction monitoring is necessary to evaluate how many additional years of pre-construction monitoring may be necessary. In the UK, a 2 year baseline survey is generally recommended (European Commission 2010). The decision for duration of monitoring is usually made based on site-specific variables such as the particular species and determined risk level at each site. Monitoring during construction is also usually recommended. Post-construction monitoring recommendations span from several to multiple years depending on the established risk level, findings from previous surveys and monitoring, and other site specific variables. The Scottish guidance for monitoring at onshore wind energy facilities recommends that monitoring take place over at least 15 years after construction to capture both the long and short term effects of each project. UK guidance often recommends increasing duration and intensity of monitoring for as long as possible to improve data reliability and statistical power.

There is still much to be learned regarding best practice monitoring techniques, and much of the learning will likely be done through putting recommendations into practice and determining best results using an adaptive management approach. Guidelines and monitoring recommendations will undoubtedly evolve as new information becomes available. In the meantime, recommendations developed using the best available research and expert knowledge should continue to be the basis for current practices. The Service also advocates that a precautionary approach (Rio Declaration) always be taken where uncertainties of impacts exist.

Ultimately, the goal should be to develop reliable, consistent, and effective monitoring techniques and timelines, which will produce data that can be used both to effectively evaluate impacts at individual sites and determine cumulative impacts to species from multiple projects. Cumulative impacts are population-level impacts resulting from the combined effects of several projects, projects region-wide and overall wind development in North America. Cumulative impacts may be difficult to identify and verify unless data across projects can be shared to provide insight into the bigger picture effects within or across various regions. Identifying and implementing effective and consistent monitoring processes and procedures is key to this goal and to producing accurate, reliable and consistent data. Monitoring data across regions and

projects combined with new technologies such as Geographic Information Systems (GIS) and other Spatial Planning Tools will provide a better understanding of wind energy and other development impacts to birds, bats, other wildlife and their habitats. This will be invaluable to guiding future management decisions and reducing uncertainties in the landscape and site evaluation process.

Below is a quick reference matrix of recommendations regarding both frequency and duration of various types of pre- and post-construction monitoring for both onshore and offshore wind energy projects. These recommendations are included in guidelines developed by individual U.S. states and other countries. More detailed information regarding decision matrices and recommendations for individual states and countries including links to the documents from which they were referenced are listed immediately following the quick reference matrix.

Jordan and Smallie (2010) also offer a fairly inclusive summary of current best practice recommendations both in the U.S. and abroad for frequency and duration of pre-construction monitoring at onshore facilities. The paper is available at:

https://www.ewt.org.za/LinkClick.aspx?fileticket=nkDN_H4XMak%3D&tabid=232

Examples of State and International Recommendations Regarding Duration and Intensity of Pre- and Post-construction Monitoring for Wind Energy Developments

Country	State/Region	On/Offshore	Technique	Pre or Post-Construction	Frequency /Duration	Recommendation	Author/Citation/Link
AUSTRALIA		Onshore	Not Specified	Pre-construction	Frequency	<p>Pre-construction frequency: Counts should be made in all seasons in which the species may be present and at all times of the daily cycle and conditions in which birds might fly.</p>	<p>Environmental Protection and Heritage Council. 2010. National Windfarm Development Guidelines. Draft. Accessed 07 December 2010 at: http://www.ephc.gov.au/sites/default/files/DRAFT%20National%20Wind%20Farm%20Development%20Guidelines_JULY%202010_v2.pdf</p>
CANADA		Onshore	Not Specified	Pre- and Post-construction	Duration	<p>Pre-construction and post-construction duration: Canada uses site sensitivity and project size to establish the level of concern category for individual projects. The duration of surveying depends on the concern category rating.</p> <p>In general, for Category 1 projects which present the lowest level of risk to birds, a specific pre-assessment timeline is not assigned but post-construction surveys of 1-2 years may be required if preconstruction surveys indicate a significant amount of birds in the area. For Category 2 projects, which present a moderate level of risk to birds, preconstruction surveys over a one year period are required, and post-construction surveys of 1-2 years are required if preconstruction surveys indicate a significant amount of birds in the area. For Category 3 project, which present an elevated level of risk to birds, comprehensive preconstruction surveys should span a year and additional surveying may be required if concerns are raised. Post</p>	<p>Environment Canada. 2007. Wind Turbines and Birds: A Guidance Document for Environmental Assessment. Prepared by the Canadian Wildlife Service. Final Report, April 2007.</p> <p>Environment Canada. 2007. Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds. Available at: http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=C8CE090E-9F69-4080-</p>

Country	Region/State	On/Offshore	Technique	Pre or Post-Construction	Frequency /Duration	Recommendation	Author/Link
						<p>construction surveys for Category 3 projects will likely span 2-3 years. Category 4 projects, which present a potentially high risk to birds will require a comprehensive baseline survey spanning a year, but if major concern are raised then an additional year may be required. Depending on the findings of preconstruction surveying, it may be advised that projects are moved to a different location. If the project continues, post construction survey duration for Category 4 projects will likely span 2-3 years or more with carcass searching around turbines lasting at least 2 years.</p>	8D47-0622E115A4FF
CANADA	Ontario	Onshore	Mortality Surveys	Post-construction	Frequency and Duration	<p>Post-construction frequency and duration: Post-construction monitoring (including mortality surveys, carcass removal and searcher efficiency trials) should be conducted during the core season when birds are active (i.e. May 1st– Oct. 31st) for the first three years of wind turbine operation.</p> <p>Mortality surveys should be conducted at each monitored turbine twice per week (3 and 4 day intervals) from May 1st – October 31st and raptor mortality surveys should be continued once per week from November 1st – November 30th.</p> <p>Bird mortality surveys should occur at all turbines at wind power projects ≤ 10 turbines. For wind power projects >10 turbines, a sub-sample of at least 30% of turbines (minimum 10 turbines) should be selected to cover representative areas throughout the project location.</p> <p>All turbines within the project location should be monitored once a month during the survey period for evidence of raptor mortalities. Subsequent post-construction mortality and effects monitoring should be conducted for two years at individual turbines (and unmonitored turbines in near proximity) where significant bird or raptor annual mortality is identified.</p> <p>Effectiveness monitoring at individual turbines should be conducted for three years where mitigation has been implemented.</p>	<p>Ontario Ministry of Natural Resources. 2010. Bird and Bird Habitats. Guidelines for Wind Power Projects. Accessed 05 January 2011 at: http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@renewable/documents/document/stdprod_071273.pdf</p>

Country	Region/State	On/Offshore	Technique	Pre or Post-Construction	Frequency /Duration	Recommendation	Author/Link
CANADA	Alberta	Onshore	Pre-construction: Migration Surveys for Songbirds and Raptors, Breeding Bird Surveys, Wintering Bird Surveys Post-construction: Carcass Collection	Pre- and Post-construction	Frequency (Pre-construction) and Duration (post-construction)	<p>Pre-construction frequency: Following consultation with the SRD-Wildlife Biologist, pre-construction wildlife surveys (including the buffer zone) and rare plant surveys should be done within project areas. In all areas of suitable habitat, surveys should be done for “species at risk” or other species of management concern, as identified by the SRD-Wildlife Biologist. Other surveys that may be applicable, depending upon the species of interest and site specific features, include: -Spring and fall migration surveys at dawn and dusk for songbirds; three surveys each season – early, mid and late migrants. -Breeding bird surveys (two surveys) early species (e.g. May 1-Jun 15) and late species (e.g. Jun 16-Jul 15). Depending upon findings, these may need to be followed by monitoring of nesting/rearing/fledging success of identified nests of species of concern. -Spring and fall migration surveys mid-day for raptors; three surveys each season – early, mid and late migrants. -Wintering bird surveys (two surveys) – early (e.g. Dec 1-Jan 15) and late (e.g. Jan 16-Feb 28).</p> <p>Post-construction duration: Wildlife carcass collection surveys should be carried out following construction of wind farms. A minimum of one year of carcass collection surveys is recommended, however, there can be high variability of many factors from year to year (eg. weather). This seasonal variation can influence timing and location of wildlife migration routes, selection of habitat, and population densities, and therefore, in most cases, more than one year of wildlife carcass collection surveys is recommended.</p>	Alberta Sustainable Resource Development – Fish and Wildlife Division. 2006. Wildlife Guidelines for Alberta Wind Energy Projects. 11pp. Available at: http://www.srd.alberta.ca/ManagingPrograms/FishWildlifeManagement/documents/WildlifeGuidelinesForAlbertaWindEnergyProjects-April05-2006.pdf
POLAND			Pre-construction: Transect population and species composition	Pre- and Post-construction	Frequency and Duration	<p>Pre-construction duration: 1 year including all phenologic periods.</p> <p>Pre-construction frequency: <u>Transect:</u> Each transect controlled every 6 - 18 days, depending upon the monitoring path.</p>	Polish Wind Energy Association (PWEA). 2008. Guidelines for assessment of wind farms’ impact on birds. Szczecin. 26 pp. Available at:

Country	Region/State	On/Offshore	Technique	Pre or Post-Construction	Frequency /Duration	Recommendation	Author/Link
			<p>studies, MPPL studies, Intensity of airspace use by birds studies, Qualification of rare and average population species</p> <p>Post-construction: Mortality monitoring,</p>			<p><u>MPPL</u>: 2 observations/square during the breeding season (April - June). <u>Intensity of airspace</u>: Each point controlled every 6-18 days depending upon the monitoring path (A, B or C), at least 1 h of observations/point; in case of coastal locations with large number of migrants, it may be necessary to control each point every 5 – 7 days during the migration period (March – April, October – November). <u>Qualification of rare and average population species</u>: 2-3 all – day observations of the entire area during the breeding period (April – mid June) plus opportunity observations during other studies; counting of White Stork population and breeding success thereof during the first days of July (a couple of hours). The qualification shall be supplemented with additional night counting (first days of June) directed to detecting Corncrake and other Rallidae, Quail and Owls.</p> <p>Post-construction duration: 3 years including all phenologic periods. Includes all four pre-construction modules listed above and mortality monitoring.</p> <p>Post-construction frequency: Mortality monitoring should occur every 10-18 days, all turbines at once (farms of up to 15 turbines), at least 15 turbines (farms of 15-50 turbines), 1/3 of turbines (farms >50 turbines); if not all turbines are monitored at once, the rotating panel survey shall be applied to control each turbine at least once per 3 observations.</p>	http://www.psew.pl/en/files/guidelines_for_assessment_of_wind_farms_impacts_on_birds.pdf
UNITED KINGDOM		Offshore	Aerial Survey	Pre- and Post-construction	Frequency and Duration	<p>Pre-construction and post-construction frequency and duration: Assuming little limitations to cost, current survey methods would be improved by maximizing the number of counts within the desired time-period and by extending this time period for as long as possible. Satisfactory statistical power could be achieved as follows: Survey for four years prior to construction and for four years after construction.</p>	<p>Maclean, I.M.D., Skov, H., Rehfisch, M.M. and Piper, W. 2006. Use of aerial surveys to detect bird displacement by offshore windfarms. BTO Research Report No. 446 to COWRIE. BTO, Thetford. Available at:</p>

Country	Region/State	On/Offshore	Technique	Pre or Post-Construction	Frequency /Duration	Recommendation	Author/Link
							http://www.offshorewind.co.uk/Pages/Publications/Archive/Birds/Use_of_aerial_surveys_a9fe454d/
UNITED KINGDOM		Offshore	Remote Techniques	Pre-, Post- and during construction	Frequency and Duration	<p>Pre-construction, post-construction and during construction frequency and duration:</p> <p>Sampling regime should aim to cover at very least 7 full days (24 hour coverage) per month, in the peak periods (preferably not in a single block). This should cover the main migration periods (March-May and mid-July-November inclusive), the breeding season (May- initial surveys and screening. At least 25 days per year should be achieved to ensure sampling of variability</p> <p>Baseline surveys should cover a minimum of 2 (preferably 3) annual cycles to achieve maximum quantification of inter annual variability, both during the baseline and post construction phases (although the brief duration of the construction phase offers no such opportunity)</p>	Desholm, M., A.D. Fox, and P.D. Beasley. 2004. Best practice guidance for the use of remote techniques for observing bird behaviour in relation to offshore wind farms. COWRIE – REMOTE-05-2004. Available at: http://www.offshorewind.co.uk/Pages/Publications/COWRIE_1_reports/Best_practice_guidance420b533c/
UNITED KINGDOM		Offshore	Aerial and Ship-based Surveys	Pre- and Post-construction	Frequency and Duration	<p>Pre-construction and Post-construction frequency:</p> <p>Surveys should, wherever possible, relate changes in bird abundance to environmental factors including season, time of day, tidal influence and prey availability. Furthermore, as far as possible, some effort should be made to collect data under different weather conditions. It is suggested that at least four flights of the whole area are undertaken during the winter, with counts carried out across the whole period if possible. Where breeding birds are present, the SNCAs suggest that at least three flights should be undertaken between May and July/August, with counts ideally undertaken in late May, late June and mid-July to early August. It is advisable that developers consider additional surveys for any other periods considered likely to be important (post-breeding, moulting or spring/autumn passage). Winter surveys are considered to be mid-October to mid-March, summer breeding from late May to early August, late summer from late August to September and Autumn from mid-September to October. It is recommended that 1 to 2 ship-based</p>	DEFRA. 2005. Nature Conservation Guidance on Offshore Windfarm Development - A guidance note on the implications of the EC Wild Birds and Habitats Directives for developers undertaking offshore windfarm developments. Available at: http://webarchive.nationalarchives.gov.uk/20080915101357/http://www.defra.gov.uk/wildlife-countryside/ewd/windfarms/index.htm

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						<p>surveys be undertaken each month during key periods.</p> <p>Pre-construction and post-construction duration: Data should be collected before the construction, up to several years after construction and, ideally, during construction. It is important that studies explore the impacts of both construction and operational phases, as the potential effects can differ at each stage of the development.</p> <p>It is recommended that aerial and ship-based surveys be carried out for at least three years following construction and some monitoring may be required for the full lifetime of the development. Radar studies may also be required in order to measure any changes in bird movements resulting from any barrier effects. Further work may be required subject to the results of the initial monitoring period. Longer term monitoring will be needed to evaluate gradual or incremental changes, for example the potential cumulative effect of increased mortality, or where birds gradually habituate to the presence of turbines.</p>	
UNITED KINGDOM	Scotland	Onshore	Not Specified	Post – construction	Duration	<p>Post-construction duration: Habitat effects, and lag effects resulting from chronic disturbance may result in change happening over periods of years rather than within one to two years of a development being built and commissioned. [Additionally,] habituation of birds to wind farms and wind farm infrastructure may mitigate initial impacts such that levels of displacement shown early on may be higher, but might decrease over time. “[Therefore], it is recommended that monitoring takes place over at least 15 years after the wind facility becomes operational.</p> <p>Monitoring should occur in years 1, 2, 3, 5, 10 and 15; after the wind farm becomes operational where major habitat change has not been part of the process, such as in upland wind farm construction. Where major habitat change has taken place, e.g. the clear felling of forest to accommodate wind farms, monitoring should take place at three-yearly intervals; i.e. years 3, 6, 9, 12 and 15 after commissioning. This will</p>	<p>Scottish Natural Heritage. 2009. Guidance on Methods for Monitoring Bird Populations at Onshore Wind Farms. Accessed on 07 December 2010 at: http://www.snh.gov.uk/docs/C205417.pdf</p>

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						better address changes in bird communities as habitats change and evolve. Monitoring should also take place during construction, where these effects are likely to be more than temporary. A decision will be necessary after 15 years as to whether monitoring needs to be continued or not.	
UNITED STATES	Arizona	Onshore	<p>Pre Bat: Acoustic Detection, Mist-netting, Roost Surveys, Visual Monitoring</p> <p>Post Bat: Carcass Search, Acoustic Detection, Mist-netting, Roost Surveys, Visual Monitoring.</p> <p>Pre-Bird: Large/Small Bird Use Counts, Raptor Nest Searches, Migration Counts, Area Searches, Winter Bird Counts.</p> <p>Post-Bird: Carcass Search, Bird Use Count, Raptor Nest Search</p>	Pre- and Post-construction	Frequency and Duration	<p>Pre-construction and Post-construction frequency and duration (refer to specifics in matrices in guideline document): The Arizona guidelines provide a matrix detailing the specific survey types that are recommended for both birds and bats for pre-and post-construction, including recommendations on when to use each. The matrix also indicates the recommended intensity and duration of surveys. Matrices can be found on pages 28 (bat pre-construction) and 34 (bird pre-construction) and pages 51 (bat post-construction) and 52 (bird post-construction).</p> <p>Pre-construction duration: The pre-construction survey duration depends on the category rating of the project. Generally, sites with at least one year of already available data which suggest no impacts to wildlife will require one year or less data collection prior to construction. Sites with little available data but no indication of impacts to wildlife require a minimum one year of surveys. Sites with high or uncertain impacts may require from 2 to multiple years of surveys.</p> <p>Post-construction duration: The post-construction survey duration for bats varies according to the type of survey and category rating of the project, but may range between 1-3 years. For birds, the duration also depends on the type of survey and category, but it is recommended that bird use counts and raptors nest surveys be conducted at intervals in specific years throughout the lifetime of the project. Bird use counts are recommended in the first two years after construction and subsequently at 3-year intervals for the life of the project. Carcass searches do not have a specific duration.</p>	Arizona Game and Fish Department. 2009. Guidelines for Reducing Impacts to Wildlife from Wind Energy Development in Arizona. Web. 22 December 2010. http://www.azgfd.gov/hgis/pdfs/WindEnergyGuidelines.pdf

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UNITED STATES	California	Onshore	Not Specified	Pre-construction	Duration	<p>Pre-construction duration: There are four categories used to guide decision-making in California. With information from the preliminary site assessment, proposed project sites can be grouped into one of four categories to provide a general framework to assist in determining whether there should be any deviation from the standardized duration and intensity of study needed for pre-permitting and operations monitoring.</p> <p>Generally, for project sites with available data spanning a minimum of one year reduced surveying may be acceptable. For projects with little data but no indication of high wildlife impact, a minimum of one year pre-permitting surveys are recommended; and the findings of these surveys may require additional surveying. Surveying in excess of a year is recommended for projects with high or uncertain potential for impacts to wildlife.</p>	California Department of Fish and Game and California Energy Commission. 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Final Committee Report: CEC-700-2007-008-CTF. Accessed on 10 December 2010 at: http://www.energy.ca.gov/2007publications/CEC-700-2007-008/CEC-700-2007-008-CMF.PDF
UNITED STATES	New York	Onshore	Not Specified	Pre- and Post-construction	Duration	<p>Pre-construction duration: A minimum of one year of pre-construction studies is recommended for all proposed wind energy projects. Additional years of study may be recommended if warranted by the results of initial on-site studies, or as information is learned through post-construction studies from other projects in the state.</p> <p>If a developer proposes to construct a wind energy project in or near one of the features or resources of concern... then two to three years of pre-construction study may be recommended incorporating one or more expanded pre-construction studies to provide in-depth information on the bird and bat resources of the site.</p> <p>Post-construction duration: The New York Department of Environmental Conservation will review the first year of post-construction studies to determine any changes to protocols that may be necessary. Extended post-construction studies may be recommended if the project is in or near a resource of concern. The pre-construction Breeding and Migrating Bird Surveys should be</p>	New York State Department of Environmental Conservation. Division of Fish, Wildlife and Marine Resources. 2009. Guidelines for conducting bird and bat studies at commercial wind energy projects. Accessed 30 November 2010 at: http://www.dec.ny.gov/docs/wildlife_pdf/windguidelines.pdf

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						repeated during the first and second years after the full project is operational. A third year of study should be conducted on the third, fourth or fifth year of project operation as determined through consultation with DEC.	
UNITED STATES	Washington	Onshore	Avian Use Surveys	Pre-construction	Duration	<p>Pre-construction duration: A minimum of one full year of avian use surveys is recommended following current protocols to estimate the use of the project area by avian species/groups of interest during the major migratory seasons or season of most concern. This information should be used to guide decisions regarding appropriate survey intensity. Two or more years of relevant data are recommended in the following cases: 1) risk to avian groups of concern is estimated to be high, 2) there is limited or no relevant data regarding seasonal use of the project site (e.g., data from nearby areas of similar habitat type), and/or 3) the project is significantly diverse in habitat and species. This additional avian use data should be collected to refine impact predictions and make decisions on project layout.</p>	Washington Department of Fish and Wildlife. 2009. Washington Department of Fish and Wildlife Wind Power Guidelines. 36 pp. Available at: http://wdfw.wa.gov/publications/00294/wdfw00294.pdf
UNITED STATES	Wyoming	Onshore	Passive Acoustic Surveys, Active Acoustic Surveys, Live Capture, Carcass Searches	Pre- and Post-construction	Duration	<p>Pre-construction and post-construction duration: Surveys should be conducted for a minimum of 2 years prior to construction and a minimum of 3 years post-construction. (This timeline is applicable to bats, sage-grouse, passerines and raptors)</p> <p>Pre-construction and post-construction frequency: Passive Acoustic Surveys: Units should be deployed between April 15 and October 15 and be programmed to begin data collection ½ hr prior to sunset and end data collection ½ hr after sunrise.</p> <p>Active Acoustic Surveys: Active acoustic monitoring should begin ½ hr before sunset and continue for at least 2½ hours.</p> <p>Live Capture: Surveys should be performed between June 1 and August 30. Each netting site that is identified in the project area should be surveyed at least 3 times during the field season. Nets should be set up ½ hour prior to sunset and be open for at least 2½ hours.</p>	Wyoming Game and Fish Commission. 2010. Wildlife Protection Recommendations for Wind Energy Development in Wyoming. 72pp. Available at: http://gf.state.wy.us/downloads/pdf/WEProtection3192010.pdf

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						Carcass Search: Carcass searches should be conducted weekly during two periods (Apr 15 – Jun 15) and (Aug 1 – Sept 30). More intensive carcass searches may be conducted if necessary.	

AUSTRALIA:

Referenced from: Environmental Protection and Heritage Council. 2010. National Windfarm Development Guidelines. Draft. Accessed 07 December 2010 at:
[http://www.ephc.gov.au/sites/default/files/DRAFT%20National%20Wind%20Farm%20Development%20Guidelines JULY%202010_v2.pdf](http://www.ephc.gov.au/sites/default/files/DRAFT%20National%20Wind%20Farm%20Development%20Guidelines%20JULY%202010_v2.pdf)

FREQUENCY (Pre-construction):

“Counts should be made in all seasons in which the species may be present and at all times of the daily cycle and conditions in which birds might fly.”

CANADA:

Referenced from:

Environment Canada. 2007. Wind Turbines and Birds: A Guidance Document for Environmental Assessment. Prepared by the Canadian Wildlife Service. Final Report, April 2007.

Environment Canada. 2007. Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds. Available at: <http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=C8CE090E-9F69-4080-8D47-0622E115A4FF>

PRE-CONSTRUCTION DURATION TIMELINE DECISION MATRIX:

Canada uses site sensitivity and project size to establish the level of concern category for individual projects. The matrices used in this determination are below.

Sensitivity Determination:

Potential Sensitivity	Determining Factor
Very High	-The presence of a bird species listed as “at risk” by the SARA, COSEWIC or provincial/territorial threat ranking, or the presence of the residence(s) of individuals of that species if listed under the SARA, or of its critical habitat. To be of concern, either the bird or its residence or critical habitat must be considered to be potentially affected by the project. -Site contains, or is adjacent to, a large or important bird colony, such as herons, gulls, terns and seabirds.

	<ul style="list-style-type: none"> -Site contains significant staging or wintering area for waterfowl or shorebirds, or significant areas of bird concentrations. -Site is in, or is adjacent to, an area recognized as nationally important for birds (e.g., by being located in or adjacent to a National Wildlife Area, Migratory Bird Sanctuary, Important Bird Area, National Park, Western Hemisphere Shorebird Reserve Network (WHSRN) site, or similar area specifically designated to protect birds). -Site contains large concentrations of raptors. -Site is on a known migration corridor.
High	<ul style="list-style-type: none"> -Site contains one or more landform factors that concentrate birds (e.g., islands, shoreline, ridge, peninsula or other landform that may funnel bird movement) or significantly increase the relative height of the turbines. -Project will disrupt large contiguous wetland or forest habitat that may be of importance to birds. -Site is located between habitats where large local bird movements occur, or is close to significant migration staging or wintering area for waterfowl or shorebirds. -Site contains, or is adjacent to, a small colony of colonial birds, such as herons, gulls, terns, or seabirds. -Site is subject to increased bird activity from the presence of a large heron, gull, tern or seabird colony located in the vicinity of the site. -Site is subject to increased bird activity from the presence of an area recognized as nationally important for birds (e.g., a National Wildlife Area, Migratory Bird Sanctuary, Important Bird Area, National Park, or similar area protected provincially or territorially because of its importance to birds). -Site contains species of high conservation

	concern (e.g., birds known to have aerial flight displays, PIF/CWS priority species, etc.).
Medium	-Site is recognized as regionally or locally important to birds, or contains regionally significant habitat types.
Low	- Site does not contain any of the elements listed above.
Special considerations required	- Presence of a SARA listed species (not just birds) or the residence(s) or critical habitat for a SARA listed species that might be affected by the project. ³ -Proposed project is located offshore.

Size of Facility:

Size	Definition
Very Large	Total local area projected to contain more than 100 turbines
Large	Total local area projected to contain 41–100 turbines
Medium	Total local area projected to contain 11–40 turbines
Small	Total local area projected to contain 1–10 turbines

Level of Concern Category Matrix - Based on Size and Sensitivity Determination:

Facility Size	Site Sensitivity			
	Very High	High	Medium	Low
Very Large	Category 4	Category 4	Category 3	Category 2
Large	Category 4	Category 3	Category 2	Category 2
Medium	Category 4	Category 3	Category 2	Category 1
Small	Category 4	Category 2	Category 1	Category 1

Category Descriptions and Recommendations:

“Category 1: Projects in this category represent the lowest level of potential risk to birds. Usually, such projects would still require some basic surveys before construction, to assess bird populations within the proposed area for the turbines, and to confirm that there are not any sensitive factors that were previously overlooked. If pre-construction surveys indicated

significant numbers of birds in the area at a particular time of year, then post-construction follow-up surveys, using comparable protocols, would normally be required over 1–2 years to determine changes in bird use of the area associated with construction of the turbines. If little or no natural habitat would be impacted (e.g., wind turbines within an industrial park or cultivated fields), few if any follow-up surveys may be required. Minimal carcass searching over one year would normally be required to rule out unexpected mass mortality events.”

“Category 2: Projects in this category present a moderate level of potential risk to birds, and would require basic surveys spread over a one-year period, to obtain quantitative information on birds using the site and to identify any potential mitigation measures to minimize damage to bird habitat during construction. If pre-construction surveys indicated significant numbers of birds in the area, then post-construction follow-up surveys, using comparable protocols would normally be required over 1–2 years to determine changes in bird use of the area associated with construction of the turbines. These follow-up surveys may not need to commence until one year after construction is completed. Carcass searching over one year will normally be required to rule out unexpected mass mortality events.”

“Category 3: Projects in this category present an elevated level of potential risk to birds, and require comprehensive surveys to gather baseline information. These will normally need to be done over the course of one calendar year unless additional concerns are identified in the process (e.g., an unexpected species at risk is found to be present) which could extend the time period. Pre-construction surveys need to quantify what species are using the area and obtain measures of their relative abundance. If the site contains concentrations of birds, or species thought to be particularly vulnerable to colliding with turbines, then observation studies may be required to determine the behaviour of these birds (e.g., to determine their usual travel routes, to determine if they might intercept proposed turbine sites). Such information may help to inform placement of turbines or to determine the need for other mitigation measures. Post-construction follow-up surveys, spread over two to three years would likely be required to determine changes in bird use of the area associated with construction of the turbines. Carcass searching around turbines over at least 2 years is likely to be required during the season when there is an elevated collision risk (e.g., when concentrations of birds are present, or during the migration season.)”

“Category 4: Projects in this category present a relatively high level of potential risk to birds, and consequently are likely to require the highest level of effort for the EA. As with category 3 projects, relatively comprehensive baseline surveys will usually be required. In many cases, these can still be completed over the course of one calendar year, unless there are specific factors that require more intensive survey (e.g., if there is a major concern over a species that shows considerable annual variation in abundance), in which case an additional year of pre-construction assessment may be required. For this reason, proponents are strongly encouraged to design and initiate baseline surveys as far in advance as possible, so that delays in data gathering do not affect EA approval of the project. Depending on the findings of baseline studies, project proponents whose projects fall into this category may be encouraged or even required to seek alternative locations if significant adverse effects on birds are anticipated. If

the project does proceed, relatively detailed follow-up is likely to be required. Post-construction follow-up surveys, spread over two to three years and sometimes more, would likely be required to determine changes in bird use of the area associated with construction of the turbines. Carcass searching around turbines over at least 2 years is likely to be required during seasons when there is an elevated collision risk (e.g., when concentrations of birds are present, or during the migration season). Data gathering for more than two years would normally be targeted to answering very specific questions or concerns, and should in most cases only require limited work in the later years.

For any category project, the extent of post-construction monitoring may be increased if unexpected high mortality or other adverse consequences are encountered. Such monitoring may be required particularly to evaluate the effectiveness of any proposed mitigation measures.”

ALBERTA:

Referenced from: Alberta Sustainable Resource Development – Fish and Wildlife Division. 2006. Wildlife Guidelines for Alberta Wind Energy Projects. 11pp. Available at: <http://www.srd.alberta.ca/ManagingPrograms/FishWildlifeManagement/documents/WildlifeGuidelinesForAlbertaWindEnergyProjects-April05-2006.pdf>

FREQUENCY (pre-construction):

“Following consultation with the SRD-Wildlife Biologist, pre-construction wildlife surveys (including the buffer zone) and rare plant surveys should be done within project areas. In all areas of suitable habitat, surveys should be done for “species at risk” or other species of management concern, as identified by the SRD-Wildlife Biologist. Other surveys that may be applicable, depending upon the species of interest and site specific features, include:

- a) Spring and fall migration surveys at dawn and dusk for songbirds; three surveys each season – early, mid and late migrants.
- b) Breeding bird surveys (two surveys) early species (e.g. May 1-Jun 15) and late species (e.g. Jun 16-Jul 15). Depending upon findings, these may need to be followed by monitoring of nesting/rearing/fledging success of identified nests of species of concern.
- c) Spring and fall migration surveys mid-day for raptors; three surveys each season – early, mid and late migrants.....
- f) Wintering bird surveys (two surveys) – early (e.g. Dec 1-Jan 15) and late (e.g. Jan 16-Feb 28).”

DURATION (post-construction):

“Wildlife carcass collection surveys should be carried out following construction of wind farms. A minimum of one year of carcass collection surveys is recommended, however, there can be high variability of many factors from year to year (eg. weather). This seasonal variation can influence timing and location of wildlife migration routes, selection of habitat, and population densities, and therefore, in most cases, more than one year of wildlife carcass collection surveys is recommended. “

ONTARIO:

Referenced from: Ontario Ministry of Natural Resources. 2010. Bird and Bird Habitats. Guidelines for Wind Power Projects. Accessed 05 January 2011 at:
http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@renewable/documents/document/stdprod_071273.pdf

FREQUENCY AND DURATION (Post-construction)

- “Post-construction monitoring (including mortality surveys, carcass removal and searcher efficiency trials) should be conducted during the core season when birds are active (i.e. May 1st– Oct. 31st) for the first three years of wind turbine operation.
- Mortality surveys should be conducted at each monitored turbine twice per week (3 and 4 day intervals) from May 1st – October 31st and raptor mortality surveys should be continued once per week from November 1st – November 30th.
- Bird mortality surveys should occur at all turbines at wind power projects ≤ 10 turbines. For wind power projects >10 turbines, a sub-sample of at least 30% of turbines (minimum 10 turbines) should be selected to cover representative areas throughout the project location.
- All turbines within the project location should be monitored once a month during the survey period for evidence of raptor mortalities.
- Subsequent post-construction mortality and effects monitoring should be conducted for two years at individual turbines (and unmonitored turbines in near proximity) where significant bird or raptor annual mortality is identified.
- Effectiveness monitoring at individual turbines should be conducted for three years where mitigation has been implemented.”

POLAND:

Referenced from: PWEA (2008). Guidelines for assessment of wind farms’ impact on birds. Szczecin. 26 pp. Available at:
http://www.psew.pl/en/files/guidelines_for_assessment_of_wind_farms_impacts_on_birds.pdf

DURATION (Pre-construction):

Monitoring should cover one year including all phenologic periods. Monitoring includes 4 modules: 1) Transect population and species composition studies (to acquire basic information about species composition of avifauna using the area and the way land is used by birds, density of particular species and variability of both parameters during the yearly cycle); 2) MPPL studies (to study the species composition and concentration of particular bird species using the area

during the breeding period); 3) Intensity of airspace used by birds (to estimate intensity of bird migrations (local and long – range) in the airspace with particular regard to collision - prone species (raptors, other large birds) to study the variability of these parameters during the yearly cycle); and 4) Qualification of rare and average population species (to estimate the population and distribution of rare and large – sized breeding species (in particular: raptors, storks, cranes, swans) on the area of the planned farm and in its direct neighborhood).

FREQUENCY (Pre-construction):

Transect population and species composition studies: “Each transect controlled every 6 - 18 days, depending upon the monitoring path..”

MPPL studies: “2 observations/square during the breeding season (April - June).”

Intensity of airspace used by birds: “ Each point controlled every 6-18 days depending upon the monitoring path (A, B or C), at least 1 h of observations/point; in case of coastal locations with large number of migrants, it may be necessary to control each point every 5 – 7 days during the migration period (March – April, October – November).”

Qualification of rare and average population species: “ 2-3 all – day observations of the entire area during the breeding period (April – mid June) plus opportunity observations during other studies; counting of White Stork population and breeding success thereof during the first days of July (a couple of hours). The qualification shall be supplemented with additional night counting (first days of June) directed to detecting Corncrake and other Rallidae, Quail and Owls.”

DURATION (Post-construction):

Post-construction monitoring should be conducted for three years including all phenologic periods. Post-construction monitoring includes all four pre-construction modules listed above and mortality monitoring.

FREQUENCY (Post-construction):

Refer to pre-construction section above for frequency of four modules: 1) Transect population and species composition studies; 2) MPPL studies; 3) Intensity of airspace used by birds; 4) Qualification of rare and average population species.

For mortality monitoring: Observations should occur “every 10-18 days, all turbines at once (farms of up to 15 turbines), at least 15 turbines (farms of 15-50 turbines), 1/3 of turbines (farms >50 turbines); if not all turbines are monitored at once, the rotating panel survey shall be applied to control each turbine at least once per 3 observations.”

UNITED KINGDOM:

FREQUENCY & DURATION (Pre- and Post- construction):

Offshore Aerial Surveys:

Referenced from: Maclean, I.M.D., Skov, H., Rehfish, M.M. and Piper, W. 2006. Use of aerial surveys to detect bird displacement by offshore windfarms. BTO Research Report No. 446 to COWRIE. BTO, Thetford. Available at:

http://www.offshorewind.co.uk/Pages/Publications/Archive/Birds/Use_of_aerial_surveys_a9fe454d/

“Optimal surveying strategy and improvements to future surveys: Assuming little limitations to cost, current survey methods would be improved by maximizing the number of counts within the desired time-period and by extending this time period for as long as possible. Satisfactory statistical power could be achieved as follows: Survey for four years prior to construction and for four years after construction.”

Offshore Remote Techniques:

Referenced from: Desholm, M., A.D. Fox, and P.D. Beasley. 2004. Best practice guidance for the use of remote techniques for observing bird behaviour in relation to offshore wind farms. COWRIE – REMOTE-05-2004. Available at:

http://www.offshorewind.co.uk/Pages/Publications/COWRIE_1_reports/Best_practice_guidance420b533c/

“Sampling regime should aim to cover at very least 7 full days (24 hour coverage) per month, in the peak periods (preferably not in a single block). This should cover the main migration periods (March-May and mid-July-November inclusive), the breeding season (May- initial surveys and screening. At least 25 days per year should be achieved to ensure sampling of variability. Baseline surveys should cover a minimum of 2 (preferably 3) annual cycles to achieve maximum quantification of inter annual variability, both during the baseline and post construction phases (although the brief duration of the construction phase offers no such opportunity).”

Offshore (general):

Referenced from: DEFRA. 2005. Nature Conservation Guidance on Offshore Windfarm Development - A guidance note on the implications of the EC Wild Birds and Habitats Directives for developers undertaking offshore windfarm developments. Available at:

<http://webarchive.nationalarchives.gov.uk/20080915101357/http://www.defra.gov.uk/wildlife-countryside/ewd/windfarms/index.htm>

“(Surveying) needs to be sufficient to give a confident assessment of numbers of birds present throughout the year. Surveys should, wherever possible, relate changes in bird abundance to

environmental factors including season, time of day, tidal influence and prey availability. Furthermore, as far as possible, some effort should be made to collect data under different weather conditions, though it is recognised that there is limited scope for this when undertaking aerial and ship-based surveys. It is suggested that at least four flights of the whole area are undertaken during the winter, with counts carried out across the whole period if possible. Where breeding birds are present, the SNCAs suggest that at least three flights should be undertaken between May and July/August, with counts ideally undertaken in late May, late June and mid-July to early August. It is advisable that developers consider additional surveys for any other periods considered likely to be important (post-breeding, moulting or spring/autumn passage). Winter surveys are considered to be mid-October to mid-March, summer breeding from late May to early August, late summer from late August to September and Autumn from mid-September to October. It is recommended that 1 to 2 ship-based surveys be undertaken each month during key periods.”

“Data should be collected before the construction, up to several years after construction and, ideally, during construction. It is important that studies explore the impacts of both construction and operational phases, as the potential effects can differ at each stage of the development.”

“It is recommended that aerial and ship-based surveys be carried out for at least three years following construction and some monitoring may be required for the full lifetime of the development. Radar studies may also be required in order to measure any changes in bird movements resulting from any barrier effects. Further work may be required subject to the results of the initial monitoring period. Longer term monitoring will be needed to evaluate gradual or incremental changes, for example the potential cumulative effect of increased mortality, or where birds gradually habituate to the presence of turbines.”

SCOTLAND:

Referenced from: Scottish Natural Heritage. 2009. Guidance on Methods for Monitoring Bird Populations at Onshore Wind Farms. Accessed on 07 December 2010 at: <http://www.snh.gov.uk/docs/C205417.pdf>

Onshore:

DURATION (Post-construction):

“Habitat effects, and lag effects resulting from chronic disturbance may result in change happening over periods of years rather than within one to two years of a development being built and commissioned. [Additionally,] habituation of birds to wind farms and wind farm infrastructure may mitigate initial impacts such that levels of displacement shown early on may be higher, but might decrease over time. “[Therefore], it is recommended that monitoring takes place over at least 15 years after the wind facility becomes operational.”

“Monitoring should occur in years 1, 2, 3, 5, 10 and 15; after the wind farm becomes operational where major habitat change has not been part of the process, such as in upland wind farm construction. Where major habitat change has taken place, e.g. the clear felling of forest to accommodate wind farms, monitoring should take place at three-yearly intervals; i.e. years 3, 6, 9, 12 and 15 after commissioning. This will better address changes in bird communities as habitats change and evolve. Monitoring should also take place during construction, where these effects are likely to be more than temporary. A decision will be necessary after 15 years as to whether monitoring needs to be continued or not.”

UNITED STATES:

ARIZONA

Referenced from: Arizona Game and Fish Department. 2009. Guidelines for Reducing Impacts to Wildlife from Wind Energy Development in Arizona. Web. 22 December 2010. <http://www.azgfd.gov/hgis/pdfs/WindEnergyGuidelines.pdf>

FREQUENCY AND DURATION (Pre- and Post-Construction)

The Arizona guidelines provide matrices detailing the specific pre- and post-construction survey types for birds and bats, including recommendations on intensity and duration for each of these surveys. Matrices can be found on pages 28 (bat pre-construction) and 34 (bird pre-construction) and pages 51 (bat post-construction) and 52 (bird post-construction). The duration depends on the category rating of the project.

The Category rating for guiding pre- and post- construction survey duration decisions is similar to the California category rating system, and consists of 4 categories detailed as follows:

“Category 1 – Project Sites with Available Wildlife Data suggesting No Significant Impacts to Wildlife

Most Category 1 projects will require one year of data collection. For those Category 1 projects which have at least one year of information regarding the use of a site by resident and migratory species, as well as credible mortality data, reduced pre-construction study effort may be appropriate. Category 1 may be appropriate for projects surrounded by or near existing wind energy projects which have been studied sufficiently and/or for which there is little uncertainty as to the level of impact. Factors to consider in determining whether or not data from an adjacent facility would allow a project to be considered for Category 1 include:

- Whether the field data were collected using a credible sample design.
- Where the data were collected in relation to the proposed site.
- Whether the existing data reflect comparable turbine type, layout, habitat, suitability for migratory species, physical features, and winds.
- Whether the data are scientifically defensible and still relevant.

Consultation with USFWS, AGFD, biologists with specific expertise, and other appropriate stakeholders (i.e. a conservation organization representative) is recommended when considering whether a project qualifies as Category 1. Caution is warranted in extrapolating existing data to unstudied nearby sites. Slight topographical or habitat variations can make substantial differences in bat and bird site use and potential impacts. In addition, technological changes including use of large turbines, variations in turbine design or layout, increased operating times, and use of different lighting may require new or additional data gathering. Pre-construction studies for Category 1 projects should focus on information gaps and particular species of concern, if any; and the cumulative impact analysis should address the effects of the proposed project combined with surrounding sites. These studies should build upon and expand existing data about those species from nearby wind resource areas.”

“Category 2 – Project Sites with Little Existing Information and No Indicators of High Wildlife Impacts

If the preliminary site assessment for a project area indicates there are no potential issues (i.e. known occurrence of special status species, knowledge of significant raptor or bat migration through the project area, or high levels of fatalities at nearby wind projects) and no substantial body of information from nearby projects indicates high potential for wildlife impacts, the project area is likely to be categorized as Category 2. Pre-construction surveys should be conducted a minimum of one year. This will allow for an assessment of how bats and birds use the site during spring, summer, fall, and winter, and may require additional years of survey if data from the first year is inconclusive.”

“Category 3 – Project Sites with High or Uncertain Potential for Wildlife Impacts

Project sites with high levels of bat and/or bird use or risk, presence of special status species, or considerable uncertainty regarding potential wildlife impacts will need a minimum of two years of study to help understand and formulate ways to reduce impacts. Characteristics which may put a proposed project site in Category 3 include: high prey abundance such as rodents or prairie dog colonies (current or historic) within, or immediately adjacent to, project areas that could attract resident and migratory raptors; known avian migration stopovers such as

water bodies within or immediately adjacent to the project; high insect abundance that may increase potential as a bat foraging area; special status species occurring on or adjacent to a proposed site; or high concentrations of migrating, wintering, and/or breeding raptors. Projects for which little information is available on bat and bird use potential risk are also included in Category 3.

For most Category 3 projects, two years of data collection are recommended because one year will not adequately characterize bat and bird use due to high variability in seasonal populations from year to year. Additionally, in areas of seasonal importance (e.g. known or expected bat and raptor migration areas) the standard timing and frequency of surveys (e.g. weekly) may be inadequate to characterize overall use during these critical periods.

The number and size of turbines and the extent of the area covered by the project may also influence the need for more or less study because of a direct relationship between the number of turbines and the magnitude of the potential impact to bat and bird populations. Development of numerous projects over large geographical areas, or those covering a heterogeneous mix of habitats and terrain, may need additional specialized or multi-year studies if these areas have never been surveyed. Such large-scale studies may be best addressed with a collaborative research approach encompassing a number of different projects within a region.”

“Category 4 – Project Sites with Significant Impacts to Wildlife

Wind development proposed within designated wilderness areas, national parks or monuments, state parks, regional parks, and wildlife or nature preserves should be considered Category 4. Some projects for which preliminary information gathering or existing data indicates potential for unacceptable risk of bat or bird fatalities may also be appropriately classified as Category 4, particularly if no feasible avoidance or mitigation measures are available to reduce impacts. In Arizona, Category 4 areas include riparian corridors and areas of significant topographic relief. AGFD will not support Category 4 wind energy projects unless a minimum of three years of data indicate the suspected impacts to wildlife populations are not significant.

If a Category 4 project moves forward despite indications that high levels of bat or bird fatalities may occur, and operations avoidance and minimization options to reduce the impacts are limited, then the project may require costly, ongoing re-assessment of impacts and adjustment of mitigation including potential operational shutdown. The most critical component and progressive need in wind development planning today, and one which best addresses cumulative impacts, is the avoidance of areas where unacceptable risk to wildlife occurs. For

those areas, mitigation is no substitute for poor site placement (e.g. Altamont Pass, CA).”

CALIFORNIA

Referenced from: California Department of Fish and Game and California Energy Commission. 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Final Committee Report: CEC-700-2007-008-CTF. Accessed on 10 December 2010 at: <http://www.energy.ca.gov/2007publications/CEC-700-2007-008/CEC-700-2007-008-CMF.PDF>

DURATION (Pre-construction):

“With information from the preliminary site assessment, proposed project sites can be grouped into one of four categories to provide a general framework to assist in determining whether there should be any deviation from the standardized duration and intensity of study needed for pre-permitting and operations monitoring. Assigning projects to categories may not always be a clear-cut process, and projects may shift from one category to another as information from the pre-permitting studies either reveals unanticipated issues or resolves expected concerns about potential impacts.”

The four categories used to guide decision-making in California are as follows:

“Category 1 – Project Sites with Available Wind-Wildlife Data

Some proposed projects have the advantage of an existing foundation of data on bird and bat use and potential impacts from nearby similar projects. For Category 1 projects that have at least one year of information on use of a site by resident and migratory species, as well as credible mortality data, reduced pre-permitting study effort may be appropriate. Category 1 might be appropriate for repowering projects and for other projects surrounded by or near existing wind energy facilities that have been studied sufficiently and for which there is little uncertainty as to the level of impact. Factors to consider in determining whether or not data from an adjacent facility would allow a project to be considered for Category 1 include:

- Whether the field data were collected using a credible sample design
- Where the data were collected in relation to the proposed site
- Whether the existing data reflect comparable turbine type, layout, habitat, suitability for migratory species, physical features, and winds
- Whether the data are scientifically defensible and still relevant”

“Category 2 – Project Sites with Little Existing Information and No Indicators of High Wildlife Impacts

Category 2 projects have no obvious “red flags” that emerge from the preliminary site assessment (for example, “red flags” might include known occurrences of special-status species or high levels of fatalities at nearby wind facilities) and no substantial body of information from nearby projects that could provide information for an impact assessment. Pre-permitting surveys should last a minimum of one year for Category 2 projects to document how birds and bats use a site during spring, summer, fall, and winter. Pre-permitting and operations monitoring may indicate that some project sites may require additional study duration or specific study protocols focused upon a certain species or type of impact. Caution is warranted in concluding that a project will have low impacts to bats based on preliminary site screening data because currently little is known about the range and distribution of California bat populations, their migratory routes, and population variation from year to year.”

“Category 3 – Project Sites with High or Uncertain Potential for Wildlife Impacts

Projects with high levels of bird and/or bat use or considerable uncertainty regarding bird and bat use or risk will need more study than Category 2 projects to help understand and formulate ways to reduce the number of fatalities.

Characteristics of a site that might put a proposed project in Category 3 are:

- Known avian migration stopover destinations such as water bodies within or immediately adjacent to the project
- Special-status species occurring on or adjacent to a proposed site
- High concentrations of wintering and/or breeding raptors
- Sites near or contiguous to wind projects that have experienced high bird or bat fatalities that cannot be avoided or minimized

Pre-permitting studies in excess of one year may be necessary for Category 3 projects when baseline information is lacking and when considerable annual and seasonal variation in bird and bat populations is suspected or when there is potential for declining or vulnerable species to occur at the site.”

“Category 4 – Project Sites Inappropriate for Wind Development

Wind development should not be considered on land protected by local, state, or federal government as: designated wilderness areas, national parks or monuments, state parks, regional parks, and wildlife or nature preserves. Sites for which existing data indicate unacceptable risk of bird or bat fatalities might also be appropriately classified as Category 4, particularly if no feasible avoidance or mitigation measures are available to reduce impacts.”

NEW YORK

Referenced from: New York State Department of Environmental Conservation. Division of Fish, Wildlife and Marine Resources. 2009. Guidelines for conducting bird and bat

studies at commercial wind energy projects. Accessed 30 November 2010 at:
http://www.dec.ny.gov/docs/wildlife_pdf/windguidelines.pdf

DURATION (Pre- construction):

“A minimum of one year of pre-construction studies is recommended for all proposed wind energy projects. Additional years of study may be recommended if warranted by the results of initial on-site studies, or as information is learned through post-construction studies from other projects in the state.”

“If a developer proposes to construct a wind energy project in or near one of the features or resources of concern... then two to three years of pre-construction study may be recommended incorporating one or more expanded pre-construction studies to provide in-depth information on the bird and bat resources of the site. Similarly, if post-construction study results from a wind energy project in a locale with similar physiographic or ecological features to the proposed project have shown that pre-construction predictions under-estimated the actual post-construction impacts, expanded pre-construction studies may be recommended.”

DURATION (Post- construction):

“Standard post-construction studies include mortality surveys, bird habituation and avoidance studies, and bat acoustical monitoring. DEC will evaluate the data from the first year of study to determine any changes to protocols that may become necessary after analysis and review of the initial data. The developer must coordinate with landowners to ensure DEC staff and its agents have full access to the site over the life of the project.”

“For wind energy projects constructed in or near one of the identified features or resources of concern, expanded post-construction monitoring studies will be recommended to provide in depth information on the impacts to bird and bat resources of the site.”

“The pre-construction Breeding and Migrating Bird Surveys should be repeated during the first and second years after the full project is operational. A third year of study should be conducted on the third, fourth or fifth year of project operation as determined through consultation with DEC. “

WASHINGTON

Referenced From: Washington Department of Fish and Wildlife. 2009. Washington Department of Fish and Wildlife Wind Power Guidelines. 36pp. Available at:
<http://wdfw.wa.gov/publications/00294/wdfw00294.pdf>

FREQUENCY AND DURATION (Pre-construction):

“A minimum of one full year of avian use surveys is recommended following current protocols to estimate the use of the project area by avian species/groups of interest during the major migratory seasons or season of most concern. This information should be used to guide decisions regarding appropriate survey intensity. Two or more years of relevant data are recommended in the following cases: 1) risk to avian groups of concern is estimated to be high, 2) there is limited or no relevant data regarding seasonal use of the project site (e.g., data from nearby areas of similar habitat type), and/or 3) the project is significantly diverse in habitat and species. This additional avian use data should be collected to refine impact predictions and make decisions on project layout.”

WYOMING

Referenced From: Wyoming Game and Fish Commission. 2010. Wildlife Protection Recommendations for Wind Energy Development in Wyoming. 72pp. Available at: <http://gf.state.wy.us/downloads/pdf/WEProtection3192010.pdf>

DURATION (Pre-construction and Post-construction):

“We recommend surveys be conducted for a minimum of 2 years prior to construction and a minimum of 3 years post-construction.” (This timeline is applicable to bats, sage-grouse, passerines and raptors).

FREQUENCY (Pre-construction and Post-construction):

Passive Acoustic Surveys: “Units should be deployed between April 15 and October 15 and be programmed to begin data collection ½ hr prior to sunset and end data collection ½ hr after sunrise.”

Active Acoustic Surveys: “Active acoustic monitoring should begin ½ hr before sunset and continue for at least 2½ hours.”

Live Capture: “Surveys should be performed between June 1 and August 30. Each netting site that is identified in the project area should be surveyed at least 3 times during the field season. Nets should be set up ½ hour prior to sunset and be open for at least 2½ hours.”

Carcass Search: “Carcass searches should be conducted weekly during two periods (Apr 15 – Jun 15) and (Aug 1 – Sept 30). More intensive carcass searches may be conducted if necessary.”

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Alberta Sustainable Resource Development – Fish and Wildlife Division. 2006. Wildlife Guidelines for Alberta Wind Energy Projects. 11pp. Available at:
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[http://www.ephc.gov.au/sites/default/files/DRAFT%20National%20Wind%20Farm%20Development%20Guidelines JULY%202010 v2.pdf](http://www.ephc.gov.au/sites/default/files/DRAFT%20National%20Wind%20Farm%20Development%20Guidelines%20JULY%202010%20v2.pdf)

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http://ec.europa.eu/environment/nature/natura2000/management/docs/Wind_farms.pdf

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Available at: https://www.ewt.org.za/LinkClick.aspx?fileticket=nkDN_H4XMak%3D&tabid=232

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