

**Maine Department of Inland Fisheries and Wildlife**  
**Maine Wind Power Preconstruction Recommendations**  
**and**  
**Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality**

*Updated March 5, 2018*

**PURPOSE AND SCOPE**

The Maine Department of Inland Fisheries and Wildlife (MDIFW) has developed this document to assist wind energy project applicants in identifying sensitive wildlife and fisheries species and habitats, and incorporating measures to eliminate or reduce the potential for adverse impacts to them, as early as possible in project design and development processes. A dual benefit is provided in that, by being aware of and avoiding adverse impacts to resources, the applicant experiences a more streamlined, efficient, and predictable review process. MDIFW wishes to provide guidance that will help identify ways to avoid or minimize project impacts through site-specific considerations; to help inform siting parameters for turbine strings, transmission lines, access roads, etc.; to help determine resource-friendly facility operational practices; to help identify other measures to protect species and habitats of concern; and, when these measures have been conducted to the extent practicable, to allow for mitigation of remaining reasonable project impacts.

As a preliminary step, applicants are encouraged to contact MDIFW's Environmental Review Coordinator, John Perry ([john.perry@maine.gov](mailto:john.perry@maine.gov); 207-287-5254) for records of known occurrences of species or habitats of concern on potential project sites. This will help determine the extent of additional information that needs to be collected. MDIFW envisions a hierarchy in which project sites will fall into one of four categories: 1) sites with available wildlife and fisheries resource data and with minimal anticipated issues of concern, where pre-siting evaluations could be completed in less than one year; 2) sites with little existing information but no initial indicators of high potential wildlife or fisheries resource impacts, where pre-permitting surveys may last one or more years; 3) sites with high or uncertain potential for wildlife or fisheries resource impacts, where surveys of multiple years may be needed; and 4) project sites with significant anticipated impacts to wildlife or fisheries resources where surveys of multiple years may also be needed. The extent and significance of anticipated impacts to wildlife and fisheries resources will directly determine MDIFW's recommendations.

This document provides information on identifying important wildlife and fisheries resources to facilitate development of project-specific measures to avoid or minimize significant adverse impacts where possible. Information on siting considerations, general preconstruction study recommendations, and descriptions of important mammalian, avian, and aquatic resources are provided. The need for such surveys is not static over time. Updates of this document may change guidance on certain topics depending on cumulative information, changes in species status, etc. Also provided are MDIFW's general minimum turbine curtailment recommendations and information on Incidental Take Permits for State Endangered and Threatened species.

## **BACKGROUND**

MDIFW envisions the following relationship between pre-construction studies, facility design and operational practices, and post-construction monitoring for wind power projects. Valuable knowledge has been gained in recent years from review of historical species and habitat information, recent patterns and trends, and the results of studies at project sites in Maine and elsewhere. This has allowed us to refine study recommendations in many areas and focus efforts in areas where information is not as well known or is known to be of concern.

**Pre-construction studies** and preliminary resource reviews are designed and conducted to identify habitats and species of concern for use in facility siting and design, as well as development of facility operational measures to avoid/minimize impacts to resources of concern.

**Facility design and operational practices**, such as areas of development, stream crossing designs, physical layout, turbine placement, minimum curtailment procedures, etc., are developed and implemented from pre-construction studies, as well as from MDIFW's recommendations based on site specific, statewide, and regional concerns.

**Post-construction monitoring** is designed to verify recommendations and assumptions, detect mortality and risks, address data gaps, provide for long-term monitoring of issues of concern, and inform an iterative process in which operational practices are reviewed and modified if necessary (MDIFW guidelines to be revised).

## **SITING CONSIDERATIONS**

MDIFW recommends that applicants factor in known resource data and the information in this document when considering siting of a proposed wind energy facility. Locating in or in proximity to certain habitats can be anticipated to result in adverse impacts to those habitats and/or the species that utilize them, and MDIFW will likely recommend increased design considerations, operational measures, monitoring practices, and mitigation efforts in attempt to avoid or minimize such impacts. For example, applicants should consider the presence of bat hibernacula, talus slopes, etc., where greater seasonal activity of these imperiled species must be accounted for. Also, significant bird migration routes through Maine's coastal plain and major river corridors are factors of concern. And, the presence of habitat-dependent species, such as northern bog lemmings, upland sandpipers, whimbrels, Bicknell thrush, great blue heron, and other Rare, Threatened, or Endangered species, as well as unique habitats such as Significant Wildlife Habitats (designated under the Natural Resources Protection Act, 38 M.R.S., §480-A et. seq.), Essential Habitats (designated under the Maine Endangered Species Act or MESA, 12 M.R.S., §12801 et. seq.), wetlands, high elevation streams, etc. must be considered. Greater details on these resources are provided within and through consultation with MDIFW.

As noted in the New York Department of Environmental Conservation's Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects (June 2016), "*One of the most effective means of reducing direct and indirect impacts to birds and bats is to site turbines*

*in a location that will avoid disturbance to migrating, breeding, wintering, roosting, and feeding birds and bats. In addition to direct and indirect mortality caused by turbines, other negative effects from factors such as habitat loss or fragmentation, introduction or spread of invasive species, avoidance of otherwise potentially suitable habitat, increased human activity and development, and increased predator and parasite presence can result from the construction and operation of a wind energy project and should also be considered.” MDIFW hopes to assist applicants in avoiding such adverse impacts.*

## **PRECONSTRUCTION STUDY RECOMMENDATIONS**

The following recommendations are intended to convey the type and extent of information typically necessary for MDIFW to make determinations on potential project-specific impacts on fisheries and wildlife resources. The results of these studies are intended to inform discussions on possible means to avoid or minimize adverse impacts to species and habitats of concern to the extent practicable. Each proposed project will be reviewed individually and site-specific recommendations provided. Applicants are strongly encouraged to meet with MDIFW staff to discuss site-specific issues, concerns, and monitoring needs as early as possible in their project development processes, to help inform project designs, schedules, etc. in as timely a manner as possible. MDIFW’s Environmental Review program operates under an adaptive management framework, where recommendations are evaluated and revised based on the best available science as well as lessons learned from other projects.

Please note that additional study recommendations, species concerns, details of recommended studies (i.e. seasonality, timing and duration of studies, elevation guidelines), etc. may vary and need to be addressed depending on the location of the project site. Therefore, please contact MDIFW to verify that you are working with the most recent and site-specific recommendations. Failure to collect appropriate and accurate data, or collecting data that are not consistent with current MDIFW methodologies, can limit and/or delay MDIFW’s assessment of the project. All project review requests should be sent to MDIFW’s Environmental Review Coordinator, John Perry ([john.perry@maine.gov](mailto:john.perry@maine.gov); 207-287-5254). Additional contacts are listed below for specific subject areas, but the Environmental Review Coordinator should be included on all correspondences.

Project monitoring reports, including data from studies described below, need to be submitted to MDIFW by December 31 of that year to provide for adequate review of information and enable MDIFW to provide appropriate feedback and recommendations for subsequent study seasons.

### **Mammalian Resources**

**Acoustic Bat monitoring:** Historical evidence indicates that, prior to the spread of white nose syndrome beginning in approximately 2010, Maine enjoyed statewide distributions of little brown bats (*Myotis lucifugus*) and northern long-eared bats (*M. septentrionalis*), as well as frequent occurrences and sizable distributions of the six other bat species that are indigenous to Maine. Both of these *Myotis* bats are listed as Endangered and the eastern small-footed bat (*M. leibii*) is listed as Threatened, pursuant to MESA. All five of Maine’s other bats are considered Species of Special Concern. Special Concern species are defined by

MDIFW as species that do not meet the criteria as Endangered or Threatened, but are particularly vulnerable and could easily become Endangered, Threatened, or Extirpated due to restricted distribution, low or declining numbers, specialized habitat needs or limits, or other factors. Today bats are still detected statewide, though in low numbers, as validated by wind energy project monitoring studies and work by MDIFW and others. Based on this established presence, instead of ongoing widespread acoustic bat monitoring to confirm presence and distribution, which has been the practice in recent years, MDIFW recommends siting away from key habitats where bats aggregate and seasonal operational curtailment measures that will be protective and provide the best opportunity for reestablishment of Maine's imperiled bats (see curtailment recommendations later in this document). MDIFW will typically only recommend acoustic bat monitoring in those areas where necessary to determine whether talus slopes, rocky outcrops, or similar features are in use as hibernacula or maternity roost sites by *Myotis* bats.

If the site contains  $\geq \frac{1}{2}$ -acre talus fields or rocky outcrops, or cliffs visible from remote imagery, MDIFW recommends **at least** 2 years of acoustic monitoring during the periods when cave-dwelling bats swarm during arrival at winter hibernacula (mid-November through December) and/or emerge the following spring (especially March). If any sites containing talus fields, rocky outcrops, or cliffs as specified above are identified, a minimum of one detector should be placed at each feature and acoustic monitoring should be conducted for a three-week period during one of the time frames listed above. Due to the lower activity of bats during these time periods, this data needs to be analyzed in a manner different from conventional activity monitoring data. This data should be scrubbed at the most liberal setting (allowing poorer quality calls) and files identified as potential bat calls by the scrubbing process should be manually vetted and identified to species when possible or at a minimum species guild (i.e. *Myotis*, EPFU/LANO). Due to discrepancies of what may constitute a talus field, rocky outcrop, or cliff, applicants are strongly encouraged to contact the MDIFW Small Mammal Biologist (contact information listed below) to discuss if any potentially valuable features exist in the project area.

MDIFW recommends that the latest, state of the art acoustic detectors be utilized to enable monitoring of the largest range possible. It is essential that all raw acoustic monitoring data be provided to MDIFW. Please contact the MDIFW Small Mammal Biologist (207-941-4473) to discuss the details of your monitoring plan.

**Northern Bog Lemming:** Northern bog lemmings (NBL) are a State Threatened Species, whose preferred habitats have the potential to intersect with, and be impacted by, certain wind energy development proposals. The habitats of interest for NBLs are alpine sedge meadows, krummholz, spruce-fir forest with dense herbaceous and mossy understories, wet meadows, and mossy stream-sides, that are  $\geq 1,000$  feet MSL (above Mean Sea Level) in western mountain and northern areas of Maine. Northern bog lemmings are presumed to be present in these habitats and, to protect this species, MDIFW recommends that these areas be avoided. Alternatively, if an applicant wishes to verify presence, MDIFW recommends as part of project wetland delineation work that the applicant note any potential habitats that meet these criteria, and that they perform surveys to document presence/probable absence. Surveys can be conducted in one of two ways.

1) Transects can be walked through NBL habitat and document any presence of run-ways, latrines, and green scat; or

2) If a more definitive method of NBL identification is desired on the part of the applicant, scats can be collected and genetically analyzed to identify if they are NBL, or other species of rodents. For a full description of the methods to conduct this level of genetic work please contact the MDIFW Small Mammal Biologist (207-941-4473). If evidence of lemmings is present either in the form of green scats, latrines, runways, and/or genetic confirmation, MDIFW will consider the area as occupied and recommendations will be to avoid these wetlands.

**Canada lynx:** Canada lynx are listed as a Species of Special Concern in Maine. If an applicant wishes to determine if lynx are currently present, MDIFW recommends conducting two or more snow track surveys on the project area each winter following MDIFW guidelines. For further guidance, please contact MDIFW Black Bear and Canada Lynx Biologist, Jennifer Vashon ([jennifer.vashon@maine.gov](mailto:jennifer.vashon@maine.gov); 207-941-4238).

### **Avian Resources**

**Nocturnal radar:** Nocturnal radar has historically been used to assess potential risk to migratory birds (songbirds, waterfowl, shorebirds) and bats by providing data on their relative numbers and flight patterns in areas of proposed wind turbines. With the detrimental effects of white nose syndrome on bat populations in recent years, radar data has become much more indicative of bird activity. The best available science on bird migration patterns across Maine, data from recent radar studies, information on predominant weather conditions that cause lower migration flight heights, and knowledge of migratory stopovers / staging areas used by bird guilds have helped determine regions of greater risk. These factors and post-construction project fatality monitoring data have demonstrated that Maine's coastal plain is principal among them, and thus an area of significant concern to the Department.

MDIFW believes that sufficient data has been collected through radar and fatality studies for proposed and active facilities in Maine's coastal plain to indicate significant use patterns and adverse risks for migrating birds in this region. As the factors above have been well demonstrated, the Department does not require additional radar data in the coastal plain as revalidation at this time. In the Department's view, based on seasonal and daily migratory patterns (numbers of migrants, flight heights, behaviors), predominant weather conditions, and the results of area studies (Downeast Wind, Weaver Wind, Bull Hill Wind), the "coastal plain" area of concern generally corresponds with the U.S. Environmental Protection Agency Ecoregions labeled as "Gulf of Maine Coastal Plain (59h)", Gulf of Maine Coastal Lowland (59f)", "Midcoast (82f)", "Downeast Coast (82g)", and a transitional area in the southern region of "Eastern Maine-Southern New Brunswick Plains (82c)", roughly represented as below Route 9 in eastern Maine (see accompanying map also found at: <https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-epa-region>). For further information on the basis of these concerns and references, see MDIFW's Avian Resources in Maine's Coastal Plain (March 2018).

The Department recommends, however, that nocturnal radar studies continue to be conducted for wind energy projects proposed along Maine's major river corridors based on the habits of migrating birds for following topographic features and limited data in such areas. For projects proposed within one mile of one of Maine's major rivers including, but not limited to, the Androscoggin, Kennebec, Penobscot, Allagash, Aroostook, and St. Croix Rivers, MDIFW recommends **at least** 2 years including **at least** 4 seasons (2 spring: April 15-June 1 and 2 fall: August 15-November 30) of 20 well distributed nights per season of data collection per project, if the data indicates consistent patterns of migration, passage rates, and flight heights. Migration patterns may be expected to vary to some degree due to changes in climate, weather, etc. If, after consideration of factors that naturally cause variability, the data are not consistent, an additional year (1 spring, 1 fall) will likely be recommended.

Note that additional nights or seasons of monitoring may be recommended depending on site specific conditions, the project location, species present, etc. Also, large projects may need multiple radar monitoring locations to ensure adequate coverage of geographically larger project sites. To ensure that applicants sample nights with representative migration activity, we recommend comparisons to other studies or to Nexrad data. MDIFW also recommends the use of X-Band radar systems to ensure consistency and comparability between study results, preferably with dual arm radar technology. If radar units are placed at sites with more than 15% ground clutter, site selection should be pre-approved by MDIFW staff often following a site visit. For verification purposes, it is essential that an image of the radar screen during a high migration event and a series of photos showing surrounding landscape/ground clutter be submitted with any report. For further guidance on radar methodologies, settings, and marine applications, please contact MDIFW Avian Biologist, Adrienne Leppold ([adrienne.j.leppold@maine.gov](mailto:adrienne.j.leppold@maine.gov); 207-941-4482).

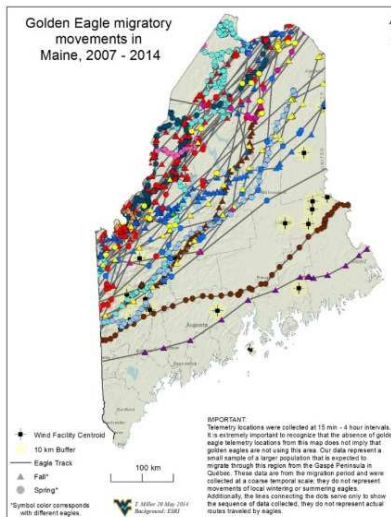
Bird migration patterns in other regions of the state typically indicate higher flight heights and/or lower passage rates, suggesting that migrating birds do not appear to be placed at unreasonable risks in these areas at this time. Therefore, nocturnal radar studies are likely unnecessary in those areas. However, applicants are strongly encouraged to contact MDIFW as early as possible in their project development process for verification.

**Raptor Migration**<sup>1</sup>: Mountainous regions and areas along Maine's major river corridors may serve to funnel raptor movements. Also, accipiters and falcons are both known to focus their movements along the coastal plain, with accipiters tending on the inland side and falcons tending on the seaward side of the coast. Raptor migration surveys provide data to indicate how raptors are using the terrain for activities such as migration, lift, stopover, refueling, foraging, etc., allowing MDIFW to recommend minor project modifications to avoid/minimize impacts based on documented raptor activity. In mountainous regions, along major river corridors<sup>2</sup>, and in coastal plains<sup>2</sup>, MDIFW recommends **at least** 2 years including **at least** 4 seasons (2 spring and 2 fall) of pre-construction monitoring because of high year-to-year variability in the numbers of migrants (Strickland et al. 2011). Where data suggest that concentrations of raptors are possible, the Hawk Migration Association of America (HMANA) asserts that three years of pre-construction study data are important for projects (HMANA Industrial Wind Turbine Siting and Monitoring Policy 2013). Surveys are conducted in the spring (March 1 - June 15) and fall (August 1 - November 30), two or more times per week in



weather conducive to migratory activity, from 9 a.m. until 2 hours before sunset, or later if birds are moving through the area, from one or more prominent locations within the project area. Information on the species, number of individuals, behavior (especially foraging or other stopover/staging activity), flight height (especially abrupt changes owing to orographic lift) and direction, time of sighting, and location / direction of travel of each bird relative to the project area should be recorded. For further guidance, please contact MDIFW Avian Biologist, Erynn Call ([erynn.call@maine.gov](mailto:erynn.call@maine.gov); 207-941-4481).

**Golden and Bald Eagle<sup>1</sup>** : Golden eagles are listed as Endangered under MESA. While most documented golden eagle sightings have occurred in northwestern Maine, smaller numbers of transients have been documented elsewhere in the State at various times of the year. In Maine, golden eagle activity typically peaks during fall and spring migrations, although a few golden eagles have been documented to overwinter in Maine. Reports of sightings during the spring/summer breeding season occur, but are rarely validated. The difficulties include the immense home range (approximately 2,000 square miles) of breeding eagles, the highly mobile nature of subadult eagles, widespread misidentification of juvenile bald eagles, and the certainty of observers that golden eagles are a very rare bird in Maine. If golden eagles have been documented within the project vicinity based on telemetry or MDIFW-verified observation data, the raptor migration surveys described above should be modified so that spring surveys are conducted between February 15 – June 15 and fall surveys are conducted between August 1 - December 15. The map below is provided as general guidance for areas of concern for Golden eagles. For further guidance, please contact MDIFW Avian Biologist, Erynn Call ([erynn.call@maine.gov](mailto:erynn.call@maine.gov); 207-941-4481).



<sup>1</sup> We request that contractors contact MDIFW to select survey sites, sampling methods, sample size prior to collecting any data in the field. Contractors should partner with MDIFW to establish an appropriate study design and deliverables based on site-specific conditions (e.g. project size, proximity to an existing wind farm, topography, and presence of species or habitat of interest) prior to initiating preconstruction surveys. To facilitate MDIFW review, work plans should include a proposed study design, including detailed methods, data sheets, and how the data will be summarized.

<sup>2</sup> Major river corridors and coastal plains are both intended as described in “Nocturnal Radar” above.

Bald eagles have gone through a remarkable recovery in Maine and, as such, the formal status of the population has changed. Until recently, bald eagles were classified as Species of Special Concern, but no longer. Based on its current State status, MDIFW does not specifically request bald eagle surveys at this time. However, they continue to be protected under the federal Bald Eagle and Golden Eagle Protection Act (Eagle Act), as well as other federal laws. It is recommended that applicants contact the US Fish and Wildlife Service (Maine Field Office, Orland) for guidance.

**Great Blue Heron:** The Great Blue Heron is categorized in Maine as a Species of Special Concern. MDIFW recommends an aerial survey area within 4-miles of proposed project boundaries to look for new and existing colonies and level of use, and to include ridgeline sightings of herons during raptor survey work. Surveys should be conducted between May 1 and June 15 for projects in northern and Downeast Maine. Earlier timing may be warranted in central and southern regions of the state. Note, heron survey periods overlap with surveys conducted pursuant to the Federal Eagle Act noted above. Please contact MDIFW Avian Biologist, Danielle D'Auria ([danielle.dauria@maine.gov](mailto:danielle.dauria@maine.gov); 207-941-4478) for further guidance.

**Bicknell's Thrush:** The Bicknell's Thrush is categorized in Maine as a Species of Special Concern. This species is known to occupy sub-alpine forests usually dominated by balsam fir and red spruce at elevations  $\geq 2,700$  feet, with recent evidence of some lower elevations, typically where a history of disturbance has resulted in a stunted dense understory. Title 35-A M.R.S., Section 3452-A, establishes a rebuttable presumption that "*any portion of the generating facilities or associated facilities of a wind energy development*" proposed in documented Bicknell's Thrush habitat would "*constitute a significant adverse effect on natural resources*". Thus, these areas should be avoided. If an applicant wishes to verify presence, a series of surveys should be conducted to assess the abundance and distribution of the population at that site. Surveys are to be conducted pursuant to the Mountain Birdwatch Program methodologies as outlined in the Program manual ([http://vtecostudies.org/wp-content/uploads/2017/03/MBW-Volunteer-Manual\\_2017.pdf](http://vtecostudies.org/wp-content/uploads/2017/03/MBW-Volunteer-Manual_2017.pdf)). For further guidance, please contact MDIFW Avian Biologist Adrienne Leppold ([adrienne.j.leppold@maine.gov](mailto:adrienne.j.leppold@maine.gov); 207-941-4482).

**Breeding Birds:** Applicants have historically submitted more incidental bird observations than requested. It should be noted that anecdotal information that is not part of a formal survey is of limited value. If, however, there is evidence of MESA listed Endangered or Threatened species or select species of Special Concern using the project vicinity, MDIFW may request breeding bird surveys be conducted. Assuming proposed wind energy projects will not be located in proximity to wetlands, beaches, or coastal islands, the primary concerns will involve grassland bird species such as upland sandpipers, grasshopper sparrows, eastern meadowlark, and horned lark. In addition to the grassland bird species, MDIFW is also concerned with American pipit, rusty blackbird, and Bicknell's thrush (see previous section). Known information on the presence of these species in a proposed area will be provided during preliminary review of project sites or upon request. As general guidance, the following describes the habitat preferences of these species.



Habitats of concern for grassland bird species include large grasslands or agricultural lands exceeding 15 acres in size. This includes, but is not limited to, hayfields, crop fields, pastures, upland and wet meadows, as well as airports and landfills over 30 acres. American pipits nest in rocky, alpine habitat above tree line. Rusty blackbirds are associated with extensive tracts (10 to 400 acres) of early successional softwood dominated forest stands in close proximity to wetlands or low-gradient streams.

If requested, one year of surveys will typically be adequate, but MDIFW may recommend additional years of sampling in some cases, namely if there is 1) limited or no relevant data regarding breeding season use of the project site (e.g., data from nearby areas of similar habitat type) or 2) significantly diverse species and habitats present.

In these limited situations primarily involving the species highlighted above, surveys should consist of point counts, designed to document singing males, though the observer should record all birds seen and heard. Survey locations should cover the entire project area and be representative of all habitat types. Point count locations should be a minimum of 200 meters apart, and, when possible, should be located at the anticipated turbine sites. In some cases, we may request control sites be established to complete Before-After-Control-Impact (BACI) assessments. Once points have been identified, a map of the project area and point count locations should be included in the work plan presented to MDIFW prior to commencing data collection. Points should be visited for surveys three times; once in May and twice in June, spaced at least seven days apart. Point counts should be conducted between sunrise and 10:00 am with detections limited to 100-meter distance radius and 10-minute sampling periods. Birds outside the 100-meter radius or sampling period should be recorded as incidental observations.

*Point Count Data Analysis:* Data should be analyzed and summarized seasonally to report species' relative abundance (i.e., mean number of observations in a 10-minute sampling period), frequency of occurrence (i.e., % of surveys a species is observed), and community richness. For further guidance, please contact [MDIFW Avian Biologist, Adrienne Leppold \(adrienne.j.leppold@maine.gov; 207-941-4482\)](mailto:adrienne.j.leppold@maine.gov).

### **Aquatic Resources**

Rivers, streams, and brooks within proposed remote wind energy project sites are often in or near headwaters, providing high water quality and habitat values for fish and other aquatic and wetland species. MDIFW recommends maintaining 100-foot vegetated buffers from the upland edge of streams and any contiguous wetlands. Maintaining and enhancing buffers along these resources is critical to the protection of water temperatures, water quality, natural inputs of coarse woody debris, and various forms of aquatic life necessary to support conditions required by coldwater fish and other aquatic species. Stream crossings should be avoided, but if a stream crossing is necessary, or an existing crossing needs to be modified, it should be designed to provide full fish passage. Small streams, including intermittent streams, can provide crucial rearing habitat, cold water for thermal refugia, and abundant food for juvenile salmonids on a seasonal basis. Undersized crossings may inhibit these functions. Generally, MDIFW recommends that all new, modified, and replacement stream crossings be sized to span at least 1.2 times the bank-full width of the stream. In addition, we

generally recommend that stream crossings be open bottomed (i.e. natural bottom), although embedded structures which are backfilled with representative streambed material have been shown to be effective in not only providing habitat connectivity for fish but also for other aquatic organisms. MDIFW encourages consideration of these factors during initial design of the project and its position in the landscape, site preparation, and installation of infrastructure to ensure continuation of these important habitats.

**Roaring Brook Mayfly:** The Roaring Brook Mayfly is listed as Threatened under MESA. This species is known to inhabit clean, cold, high elevation perennial streams in central and western mountainous regions of the state. All known occurrences of this species are in streams draining off slopes above 1,000 feet elevation MSL with coarse substrates (rocks, cobble, boulders) and bordered by relatively undisturbed mixed or hardwood forest. To protect this species, MDIFW recommends a 250-foot riparian management zone for streams meeting these location preferences, extending from each bank. Alternatively, if an applicant wishes to verify presence, potentially suitable habitat should be identified during stream delineations and surveyed during the appropriate timing window (September). Please contact MDIFW Wildlife Biologist Beth Swartz ([beth.swartz@maine.gov](mailto:beth.swartz@maine.gov)) for further details on riparian management zones, survey protocol, etc.

**Spring Salamander:** The Northern Spring Salamander is categorized in Maine as a Species of Special Concern. This species is known to inhabit clear, cold, mountain streams in the central and western regions of the state, with scattered records in York and Cumberland counties. Most occurrences in Maine are known from elevations ranging between 500 and 2,000 feet MSL in relatively steep gradient, first or second order streams underlain by coarse substrates (rock, cobble, gravel) and bordered by hardwood or mixed forest. This species can also be found in larger third-order streams and rivers if the habitat is appropriate as described above. To protect this species, MDIFW recommends a 250-foot riparian management zone for streams meeting these location preferences, extending from each bank. Alternatively, if an applicant wishes to verify presence, potentially suitable habitat should be identified during stream delineations and surveyed during the appropriate timing window (mid-May to mid-September). Please contact MDIFW Wildlife Biologist Beth Swartz ([beth.swartz@maine.gov](mailto:beth.swartz@maine.gov)) for further details on riparian management zones, survey protocol, etc.

**Vernal Pools:** The “significance” of vernal pools and their associated buffers is dependent upon several factors, including the presence or use by state Rare, Threatened, or Endangered Species, or the presence and reproductive success of certain pool-breeding amphibians. The optimal time for assessing the latter criteria coincides with a 2-3-week spring breeding period that varies slightly with geography, elevation, and weather. Vernal Pools are designated as “Potentially Significant” until such time that a seasonally valid survey is conducted and the true value determined. Because of the limited survey period, some developers may choose to initially consider their pools as Significant and reassess them in the future under viable conditions. Alternatively, a developer may choose to consider them as Significant Vernal Pools (SVPs), not formally survey them, and design the proposed project accordingly to avoid (recommended), minimize, and mitigate for any impacts to these resources.

When performed, vernal pool surveys should be conducted within 250 feet of any proposed project impact and during the recommended egg mass periods. These surveys should extend out to 250 feet beyond the anticipated project footprint because of potential impacts to off-site Significant Vernal Pools, assuming such pools are located on land owned or controlled by the applicant. A MDEP Maine State Vernal Pool Assessment Form should be completed for each pool and submitted to MDIFW for pool status determination as soon as possible and **well before the project application is submitted to MDEP**. Please contact MDIFW Wildlife Biologist Beth Swartz ([beth.swartz@maine.gov](mailto:beth.swartz@maine.gov)) for further details.

**Additional Surveys and Rare Animal Forms:** In addition to those noted above, surveys may be recommended for other Endangered, Threatened, and Special Concern species based on the project location and site specific conditions. Any additional surveys warranted will largely be identified by MDIFW during early project consultations.

In many regions of the State, formal surveys for Rare, Threatened, and Endangered species have not been conducted, so it is possible that other rare species may be resident or transient in the project area based on location, habitats present, and life history requirements, including one or more rare species of migratory birds during spring and fall migrations. MDIFW requests that the applicant/consultants voluntarily document any Rare, Threatened, or Endangered Species encountered during project surveys by completing and submitting a *Rare Animal Form* for each observation. For forms, please contact MDIFW's Environmental Review Coordinator, John Perry ([john.perry@maine.gov](mailto:john.perry@maine.gov); 207-287-5254).

### **MINIMUM TURBINE CURTAILMENT RECOMMENDATIONS**

Of the eight species of bats that occur in Maine, three *Myotis* species are afforded special protection under Maine's Endangered Species Act: the little brown bat (*M. lucifugus*, State Endangered); northern long-eared bat (*M. septentrionalis*, State Endangered); and eastern small-footed bat (*M. leibii*, State Threatened). The five remaining bat species are designated as Species of Special Concern: red bat (*Lasiurus borealis*), hoary bat (*L. cinereus*), silver-haired bat (*Lasionycteris noctivagans*), tri-colored bat (*Perimyotis subflavus*), and big brown bat (*Eptesicus fuscus*). It is MDIFW's position that the only adequate protection for bats at wind power facilities at this time is seasonal curtailment of turbines under appropriate conditions, though continuing research may lead to other avoidance measures in the future.

MDIFW's curtailment recommendations are based on project and site specific considerations, recent recommendations for other similar facilities, seasonality, proximity to specific habitats important to bats, and ambient temperatures. MDIFW's recommendations will be updated in the event of new conservation measures with demonstrated efficacy, status updates on listed bat populations, insights on cumulative impact, etc.

For planning purposes, in most circumstances based on current research<sup>3</sup> and recent project reviews, MDIFW recommends that turbines operate only at cut-in wind speeds exceeding 6.0 meters per second each night (from at least ½ hour before sunset to at least ½ hour after sunrise) during the period April 15 –September 30, whenever the ambient air temperature is at or above 32 degrees Fahrenheit, measured at both ground level and nacelle hub height. Proximity to hibernacula, documented maternity sites, rocky features, the coastal mainland, and migration patterns, may increase risks and thus possibly necessitate additional safeguards, such as extended timeframes (earlier and/or later) and/or higher wind speeds. At this time, MDIFW considers proximity to be within three miles, subject to revision with ongoing research. Additionally, based on higher bat mortality during July – September demonstrated through post-construction project monitoring in Maine and research elsewhere, applicants can anticipate a need for increased curtailment wind speeds during this period. Cut-in speeds are determined based on mean wind speeds measured at nacelle hub heights of a turbine over a 10-minute interval. MDIFW advises that turbines be feathered during curtailment and allowed to turn at no more than one revolution per minute to minimize risks of bat mortality. MDIFW urges applicants to discuss site specific curtailment recommendations in early stages of project design.

## **INCIDENTAL TAKE PLANS**

Under MESA, MDIFW has the authority to approve project-specific Incidental Take Plans (ITPs) when such plans minimize the incidental “taking” (death) of Endangered or Threatened species and demonstrate that the “taking” will not impair the recovery of the species. For projects that incorporate appropriate siting, design, and operational practices to ensure

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<sup>3</sup> At the 355-turbine Fowler Ridge Wind Farm in Indiana in 2010, “An approximate 50% reduction in overall bat mortality was observe[d] by raising the cut-in speed from 3.5-5.0 mg/s, while an approximate 78% reduction in overall bat mortality was realized by raising the cut-in speed from 3.5-6.5 m/s”. “The Fowler Ridge study is the first to demonstrate that bat fatality rates were not only significantly different between control and treatment turbines, but that bat fatality rates were significantly different between cut-in speeds raised to 5.0 m/s versus turbines with cut-in speeds raised to 6.5 m/s.”

At the 16-turbine Sheffield Wind Facility in Vermont in 2012, “Total fatalities at fully operational turbines were estimated to be 2.6...times greater than at [6.0 m/s] curtailed turbines, resulting in an estimated 60%...reduction in bat fatalities [when curtailed at this level].”

At the 67-turbine Beech Ridge Wind Farm in West Virginia in 2013, “The cut-in speed for all turbines was raised [from the nominal cut-in speed of 3.5 m/s] to 6.9 m/s all night long throughout the entire study period. Turbines were feathered so that they did not rotate at wind speeds below 6.9 m/s.” “The bat fatality rate at the Project was approximately 89% less than the average for other annualized West Virginia projects.”

“Indeed, several previous or concurrent studies have shown that raising turbine cut-in speeds...from the manufactured speed (usually 3.5-4.0 m/s for modern turbines) by 1.5-3.0 m/s [total 6.5-7.0 m/s] results in significant reductions in bat fatalities compared to normally operating turbines (Baerwald et al. 2009, Arnett et al. 2011),”

“Currently, only operational mitigation (stopping turbine blades from spinning) during predictable high risk periods has demonstrated effective reductions of fatalities of bats.” “We conclude that increasing cut-in speed between 1.5 and 3.0 m/s [above manufacturer cut-in speeds of 3.5-4.0 m/s for a total of 6.5-7.0 m/s] or feathering blades and slowing rotor speed up to the turbine manufacturer’s cut-in speed yields substantial reductions in fatality of bats.”

All from Arnett et al., 2013

avoidance/minimization of bat mortality, this provides legal protection against liability for incidental take, benefitting applicants seeking permits to build and operate wind energy projects into the future. Developers have the option to prepare ITPs in advance of the normal review conducted by permitting agencies. However, it should be noted that ITPs are developed and approved for specific Endangered or Threatened species. As such, an approved ITP for bat mortality does not address, nor provide protection against liability for, adverse impacts to other species or resources. Such other impacts must be addressed independently. For more information on ITPs, please contact MDIFW's Endangered and Threatened Species Coordinator, Charlie Todd ([charlie.todd@maine.gov](mailto:charlie.todd@maine.gov); 207-941-4468).



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