

Maine Department of Inland Fisheries and Wildlife

Avian Resources in Maine's Coastal Plain

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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^{1,2}, and knowledge of migratory stopovers / staging areas used by bird guilds have helped determine regions of greater risk to migratory birds (MDIFW unpublished data). These factors and post-construction wind 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. The concentration of migratory birds in the coastal plain is greater than in other areas of Maine and the seasonal and daily movement patterns are unique for represented guilds, creating a very complex dynamic. In and around the Gulf of Maine, over 300 species of birds have been documented during migration. The Gulf of Maine and coastal plain is an especially important region for millions of migrants during both spring and fall migration and serves as a nexus for many boreal breeding bird species whose migration routes intersect over the Gulf of Maine (Drury and Keith 1962, Hicklin 1987, Humphrey et al 1995, Leppold and Mulvihill 2011, Richardson 1978 and 1979). Of these migrant species, 100 are listed in Maine's 2015 State Wildlife Action Plan as species of Special Concern or Species of Greatest Conservation Need (SGCN). 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. SGCN are designated and prioritized based primarily on risk of extirpation, population trend, endemism, and regional conservation responsibility. Concerns with migratory birds in the coastal plain involve passerines and shorebirds that are migrating through Maine at different times and from different directions. In addition to those that migrate through, other shorebirds breed in Maine's coastal plain and are present through the spring, summer and fall, with localized behavioral patterns that put them at significant risk.

¹ *"The Project's proximity to the coast and its microclimate (i.e., wind speed above tree height and propensity for fog) may put it at greater risk of collision for nocturnal migrant passerines than other Projects in the region." Bull Hill Wind Project Year 1 Post-Construction Wildlife Monitoring Report, 2013.*

² The area referenced by MDIFW as the "Downeast Coastal Plain" can be observed as an unusual formation between two separate ecoregions in which the Eastern Maine-Southern New Brunswick Plains Ecoregion (82c) protrudes southward into the Downeast Coast Ecoregion (82g). The US Environmental Protection Agency, US Geologic Survey, and other partners' note for 82c, *"The climate is milder than in ecoregions to the north and northwest, and is transitional to the coastal Ecoregion 82g."* For 82g, *"The Downeast Coast has more fog and precipitation than other coastal regions, and the wet, cool, foggy climate supports these spruce-fir forests of a more northern character"*. Ecoregions of New England (Griffith, G.E., Omernik, J.M, et al, US Geologic Survey, 2009).

Migrating passerines: The natural orientation of the coastline (southwest to northeast) provides a leading line for migrant birds traveling to and from northern Maine and the eastern Canadian Provinces (i.e. Nova Scotia and Newfoundland). While many migratory movements occur as broad-front pulses, birds are also adapted to follow topographical features like coastlines, regardless of the orientation (Åkesson 1993, Bruderer and Liechti 1998). Ecological barriers, such as oceans, may even attract birds (Berthold 1993). When migratory movements converge and funnel along a guiding line, mass migrations develop into migration corridors or flyways (Baird et al. 1958, 1959, Berthold 1993). Migration research in and around the Gulf of Maine since the 1950's supports classifying the Gulf of Maine as one of these major migration corridors (McCabe 2015, Leppold 2016, Smetzer 2017).

In Maine, passerine spring migration occurs from April to June and consists of congregations of many species, but with dominant guilds represented at different times during the season. Passerine fall migratory movements occur primarily from mid-August to November, as large numbers of individuals make their way south to wintering grounds in the southern U.S., Caribbean Islands, and Central and South America. Maine's coastline and more than 4,000 islands provide critical stopover areas for these migrating birds (Grunzel 2014, McCabe 2015, and Leppold 2016). As such, we expect individuals to be flying at lower flight heights arriving and departing from migratory stopover sites. Additionally, birds fly lower over water (Bruderer and Liechti 1998, Liechti 2006). MDIFW believes that the large number of birds migrating through the coastal plain at lower flight heights represents a significant risk and provides the following data to illustrate.

Nocturnal radar monitoring has indicated that proposed wind power sites in Maine's coastal plain are subject to the highest spring passage rate (targets/kilometer/hour (t/km/hr)) recorded in New England (Weaver Wind 2014) as well as the second highest fall passage rate in Maine / third highest fall rate in New England (Downeast Wind 2015). At the proposed Weaver Wind site (Spring 2014), 35% of nights surveyed had averages of more than 1,000 t/km/hr, with 23% - 72% of radar targets below the height representing the tip of the proposed turbine blades. On the night of highest passage, data indicated a nightly average of 2,586 targets/km/hr, with 48% of targets below the tip of the proposed turbine blades. During the hour of highest passage, data indicated 5,161 t/km in one hour, with the mean target flight height at 16 meters below the height representing the tip of the proposed turbine blades.

Fatality data from post-construction monitoring at the Bull Hill Wind facility in the Downeast coastal plain indicated the highest bird fatality estimates in northern New England. The originally reported 2013 and 2014 fatality estimates each represented approximately double the number of carcasses per turbine per study period than the next highest wind project in Maine. Subsequently, the applicant's consultant revised its findings and indicated plans to reexamine the results of all their projects based on new fatality estimate guidance. These revisions have not yet been obtained but, it is anticipated that, though the total fatality estimate numbers for all of the consultant's projects may decrease following statewide adjustments, the relative difference between the Bull Hill results in the Downeast coastal plain in comparison to other projects will likely remain.

Of note, fifty percent of the species represented in bird fatalities at Bull Hill in 2013 (partial migration period) and 2014, consisted of Priority 2 and Priority 3 SGCN pursuant to the Maine State Wildlife Action Plan. Additionally, fifty percent of all SGCN priority species fatalities reported at Bull Hill (2013 partial season, 2014) (Priorities 2,3,4) are reported as experiencing significant population declines. Unsurprising because of their rarity, no Endangered (Priority 1) species fatalities were reported. MDIFW believes that this data from proposed and operating wind facilities, migration heights and numbers consistent with our understanding of bird migration patterns through the area and reported high fatality estimates, illustrates the increased risk to migrating passerines in the coastal plain and thus our agency's concern.

Migrating shorebirds:³ Shorebirds are an important group for management consideration because large numbers of these birds concentrate in discrete areas of coastal habitat where they are highly susceptible to disturbance, development, and environmental contaminants. The conservation status of North American shorebirds warrants concern. Consistent declines are evident in populations of lesser yellowlegs, whimbrel, semipalmated sandpipers, red knot, purple sandpiper and dunlin (Andres et al. 2012). More than 20 species of shorebirds, including those species experiencing consistent decline, depend on Maine coastal habitats to feed and rest during migration from the high arctic breeding grounds of Canada to the furthest tip of South America. Nine of the 23 species that regularly migrate through Maine are listed as Federally Threatened, Maine Species of Special Concern, and/or Maine Priority 1 or Priority 2 SGCN.

Maine coastal habitats are included in the Maritime Canada and Northeast U.S. region identified by the Atlantic Flyway Shorebird Initiative as a critical shorebird stopover area where conservation should be focused. (Winn et al. 2013). The greatest numbers of shorebirds feed and roost along the Maine coast during southward migration, which begins in July and continues through November. In their short stopover period, birds must double their body weight to acquire the fat reserves needed to fuel a nonstop, transoceanic flight to coastal and inland habitats in the Caribbean, Florida, and South America. Feeding and roosting areas associated with staging areas occur along the entire Maine coast. Areas within and near the intertidal areas of Penobscot, Sheepscot, Muscongus, and Casco Bays are important for migrating shorebirds. However, Downeast Maine (Trenton Bay east to Perry) is probably the most important fall migratory stopover area in the eastern U.S. for Semipalmated Sandpipers, Semipalmated Plovers, Black-bellied Plovers, Ruddy Turnstones and Short-billed Dowitchers (Famous and Ferris 1980, McCollough and May 1980).

During 2013-2016, MDIFW and partners investigated habitat use, length of stay, and premigration condition of shorebirds using coastal staging habitats in Downeast, mid coast, and southern coastal regions. Results of this work indicated variation in refueling rates and condition between the three regions. Downeast birds had significantly shorter stopover periods and individuals relied exclusively on this region before initiating their transoceanic flights. In comparison, results from analogous studies conducted in southern

³ Information obtained from MDIFW Issue Profile: Migratory Shorebird Use of the Maine Coast, April 2017

Maine and Massachusetts at high disturbance areas experienced longer stopover periods and were more likely to make multiple stops at different locations during southward migration. This work highlights the critical importance of the Downeast area as being a single, final stopover location for thousands of shorebirds before making the 3-5-day non-stop flight to wintering areas in South America (Holberton et al. in prep. 2017).

The combination of colder air in the coastal plain providing less lift for migrating shorebirds approaching from the north and their subsequent descent into stopover habitats, results in lower flight heights that put them at risk of impact with large structures. The potential for collisions is a concern, as studies suggest that on migration stopover, during take-off and landing adjacent to turbines, shorebirds showed little avoidance of wind farms (Kriggsveld et al 2011). Additionally, for most shorebird species, the adults and juveniles migrate from the breeding grounds at different times, prolonging the period of risk.

Seasonally local shorebird populations: From May through September each year, shorebirds undertake a variety of activities in the coastal plain, including breeding by upland sandpipers and staging and feeding by whimbrels. These shorebirds have unique habits that subject them to increased risks, with the potential for population-level changes in Maine. Studies on breeding shorebirds in or near wind farm projects found that breeding success declined during the construction phase and remained low during the operational phase. As the period of operation increases, greater declines in abundance generally occur, resulting in local population effects. Breeding shorebirds were shown to be displaced within 500–800 meters of turbines (BirdLife International 2013).

Upland sandpiper: Upland sandpipers are listed as a MESA Threatened Species (Priority 1 SGCN). Upland sandpipers are grassland birds that are easily displaced from their habitats, and placed at risk during characteristic aerial courtship displays and local movements of broods during the nesting and premigration season, if in proximity to large structures.

If an applicant wishes to evaluate presence/absence, behavior and habitat use by upland sandpipers, MDIFW recommends weekly 10-minute point counts during the breeding season (May-June). Because of their cryptic and secretive behavior, to determine presence/absence and habitat use during post breeding period (July through September), weekly systematic walking transects should be conducted through the barrens at a slow walk or weekly aerial surveys using a fixed – wing aircraft flying at 200 feet or less over fields using multiple passes spaced about 400 meters apart. For further guidance and to coordinate monitoring efforts, please contact the MDIFW Shorebird Biologist (207-941-4479).

Whimbrel: In 2006, Whimbrels were identified as a species of High Conservation Concern by the U. S. Shorebird Conservation Plan because of steep population declines and elevated threats (USSCP 2016). In Maine, whimbrels are characterized as Species of Special Concern (Priority 2 SGCN), susceptible to declines caused by increased mortality (Watts et al. 2015).

During their residence period, whimbrels undertake daily movements dictated by tidal stage, between intertidal habitats (mudflats, saltmarsh, and offshore islands) and interior blueberry barrens for roosting and feeding. Barriers intercepting movement between feeding areas result in fitness costs that may impact migration success. (Birdlife International 2013)

If an applicant wishes to evaluate presence/absence, behavior and habitat use by staging whimbrels, MDIFW recommends weekly aerial surveys using fixed – wing aircraft flying at 200 feet or less over fields using multiple passes spaced about 400 meters apart from mid-July through mid-September. Surveys need to be coordinated with the tide. Surveys conducted on the barrens or inland areas need to occur 2 hours either side of high tide, while surveys on intertidal habitats should be conducted 2 hours either side of low tide. For further guidance and to coordinate monitoring efforts, please contact the MDIFW Shorebird Biologist (207-941-4479).

The behavioral patterns of both of these shorebird species put them at significant risk from wind power development in the coastal plain.

Coastal Plain Specific Recommendations: MDIFW believes that sufficient data has been collected through regional research studies (cited above) as well as radar and fatality studies for proposed and active facilities in Maine’s coastal plain (Downeast Wind, Weaver Wind, Bull Hill Wind) 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 light of the compelling evidence described, if a developer desires to pursue wind power development in this region, MDIFW recommends a *pre-approved, rigorous, independent, and research quality data collection effort* consisting of **at least** 3 years including **at least** 6 full seasons (3 spring: April 15-June 1 and 3 summer/fall: July 15-October 31). The additional summer survey period is necessary to address southbound shorebird migration to and through the coastal plain. Shorebirds have a staggered migration of species, age class, and breeding region-specific waves, strongly correlated with weather fronts. To provide for the inter-seasonal and annual variability in behavioral patterns described for passerines and shorebirds in the coastal plain, data should be collected nightly, with sufficient monitoring locations to cover at least 75% of the air space within the proposed project area. If, after consideration of factors that naturally cause variability in migration, the data are not consistent or do not accurately capture conditions, an additional year (1 spring, 1 summer / fall) will likely be recommended. 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, which corresponds

with the northern boundary of one of the project study areas (Weaver Wind) (see accompanying map also found at: <https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-epa-region>). The Department notes that this region of increased concern is an approximation based on the aforementioned facts. The purpose of any research undertaken would be to further define its boundaries.

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. 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; 207-941-4482).



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