Maine Department of Inland Fisheries and Wildlife

Solar Energy Project General Resource Guidance and Recommendations

Updated March 5, 2020

PURPOSE AND SCOPE

The Maine Department of Inland Fisheries and Wildlife (MDIFW) has developed this document to assist solar energy project applicants in identifying sensitive wildlife and fisheries resources, and incorporating measures to eliminate or reduce adverse impacts to them as early as possible in the project design and development stages. A dual benefit is provided in that, by being aware of and considering significant resource concerns in project design and development, the applicant may experience a more streamlined, efficient, and predictable regulatory review process.

This document provides general information on important wildlife and fisheries resources to facilitate development of project-specific measures to avoid or minimize impacts where possible; to help inform siting parameters for solar arrays, transmission lines, access roads, etc.; to help identify means to protect species and habitats of concern; and, when these measures have been conducted to the maximum extent practicable, to allow for mitigation of reasonable project impacts. Descriptions of important, often encountered, and regionally significant resources, as well as information on siting considerations, are provided. Next to the name of each selected resource, a general geographic reference is provided in red text to help guide the reader on the primary distribution of that resource. Please make sure that you are consulting the most recent version of this document, as guidance may change depending on new and cumulative information, species statuses, or other factors. Information on Incidental Take Permits for State Endangered and Threatened species is also provided.

As a preliminary step, applicants are encouraged to contact IFWEnvironmentalreview@maine.gov to request a summary 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 in order to inform Department recommendations.

BACKGROUND

MDIFW recommends that applicants consider the information in this document and incorporate site-specific and resource-specific information provided by MDIFW when considering siting of a proposed solar energy facility.

MDIFW concerns typically relate to Rare, Threatened, and Endangered species occurrences and habitats; Essential Habitats; Significant Wildlife Habitats; and Protected Natural Resources. MDIFW conducts searches of its records to document known resources within areas of interest, however, site surveys may be necessary to identify other important resources that have not yet been investigated but may be present in an area. Some species are limited by specific region or habitat type, which quickly precludes them from being present in some areas or, alternatively, indicates a potential presence that needs to be evaluated by field surveys. Locating a project within or in proximity to certain priority habitats can result in adverse impacts to those habitats and the species that utilize them. In these situations, MDIFW will likely recommend increased siting and design considerations, operational measures, monitoring practices, and/or other efforts in attempts to avoid, minimize, and possibly compensate for such impacts.

Rare, Threatened, and Endangered (RTE) Species and Habitats

The Maine Endangered Species Act (MESA; 12 M.R.S, §12801 et. seq.) identifies all inland fish and wildlife species that are listed as Endangered or Threatened in Maine and provides the Commissioner of MDIFW with the authority to implement MESA. Pursuant to MESA, listed species are afforded protection against activities that may cause "take" (kill or cause death), "harassment" (create injury or significantly disrupt normal behavior patterns), and other adverse actions. Further, the No Adverse Environmental Effect Standard of the Site Location Law (06-096, CMR 375) provides for the preservation of "*unusually important wildlife habitats, particularly those of rare or endangered species*", as well as protection of all "*wildlife and fisheries by maintaining suitable and sufficient habitat*" and avoiding adverse effects on "*wildlife and fisheries lifecycles*". Rare or "Special Concern" species are defined by MDIFW as species that do not meet the criteria as Endangered or Threatened, but are particularly vulnerable and at risk of becoming Endangered, Threatened, or Extirpated due to restricted distribution, low or declining numbers, specialized habitat needs or limits, or other factors. We recommend that you work closely with MDIFW staff to design a project that minimizes the risk for potential Take and Harassment of any MESA-protected species.

Essential Habitats

Essential Habitats (EHs) are areas that currently or historically provide physical or biological features essential to the conservation of an Endangered or Threatened species in Maine, and are designated and protected pursuant to MESA. Currently, EH is designated only for Piping Plovers (*Charadrius melodus*), Least Terns (*Sterna antillarum*), and Roseate Terns (*Sterna dougallii*), all of which are coastal breeding species classified as Endangered Species in Maine.

Significant Wildlife Habitats

Significant Wildlife Habitats (SWHs) are defined and protected pursuant to the Natural Resources Protection Act (38 M.R.S., §480-B.10) and SWH Rules (06-096 CMR 335; 09-137 CMR 10). Subject to the requirements of the Rules, SWHs may include habitats for state and federal Endangered and Threatened animal species; high and moderate value deer wintering areas and travel corridors; seabird nesting islands; critical Atlantic salmon spawning and nursery areas; significant vernal pool habitat; high and moderate value waterfowl and wading bird habitat; and shorebird nesting, feeding, and staging areas.

Protected Natural Resources

Protected Natural Resources (PNRs) are defined and protected by the Natural Resources Protection Act (38 M.R.S., §480-B.8). PNRs include coastal sand dune systems, coastal wetlands, significant wildlife habitats, fragile mountain areas, freshwater wetlands, great ponds, rivers, streams, and brooks. Some of these resources are specifically managed by MDIFW based on the presence of, and unique habitat value for, certain species of fish or wildlife.

It should be noted that there is no comprehensive statewide inventory that includes all RTE species occurrences and habitats, EHs, SWHs, and PNRs. Though many important resources are included on data layers and resource maps, the completeness of such varies by habitat type, location, and previous survey efforts. Thus, such tools should be considered preliminary information until otherwise noted by the appropriate resource agency. Resource surveys, project siting, facility design/layout, and operational practices are all important aspects in this process. MDIFW provides recommendations based on known, reported, and potential resource information but, it is the applicant's ultimate responsibility to ensure that its activities do not result in detrimental impacts to resources.

SELECTED RESOURCES

The following describes some resources of concern that may be encountered on solar project sites, with general descriptions and preliminary recommendations. MDIFW provides more detailed site-specific and resource-specific recommendations as part of formal project reviews. Resource-specific Department contacts are provided where applicable. Please include IFWEnvironmentalreview@maine.gov on any project-related correspondences.

1. Aquatic Resources

a. Significant Vernal Pools (Significant Wildlife Habitat). Statewide.

Vernal pools are shallow depressions that usually contain water for only part of the year and typically dry out by mid to late summer. Despite their relatively short hydroperiod, vernal pools serve as unique breeding habitat for certain species of wildlife, including specialized amphibians and invertebrates. The regulatory "significance" of vernal pools and their associated buffers (Critical Terrestrial Habitats or CTHs) is dependent upon several factors, including the use by state RTE Species or the presence and productivity of certain pool-breeding amphibians. It should be noted, a comprehensive statewide inventory for Significant Vernal Pools (SVPs) has not been conducted. And, since vernal pools dry out on a seasonal basis, they can be missed during dry conditions. Therefore, we recommend that surveys for vernal pools be conducted by qualified wetland scientists prior to final project design to determine whether there are SVPs present in the project area. These surveys should extend out to 250 feet beyond the anticipated project footprint to determine potential impacts to the CTHs of off-site SVPs, assuming such pools are located on land owned or controlled by the applicant. A 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 state regulatory agencies. The optimal time for assessing the presence of amphibian indicator species coincides with a relatively brief spring breeding period that varies slightly with geography, elevation, and weather. Because of the limited survey period, vernal pools should be considered as "Potentially Significant" until such time that a seasonally valid survey is conducted, and the true pool status is determined. Alternatively, a developer may choose to not conduct formal surveys, consider all natural origin pools as SVPs, and design the project accordingly to avoid (recommended), minimize, and mitigate for any impacts to these resources. MDIFW typically recommends Best Management Practices for forestry (available from MDIFW or the Maine Forest Service) and minimum development impacts within the 250-foot wide Critical Terrestrial Habitat bordering a SVP, where possible.

Please also refer to MDIFW's Recommended Performance Standards for Maine's Significant Vernal Pools in Overhead Utility ROW Projects (March 2012) for further guidance, if applicable to your project. Please contact MDIFW's Reptile, Amphibian, and Invertebrate Biologist, Beth Swartz (beth.swartz@maine.gov, 207-941-4476), for further details.

b. Intermittent and Perennial Streams (Protected Natural Resources). Statewide.

One of MDIFW's principal concerns relates to the presence and efforts to protect intermittent and perennial streams and associated species of concern. Rivers, streams, and brooks within remote project sites are often in or near headwaters, providing high water quality and habitat values for fish and other aquatic and wetland species. MDIFW generally recommends maintaining 100-foot undisturbed, forested buffers from the upland edge of all intermittent and perennial streams and any contiguous wetlands. Maintaining and enhancing buffers along these resources is critical to the protection of water temperature, water quality, natural inputs of coarse woody debris, and various forms of aquatic life necessary to support coldwater fish and other aquatic species. Riparian buffers also provide critical habitat and important travel corridors for a variety of wildlife 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 for full aquatic 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 and become a frequent maintenance problem that causes reoccurring damage to the resource. 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 providing habitat connectivity for fish and other aquatic organisms. MDIFW encourages consideration of these factors during initial design of the project, selection of its position in the landscape, site preparation, and installation of infrastructure, to ensure continuation of these important habitat functions.

c. Freshwater Wetlands (Protected Natural Resource). Statewide.
Freshwater wetlands are valuable natural resources that serve important functions to help preserve, protect, and enhance adjacent aquatic and terrestrial habitats, as well as provide important habitats themselves for a high diversity of fish and wildlife species. Wetland impacts should be avoided or minimized to the maximum extent practicable, and remaining reasonable impacts appropriately mitigated. MDIFW recommends that freshwater wetlands be definitively located and delineated on site by qualified wetland scientists to enable an informed assessment of resources and appropriate agency recommendations.

2. Mammals and Habitats
a. Bat Habitat (State Endangered, Threatened, Special Concern Species). Statewide.
Of the eight species of bats that occur in Maine, three *Myotis* species are afforded 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*). Prior to the spread of White Nose Syndrome beginning in approximately 2010, Maine enjoyed statewide distributions of little brown bats and northern long-eared bats, as well as frequent occurrences and sizable distributions of the six other bat species that are indigenous to Maine. Since then, however, bat populations have declined dramatically, reducing the populations of some species by more than 90%. While a comprehensive statewide inventory for bats has not been completed, work by MDIFW and others validates that bats are still present statewide during fall/spring migration, summer breeding, and/or overwintering, though in significantly lower numbers. Based on this established presence and to allow for restoring bat populations to the extent possible, MDIFW recommends siting away from key habitats where bats aggregate.

If the project has a Federal regulatory nexus, either through funding or permitting, or if the project is not consistent with the U.S. Fish and Wildlife Service (USFWS) "4(d) Rule", we recommend that applicants contact the USFWS -- Maine Fish and Wildlife Complex (Wende Mahaney, 207-902-1569) for further guidance, as the northern long-eared bat is also listed as a Threatened Species under the Federal Endangered Species Act. The USFWS "4(d) Rule" provides guidance for protection of bat winter hibernacula and maternity roost trees for northern long-eared bats (https://www.fws.gov/midwest/endangered/mammals/nleb/4drule.html). MDIFW Endangered Species Rules for bats (09-137, CMR 8.06; http://www.maine.gov/sos/cec/rules/09/137/137c008.docx) provide equivalent seasonal protection of maternity roost trees for any of the three state-listed bats, seasonally prohibits entry into subsurface winter hibernacula, and has additional protections for tree removal

within ¼ mile of winter hibernacula. At present, no maternity roost trees have been designated for protection.

It is well known that myotis bats hibernate in caves and mines however, these traditional subsurface hibernacula are very limited in Maine. Recent research indicates that *Myotis* and big brown bats may also overwinter in exposed rocky features, between rocks, cracks, and crevices in talus slopes, rocky outcrops, and cliff faces. Some species of bats, like the eastern small-footed bat, use rocky features year-round. To date, Maine studies have focused on relatively exposed slopes with minimal canopy cover, although ongoing research has shown that bats also occupy rocky features under forest canopy.

Occupied talus slopes in Maine have consisted of variable rock sizes, ranging in size from softball to car-sized boulders. Rock piles, rock ledges, and small vertical cracks in rocks (>1/2-inch-wide) create crevices that allow bats to access deeper cavities that provide protection from predators and suitable temperature and humidity conditions. Relatively few of these habitats have been mapped statewide. Therefore, we advise that all areas of talus and rocky features of approximately 1,000 square feet or greater in size be documented on and within 250 feet of the project area, including smaller areas of rock piles and tailings (i.e., quarry spoils). Please see MDIFW's Representative Photographs of Suitable Bat Rock-Roosting Sites for example features for guidance purposes. Detailed photographs and coordinates should be submitted to MDIFW for review, and acoustic monitoring may be recommended to document occupancy. Alternatively, these features should be appropriately buffered commensurate with the size and layout of the project. If the habitat features described above are not present in the project area, MDIFW does not anticipate significant impacts to bat species as a result of a solar project, based on current best available science. For further guidance, please contact the MDIFW's Small Mammal Biologist, Shevenell Webb (shevenell.webb@maine.gov, 207-941-4473).

b. Deer Wintering Areas and Travel Corridors (Significant Wildlife Habitat). Statewide.
Deer Wintering Areas (DWAs) contain habitat cover components that provide conditions for protection from deep snow and cold wind, which is important for overwinter survival of white-tailed deer (*Odocoileus virginianus*). DWA Travel Corridors contain similar habitat qualities and provide the means for DWA ingress and egress. The need and value of DWAs vary across the state according to factors such as the population of deer in relation to species management objectives, habitat quality and quantity, and the severity of winter conditions. Particularly in southern and coastal areas, we recommend that you consult with MDIFW staff to verify the status and value of DWA habitats depicted.

MDIFW generally recommends that development projects be designed to avoid impacts to the continued availability of coniferous winter shelter within important DWAs and Travel Corridors. Any removal of vegetation should be conducted in such a way that improves the quality and vigor of the coniferous species providing this winter shelter. If the project will involve the removal of trees important to overwintering deer, we recommend that you contact our Regional Wildlife staff for additional guidance. Please also refer to the Recommended Performance Standards for Deer Wintering Areas in Overhead Utility ROW Projects (March 2012) for further guidance, if applicable to your project.

c. New England Cottontail (State Endangered Species). Southern Maine.
The New England cottontail (*Sylvilagus transitionalis*) is listed as a State Endangered species and is afforded protection under MESA. New England cottontails require areas of shrubs and densely growing young trees and, in the Northeastern U.S., much of the area supporting the species has been fragmented and no longer provides habitat of suitable quality, size, or connectivity. As noted in MDIFW's Wildlife Research & Management Report 2018, New England cottontails are now only known to exist in three populations in Maine: 1) Cape Elizabeth / Scarborough, 2) Wells, and 3) Kittery / York / Elliot. We recommend that you contact MDIFW Region A Wildlife Biologist, Cory Stearns

(cory.r.stearns@maine.gov, 207-657-2345) for any site-specific data for your project, as well as to schedule a site visit, if necessary, to assess potential cottontail presence and habitat suitability.

d. Northern Bog Lemming (State Threatened Species). Western, Northern Maine.
The northern bog lemming (*Synaptomys borealis*) is listed as a State Threatened species and is afforded protection under MESA. Northern bog lemming habitat consists of alpine sedge meadows, krummholz, spruce-fir forest with dense herbaceous and mossy ground cover, acidic wet meadows, and mossy stream-sides that are at or above 1,000 feet elevation 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, including the collection of appropriate field samples for eDNA testing. For information on survey protocols and further guidance, please contact MDIFW's Small Mammal Biologist, Shevenell Webb (shevenell.webb@maine.gov, 207-941-4473).

e. Canada Lynx (State Special Concern Species). Northern, Western, Central, Eastern Maine.
The Canada lynx (*Lynx canadensis*) is designated as a Species of Special Concern in Maine. Lynx habitat consists of large connected blocks of moderately dense to densely stocked spruce and fir sapling trees. Lynx are most common in Maine in the spruce/fir flats of Aroostook and Piscataquis Counties and northern Penobscot, Somerset, Franklin, and Oxford Counties. Historic and recent observations suggest lynx also occasionally occur in portions of eastern Maine. As this animal is also listed as a Threatened Species under the Federal Endangered Species Act, MDIFW generally defers to recommendations from the U.S. Fish and Wildlife Service (Maine Field Office, Mark McCollough, 207-902-1570). If an applicant wishes to determine if lynx are currently present, MDIFW recommends conducting snow track surveys or utilizing other survey methods within or adjacent to the project area following MDIFW guidelines. For further guidance, please contact MDIFW's Black Bear and Canada Lynx Biologist, Jennifer Vashon (jennifer.vashon@maine.gov, 207-941-4238).

3. Priority Birds and Habitats.
a. Essential Habitats (Maine Endangered Species Act). Coastal and Vicinity.
As noted above, Essential Habitats are currently only designated for piping plovers, least terns, and roseate terns, all of which are coastal breeding species, classified as Endangered Species in Maine. Piping plover and least tern Essential Habitat focuses on coastal wetlands, salt marshes, and sand dune systems to maintain nesting, feeding, and brood-rearing habitats essential to conserving these species and to minimize human-related disturbance that can cause nest failure. Roseate tern Essential Habitat focuses on coastal island nesting areas to maintain breeding habitat and prevent disturbance that may cause nesting failure. Nesting areas encompass all or part of a subset of coastal islands. All of these Essential Habitats have been mapped. Because of the importance of these resources, MDIFW's recommendation is to completely avoid impacts to Essential Habitats.

Prior to issuance of a permit for any project affecting Essential Habitat, the applicant needs to submit a Request for Project Evaluation (MDIFW Form EHR4/03) to MDIFW for final approval of the activity within Essential Habitat under MESA. Pursuant to the Maine Endangered Species Act (12 MRS, §12806), a state agency or municipal government may not permit, license, fund or carry out projects that will significantly alter Essential Habitat or violate protection guidelines established for Threatened or Endangered species without certification from the commissioner of MDIFW that the proposed action would not pose a significant risk to those species.

b. Inland Waterfowl and Wading Bird Habitats (Significant Wildlife Habitat). Statewide.
Inland Waterfowl and Wading Bird Habitats (IWWHs) provide important breeding, feeding, migration, staging, and wintering habitat for waterfowl and wading bird species. High and moderate value IWWHs include both the freshwater wetland complex and a 250-foot adjacent upland zone. MDIFW recommends that these resources be avoided entirely, including no clearing within the 250-foot upland zone extending from the wetland edge. Please also refer to MDIFW's Recommended Performance Standards for Inland Waterfowl and Wading Bird Habitats in Overhead Utility ROW Projects (March 2012) for further guidance, if applicable to your project.

c. Tidal Waterfowl and Wading Bird Habitats (Significant Wildlife Habitat). Coastal and Vicinity
Tidal Waterfowl and Wading Bird Habitats (TWWHs) provide important feeding and/or breeding habitat for diverse waterfowl and wading bird species. Birds utilize mudflats, eelgrass beds, mussel beds, intertidal areas, and shallow subtidal waters to forage for aquatic invertebrates, a primary food source, and maintaining natural tidal flow is essential to maintaining healthy intertidal areas and food sources to support waterfowl and wading bird species. We recommend that projects near TWWHs be designed to provide as much undisturbed buffer as possible to protect this habitat.

d. Priority Breeding Birds (State Endangered, Threatened, Special Concern). Statewide.
If there is evidence of MESA-listed Endangered or Threatened bird species or select species of Special Concern using the project vicinity, MDIFW may recommend that breeding bird surveys be conducted. In addition to the wetland, beach, and coastal island habitats mentioned above, project sites in proximity to grassland habitats are also of priority concern, given the at-risk species they host and their desirability for solar development. As general guidance, habitats of concern for grassland bird species include large grasslands, barrens, and agricultural lands exceeding 15 acres in size. This may include, but is not limited to, hayfields, crop fields, pastures, blueberry barrens, upland and wet meadows, as well as airports and landfills over 30 acres.

If requested, one season 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 habitats and species are present. In these limited situations, MDIFW-approved 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.

MDIFW will provide a summary of known occurrences of species or habitats of concern in a proposed area during preliminary review of project sites or upon request. Some species most likely to intersect with solar projects are discussed individually below, however, this is not a comprehensive list. Thus, applicants should consult with MDIFW. Specific habitat buffer recommendations are not provided for some of the examples that follow. As individuals do not always occur at discreet points on the landscape, fixed buffers may not always be applicable. Instead, MDIFW may provide acreage recommendations for some species of concern, based on life history breeding home-range requirements, that should be avoided or considered in determining impacts from a project footprint or the effects of habitat fragmentation. For further guidance on breeding bird surveys, protocols for point count surveys, Before-After-Control-Impact assessments, and data analysis, please contact MDIFW Avian Biologist, Adrienne Leppold (adrienne.j.leppold@maine.gov; 207-941-4482).

e. Upland Sandpiper (State Threatened Species). Statewide.
The upland sandpiper (*Bartramia longicauda*) is listed as a State Threatened species and is afforded protection under MESA. Upland sandpipers nest only on the ground and use both native and cultivated grasslands and barrens for nesting sites. These birds are susceptible to direct habitat loss and are also easily displaced from important breeding, nesting, and staging areas by the presence of imposing structures within up to 2,600 feet (800 meters). Upland sandpipers are very area-sensitive, requiring 75-100 acres of open habitat, and can also be displaced due to fragmentation of open landscapes. The blueberry barrens of Downeast Maine are acknowledged to support the largest numbers of breeding upland sandpipers in the Northeast though, even with this, the species is still categorized as Threatened. We recommend that development be avoided within or adjacent to upland sandpiper habitat and as much undisturbed buffer provided as possible from any habitats with documented breeding occurrences. If a site containing upland sandpiper habitat cannot be fully avoided, MDIFW will likely recommend specialized surveys to document the locations of nesting individuals for establishment of appropriate buffers for the areas being used. We also recommend that you contact MDIFW's Shorebird Biologist at (207-941-4479) for further guidance prior to final project design.

f. Grasshopper Sparrow (State Endangered Species). Southern, Central Maine.
The grasshopper sparrow (*Ammodramus savannarum*) is listed as a State Endangered species and is afforded protection under MESA. This species may currently be found within an area extending from southern Maine to Augusta. Grasshopper sparrows are an area-sensitive species, requiring 10-40 acres of open grassland or barrens habitat with patches of bare ground for nesting and will use both native and cultivated vegetation. We recommend that development be avoided in or adjacent to grasshopper sparrow habitat and as much undisturbed buffer provided as possible from of any documented occurrences and habitat of this species. We also recommend that you contact MDIFW's Avian Biologist, Adrienne Leppold (adrienne.j.leppold@maine.gov, 207-941-4482) for further guidance.

g. Great Blue Herons (State Special Concern Species). Statewide.
The great blue heron (*Ardea herodias*) is designated as a Species of Special Concern in Maine due to an 82% decline in the coastal breeding population observed from 1983 to 2018. Since 2009, MDIFW has been monitoring the statewide population to determine if the decline seen along the coast is also occurring statewide. Great blue herons build large stick nests in live, dead, or dying trees 8-100 feet or more above the ground, and may nest in uplands, wetlands, or on islands. Great blue herons nest in groups and generally occupy colonies from April 1 through August 15 (known as the Sensitive Nesting Period). During this time, the birds are extremely sensitive to disturbances caused by human intrusion, noise, and predators, and may abandon a colony as a result.

Not all great blue heron colonies have been mapped in Maine and not all mapped colonies are still occupied. For this reason, MDIFW recommends a survey of the proposed project site to look for new and existing colonies and their level of use. Heron 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. MDIFW recommends that no new development occur within 250 feet of any known or discovered heron colonies. Within this 250-foot buffer, any land management practices should serve to maintain or improve the overstory and provide for a continuing supply of mature trees favored for nesting. MDIFW further recommends that no construction activities (land clearing, road construction, building of permanent structures, etc.) occur within 600 feet of nest colonies during the Sensitive Nesting Period. And, any standing dead wood in the vicinity of heron nests that doesn't pose a safety hazard should be left to provide potential nesting habitat for waterfowl, wading birds, or cavity nesting birds/mammals. For further guidance, please contact MDIFW's Avian Biologist, Danielle D'Auria (danielle.dauria@maine.gov, 207-941-4478).

h. Rusty Blackbird (State Special Concern Species). Eastern, Western, Northern Maine.
The rusty blackbird (*Euphagus corolinus*) is designated as a Species of Special Concern in Maine. This species may currently be found in Oxford, Franklin, Somerset, western Piscataquis, and western Aroostook Counties. These birds 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. Rusty blackbirds in Maine inhabit lakeshores, riparian zones along streams and around ponds, forested wetlands, and bogs. We recommend an undisturbed buffer of 250 feet or more from any documented occurrences and habitat of this species. We also recommend that you contact MDIFW's Avian Biologist, Adrienne Leppold (adrienne.j.leppold@maine.gov, 207-941-4482) for any site-specific data for your project and to schedule a site visit or to obtain survey recommendations, if necessary, to determine rusty blackbird presence and habitat suitability.

4. Rare Snakes and Habitat
Maine has two species of rare snakes that are more likely to be found in areas proposed for solar development. For project sites that are known to contain these species, or that are in the vicinity of known occurrences and have suitable habitat on site, MDIFW may recommend that a detailed assessment of potential habitat and population status be conducted.

a. Northern Black Racer (State Endangered Species). Southern, Southwestern Maine.
The northern black racer (*Coluber constrictor*) is listed as a State Endangered species and is afforded protection under MESA. The black racer is Maine's largest and rarest snake and is only known to have a few population strongholds, mostly restricted to York County. This snake prefers habitat types consisting of dry, shrubby grasslands, early successional shrub-dominated areas, barrens, recently harvested forests, and open woodlands. Recommended site protection measures and buffers for black racers are highly habitat specific and will be developed in consultation with MDIFW staff.

b. Eastern Ribbon Snake (State Special Concern Species). Southern, Central Maine.
The eastern ribbon snake (*Thamnophis sauritus*) is designated as a Species of Special Concern in Maine. This slender, semiaquatic snake generally favors acidic wetlands with shallow hydrology, sandy outwash soils, and grassy emergent vegetation intermixed with, or surrounded by, scrub-shrub vegetation. They can be observed near the edges of emergent marshes, wet meadows, vernal pools, scrub-shrub wetlands, beaver impoundments, bogs, river and stream floodplains, and vegetated shorelines of ponds and lakes. We recommend 250-foot buffers of undisturbed, natural vegetation surrounding wetlands hosting ribbon snakes.

If either of these rare snake species is documented in the project vicinity, we recommend that viable habitat areas be avoided and adequately buffered. We recommend that you contact MDIFW's Reptile, Amphibian, and Invertebrate Biologist, Derek Yorks (derek.yorks@maine.gov, 207-941-4475), for further guidance and for any site-specific data for your project area.

5. Rare Turtles and Habitat
Maine has several turtle species that are designated as State Endangered, Threatened, and Special Concern species, noted below. For project sites that are known to contain one or more of these species, or that are in the vicinity of known occurrences and have suitable habitat on site, MDIFW recommends that a detailed assessment of potential habitat and surveys for the species be conducted.

a. Blanding's Turtle (State Endangered Species). Southern Maine.
The Blanding's turtle (*Emydoidea blandingii*) is listed as a State Endangered species and is afforded protection under MESA. In Maine, Blanding's turtles are found most frequently in southern Maine in forested settings with vernal pools, acidic wetlands, and larger marsh complexes. They also use small

streams, shrub swamps, wet meadows, bogs, and forested swamps. If the species is documented in the vicinity, and high-quality examples of these habitats are present in the project area, MDIFW may recommend that a detailed assessment of potential habitat be conducted for all wetlands on and in close proximity to the project parcel. In most cases, MDIFW recommends that wetlands with documented use by Blanding's turtles, or with a high potential to host the species, be left undisturbed and buffered by at least 250 feet of natural vegetation. We also recommend that natural landscape connectivity be conserved between occupied or high potential use wetlands since this species has large home ranges and is known to use multiple wetlands within a single activity season. Development activity that compromises riparian integrity or migration permeability among seasonally critical wetlands can lead to degradation of habitat quality and potential loss of local populations. Additionally, development projects that lead to significant increases in local traffic volume can lead to increased road kill and possible extirpation of the local population.

b. Spotted Turtle (State Threatened Species). Southern and Coastal Maine.
The spotted turtle (*Clemmys guttata*) is listed as a State Threatened species and is afforded protection under MESA. Spotted turtles are most frequently found in southern and coastal Maine in forested settings with complexes of small acidic wetlands and vernal pools. They also use small streams, shrub swamps, wet meadows, bogs, and forested swamps. If the species is documented in the vicinity, and high-quality habitats are present in the project area, MDIFW may recommend that a detailed assessment of potential habitat be conducted for all wetlands on and in close proximity to the project parcel. In most cases, MDIFW recommends that wetlands with documented use by spotted turtles, or with a high potential to host the species, be left undisturbed and buffered by at least 250 feet of natural vegetation. We also recommend that natural landscape connectivity be conserved between occupied or high potential use wetlands since this species is known to use multiple wetlands within a single activity season. Development activity that compromises riparian integrity or migration permeability among seasonally critical wetlands can lead to degradation of habitat quality and potential loss of local populations. Additionally, development projects that lead to significant increases in local traffic volume can lead to increased road kill and possible extirpation of the local population.

c. Wood Turtle (State Special Concern Species). Statewide.
The wood turtle (*Glyptemys insculpta*) is designated as a Species of Special Concern in Maine. Wood turtles use both aquatic and terrestrial habitats throughout the year, centered around a stream or river, including riparian meadows, shrub thickets, farmland, deciduous and mixed forests, forested wetlands, and floodplain vernal pools. Generally, this species appears to prefer edge-associated terrestrial habitats, as riparian areas, forest gaps and edges often have dense shrubbery or ground cover for protection, food, and open areas for basking. If the species is documented in the vicinity, and high-quality examples of these habitats are present in the project area, MDIFW may recommend that a detailed assessment of potential habitat for wood turtles be conducted on and in close proximity to the project parcel. In most cases, MDIFW recommends that streams with documented use by wood turtles be left undisturbed and buffered by at least 300 feet of natural vegetation. In cases where forest clearing or forest management is anticipated as part of the project proposal, please refer to Forest Management Recommendations for the Wood Turtle (*Glyptemys insculpta*).

We recommend that you contact MDIFW's Reptile, Amphibian, and Invertebrate Biologist, Derek Yorks (derek.yorks@maine.gov, 207-941-4475), for further guidance and for any site-specific data and survey protocols for your project area.

6. Rare Mussels and Habitat

Maine has three species of freshwater mussels that are designated as State Threatened species, noted below. For project sites that intersect with, or are adjacent to, waterbodies with documented occurrences of one or more of these species, MDIFW may recommend that surveys be conducted. These rare animals have experienced declines throughout their ranges, with some populations vulnerable to local extirpation from low population densities, fragmented distributions, and limited evidence of recruitment. Development projects adjacent to waterbodies containing Threatened mussels can result in detrimental impacts to the species.

a. Brook Floater (State Threatened Species). Midcoast to Central, Interior, Eastern Maine.
The brook floater (*Alasmidonta varicosa*) is listed as a State Threatened species and is afforded protection under MESA. In Maine, the brook floater is largely concentrated in rivers and streams within the Penobscot River drainage. It is also found in several Downeast river systems, as well as a few scattered locations in the Kennebec, St. George and Sheepscot River watersheds. An isolated population in the Pleasant River (Cumberland Co.) is the only known occurrence remaining in southern Maine. The brook floater requires clean, free-flowing rivers and streams with gravel/cobble substrates and intact riparian buffers. It does not live in high-gradient streams with very fast current, nor is it usually found in very slow water.

b. Yellow Lampmussel (State Threatened Species). Midcoast to Central, Interior Maine.
The yellow lampmussel (*Lampsilis cariosa*) is listed as a State Threatened species and is afforded protection under MESA. The yellow lampmussel is currently found only in the Penobscot, St. George, and lower Kennebec River watersheds. This species typically prefers medium to large rivers, but in Maine is also found in lakes and ponds, including impounded sections of rivers. It occurs in a variety of bottom substrates, including silt, sand, gravel, and cobble.

c. Tidewater Mucket (State Threatened Species). Midcoast to Central, Interior Maine.
The tidewater mucket (*Leptodea ochracea*) is listed as a State Threatened species and is afforded protection under MESA. The tidewater mucket is currently found only in the Penobscot, St. George, and lower Kennebec River watersheds. Its distribution is similar to that of the yellow lampmussel and they are often found together. Despite its name, the tidewater mucket can be found quite far inland (as far north as Millinocket Lake in the Mt. Katahdin region). This species prefers lakes, ponds, and slow-moving portions of rivers, and is often found in impoundments. It occurs in a variety of bottom substrates, including silt, sand, gravel, cobble, and occasionally clay.

Freshwater mussels are especially vulnerable to impacts from pollution, sedimentation, dams, and surrounding land use practices that degrade or alter aquatic habitat. MDIFW recommends that contiguous forested riparian buffers remain intact for a distance of at least 250-feet from each bank for waterbodies where one or more state-listed mussel species have been documented. If development or forest clearing is being considered in the vicinity of a known or potential occurrence of a state-listed freshwater mussel species, please contact MDIFW's Reptile, Amphibian, and Invertebrate Biologist, Beth Swartz (beth.swartz@maine.gov, 207- 941-4476), for further guidance.

7. Rare Mayflies and Habitat.

Maine has several species of rare mayfly that are designated as State Threatened and Special Concern species, the two rarest of which are noted below. For project sites that intersect with, or are adjacent to, waterbodies with documented occurrences of one of these species, or that have high quality suitable habitat on site, MDIFW may recommend that a detailed assessment of potential habitat and surveys for the species be conducted.

a. Roaring Brook Mayfly (State Threatened Species). Central and Western Maine.
The Roaring Brook mayfly (*Epeorus frisoni*) is listed as a State Threatened species and is afforded protection under MESA. Roaring Brook mayflies are restricted to clean, cold, high elevation headwater streams with coarse substrates (rocks, cobble, boulders) above 1,000 feet elevation (including unmapped streams) and bordered by relatively undisturbed mixed or hardwood forest. The currently documented range for the species is confined to the northern Appalachian Mountain Range, stretching from Mt. Katahdin to Maine's western border with New Hampshire and Quebec. Any instream work within or adjacent to suitable, high elevation perennial or intermittent streams in this area has the potential to impact this species. MDIFW recommends that contiguous forested riparian buffers remain intact for a distance of at least 250-feet from each bank for streams where this species has been documented to occur. Please also refer to Recommended Management Guidelines for Land Use in or Adjacent to Roaring Brook Mayfly and Northern Spring Salamander Habitat.

b. Tomah Mayfly (State Threatened Species). Statewide.
The Tomah mayfly (*Siphlonisca aerodromia*) is listed as a State Threatened species and is afforded protection under MESA. The Tomah mayfly is one of the rarest mayflies in the world, and all but one of its currently known populations are found in Maine. Their distribution is potentially statewide, but they occur in only widely scattered locations. The Tomah mayfly is only found in rivers and streams bordered by seasonally flooded sedge meadows. Because most of the Tomah mayfly's life is spent in the aquatic stage, this mayfly is affected by alteration of river and stream ecosystems, including water quality degradation, water flow and level fluctuations, and other indirect impacts. MDIFW recommends that contiguous forested riparian buffers remain intact for a distance of at least 250-feet from each bank for rivers and streams where this species has been documented to occur.

If development is being considered in the vicinity of a known or potential occurrence of either rare mayfly species, please contact MDIFW's Reptile, Amphibian, and Invertebrate Biologist, Beth Swartz (beth.swartz@maine.gov, 207-941-4476), for further guidance, including the potential need for additional surveys and associated protocols. Surveys for potentially suitable Roaring Brook and Tomah mayfly habitat should be conducted in streams within 250 feet of areas where project-related forest clearing or stream impacts are planned (e.g., project infrastructure, roads, transmission lines, bridges, culverts, or other clearings), during the appropriate timing window (September for Roaring Brook mayfly, May-early June for Tomah mayfly). As an alternative to surveys, a developer may choose to consider streams that meet the location and habitat preferences described above as occupied by Roaring Brook or Tomah mayfly, not formally survey them, and design the proposed project accordingly, incorporating the recommended 250-foot riparian management zone.

8. Rare Dragonflies and Habitat.
Maine has several rare dragonflies that are designated as State Endangered, State Threatened, and Special Concern species, the two rarest of which are noted below. For project sites that intersect with, or are adjacent to, waterbodies with documented occurrences of one of these species, or that have high quality suitable habitat on site, MDIFW may recommend that a detailed assessment of potential habitat and surveys for the species be conducted.

a. Ringed Boghaunter (State Threatened Species). Southern, Southwestern Maine.
The ringed boghaunter dragonfly (*Williamsonia lintneri*) is listed as a State Threatened species and is afforded protection under MESA. The ringed boghaunter is one of the rarest dragonflies in North America. This dragonfly is at the northern extent of its range in southwestern Maine, where it has been confirmed at only ten sites in York and southern Oxford Counties. It is found in fens, bogs, and small acidic wetlands dominated by *Sphagnum*, and is sometimes associated with forests of Atlantic white cedar. If these habitats are documented on the project site, within the geographic range of the species,

MDIFW may recommend that specialized surveys be conducted. In most cases, MDIFW recommends that wetlands with confirmed or probable use by ringed boghaunter be left undisturbed and buffered by at least 250 feet of natural vegetation.

b. Boreal Snaketail (State Threatened Species). Statewide
The boreal snaketail dragonfly (*Ophiogomphus colubrinus*) is listed as a State Threatened species and is afforded protection under MESA. This species is among the rarest dragonflies in Maine with only three confirmed populations scattered statewide, on the St. John River, Penobscot River, and Saco River. Preferred habitat for the boreal snaketail is clean, free-flowing, forested rivers and large streams underlain with rock, gravel, or sand. If this habitat is documented on the project site, MDIFW may recommend that specialized surveys be conducted. In most cases, MDIFW recommends that rivers with confirmed or potential use by boreal snaketail be left undisturbed and buffered by at least 250 feet of natural vegetation.

There are nearly a dozen species of rare dragonflies in Maine, yet most are unlikely to intersect with most solar development projects. These are two of the state's rarest dragonflies due to low population numbers and sensitivity to aquatic and riparian habitat degradation. We recommend that you contact MDIFW's Reptile, Amphibian, and Invertebrate Group Leader, Phillip deMaynadier (phillip.demaynadier@maine.gov, 207-941-4239), should any work be planned in proximity of known or expected occurrences of any Rare, Threatened, or Endangered dragonflies.

9. Rare Butterflies and Moths and Habitats
Maine has several rare butterflies and moths that are designated as State Endangered, State Threatened, and Special Concern species, some of which are noted below. For project sites that are known to contain these species, or that have high-quality suitable habitat on site, MDIFW recommends that a detailed assessment of potential habitat and surveys for the species be conducted.

a. Edwards' Hairstreak (State Endangered Species) and Sleepy Duskywing (State Threatened Species). Southern, Southwestern Maine.
The Edwards' Hairstreak (*Satyrium edwardsii*) and Sleepy Duskywing (*Erynnis brizo*) are listed as State Endangered and State Threatened species respectively, and are afforded protection under MESA. Both species are restricted to specialized barren habitats in York and southern Oxford Counties. They inhabit dry oak shrublands in oak-pine woodlands, and semi-open barrens. These sites typically have dry, poor soil and low plant diversity. Maine sites are usually in pitch pine-scrub-oak barrens, a rare and declining forest type that often provides habitat for a unique assemblage of rare insects and other biota. Both species are only found where their host plant, scrub oak (*Quercus ilicifolia*), grows in abundance. If these habitats are documented on the project site, within the geographic range of these species, MDIFW may recommend that specialized surveys be conducted.

b. Twilight Moth (State Threatened Species) and Pine Barrens Zanclognatha (State Threatened Species). Southern, Southwestern Maine.
The twilight moth (*Lycia rachelae*) and pine barrens zanclognatha (*Zanclognatha martha*) are listed as State Threatened moth species and are afforded protection under MESA. In Maine, both species are known only from pitch pine-scrub oak barrens, a rare and declining forest habitat found on just seven sites in York and southern Oxford Counties. If these habitats are documented on the project site, within the geographic range of these species, MDIFW may recommend that specialized surveys be conducted.

c. Clayton's Copper Butterfly (State Threatened Species) Eastern and Northern Maine.
The Clayton's copper butterfly (*Lycaena dorcas claytoni*) is listed as a State Threatened species and is afforded protection under MESA. This butterfly is currently known from only ten sites in Maine, including four in a ten square mile area of eastern Penobscot County in the vicinity of Lee and Springfield, and three sites in northern Piscataquis and eastern Aroostook Counties. Clayton's copper is found only in association with its larval host plant, the shrubby cinquefoil (*Dasiphora fruticosa*). This uncommon shrub requires limestone soils and has a scattered distribution throughout Maine, however, there are relatively few stands large enough to support viable Clayton's copper populations. Shrubby cinquefoil is intolerant of shade and can only thrive in open areas. It typically occurs along the edge of calcareous (limestone) wetlands. It can also be found in old fields, but these stands are typically short-lived because of forest succession. All of the currently known occurrences for Clayton's copper are in enriched fens and bogs, and streamside shrublands or meadows. Please contact MDIFW's Reptile, Amphibian, and Invertebrate Biologist, Beth Swartz (beth.swartz@maine.gov, 207- 941-4476), for further guidance.

d. Spicebush Swallowtail (State Special Concern Species). Southern Maine.
The spicebush swallowtail butterfly (*Papilio troilus*) is designated as a Species of Special Concern in Maine. This rare swallowtail is found in rich hardwood and mixed wood forests with slow streams or seepages that contain its host plants, northern spicebush (*Lyndera benzoin*) or sassafras (*Sassafras albidum*). Evidence of breeding has been documented only in York County. Any impacts on populations of spicebush or sassafras could also have potential impacts to this rare butterfly species.

e. Dusted Skipper (State Special Concern Species) and Cobweb Skipper (State Special Concern Species). Southern, Southwestern Maine.
The dusted skipper (*Atryonopsis hianna*) and cobweb skipper (*Hesperia metea*) are both designated as Species of Special Concern in Maine. These two butterflies are restricted to specialized barren habitats in York and southern Oxford Counties. They inhabit shrubby barrens, grasslands, rights-of-way, and open oak-pine woodlands with dry, often sandy soils. Both species are only found where their host plant, little bluestem (*Schizachyrium scoparium*), grows in abundance. If these habitats are documented on the project site, within the geographic range of these species, MDIFW may recommend that specialized surveys be conducted.

Guidelines for buffers and site protection measures for each of these species are highly habitat specific and should be developed in consultation with MDIFW staff. MDIFW encourages collaboration with our Department to avoid, minimize, and mitigate impacts to these rare species. Please contact MDIFW's Reptile, Amphibian, and Invertebrate Group Leader, Phillip deMaynadier (phillip.demaynadier@maine.gov, 207-941-4239), should any work be planned in the vicinity of a known occurrence of any of these species, for any further site-specific data, and for recommendations for habitat and species protection.

10. Rare Amphibians and Habitat.
a. Northern Spring Salamander (State Special Concern Species). Western, Central, Southern Maine.
The northern spring salamander (*Gyrinophilus p. porphyriticus*) is designated as a Species of Special Concern in Maine. This rare salamander utilizes clear, cold, mountain streams underlain by coarse substrates (rock, cobble, gravel) and bordered by hardwood or mixed wood forests. Most spring salamanders in Maine occur at elevations at or above 500 feet, in moderate to fast gradient, first or second order streams, some of which are not indicated on topographic maps. Spring salamanders can also occur in larger third-order streams and rivers if the habitat is consistent with that described above. This species' documented range in Maine is primarily in the western mountains, north and east into the mountains of central Penobscot County, with scattered records in York and Cumberland Counties. Any

instream work in perennial or intermittent streams or work adjacent to high elevation headwater streams in this area has the potential to impact this species. MDIFW generally recommends a 250-foot undisturbed riparian buffer from each bank of any streams containing this species.

Surveys for potentially suitable spring salamander habitat should be conducted within 250 feet of areas where project-related forest clearing is planned (i.e., roads, culverts, project infrastructure, transmission lines, or other clearings), during the appropriate timing window (mid-May to mid-September). Please contact MDIFW's Reptile, Amphibian, and Invertebrate Biologist, Derek Yorks (derek.yorks@maine.gov, 207-941-4475), for survey protocols and guidance should any work in streams or within 250 feet of streams be anticipated in the project area. Alternatively, a developer may choose to consider streams that meet the location and habitat characteristics described above as providing spring salamander habitat, not formally survey them, and design the project accordingly, incorporating the recommended 250-foot riparian buffer zone.

We recommend consulting with MDIFW staff prior to implementing any activities in or adjacent to any mapped and unmapped perennial or intermittent streams. Please also refer to Recommended Management Guidelines for Land Use in or Adjacent to Roaring Brook Mayfly and Northern Spring Salamander Habitat.

11. 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 anticipated will be identified by MDIFW as early as possible during project-specific consultations.

In most regions of the State, formal surveys for Rare, Threatened, and Endangered species have not been conducted, so it is possible that other such 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 IFWEnvironmentalreview@maine.gov.

INCIDENTAL TAKE PLANS

As stated above, pursuant to the Maine Endangered Species Act (MESA; 12 M.R.S, §12801 et. seq.) Endangered and Threatened species in Maine are afforded protection against activities that may cause "take" (kill or cause death), "harassment" (create injury or significantly disrupt normal behavior patterns), and other adverse actions.

Under MESA, MDIFW has the authority to approve project-specific Incidental Take Plans (ITPs) when such plans minimize the incidental "taking" 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 avoidance/minimization of mortality for the listed species, this provides legal protection against liability for incidental take, benefitting applicants seeking permits to build and operate 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; other impacts must be addressed independently. For more information on ITPs, please contact MDIFW's Endangered and Threatened Species Coordinator (207-941-4468).

MITIGATION OF IMPACTS

MDIFW recommends that all proposed projects avoid or minimize adverse impacts to sensitive species and habitat resources to the greatest extent practicable through project site selection, facility design/layout, operational practices, and other available methods. When this has been accomplished, methods to compensate for remaining, reasonable impacts may be explored. These steps may include such measures as modification of project design, consolidation of infrastructure to smaller concentrated areas, preservation of unique host plant species, development of habitat-specific buffers in consultation with MDIFW, permanent habitat protection, enhancement, and management, and other methods, subject to review and recommendation by MDIFW biologists.

Information in this document was obtained from MDIFW biologists and agency informational materials. **For more information, including additional agency contacts and copies of referenced documents, please contact** IFWEnvironmentalreview@maine.gov.

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