



Illinois Department of Natural Resources

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Bruce Rauner, Governor
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February 5, 2018

Mr. Philip Dick, Director
McLean County Department of Building & Zoning
McLean County Government Center
115 East Washington Street, Room M-102
P.O. Box 2400
Bloomington, IL 61701-2400

**RE: Lexington-Chenoa Wind Farm, McLean County
Endangered Species Consultation
EcoCAT Review #1806137**

Dear Mr. Dick:

This letter addresses consultation on this proposed action, a large wind energy generation facility, pursuant to the requirements of the *Illinois Endangered Species Protection Act* [520 ILCS 10/11], the *Illinois Natural Areas Preservation Act* [525 ILCS 30/17], and Title 17 *Illinois Administrative Code* Part 1075. Additionally, the Department may offer advice and recommendations for species covered under the *Fish & Aquatic Life Code* [515 ILCS 5, *et seq.*]; the *Illinois Wildlife Code* [520 ILCS 5, *et seq.*]; and the *Herptiles-Herps Act* [510 ILCS 69].

The proposed facility will generate approximately 200 megawatts of power from wind turbines with a capacity of approximately 2.5 megawatts or more, each. Turbines of this class usually approach five hundred feet in height and possess rotors with diameters exceeding 300 hundred feet. The environmental effects associated with turbines of this class may differ considerably from those in the 1.5-1.6 MW class existing elsewhere in McLean County.

The facility will occupy the northeastern corner of the County, south of US Highway 24. Most of the area proposed for the facility is agricultural in character. It is drained mainly by tributaries of Rooks Creek, itself a tributary of the Vermilion River, but a small portion is drained by Henline Creek, a tributary of the Mackinaw River.

The Department's purpose in the consultation process is to address potential adverse effects to Natural Areas and endangered species, and to fish and wildlife habitat more generally; this review is not intended to be the equivalent of the more comprehensive Environmental

Assessment (EA) or Environmental Impact Statement (EIS) produced for compliance with the *National Environmental Policy Act* (NEPA), which are required only for actions undertaken, authorized, or funded by the federal government. The products of this review are advisory recommendations which the County has the discretion to adopt, modify, or reject in accordance with the powers it possesses. The only exception is the case where going forward with the action would be certain to take endangered or threatened animals, when the applicant would be required to obtain an Incidental Take Authorization from the Department of Natural Resources for that species.

Here are the Department's recommendations concerning this facility, followed by discussion of each site or species' characteristics which justify the recommendations.

Recommendation #1: The Department recommends the County consider imposing a requirement for the applicant to avoid siting wind turbines within one mile of Weston Cemetery Prairie Nature Preserve. This may affect only turbines located in Section 10, Yates Township. While it may not assure there are no physical effects within the Nature Preserve, it is likely to reduce them below a level of significance. Turbines of the facility will still be easily visible from the Nature Preserve.

Recommendation #2: The Department recommends the County consider imposing a requirement for the applicant to curtail turbine operations below wind speeds of 5.0 meters per second during the period from July 15 through October 15 to conserve endangered, threatened, and non-listed bats. This measure will likely prevent the prohibited taking of endangered or threatened bats, and will reduce the mortality of non-listed bats by approximately fifty percent. While the project area is essentially treeless, migrating bats will still be subject to significant mortality.

Recommendation #3: The Department recommends the County consider imposing a requirement to conduct three years of mortality monitoring to statistically quantify bird and bat mortality by species due to turbine operations. If the County cannot do so, or chooses not to do so, the applicant should consider implementing such a program to demonstrate the level of mortality experienced and the species affected.

Recommendation #4: The Department recommends the County consider imposing a requirement for the applicant to perform and report fish & mussel surveys 100 meters up and downstream of any proposed physical disturbance of a perennial stream channel or drain associated with Rooks Creek prior to disturbance of the channel. This includes bridge or culvert improvements to facilitate transportation of turbine components. If the County cannot do so, or chooses not to do so, the applicant should consider doing so to avoid prohibited taking of previously-undocumented State-listed aquatic animals which may be present.

Recommendation #5: The Department recommends the County consider imposing a requirement for the applicant to avoid siting turbines within 500 feet of a perennial stream. While this requirement will not eliminate effects to aquatic habitats from noise, vibration, and flicker, those

effects, resulting from wave forms (noise and vibration), generally conform to the inverse-square law of physics, where doubling the distance reduces the impact to one-fourth. The Department does not believe 500 feet is adequate to fully-eliminate such effects, and such effects may still be significant at that distance, but a 500-foot setback is consistent with other setbacks applied to wind turbines and will assure such effects within the stream are diminished. Turbine operations will then be less likely to adversely affect populations of listed aquatic species. If the County cannot do so, or chooses not to do so, the applicant should consider voluntarily not siting turbines within 500 feet of perennial streams. Alternatively, the applicant could consider sponsoring scientific research to measure and report the effects of turbine noise, vibration, and flicker on aquatic organisms.

Recommendation #6: The Department recommends the County consider assuring no wind turbines are sited within one-half mile of the Mackinaw River INAI Site (Henline Creek). If the County cannot do so, or chooses not to do so, the applicant should consider voluntarily not siting turbines within half a mile of Henline Creek. Doing so will minimize any effects to the INAI Site and its essential habitat for State-listed species from wind turbine operations.

Supporting information for these recommendations is provided below.

Natural Areas

Weston Cemetery Prairie Nature Preserve and INAI Site. This five-acre Nature Preserve and INAI Site is located about five miles east of Chenoa, just north of US Route 24. Turbines associated with this facility will be clearly visible to visitors and to some forms of wildlife within the Preserve, but if the nearest turbine is at least one mile away, other impacts, such as noise and flicker, are unlikely to be significant. The Department believes visibility at this range is unlikely to adversely affect wildlife behavior.

Decades ago this Nature Preserve supported the State-listed threatened **Franklin's Ground Squirrel**, *Poliocitellus franklinii*. It may still do so, but no observations have been reported in recent years. Flicker shadows could have an adverse effect on this species, which is active in daylight and subject to avian predation. However, the orientation of the turbine array to the Nature Preserve is likely to subject the Preserve to only a few minutes of flicker, if any, on late winter afternoons, when this species is hibernating underground and would not be affected.

The IDNR generally seeks a one-mile setback for wind turbines near Nature Preserves. The information provided to the Department indicates that, with the possible exception of those in Section 10 of Yates Township, all wind turbines in this facility will be sited at a distance greater than one mile.

Mackinaw River INAI Site. The entire length of the Mackinaw River, from its headwaters near Sibley to its confluence with the Illinois River, is designated by this Department as an Illinois Natural Areas Inventory (INAI) Site; this medium-gradient river provides essential habitat for

several State-listed endangered or threatened species and supports unique and unusual assemblages of non-listed mussel invertebrates. One of its larger tributaries, Henline Creek, is included in the INAI designation because it, too, supports listed aquatic species. The INAI designation extends up Henline Creek to its intersection with the McLean-Ford County Line.

The Department requests a one-half mile setback from Henline Creek to minimize adverse effects from noise, vibration, and flicker to fish & wildlife present in this habitat. State-listed species known to be present or likely to be present in Henline Creek include the Slippershell Mussel and the Mudpuppy Salamander. More extensive descriptions of potential adverse effects to these species are described later.

Vermilion River INAI Site. Most of the Vermilion River (Illinois River Drainage) is designated by this Department as an Illinois Natural Areas Inventory (INAI) Site; this medium-gradient river provides essential habitat for several State-listed endangered or threatened species and supports unique and unusual assemblages of non-listed mussel invertebrates. The INAI Site includes one of its major tributaries, Rooks Creek, upstream to a point just north of the McLean-Livingston County Line, a stream especially noted in Livingston County for its diverse array of mussels as well as for the essential habitat it provides for the State-listed endangered Greater Redhorse. No turbines are proposed within one-half mile of the INAI-designated length of Rooks Creek.

However, the greater portion of the project area drains to Rooks Creek. Energy facilities entail a great deal of construction disturbance to roads, bridges, culverts, drains, and fields. A single turbine foundation may require the excavation and re-distribution of more than 300 cubic yards of soil. There is a significant risk of erosion with associated siltation and sedimentation of drains and streams. The Rooks Creek is noted for its high water quality, and its sand, gravel, and cobble substrate habitats support a wide diversity of invertebrate fauna. Siltation covers and chokes such habitats, suffocating aquatic organisms. Thus, it is very important that construction crews employ effective erosion controls to prevent the movement of soils into the streams feeding the Vermilion and Mackinaw Rivers. While this is a central element of the developer's agreement with the Illinois Department of Agriculture, it may fall to the County to assure such measures are fully deployed and adequately maintained.

Where underground power lines must cross drains and streams, open-trenching should be avoided if possible; directional boring is preferred where such crossings are necessary.

Where bridges on local roads must be widened or replaced to accommodate the transportation of wind turbine components, fish and mussel surveys should be performed to determine whether an Incidental Take Authorization from IDNR is necessary to allow endangered or threatened species to be relocated. The headwaters of Rooks Creek likely have not been evaluated for fish and mussel fauna, but it is possible such species may be present, as they are in Henline Creek. (Indian Creek, another tributary of the Vermilion River just east of the project area, has

documented records of the Slippershell Mussel.) The fact many portions of these streams have been channelized does not preclude them from supporting protected fauna.

Species diversity is an important characteristic of the Vermilion River INAI Site. Many fish are migratory to some degree, moving upstream to spawn and returning downstream. Juveniles and larvae of some species, such as the Greater Redhorse, use headwaters in the early stages of life to avoid predators present in larger streams. These movements are key elements in the life cycles of many other forms of aquatic life, particularly for mussels, which begin their lives as parasites on fish, who carry young mussels to new habitats. The operation of wind turbines may have adverse effects on fish movements due to blade shadows moving across streams, magnetic fields associated with power lines which cross beneath streams, and the noise and vibrations emanating from turbines. It has been demonstrated that traffic noises on bridges can interfere with fish attempting to breed several miles away.¹

While this has yet to be shown or quantified for the operation of wind turbines, the Department considers such effects likely. To the extent that aquatic animals are excluded from habitat or cannot complete reproductive activity, species diversity in the Vermilion and Mackinaw River could be diminished over the long term. There is a need for scientific research to determine the existence and impacts of such effects.

Birds.

A great deal has been written about the effects of wind turbines on birds, with the result that this has become a matter of concern to members of the public wherever wind energy facilities are proposed.

Experience in Illinois has shown that utility-scale wind turbines rarely kill more than six birds annually, with many killing none. Cumulatively, that amounts to thousands of individual birds annually, but because they are also distributed across hundreds of different species, these losses are not biologically significant, except for endangered or threatened species.²

Experience in Illinois has also failed to demonstrate that turbine siting has any discernable effect on avian mortality. Interested parties, including this Department, have been unable to predict with any accuracy the level of avian mortality, nor the avian species to which mortality occurs. Considering that Illinois is positioned to experience broad-front migration of most avian species, which birds will be killed and where they will die appear to be random events. Moreover, efforts

¹ Holt, Daniel E. and Johnston, Carol E.; “*Traffic Noise Masks Acoustic Signals of Freshwater Stream Fish;*” Biological Conservation 187 (2015); pp. 27-33. The authors found that noise caused by truck traffic over an interstate highway bridge interfered with the mating behavior of one fish species for a distance up to 12 kilometers (about seven miles) downstream.

² The death of an endangered or threatened bird is always of legal significance, but the biological significance of a single mortality is less clear, varying across listed species; some losses are more crucial than others.

to reduce mortality, such as painting rotor blades to be more visible to birds, have proven ineffective.³

Twenty-two of the 31 State-listed avian species in Illinois have been observed in McClean County in recent years, as reported by bird-watchers. In most cases these observations have occurred during annual spring and fall migrations, and most likely occurred in habitats which will be unaffected by turbine construction or operation. IDNR, by contrast, records only documented breeding efforts (males calling on territory, nests, the presence of juveniles). No breeding of listed avian species has been reported to IDNR within the proposed boundaries of this facility. Nevertheless, migrants are as susceptible to collision mortality as breeding residents. The only known instance of a State-listed bird being injured or killed at a wind energy facility in McClean County occurred in September 2007, when a juvenile **Osprey**, *Pandion haliaetus*, was injured while attempting to perch on a turbine nacelle. This bird was treated and released the following day and continued its migratory movement. This remains the only reported incident involving wind turbines and Ospreys in Illinois.⁴

Other State-listed birds which have been reported as killed at Illinois wind turbines include the loss of a single endangered **Black Rail**, *Laterallus jamaicensis*, and four threatened **Black-Billed Cuckoos**, *Coccyzus erythrophthalmus*. The latter bird illustrates the difficulty of anticipating mortality for particular species.

These four losses occurred at two wind energy facilities located on opposite sides of the State; each facility reported one mortality in successive years, and each facility has since sought and received an Incidental Take Authorization⁵ from the Department, since it appears such losses are likely to continue in these locations. However, these losses occurred at turbines located far from habitat suitable for this species, far from any records of breeding activity, and where no such birds were observed during pre-construction assessments. By contrast, other State-listed bird species which were observed at and near these facilities (Upland Sandpiper; Loggerhead Shrike) were not killed or injured. Consequently, the Department cannot say with confidence that this facility will, or will not, kill any State-listed birds during its operation.

In 2007, the State-listed endangered **Loggerhead Shrike**, *Lanius ludovicianus*, was observed nesting in a white pine tree at a farmstead adjacent to the project area. The nest was unsuccessful in fledging any young, likely due to farm cats, and the nesting attempt has not been repeated. This occurrence was deemed unusual in that this species' diet is comprised mainly of larger insects and smaller mammals, but it requires barbed wire or thorny trees and shrubs on

³ The rotor blade that kills a bird is invisible to the bird due to the blade's speed of motion, no matter its color.

⁴ Information on avian mortality is typically gathered only where a wind energy facility is conducting mortality monitoring, and that usually ceases after two or three years of operation; some facilities conduct no mortality monitoring at all. Nevertheless, the Department believes sufficient monitoring has occurred at Illinois facilities to fairly characterize avian risk.

⁵ Pursuant to the Illinois Endangered Species Protection Act, the Department may authorize taking that is otherwise prohibited which occurs due to a lawful activity, provided the taking will not jeopardize the survival or recovery of the species. 520 ILCS 10/5.5. These Authorizations were #139 and #140.

which to impale its prey for several days, after which it can more easily be dismembered and consumed. It is more typically found in grassland habitats, which are absent in this vicinity. The Department considers it unlikely the project will adversely affect this species.

The State-listed endangered **Upland Sandpiper**, *Bartramia longicauda*, has nested in the past at Weston Cemetery Prairie, but the last observed instance was in 1972. More recent observations in McLean County have been south of the Mackinaw River. The species is regarded as a ground-nesting grassland bird, but it has been found in grassed waterways and along roadsides. The Department considers its presence in this project area as possible, but unlikely.

The federally-listed endangered **Whooping Crane**, *Grus canadensis*, has been observed in McLean County. These birds are part of an experimental population which breeds in Wisconsin and migrates to Tennessee and Florida in the winter, stopping to rest and forage along the way. Several years ago, a Whooping Crane with two broken legs, an injury typically associated with power-line collisions, was recovered from a field southeast Gridley, but died before it could be treated. The incident serves to demonstrate that this species does stage through McLean County but, in more than a decade since the Eastern Flock was established, there have been no incidents of fatal interactions with wind turbines.

Wind energy generation facilities also directly adversely affect birds in non-lethal ways or indirectly, such as by exclusion from habitat, disruption of habitat, alteration of breeding behavior, or altering the behavior of prey or predators.

For example, the Department has noted that the State-listed **Northern Harrier**, *Circus cyaneus*, is almost always reported from pre-construction avian assessments for wind energy facilities, but is always absent from post-construction assessments. The Department speculates this species, which hunts by sound more than by sight, is prevented from locating prey within a wind facility due to the noise generated by wind turbines. Whether or not this is the reason, it is clear this species is excluded from the use of habitat encumbered with turbines.

Another species similarly excluded is the non-listed **American Golden Plover**, *Pluvialis dominica*. Experience in Illinois and Indiana wind energy facilities has shown this species is excluded from habitat with one-quarter mile of a wind turbine, apparently due to an aversion to vertical structures and “breaks” in habitat; the species also avoids roads and buildings. Given the road, property line, and human habitation setbacks required under most wind turbine siting ordinances, this species is effectively excluded from all habitat within a wind generation facility. The cumulative effect of multiple wind facilities is of concern, because this arctic-bound species must spend several weeks on the ground in the Midwest as it molts into its arctic plumage, and not every open field provides suitable habitat.

Turbine noise, though slight to human ears, can be sufficient to interfere with bird songs essential to breeding success. Research on the effects of highway noise has demonstrated that males of some species nesting close to roads must alter the pitch of their songs to be heard, but

that females remain more responsive to the original pitch, resulting in infidelity or a lack of breeding success within 500 feet of busy highways. The same may be true for utility-scale wind turbines.

The presence of turbines can alter the behavior of prey and predators. Whether due to motion, noise, or shadow-flicker, turbine operation may stress small mammals, resulting in a heightened state of alert which helps them avoid avian and mammalian predators. Because of avian and bat mortality due to blade collisions, some mammalian predators, such as **Coyotes**, *Canis latrans*, learn to scavenge beneath wind turbines for easy meals and take other prey as the opportunity arises. This was demonstrated at another wind energy facility in McLean County when Common Pheasants, *Phasianus colchicus*, were tallied as the most common bird “killed” in a turbine mortality study. Pheasants do not fly high enough to be struck by turbine blades but all feather-spots were attributed to the turbine. However, the more likely explanation is that these birds, attracted to the open study plots, were killed by scavenging coyotes. Coyotes have also been directly observed moving from turbine to turbine without foraging between them.

The State-listed endangered **Upland Sandpiper**, *Bartramia longicauda*, has been documented as breeding in McLean County fields south of the Mackinaw River between Lake Bloomington and I-55. There is no reason to believe this species does not also breed in fields north of the River. While grazed pasture is a preferred breeding habitat, this species has been documented as nesting in roadsides and grassed waterways in corn and bean fields. Elsewhere in McLean County, this species has continued using habitat within sight and sound of operating wind turbines. The Department has seen no evidence this species is excluded from habitat due to the presence of wind turbines. No Upland Sandpipers have been reported to the Department as being taken due to wind turbines. Perhaps the greatest risk to this species is that an established but unknown nest may be disturbed or destroyed during the construction phase of the project.

Turbines proposed for this facility may lie within the foraging range of **Bald Eagles**, *Haliaeetus leucocephalus*, nesting along the Vermilion and Mackinaw rivers and their tributaries. Although no longer listed as endangered or threatened, this species continues to be federally-protected under the *Bald and Golden Eagle Protection Act* (BGEPA). **Golden Eagles**, *Aquila chrysaetos*, do not breed or nest in Illinois but sometimes appear as a winter migrant as far south as St. Louis. Accounts of eagle fatalities due to wind turbines almost always involve the Golden Eagle; the mortality of Bald Eagles due to wind turbines is extremely rare, and none have been reported in Illinois. However, the Illinois population of Bald Eagles continues to expand at a rapid rate, and new pairs are colonizing sites, even in cities, which would have been avoided in the past. The Department believes the risk this facility poses to Bald Eagles is slight.

Bats.

Wind turbines take a far greater toll on bats than on birds. Utility-scale wind turbines in the 1.5/1.6 MW class in Central Illinois, when operated normally throughout the year, kill an average of 15 bats per year. Because turbines in the 2.5 MW class begin operations at lower

wind speeds and have larger rotor diameters, they can be expected to kill higher numbers of bats unless measures are taken to reduce bat mortality.

The great majority of bats killed by wind turbines belong to three non-listed species of migratory “tree” bats, so-called because they do not hibernate and migrate south for the winter. While proportions vary, it is not unusual for 90% or more of bats killed at an Illinois wind facility to be **Hoary Bats**, *Lasiurus cinereus*; **Silver-Haired Bats**, *Lasionycteris noctivagans*, and **Eastern Red Bats**, *Lasiurus borealis*. Losses for these long-lived species are so severe that experts are estimating they will all be listed as endangered by mid-century even if no more turbines were built after 2014. Since wind energy facilities are expanding rapidly, conservation of these species will become increasingly important. These bats do not suffer losses from White-Nose Syndrome, to which only cave-hibernating bats are exposed.

The federally-listed and State-listed endangered or threatened bats whose range includes McLean County belong to the *Myotis* genus: the endangered **Indiana Bat**, *Myotis sodalis*, and the threatened **Northern Long-Eared Bat**, *Myotis septentrionalis*. (The latter species has been documented near Fairbury along Indian Creek.) The range of a third species, the **Little Brown Bat**, *Myotis lucifugus*, also includes McClean County. These bats hibernate in mines and caves, where the White-Nose fungus is an ever-present threat. Two other cave-hibernating species may also be present: the **Tri-Color Bat**, *Perimyotis subflavus*; and the **Evening Bat**, *Nycticeius humeralis*. While these bats roost and forage generally near and above tree canopies, each has been tallied as a wind turbine fatality in Illinois.

The Little Brown Bat was once Illinois’ most common species, followed closely by the Northern Long-Eared Bat, but these species have proven highly susceptible to White-Nose Syndrome, with annual mortality exceeding 90%. Once easily captured in surveys, they are now difficult to find. The Indiana Bat, by contrast, appears to have suffered only an approximate 20% reduction in population numbers due to this disease. The US Fish & Wildlife Service is studying whether to list the Little Brown Bat and, on December 20, 2017, announced the beginning of an effort to evaluate the listing status of the Tri-Color Bat. It is likely these species will become federally-listed (and State-listed) at some point during the useful life of this facility.

Before the 2013 advent of White-Nose Syndrome (WNS) in Illinois, there had been no reported losses of Indiana Bats or Northern Long-Eared Bats at Illinois wind turbines, and relatively few reports of mortality for the Little Brown Bat, Tri-Color Bat, or Evening Bat. The hunting and habitat preferences of the two groups of bats account for the great difference in wind turbine mortality. The cave-hibernating species prefer to forage just below, just-above, or within the forest canopy; wind turbines are seldom built in proximity to trees. These bats do fly across and over open spaces, but tend to stay below 30 meters (100 feet), and even lower, and so are much less likely to collide with turbine rotors. By contrast the larger and heavier “tree” bats prefer foraging over open fields and often at higher altitudes, and during higher wind speeds. This is especially true in August and September when these species migrate from northern breeding grounds to southern climes where food remains available during the winter.

There is an inverse relationship between wind speed and the number of bats in the air, and which species comprise them. Numerous research studies have shown that if turbine operations are not initiated until higher winds are present, total bat mortality can be reduced by more than 50%, and mortality for *Myotis* species by even more. However, the industry trend is to deploy turbines which can begin operations at ever-lower wind speeds, thus making more areas with poorer wind resources viable locations for a wind energy facility. Whereas the turbines deployed earlier in McClean County could cut-in at wind speeds of 4.5 or 4.0 meters per second (m/s), the larger more modern turbines do so at 3.5 or even 3.0 m/s.

At present, one Indiana Bat and four Northern Long-Eared Bats have been reported killed at Illinois turbines. Each turbine was being operated “normally,” that is, in accordance with manufacturers’ recommended wind speeds, and all but one of these bats died during the fall migration period, which may begin as early as mid-July and runs through October in most parts of Illinois. Currently, based on experience in this State, the Department is recommending that turbine operations be curtailed below wind speeds of 5.0 m/s between July 15 and October 15 to avoid killing listed bats; this is also the wind speed which reduces total bat mortality of all species by approximately 50%. However, unless directed by the local government with jurisdiction, or pursuant to a State or federal Incidental Take Permit,⁶ operation of a wind facility in this manner remains voluntary with the facility owner.

The applicant for this facility intends to conduct acoustic monitoring of bat activity. The Department anticipates little, if any, activity by *Myotis* bats will be detected. In 2010, a maternity colony of the Northern Long-Eared Bat existed on the South Fork Vermilion River near its confluence with Indian Creek. While Indian Creek is not far east of the project area, extensive forays of *Myotis* bats based along Indian Creek into the project area appear unlikely. Bats using the Vermilion River most likely hibernate at the Blackball Mine near LaSalle, which means they would be unlikely to migrate through the turbine array proposed for this project. Nevertheless, the potential for high rates of annual bat mortality among non-listed species remains a grave concern.

Fish, Amphibians, Reptiles, and Mussels.

Fish can be affected by alterations or disturbances to habitat, such as loss of access due to obstruction, reduction in water quality, siltation and sedimentation, noise, and vibration. Fish can also be relatively mobile, migrating up and downstream in response to flow conditions or biological imperatives. Apart from their important role as aquatic predators, fish play an important role in the life-cycle of all North American mussels, save one. For several weeks, juvenile mussels (glochidia) act as parasites on fish gills, and this is the main mechanism for

⁶ At present, only one wind energy facility in Illinois possesses both a federal and state Incidental Take permit, the Pioneer Trail facility in Ford and Iroquois Counties (Illinois ITA #134). After two years of operating only above 5.0 m/s during the period from August 1 to October 15, no *Myotis* species of bats were killed, and the average mortality per turbine was held to about 7.5 bats per turbine. That facility deploys 1.6-MW GE turbines.

mussel dispersal to new habitats. Often, mussels require a specific fish host to successfully reproduce.

The only currently State-listed fishes recorded from the Mackinaw River watershed are the recently-listed **Brassy Minnow**, *Hybognathus hankinsoni*, and the **Lake Sturgeon**, *Acipenser fulvescens*. The Brassy Minnow record is decades old and thus may be unlikely in this vicinity. At least two Lake Sturgeon were present below the spillway of Lake Bloomington in 2009, having ascended Money Creek until they could go no further. Lake Sturgeon are a species noted for long-distance movements, and could occur anywhere in the watershed where access is possible. A species with few predators because of its size and “armor,” it feeds on invertebrates on the streambed and seems unlikely to be sensitive to noise, vibration, or shadow flicker.

Other listed fishes may occur in the Mackinaw River watershed, such as the **American Eel**, *Anguilla rostrata*, and the **American Brook Lamprey**, *Lethenteron appendix*. Eels breed in the Atlantic Ocean, but females may spend 20 years or more in freshwater streams of the Midwest; many records for this species occur in the Illinois River upstream of the mouth of the Mackinaw.

The non-parasitic American Brook Lamprey spends up to four years as a larva (ammocoete) buried in stream detritus and is chronically under-sampled; non-standard techniques have the best chance of detecting it. The Mackinaw River lies within its range and its excellent water quality suggests habitats in the watershed are suitable for this species.

The Vermilion River watershed supports the State-listed endangered **Greater Redhorse**, *Moxostoma valenciennesi*, and the State-listed threatened **River Redhorse**, *Moxostoma carinatum*. Smaller creeks provide important habitat for the Greater Redhorse, which has been collected at several points on Rooks Creek in Livingston County; how high they may ascend the watershed is unknown.

Although not documented from Rooks Creek, the State-listed threatened **Slippershell Mussel**, *Alasmidonta viridis*, is present elsewhere in small streams of the Vermilion River watershed, and Rooks Creek supports a diverse array of more than ten species of mussel fauna, so that the presence of the Slippershell would not be surprising.

Maintenance of good water quality, and control of siltation and sedimentation are important to these species, but the essential element is the access of host fish species to reproductive female mussels at the right time of year. The exclusion of host fish from the vicinity of reproductive mussels could effectively halt reproduction and recruitment to existing populations, as well as preventing the establishment of new populations in suitable habitat not now occupied by these species, hampering their Statewide recovery. Hence there is the potential for noise, vibration, and flicker from turbines sited close to tributary streams to adversely modify essential mussel habitat to the extent that host fish are excluded by these effects.

The Mackinaw River is noted for its abundant records of the State-listed threatened amphibian, the **Mudpuppy Salamander**, *Necturus maculosus*. Grown Mudpuppies are large salamanders, eleven-to-twelve inches long. Nocturnal by preference, they are most often encountered by fishermen using trot-lines for catfish. During daylight, they hide beneath logs and boulders. This species is unusual for the fact it never reaches a fully-mature life stage and does not develop lungs, remaining dependent on external gills which confine it to the water. Despite its permanent adolescence, it reproduces by spawning in shallow riffles.

Another unusual feature of this cold-blooded animal is its preference for cold water: it is most active when water temperatures are around 40°F; it avoids water warmer than 72°F, and a temperature of 77°F is fatal to it. Unsurprisingly, this means it can only access its spawning areas in the winter and retreats to deeper pools in larger streams for the warmer months. However, the presence of cool groundwater emanating from field tiles may extend the habitats it can exploit in the summer.

The third unusual aspect of this animal is that it is the only known non-fish host of a North American mussel, the State-listed endangered **Salamander Mussel**, *Simpsonaias ambigua*. There are no records for this mussel species in the Mackinaw River or the Vermilion River watershed, but this is the most difficult mussel species to discover due to the fact they tend to abandon the Mudpuppy while it is resting in its nest beneath a log or boulder in deeper water, and such areas are often not examined during mussel surveys.

The Mudpuppy is a predator of crayfish and other invertebrates, as well as small fish. It has an extremely sensitive lateral line along both sides of its body, which aids it in navigation and in the detection of prey and predators. The importance of the lateral line may enhance its sensitivity to unusual stimuli, such as the noise and vibrations emanating from wind turbines. The Mudpuppy may also be sensitive to magnetic fields⁷ and thermal effects⁸ created by power lines routed beneath streams, and it may be alarmed by shadow-flicker.⁹

The concern for this species is that the vibration, noise, movement and magnetic fields or thermal effects associated with operating wind turbines may exclude Mudpuppies from spawning grounds in tributaries located within the turbine array, thus hampering reproduction. Unfortunately, the locations of Mudpuppy spawning areas in the Mackinaw River and its tributaries are currently unknown.

⁷ The strength of the magnetic field will vary based on the current, which in turn may vary with the strength of the wind and the number of turbines on that line.

⁸ The four-ought (0000) cables often used between turbines can fail at temperatures of 196°F; while they do not typically operate at anywhere near this limit, heat from the conductor enters the surrounding soil, and a saturated soil will conduct that heat more efficiently. To what degree this may heat the water in a stream above is unknown.

⁹ While the sun does not shine when the Mudpuppy is most active, the moon also causes shadow flicker. The Department is unaware of the availability of any models for lunar flicker, like those used to study the effects of solar flicker, because concerns typically center around the effects of solar flicker on humans. Unlike the Sun, the Moon has phases which would considerably complicate the creation of a model. Nonetheless, it is well known that many nocturnal species have synchronized their reproductive activities with the full or new moon, so that the flicker effect cast by moonlight is a legitimate concern for its influence on the behavior of nocturnal species.

Mammals.

The fact mammalian predators, such as coyotes, may alter their hunting and foraging patterns has already been described.

The only State-listed endangered or threatened terrestrial mammal known to occur in McLean county is the threatened **Franklin's Ground Squirrel**, *Poliocitellus franklinii*. A colony of this species has persisted for more than twenty years in the right-of-way of Old Route 66 just south of the Mackinaw River, and this species was reported from the Weston Cemetery Prairie Nature Preserve in 1982. Young males of this species are known to disperse up to six miles from their natal burrow during their first year, and tend to follow linear features such as highways and railroads where appropriate habitat is present. Highways and railroads offer such habitat throughout the proposed facility, and this species is sometimes found occupying grassed waterways in row-crop fields or the spoils dredged from drains and channelized streams, which are also present in the project area.

Unlike many small mammals, this species is active during the daylight hours, but still spends most of its time underground. It has a long hibernation period which may extend from September to the end of April, limiting the time trapping surveys may be successful. Above ground, it prefers bright sunny days. It feeds on leaves, shoots, and seeds, but has a higher animal protein diet than any other rodent, consuming insects, the hatchlings of ground-nesting birds, and the young of mice and voles. Its own predators include weasels, coyotes, snakes, and birds of prey.

The latter factor may make this species sensitive to shadow flicker, which may mimic the shadows of soaring hawks. A study of Richardson's Ground Squirrels, a closely related species in California, found much higher levels of stress among ground squirrels living in proximity to wind turbines, as measured by the frequency of alarm calls, but could not establish the reasons for the higher stress. The older wind turbines in that area provided perches for raptors, which might be one explanation, but trees would do the same.

This Department speculates that shadow flicker is likely to stimulate defensive responses driving squirrels underground, and thus interfering with their normal foraging, feeding, and mating behaviors, the very definition of harassment, which is a form of prohibited taking.

The Department currently has no records of observations of this species within the boundaries of the proposed wind energy facility. Given the long-term colony not far away, there seems a possibility this species is present, but the Department does not feel trapping surveys for this species in this project area are justified absent further evidence.

Consultation on the part of the Department is closed, unless the County desires additional information or advice related to this proposal. In accordance with 17 Ill. Adm. Code 1075.40(h),

the County should notify the Department of its decisions on these recommendations in writing: whether it will proceed with the action as proposed; whether it will require modification of the proposed action consistent with the Department's recommendation or otherwise; or whether it will forego the proposed action.

This consultation is valid for two years unless new information becomes available which was not previously considered; the proposed action is modified; or additional species, essential habitat, or Natural Areas are identified in the vicinity. If the action has not been implemented within two years of the date of this letter, or any of the above listed conditions develop, a new consultation is necessary.

The natural resource review reflects the information existing in the Illinois Natural Heritage Database at the time of the project submittal, and should not be regarded as a final statement on the project being considered, nor should it be a substitute for detailed site surveys or field surveys required for environmental assessments. If additional protected resources are encountered during the project's implementation, the applicant must comply with the applicable statutes and regulations. Also, note that closure of consultation does not imply IDNR's authorization or endorsement of the proposed action.

Please do not hesitate to contact the Department should any questions arise regarding the Department's review of this proposed action.

Sincerely,



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