APPENDIX F-2 – INVERTEBRATE SURVEY

Invertebrate Survey

Killingly Energy Center
Lake Road, Killingly, Connecticut

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for
REMA Ecological Services, LLC

August 2016

Killingly
Energy Center
an NTE Energy Project

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1.0 Overview

REMA Ecological Services, LLC (REMA) of Manchester, CT requested assistance in conducting a survey of moth and butterfly species at the 73-acre Lake Road site of the Killingly Energy Center (KEC, KEC Site), a proposed 550-megawatt (MW) air-cooled, combined cycle, electric generating facility and associated electrical interconnection switchyard. The purpose of the survey was to determine the presence of any of the two "state-listed" moth species and one "state-listed" butterfly species identified by the Connecticut Department of Energy & Environmental Protection's (DEEP's) Natural Diversity Database (NDDB). In addition, a representative sample of non-target Lepidoptera and other insect taxa were collected as vouchers to be deposited in the entomology collection of the University of Connecticut.

The study area is divided into two parcels: a 63-acre parcel located north of Lake Road and a 10-acre parcel located south of Lake Road. The KEC Site largely consists of dense, undeveloped woodland and wetland. One two-story house and associated facilities are located in the southeastern corner of the parcel north of Lake Road. A field and several structures are located on the northern edge of the parcel south of Lake Road. Generally, on-site soils were formed in glacial till sediments that were derived mainly from gneiss, granite, and/or schist-grade metamorphic parent material.

2.0 Survey Dates

The KEC Site was surveyed on 3 separate nights in July, 2016. These are as follows:

July 1st, from 9:00 p.m. to 12:00 a.m.,
July 18th /19th, from 8:00 p.m. to 12:30 a.m.,
July 26th, from 8:30 p.m. to 12:45 a.m.

In addition, butterfly species were observed on:

June 10th, 2016 from 8:00 a.m. to 12:00 p.m.
August 3rd, 2016 from 2:30 p.m. to 4:30 p.m.

The above dates fit well within the documented flight times of the target species.

3.0 Methods

Survey methods included the use of Ultraviolet, Mercury Vapor, and white fluorescent lights to attract insects, and searching of flower heads and ground by headlamp and sweeping.

Voucher specimens were collected for non-target species of Lepidoptera. All voucher specimens will be deposited in the collection of the University of Connecticut in Storrs as a representative sample of mid-summer night-active Lepidoptera for the KEC Site.

For the nighttime surveys, the equipment was set up at the two open fields associated with the KEC Site. During the first two surveys (on July 1st and July 18th), collection took place in the roughly 1.3-acre field within the northern section of the Switchyard Site. On July 26th, 2016, collection took place in the small field (i.e., +/- 0.5 acre) within the Generating Facility Site immediately to the east of the existing residence.

4.0 Target Species

The following are the targeted species listed in a letter[1] from the DEEP NDDB for the KEC Site:

Acronicta fragilis	Fragile Dagger Moth	Special Concern
Derrima stellata	Pink Star Moth	Special Concern
Callophrys irus	Frosted Elfin	Threatened

The three listed species were reviewed from images available online. I am familiar with the major Macrolepidoptera taxa and can recognize the listed species. I have participated in Invertebrate Surveys in both Connecticut and Massachusetts and previously worked in the Laboratory of Dr. David Wagner at the University of Connecticut assisting with studies of Lepidoptera.

5.0 Target Species Found

None of the target species were found during invertebrate surveys of the KEC Site.

Callophrys irus (Frosted Elfin) – No individuals of this species were observed during the appropriate flight time in early June. Wagner et al. (2011) mapped vegetation along the NU powerlines both north and south of Lake Road as part of their survey of rare insect habitats. The host plant of the Frosted Elfin (Wild Indigo; *Baptisia tinctoria)* was specifically mapped. No population of *Baptisia* was noted within or in close proximity to the study area. The closest population was located approximately 0.5 kilometers to the south of the study site along the powerline easement. Based on both observations and the lack of host plant, I've determined with a strong level of certainty that the presence of *Callophrys irus* does not occur on this site.

Acronicta fragilis (Fragile Dagger Moth) – No individuals were observed during the survey.

Derrima stellata (Pink Star Moth) – No individuals were observed during the survey.

[1] The letter from Dawn McKay of the DEEP was addressed to George T. Logan of REMA, and is dated March 8th, 2016.

6.0 General Observations

Insects attracted to the lights were predominantly flies (Diptera), caddisflies (Trichoptera) and Lepidoptera. Smaller numbers of Hemiptera, Homoptera, Neuroptera and Coleoptera were observed. At least 80 species of macrolepidoptera were observed from the families Noctuidae, Geometridae, Arctiidae and other groups (see Appendix A). Noctuids represented the most species diverse group of macrolepidoptera observed and were represented by genera including *Catocala* (Underwings), *Xestia* (Darts), and others. Approximately 110 species of Lepidoptera were observed during the survey, including unidentified macrolepidoptera, microlepidoptera, and butterflies.

As would be expected for open fields adjoining deciduous forest, many of the moth species observed feed as larva on detritus, lichen, mosses, and common plant species found in the survey area including *Plantago, Vitis* and various grasses (e.g. *Poa*). Other species feed on common trees and shrubs found on the KEC Site, such as oak and maple. Many of the moth species observed are generalist feeders with a long list of potential host plants. Some of the moths observed, are host specific or have a narrow range of host plants like *Catocala lineela* and *Catocala amica* which are Oak specialists.

A variety of widespread polyphagous species are present at the KEC Site and have a wide selection of grasses, early successional plants, trees and shrubs to feed on. Some widespread host-specific species of Lepidoptera are also present at the KEC Site and rely on common plant species.

A variety of common butterfly species were observed (Appendix B) primarily in the field sites and edges. The most abundant butterfly species was the Common Ringlet (*Coenonympha tullia)*, a grass-feeding species that was found in the fields both north and south of Lake Road. Other species observed included Viceroy, Little Wood Satyr, Black Swallowtail, Least Skipper and Question Mark.

Photographs are provided in Appendix C.

7.0 Other Insect Taxa

The presence of significant numbers of aquatic insects such as caddisflies, aquatic hemipterans, and coleoptera from a diverse assortment of families indicate the proximity of the KEC Site to nearby aquatic and wetland habitats, mostly occurring offsite within the Eversource electric transmission ROW.

8.0 Conclusion

Daytime surveys and a lack of the host plant on, or in close proximity to, the KEC Site indicate that *Callophrys irus,* the Frosted Elfin, is not present on the KEC Site in Killingly, Connecticut.

The survey of the KEC Site in Killingly, Connecticut, conducted on three nights in July 2016 yielded no observations of the two target, state-listed moth species (*Acronicta fragilis and Derrima stellata).* While this does not preclude their presence, their absence during the survey and the differing habitats at the reported nearby collection sites make this possibility less likely.

9.0 References

1. Wagner DL and Metzler K. Final Report: Insect survey for the Interstate Reliability Project. 18 April 2011. http://www.transmission-nu.com/residential/projects/IRP/Supplemental%20MCF/Volume%204%20-%20Environmental%20EX%202.PDF
2. Wagner, David. Caterpillars of Eastern North America. Princeton University Press. 2005
3. Beadle D and Seabrooke L. Field Guide to Moths of Northeastern North America. Houghton Mifflin Harcourt. 2012.
4. North American Moth Photographers Group, Mississippi Entomological Museum. Digital Guide to Moth Identification Website. http://mothphotographersgroup.msstate.edu/Plates.shtml Accessed: August 2016
5. Bug Guide. Iowa State University Entomology Department. Website: http://bugguide.net/node/view/15740 Accessed: August 2016.
6. Robinson GS et al. HOSTS – a database of the World's Lepidopteran Hostplants. Natural History Museum, London. Website: http://www.nhm.ac.uk/research-curation/research/projects/hostplants/ Accessed: August 2016.

ATTACHMENT A: LIST OF MOTHS

MOTHS AT THE KEC SITE	
Latin Name	**Common Name**
Drepanidae Hooktip and False Owlet Moths	
Drepana arcuata	Arched Hooktip
Saturniidae Wild Silk Moths	
Anisota stigma	Spiny oakworm moth
Dryocampa rubicunda	Rosy maple moth
Sphingidae Sphinx Moths, Hawkmoths	
Smerinthus jamaicensis	Twin-spotted sphinx
Notodontidae Prominents	
Cerura scitiscripta	Black-Etched Prominent
Noctuidae Owlet Moths, Miller Moths	
Ponometia erastrioides	Small Bird-dropping Moth
Amolita fessa	Feeble Grass Moth
Amphipoea americana	American Ear Moth
Chytonix palliatricula	Cloaked Marvel
Pseudeustrotia carneola	Pink-barred Pseudeustrotia
Leucania sp.	Noctuid moth
Anicla forbesi	Noctuid moth
Apamea amputatrix	Yellow-headed Cutworm Moth
Xestia badicollis	Noctuid moth
Erebidae Erebid Moths	
Subfamily: Arctiinae (Tiger and Lichen Moths)	
Apantesis nais	Nais Tiger Moth
Hypoprepia fucosa	Painted Lichen Moth
Lophocampa caryae	Hickory Tussock Moth or Hickory Tiger Moth
Phragmatobia assimilans	Large Ruby Tiger Moth
Subfamily: Herminiinae (Litter Moths)	
Idia aemula	Common Idia Moth
Macrochilo absorptalis	Slant-line Owlet Moth
Phalaenostola larentioides	Black-banded Owlet Moth
Subfamily: Hypeninae (Hypenines)	
Hypena baltimoralis	Baltimore Bomolocha Moth

MOTHS AT THE KEC SITE	
Latin Name	**Common Name**
Subfamily: Erebinae (Erebine Moths)	
Caenurgina crassiuscula	Clover Looper Moth
Catocala amica	Girlfriend Underwing
Catocala lineella	Girlfriend Underwing
Catocala serena	Serene Underwing
Zale horrida	Horrid Zale
Subfamily: Lymantriinae (Tussock Moths)	
Lymantria dispar	Gypsy Moth
Gracillariidae Leaf Blotch Miner Moths	
Phyllocnistis populiella	Noctuid moth
Tortricidae Tortricid Moths	
Ecdytolopha insiticiana	Locust Twig Borer Moth
Archips purpurana	Noctuid moth
Cenopis pettitana	Maple-basswood Leafroller Moth
Sparganothis unifasciana	Noctuid moth
Limacodidae Limacodids, Slug Caterpillar Moths	
Lithacodes fasciola	Yellow-shouldered Slug Moth
Tortricidia flexuosa	Noctuid moth
Crambidae Crambid Snout Moths	
Elophila obliteralis	Waterlily Leafcutter Moth
Chrysoteuchia topiaria	Noctuid moth
Crambus saltuellus	Noctuid moth
Urola nivalis	Noctuid moth
Desmia funeralis	Grape Leaffolder Moth
Herpetogramma pertextalis	Noctuid moth
Herpetogramma thestealis	Noctuid moth
Parapoynx maculalis	Polymorphic Pondweed Moth
Xanthophysa psychialis	Xanthophysa Moth
Pyralidae Pyralid Moths	
Eulogia ochrifrontella	Noctuid moth
Dolichomia intermedialis	Red-shawled Moth
Hypsopygia costalis	Clover Hayworm Moth

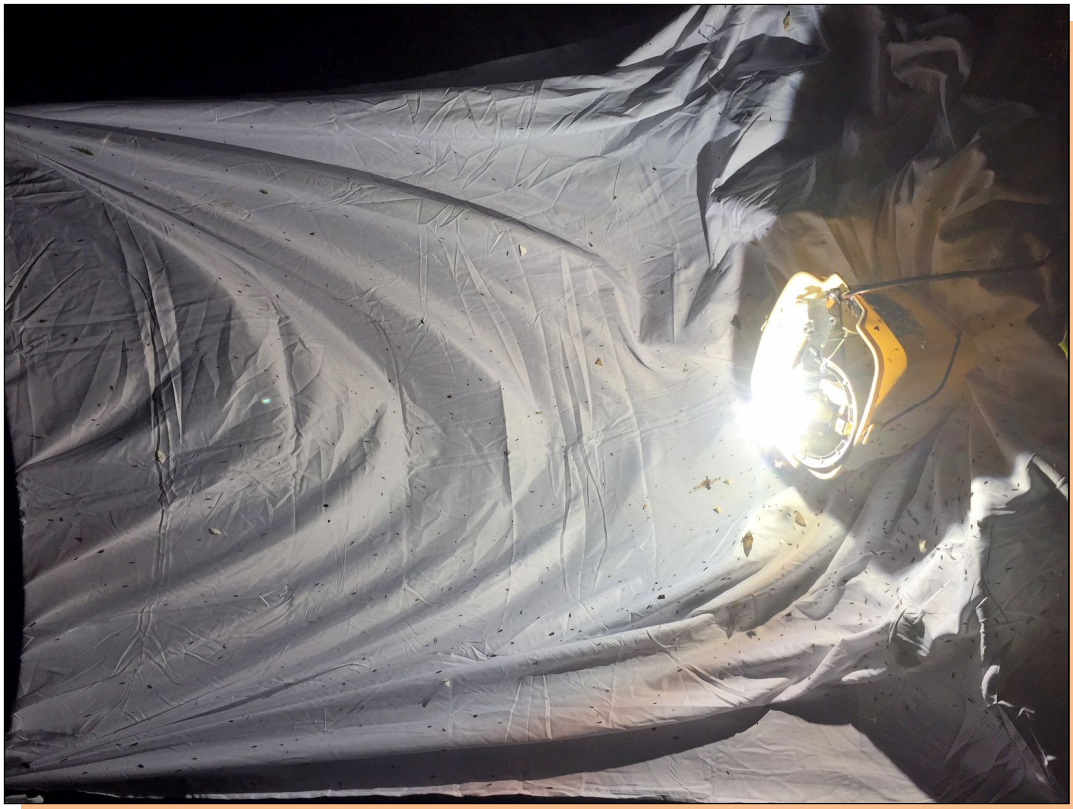
MOTHS AT THE KEC SITE	
Latin Name	**Common Name**
Geometridae Geometer Moths, Looper Moths	
Eugonobapta nivosaria	Snowy Geometer
Eusarca confusaria	Confused Eusarca
Nematocampa resistaria	Horned Spanworm Moth
Plagodis phlogosaria	Straight-lined Plagodis
Prochoerodes lineola	Large Maple Spanworm Moth
Speranza pustularia	Lesser Maple Spanworm Moth
Macaria notate	Birch Angle
Epirrhoe alternata W Carpet	White-banded Toothed Carpet
Eulithis diversilineata	Lesser Grapevine Looper Moth
Eulithis gracilineata	Greater Grapevine Looper Moth
Heliomata cycladata	Common Spring Moth
Scopula limboundata	Large Lace-border
Lasiocampidae Lasiocampid Moths	
Malacosoma americanum	Eastern Tent Caterpillar Moth

ATTACHMENT B: LIST OF BUTTERFLIES

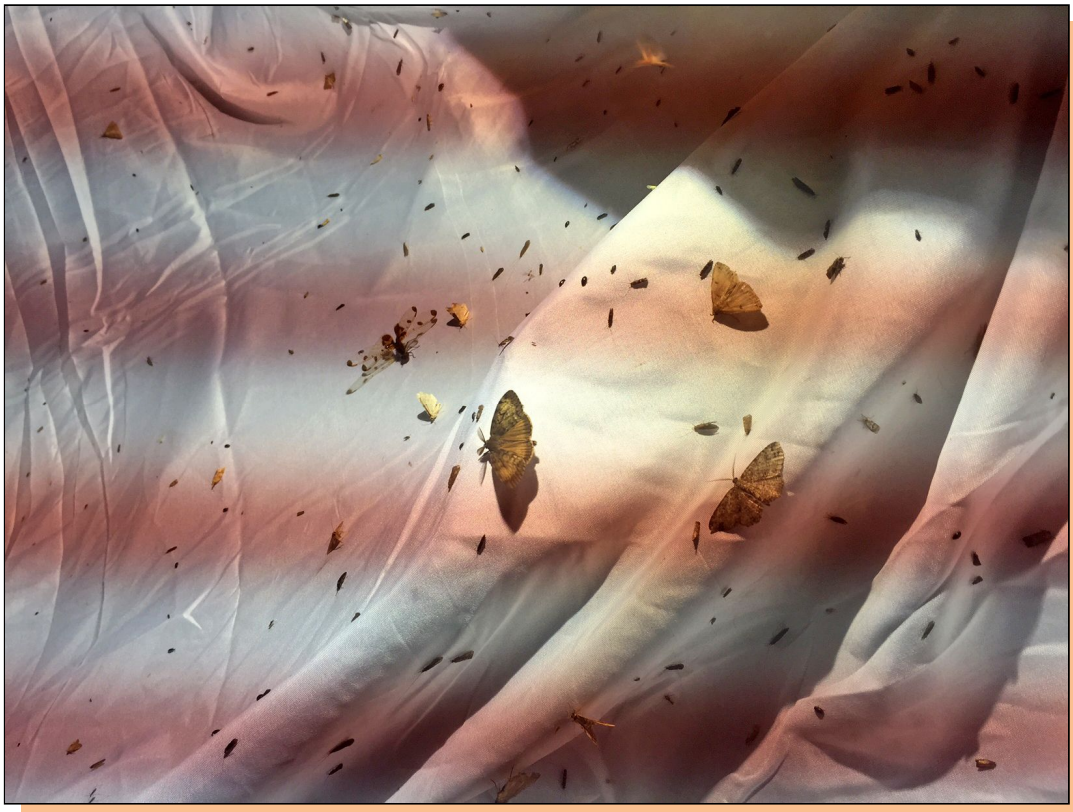
BUTTERFLIES AT THE KEC SITE	
Latin Name	**Common Name**
Hesperiidae Skippers	
Ancyloxypha numitor	Least Skipper
Poanes massasoit	Mulberry Wing
Papilionidae Parnassians and Swallowtails	
Papilio polyxenes	Black Swallowtail
Papilio glaucus	Eastern Tiger Swallowtail
Pieridae Whites and Sulphurs	
Pieris rapae	Cabbage White
Colias philodice	Clouded Sulphur
Lycaenidae Gossamer-wing Butterflies	
Strymon melinus	Gray Hairstreak
Nymphalidae Brush-footed Butterflies	
Speyeria cybele	Great Spangled Fritillary
Limenitis archippus	Viceroy
Phyciodes tharos	Pearl Crescent
Polygonia interrogationis	Question Mark
Satyrodes appalachia	Appalachian Brown
Coenonympha tullia	Common Ringlet
Megisto cymela	Little Wood-Satyr
Cercyonis pegala	Common Wood-Nymph
Junonia coenia	Common Buckeye

ATTACHMENT C: PHOTOS

Lepidopteran Survey at the Killingly Energy Center, Lake Road, Killingly, CT
Photos taken by Jonathan Trouern-Trend, July 2016



A: Mercury Vapor lamp employed at the KEC Site to attract night-flying moths



B: Close up of moths and other invertebrates attracted to mercury vapor lamp

Lepidopteran Survey at the Killingly Energy Center, Lake Road, Killingly, CT
Photos taken by Jonathan Trouern-Trend, July 2016

C: Field-pinned moths from the KEC Site, Lake Road, Killingly, CT