

Observational Analysis of Pollinators and their Resources: Long Island Central Pine Barrens Forest

Dulaine Vining, Natural Sciences, Southern University at New Orleans, New Orleans, LA. 70122

Dr. Timothy Green, Environmental Science Division, Brookhaven National Laboratory, Upton, NY. 11973

Abstract

Long Island Central Pine Barrens forest provide an array of varied ecosystems for pollinators, vegetation, and other species. Pollinators *Bombus* species (bumblebees) and their resources e.g., *Securigera varia* (purple crown vetch) and other vegetative species were observed on solar farm and forest interior sampling sites used for this baseline observational study during early June through July of 2018. The Long Island Solar Farm (LISF) at Brookhaven National Laboratory (BNL) encompasses flat- opened terrains and meadowlands leading into forest's edges, compared to forest interiors which are usually comprised of scattered patches of sunlight, shrubs, and dense canopy. This baseline study will focus on bumblebee sightings/visitations between solar arrays #1 and #2 of the LISF. Analyzing and comparing sightings/visitations during observation periods was used to determine the preferred vegetative resource selected by bumblebees at random geographical locations. In contrast, I was only able to collect data in the solar farm for 3 weeks and the remainder of observations were completed in the forest interior. Inconclusively, lack of full flight season of bumblebees creates a need for continuation and funding of this baseline research. Possible findings could include frequency points of bumblebees increases/decreases on solar farms and forest interior based on the available resources. Furthermore, continuing this project may include: understanding phenological periods of the northeastern region, whether reduction of vegetative species is based on climate, selectivity or other unknown factors that possibly play a role in increase/decrease frequency of

sightings/visitation to the solar farm versus interior forestry points by bumblebees of Long Island Central Pine Barrens forest.

Introduction

Long Island Central Pine Barrens forest sits on approximately 42,500 hectares of land¹ which Brookhaven National Lab comprises approximately 5%². The solar farm is a renewable energy project that services power to several thousands of residents in the surrounding communities. In addition, the solar farm provides unrestricted access allowing plants and pollinator diversity to increase. Current data during the same observational period highlights solar farm areas confirming multiple sightings of bumblebees with purple crown vetch as the dominant flowering plant species. An observational analysis between the solar farm and interior terrains of the Pine Barrens forest will seek to understand available resources necessary to sustain bumblebees during flight seasons. In addition, there are multiple other factors; whether its environmental or normal phenological periods,³ in which the months of June and July sightings of bumblebees are zero. Long Island Central Pine Barrens forest interiors yields dense populations of trees e.g., Pine trees, Oak trees, and patchy colonies of shrubs e.g., blueberry and huckleberry are evidence of bumblebee visitations. Much can be hypothesized about Long Island Central Pine Barrens forests lack of natural water resources, which is a necessary element to promote increase pollination within the forest interior. However, it remains unclear if resources of bumblebees are based on selectivity of specific plant species, phenological periods, and/or unknown visitation traits of *Bombus* spp. During data collecting periods, observations show the solar farm, meadowlands, and forest edges are preferred resources for bumblebees where populations of purple crown vetch were abundant. At some point during one full flight season (provide full flight season for bumblebees as a point of reference) other than the months June and July, bumblebees migrate to

terrains where flowering plants are in abundance within the Long Island Central Pine Barrens forest preserve.

Material & Methods

To ensure a clear comparative analysis between both sampling sites, the solar farm and the forest interior certain points were randomly selected to compare pollinators, plant's locations, and resources of bumblebees. Solar farms were the primary sampling sites for observations and data collection for this baseline research study. Hand-held devices (Kestrel Model 3000) were used during data collection period of early June through early July. Most, if not all the species collected were members of the *Bombus*. A total of five quadrants (1 m^2) were used to identify specific vegetative species on each 50m line transect to ensure accuracy of collecting and identifying pollinators and plants. In the forest's interior, radio- transmitters outfitted for eastern box turtles were used primarily as comparative sampling sites to gain geographical locations. At each random location, a 7 m radius was used as guidance observing pollinators and identifying vegetation within that point. Observational analysis and data collecting were required to capture or omit sightings of pollinators within forest's interiors. Data was analyzed by comparing forest interior to solar farms, meadowlands, and forest edges observational sighting of *Bombus* within these terrains.

Results

Data proves between the months of June and July no sightings of bumblebees were observed (figure #1). Data were also inconclusive due to inability to capture data during an entire full flight season. Outside of the data collection period it remains unknown at what part of the phenological period of bumblebee's sightings increases/decreases within the forest's interior. Solar farms, meadowlands, and the forest's interior were optimal resources for bumblebees,

rather than the forest's interior. Although blueberry shrubs were the dominant plant species (figure #2), it is unclear why bumblebees gravitate to solar farms; a sharp contrast from forest interior areas during the same flight season.

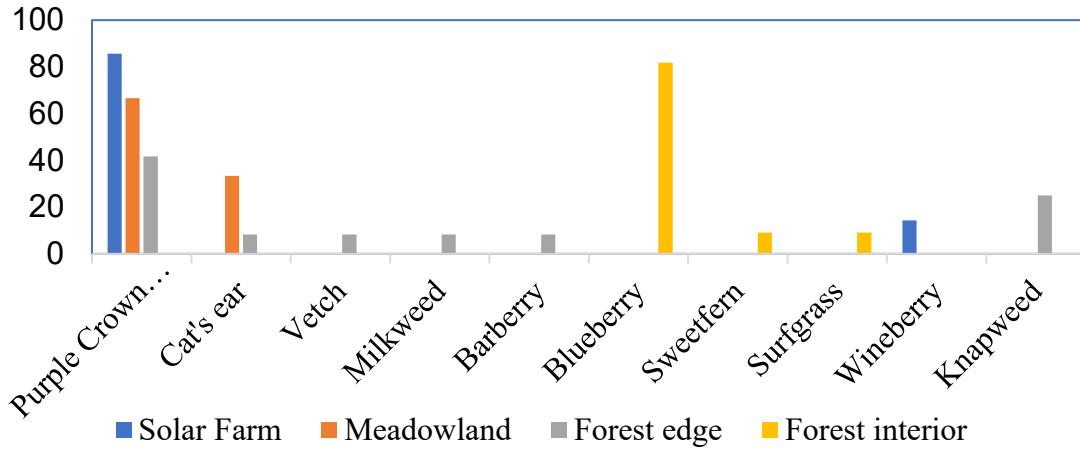


Figure 1. Percentage of plant diversity in sampling sites at BNL: Purple Crown Vetch was the dominant flowering plant located on solar farms, meadowlands, and forest edges. Data during observational period also shows the forest's interior main plant species were blueberry at each random site.

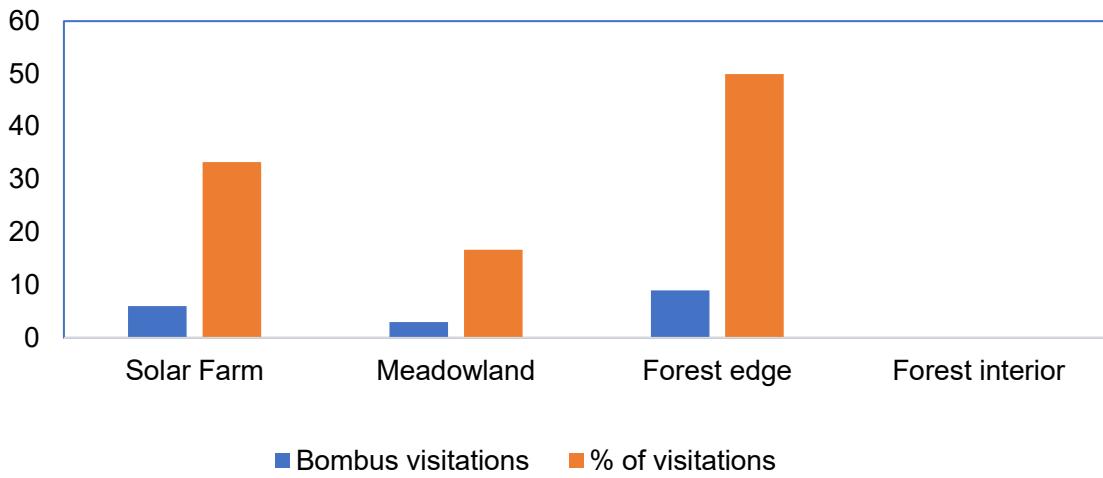


Figure 2. Percentage of Bonbus visitations: Forest edges were the dominant selective locations chosen by bumblebees. Next, the solar farm where other variety of plant species were located. Notice the forest interior with zero sightings, compared to other sampling sites.

Discussion/Conclusion

Much can be hypothesized about pollinators; however, the facts prove *Bombus* spp are not the prevalent pollinators during the observational periods between June and July. With randomly selected geographical coordinates, it is unknown the visitational timeframes of bumblebees within the forest's interior currently. Sightings of multiple scattered patches of shrubs with blueberry as the dominant plant species observed at these randomly selected locations indicates at some point during one flight season bumblebees are possibly partly responsible for cross pollinating and pollinating plants within the forest's interior. Noticeably, upon observing various arrays containing different terrains within Long Island Central Pine Barrens forest, natural water resources sightings were infrequent. Precipitation was not considered as a possible variable; possibly, it should be noted as a factor in resources for pollinators. Water is essential to flowering plants and is necessary for promoting growth. Without previous data, environmental factors cannot be ruled out e.g., drought conditions, selectivity of terrains or plant species by bumblebees, or global declinations of *Bombus* spp. It is worth to mention, the gypsy moth was observed in all arrays of the forest interior, meadowlands, forest edges, and solar farms. The gypsy moth is not a main pollinator; however, it could be one or multiple factors affecting bumblebee's frequency/visitations to forest interior areas, mainly upon visits from moths and other insects that destroys a variety of plant resources where bumblebees may visit ⁴. Naturally, without an abundance of plant species within the forest's interior at certain times of the flight season sightings will be limited of pollinators. Furthermore, future research and funding of this baseline project will assist other study researchers with necessary data and tools to better understand pollinators are their resources on Long Island Central Pine Barrens forest.

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