Wildlife Species Utilization of Solar Sites in Massachusetts

Ryan Dougherty, Zara Dowling (Advisor)
Department of Environmental Conservation, UMass CEE
University of Massachusetts Amherst

Introduction

- Over the past decade, solar energy has become one of the most popular forms of renewable energy for both homeowners and large companies. The highly land intensive nature of solar paired with its rapid expansion has led many conservationists, ecologists, and policy makers to worry about unforeseen ecological consequences.(1)
- In an effort to minimize some potential environmental issues, many solar arrays are implementing new conservation practices to ease the transition. One such example includes implementing what is known as "**pollinator friendly" practices** as part of a sites establishment and management plan. This most frequently involves planting and maintaining native wildflower species on site instead of traditional turf grass and fescue or gravel.
- In Massachusetts, pollinator-friendly practices are supported by a certification issued through the UMass Clean Energy Extension. Certified solar arrays may qualify for an additional financial incentive per kWh generated through the state's solar incentive program (SMART).(2)
- This incentive has allowed for an accelerated application of pollinator-friendly practices within the state, but little is known about the effectiveness of these practices in supporting local ecosystems.
- **In this pilot study, we collected data on wildlife at both pollinator-friendly and conventional sites in hopes of elucidating some of the costs and benefits that pollinator-friendly solar arrays provide in terms of wildlife habitats in comparison to conventional solar arrays.**

Fig. 1: Wildlife activity observed from Browning trail cameras on motion capture mode at both pollinator-friendly (left) and conventional (right) arrays.

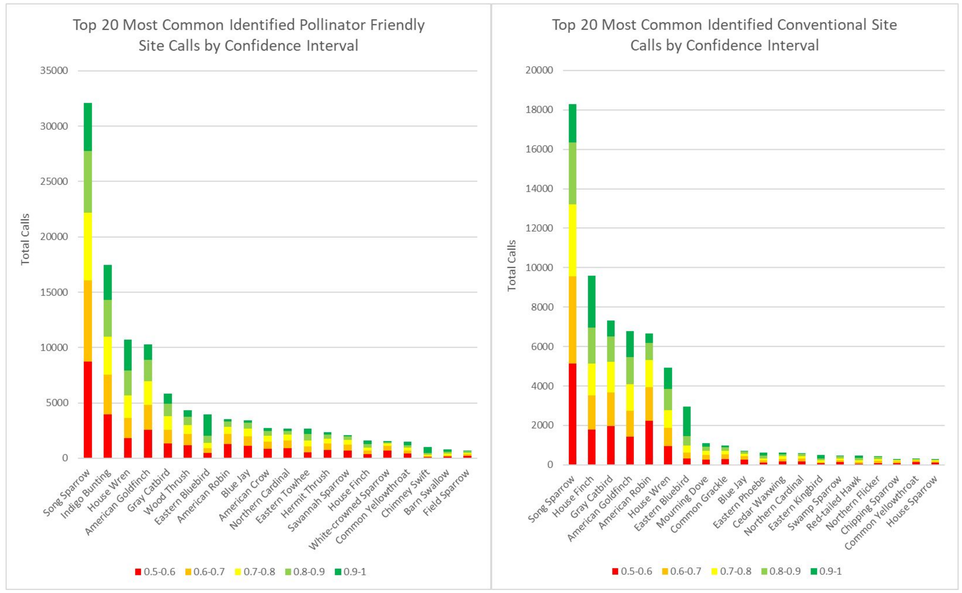

Fig. 2: Avian species makeup of pollinator-friendly vs. conventional solar sites. Confidence interval per call is represented by color.

Methods

- To ensure accurate comparisons are able to be made, data from both pollinator-friendly and conventional sites were gathered during the same time period. Two sites of both types were chosen based on location accessibility, totaling four sites.
- Camera data were collected using Browning's "Strike Force Extreme" trail camera series. Audio data were collected using acoustic recording devices known as Audiomoths. Multiple camera and Audiomoth devices were deployed at each site. Audiomoth deployments were done in pairs, with one Audiomoth recording at dawn and dusk and another recording ten minutes every hour for the majority of the day to help determine the best method for use in future studies, while also gathering a large number of calls for analysis.
- Our study was performed over a two-month period (late June to late August) with 20 Audiomoth devices and 10 cameras deployed. Data collections were performed biweekly to swap MicroSD cards and batteries.
- Camera data were stored and analyzed through the Wildlife Insights web application. The Wildlife Insights system assisted our identification of blank images and facilitated camera data processing. Audio data was analyzed using Cornell University's BirdNET AI, making it possible to efficiently analyze tens of thousands of calls. Data was exported into Excel for statistical and graphical analysis (Fig. 2 & 3).
- A full methodology is available here: https://tinyurl.com/PFSMethodology

Results & Discussion

- During our study, we collected over 188,000 bird calls from all of our deployed Audiomoth devices. We were able to create a comprehensive list of the dominant species present at the pollinator-friendly and conventional sites in our study (Fig. 2). The total number of calls per species at each site is not weighed based on the number of deployments collected at each site and should not be analyzed on this basis, as some sites had a larger number of Audiomoth devices deployed than others.
- The most common birds observed at the solar arrays studied include the Song Sparrow, House Finch, Indigo Bunting, House Wren, Gray Catbird and American Goldfinch.
- The differences in calls identified from hourly recordings and dawn/dusk recordings was analyzed and shows variance in the density of calls at certain times of day (Fig. 3), but does not appear to have a significant amount of weight on the total number of species identified. Both the hourly and dawn/dusk recordings identified a total of 66 different species, albeit not identical between the two. This data suggests that the time of recording may not be critical to determining species presence.
- Although the scope of our camera data was limited for this study, we identified a wide variety of species in camera data, including wild turkeys, coyotes, groundhogs, foxes, and a number of avian species. See Figure 1 for examples.

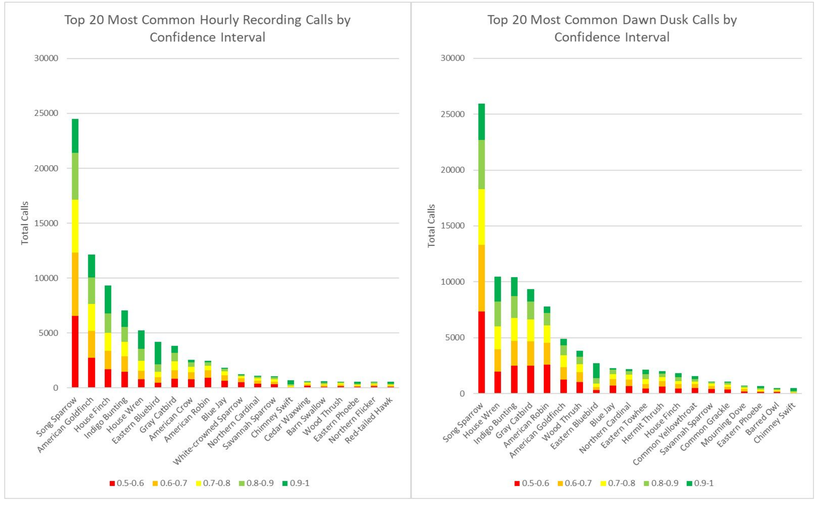

Fig 3. Avian species counts from hourly recordings vs. recordings exclusively at dawn and dusk. Confidence interval per call is represented by color.

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(1) Hernandez, R. R.; Hoffacker, M. K.; Field, C. B. Land-use efficiency of big solar. Environ. Sci. Technol. 2014, (2) UMass Clean Energy Extension, Pollinator-Friendly Solar PV for Massachusetts: https://ag.umass.edu/clean-energy/services/pollinator-friendly-solar-pv-for-massachusetts