DEVELOPING A POLLINATOR-FRIENDLY CERTIFICATION PROGRAM FOR SOLAR PHOTOVOLTAIC ARRAYS IN MASSACHUSETTS

ZARA DOWLING

Increasing development of large-scale solar photovoltaic (PV) arrays across the state has led to concerns about deforestation and habitat loss. While planting native species under and around solar arrays cannot replace lost forest, it can provide foraging and nesting habitat for pollinators and other native wildlife. This article discusses UMass Clean Energy Extension's development of a pollinator-friendly certification program for solar PV arrays in Massachusetts, which promotes establishment of native vegetation at these facilities.

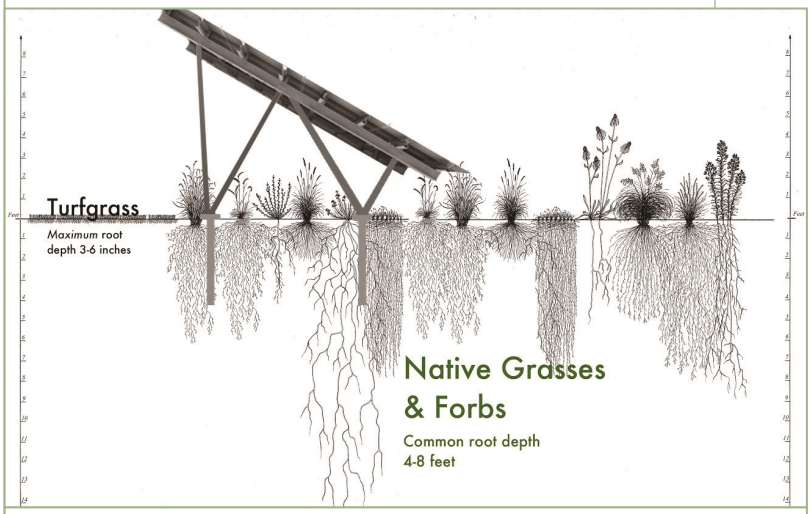
Solar PV Development in Massachusetts

The state of Massachusetts is one of the national leaders in clean energy,[1] with rigorous Renewable Portfolio Standards for the electricity supply. The state's strong support for solar PV development has been evident in its successive solar incentive programs, most recently, the Solar Massachusetts Renewable Target (SMART) program, which launched in late 2018. These programs have led to the continued growth of solar PV capacity in the state, exceeding 2,500 megawatts in 2020[2] (enough to power over 400,000 homes). While the majority of installed projects have been small rooftop, residential, and business-scale solar arrays, the majority of installed capacity (in megawatts) has consisted of large, commercial-scale, ground-mounted projects.

Commercial-scale solar PV facilities provide an important source of renewable electricity generation, reducing the need for fossil fuels, and helping the state on its path to a legally-mandated 80% reduction in greenhouse gas emissions by 2050.[3] However, these facilities can have significant environmental trade-offs, including impacts on biodiversity, land use, and land cover.[4] Analysis suggests that roughly three-quarters of large solar projects in Massachusetts have been installed on undeveloped sites, primarily forest and agricultural land.[5,6]

Massachusetts' 2015 State Wildlife Action Plan[7] identifies energy development as a significant threat to conservation of grassland and upland forest habitats, and Mass Audubon's 2020 *Losing Ground* report[8] found that solar PV development has been responsible for as much as one-fourth of all new land development in recent years.

Whatever the future trajectory of solar development in Massachusetts, significant acreage has already been converted to solar, and more is expected under the SMART program. Solar PV development is incompatible with continued forest cover, since large trees would shade panels and reduce electricity generation. However, solar development does not preclude establishment of native grasses and flowering species beneath solar panel arrays, nor the establishment of native shrubs in areas bordering arrays. While these plantings may not provide habitat quality equivalent to that of natural ecosystems, these sites can nevertheless provide better habitat for grassland and shrubland species than the non-native turf grass or gravel often placed beneath solar PV arrays.



Cross section of solar with native plants. Not to be mistaken with concentrated solar, which uses heat, photovoltaic (PV) solar panels get only as hot as a car parked in the sun. (Source: https://www.beeculture.com/can-solar-sites-help-save-bees/ Original illustration by Heidi Natura)

Pollinator-Friendly Solar Development in the U.S.

In recent years, a number of states have taken steps to encourage the establishment of native flowering plants at solar arrays, in the form of voluntary pollinator-friendly certification programs for solar PV facilities. Minnesota's legislature was the first to establish a "pollinator-friendly" designation, in May 2016. At least seven other states have now implemented similar legislation or guidelines,

(Continued on page 9)

(Continued from page 8)

including Illinois, Maryland, Michigan, New York, North Carolina, South Carolina, and Vermont.

Source: https://ccrenew.com/news/cypress-announces-plan-build-new-yorks-first-solar-farms-pollinator-friendly-habitats/

Establishment of flowering plant communities under solar PV arrays is a straightforward means of increasing habitat value for pollinator species, many of which are thought to be in decline, in part due to habitat loss.[9,10] A lack of baseline data and long-term monitoring has rendered documentation of population trends in wild bees difficult, but some bees suffer from pathogens known to be infecting commercial honey bees, and a number of native bumblebee species have experienced significant range contractions and declines in relative abundance.[11] Little is known about population trajectories of many other insect pollinators,[12] but Monarch butterflies have also been identified as being in serious decline.[13,14] The Massachusetts Pollinator Protection Plan, completed in 2017, calls for the restoration or enhancement of 7 million acres of habitat for pollinators by 2022.[15]

Early experience with pollinator-friendly solar sites suggests they are not only better for pollinators, but also are more cost-effective, requiring less frequent mowing and lower maintenance costs over time. Wildflower meadows and flowering vegetative screens are also aesthetically appealing, and often preferred by neighbors and community residents over typical turf grass-dominated sites lined with arborvitae.

Defining Pollinator-Friendly Solar Certification Criteria for Massachusetts

Under the Massachusetts Endangered Species Act, there are specific requirements that must be met in order for solar facilities to be built in Priority and Estimated Habitats for state-listed species, which can occasionally influence the vegetation established under and around solar arrays. However, prior to the effort described here, there was no wider policy or program promoting habitat management for pollinators or other native species under and around solar PV arrays within the Commonwealth.

In 2018, UMass Clean Energy Extension (CEE) recognized other on-going efforts around the country, and initiated development of a pollinator-friendly certification program appropriate for solar PV arrays in Massachusetts. CEE is the newest program within the suite of research and education programs that make up the Center for Agriculture, Food and the Environment at UMass Amherst. Initially established through funds provided by the Massachusetts Department of Energy Resources, CEE provides on-going technical assistance services, applied research, and education outreach to municipalities, businesses, and institutions operating around the state, with a focus on renewable energy and energy efficiency.

Before drafting certification guidelines for habitat management at solar PV facilities in Massachusetts, CEE conducted a review of criteria used in other state pollinator-friendly designation programs. This review highlighted the need for certification criteria addressing establishment and maintenance plans, fencing, pesticide use, reduced mowing regimes, monitoring, and appropriate seed mixes and plantings, providing a diversity of native flowering species with seasonal variation in bloom times. Guidelines from other states also addressed pollinator nesting habitat, perennial water sources, and educational signage.

Subsequently, CEE convened a review board of experts and stakeholders to review and inform draft criteria. The group included pollinator biologists, solar developers, apiculturists, and state agency staff. The group identified the need for a clear separation of required and optional criteria for establishment and maintenance, which was accomplished through use of a checklist format, rather than the scorecard style used in many states. Exclusion of on-site fungicide use at certified facilities was also added for the protection of pollinators.[16]

Habitat management for other wildlife species was also identified as a program goal. Both grassland birds and turtles can benefit from infrequent mowing, timed to occur outside their summer activity seasons. Raising the security fence bordering a solar array by 6-12 inches above ground level has the potential to reduce habitat fragmentation and allow wildlife passage for amphibian, reptile, and mammal species not small

(Continued on page 10)

(Continued from page 9)

enough to easily pass through holes in the fence. Establishing or maintaining early successional habitat around the solar PV array may also provide habitat to some uncommon butterfly and moth species or birds that utilize shrublands. Of course, some avian and Lepidopteran species have requirements in terms of habitat type and scale that cannot be met at solar PV sites; use of solar sites by generalist and specialist species has yet to be explored.

UMass CEE's Pollinator-Friendly Solar Certification Program

CEE's Pollinator-Friendly Certification Program for Solar PV Arrays was launched in late 2019. The final program includes criteria for facilities intending to qualify at one of four certification levels (Certified, Silver, Gold, Platinum). Available resources include a Best Management Practices guide and a spreadsheet of recommended plant species, compiled from pollinator-friendly planting guides for New England and the Northeast. The certification procedure and application form can also be found on the CEE website: https://ag.umass.edu/clean-energy/services/pollinator-friendly-solar-pv-for-massachusetts

Once certified, facilities will be monitored by CEE at 3-year intervals to ensure they continue to meet pollinator-friendly standards, and to identify any on-going issues (such as invasive species management) which may need to be addressed.

In April 2020, the Massachusetts Department of Energy Resources updated the SMART solar incentive program through an emergency regulation process. Among other changes, the updated program includes an incentive for pollinator-friendly development. Specifically, a Massachusetts solar PV facility *that obtains and maintains at least a silver certification from the University of Massachusetts Clean Energy Extension Pollinator-Friendly Certification Program, or other equivalent certification as determined by the Department, shall be eligible to receive an additional $0.0025/kWh Compensation Rate Adder*.[17] The adder is available for both new and retrofitted solar arrays.

Thus far, CEE has received and approved Site Establishment and Maintenance Plans for seven pollinator-friendly solar PV facilities located across the state, in Berkshire, Bristol, Franklin, Hampden, and Worcester counties. Following the state's announcement of the SMART incentive for this type of development, we have seen an uptick in interest from developers, and expect to see additional proposals put forward late this year, or in early 2021.

Next Steps

Looking ahead to 2021, we expect to continue to provide flexibility and make minor adjustments to improve the program, as we work with developers, installers, and scientists to understand how to successfully and economically establish and maintain these sites. We also plan to incorporate additional information about pollinator habitat needs as it becomes available.

While pollinator-friendly plantings are becoming relatively common, pollinator-friendly solar sites are still relatively new, and take several years to establish successfully. Many questions still remain regarding the success of these programs, including how many solar developers will choose to participate, what seed mixes perform well, and whether these habitats provide significant benefits to pollinators and other wildlife, particularly specialist species. CEE hopes to identify research funds to work collaboratively with solar developers, botanists, and wildlife researchers to understand how to successfully establish native plantings under solar arrays, how to mimic native grassland and shrubland ecosystems to the degree possible, and how to maximize the benefits of these sites to pollinators and other native wildlife.

Zara Dowling, Research Fellow
Clean Energy Extension
UMass-Amherst, Amherst, MA
zdowling@eco.umass.edu

Footnotes

1. Union of Concerned Scientists. (2017). Clean energy momentum: Ranking state progress. https://www.ucsusa.org/clean-energy/increase-renewable-energy/momentum#.WzvkPrpFxPY
2. Massachusetts Department of Energy Resources. (2020). Renewable energy snapshot. https://www.mass.gov/info-details/renewable-energy-snapshot
3. Massachusetts Department of Energy Resources. (2020). Global Warming Solutions Act. https://www.mass.gov/service-details/global-warming-solutions-act-background
4. Hernandez, RR., SB Easter, ML Murphy-Mariscal, FT Maestre, M Tavassoli, EB Allen, CW Barrows, J Belnap, R Ochoa-Hueso, S Ravi, S., & MF Allen. (2014). Environmental impacts of utility-scale solar energy. *Renewable and Sustainable Energy Reviews*, *29*, 766-779.
5. Johnson, E, B Hall, M Power, A Therien and D Foster. (2019). The siting and impact of photovoltaic systems in Franklin, Hampshire, & Hampden counties: A preliminary study.

(Continued on page 11)

(Continued from page 10)

6. Massachusetts Department of Energy Resources. (2020). Lists of qualified generation units. https://www.mass.gov/service-details/lists-of-qualified-generation-units
7. Mass Division of Fisheries and Wildlife. (2015). State Wildlife Action Plan. https://www.mass.gov/service-details/state-wildlife-action-plan-swap
8. Massachusetts Audubon Society. (2020). *Losing Ground*. https://www.massaudubon.org/our-conservation-work/advocacy/shaping-the-future-of-your-community/publications-community-resources/losing-ground
9. Potts, SG, JC Biesmeijer, C Kremen, P Neumann, O Schweiger & WE Kunin. Global pollinator declines: trends, impacts and drivers. *Trends in ecology & evolution*, *25*(6), 345-353.
10. Cameron, SA., JD Lozier, JP Strange, JB Koch, N Cordes, LF Solter, & TL Griswold. (2011). Patterns of widespread decline in North American bumble bees. *Proceedings of the National Academy of Sciences*, *108*(2), 662-667.
11. Colla, SR., & L Packer. (2008). Evidence for decline in eastern North American bumblebees (Hymenoptera: Apidae), with special focus on Bombus affinis Cresson. *Biodiversity and Conservation*, *17*(6), 1379.
12. Cane, JH., & VJ Tepedino. (2001). Causes and extent of declines among native North American invertebrate pollinators: detection, evidence, and consequences. *Conservation Ecology*, *5*(1).
13. Brower, LP, OR Taylor, EH Williams, DA Slayback, RR Zubieta, & MI Ramirez. (2012). Decline of monarch butterflies overwintering in Mexico: is the migratory phenomenon at risk?. *Insect Conservation and Diversity*, *5*(2), 95-100.
14. Vidal, O, & E Rendón-Salinas. (2014). Dynamics and trends of overwintering colonies of the monarch butterfly in Mexico. *Biological Conservation*, *180*, 165-175.
15. Massachusetts Department of Agricultural Resources. (2017). MA Pollinator Protection Plan. https://www.mass.gov/files/documents/2017/06/zw/pollinator-plan.pdf
16. McArt, SH., C Urbanowicz, S McCoshum, RE Irwin, & LS Adler. (2017). Landscape predictors of pathogen prevalence and range contractions in US bumblebees. *Proc. R. Soc. B*, *284*(1867), 20172181.
17. MA DOER. (2020). Solar Massachusetts Renewable Target Program. https://www.mass.gov/doc/225-cmr-2000-final-071020-clean/download