CONSERVATION CONSIDERATIONS FOR SITING, PLANNING, AND MAINTAINING GRID-SCALE SOLAR SYSTEMS IN PENNSYLVANIA

This resource was developed by the Pennsylvania Department of Conservation and Natural Resources and is intended for landowners, investors, developers, planners, and government officials and serves to support informed decision-making and promote conservation and sustainable best practices in the planning, siting and construction of grid-scale solar systems.

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

The Pennsylvania Department of Conservation and Natural Resources (DCNR)

supports Pennsylvania's transition to renewable energy alternatives, such as solar, to mitigate the impacts of climate change and reduce the Commonwealth's greenhouse gas emissions. DCNR supports the advancement of grid-scale solar while proactively seeking opportunities to avoid unnecessary forest conversions, keep mature forests intact, support wildlife habitat and corridors, ensure the integrity of our water resources, and defend against degradation of our environment.

DCNR is a trustee of the Commonwealth's natural resources. State parks and forests are part of the public natural resource trust and through the execution of DCNR grant making responsibilities and post grant stewardship efforts, local public recreation land is also part of the Department's public trust responsibilities. Grid-scale solar is not permitted on DCNR managed lands or on DCNR grant-funded lands.

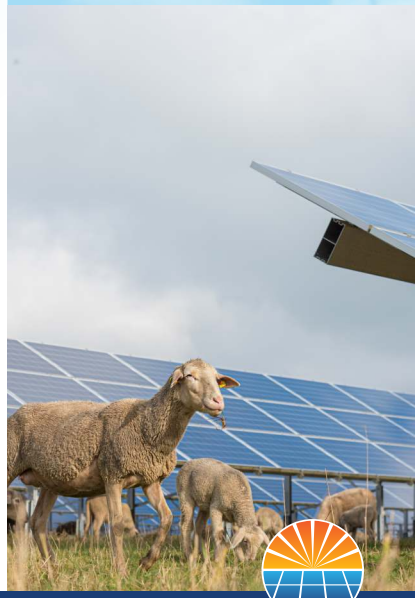
DCNR upholds these Commonwealth principles related to the implementation of grid-scale solar as Pennsylvania seeks to expand its solar capacity to advance climate goals and mitigate climate change:

- Prioritize reuse and repurposing of previously impacted lands to make these sites viable alternatives for hosting grid-scale solar development compared to greenfield areas such as agricultural and forested lands.
- Balance potential opportunities of grid-scale solar energy projects with priorities and benefits of agricultural preservation and sustainable forest management.
- Support project siting that elevates equitable sharing of environmental, health, social, and economic benefits while advancing the Commonwealth's environmental and climate justice goals.
- Respect local decision making on the siting of projects within parameters established in existing and informed community-based comprehensive planning efforts.
- Protect landowner interests and safeguard future land uses through informed project planning that includes project decommissioning plans to ensure site restoration following project closure.

The following practices are intended to support sustainable and conservation best practices in the development of utility-scale solar and assist the Commonwealth in achieving its climate change goals.

Siting Best Practices

- Prioritize the conservation and protection of mature forests, protected recreational lands and wildlife habitat, native wild plant species, and vital ecosystems that provide significant community, health, climate mitigation, environmental, and economic benefits. View Principles of Low Impact Solar Siting and Design (The Nature Conservancy in North Carolina).
- Prioritize siting on marginalized, disturbed, or degraded lands such as brownfields and abandoned mine lands to optimize benefits in terms of carbon sequestration on existing forested lands and reduce impacts on biodiversity and water quality. DCNR recommends reviewing Environmental Protection Agency's Re-Powering America's Land site.
- Avoid areas inhabited by endangered, threatened, and other species of concern. Developers should use the Pennsylvania Conservation Explorer Tool during the siting and planning phases to screen a project area for potential impacts to species that are threatened, endangered, and of special concern.
- Consider minimizing impacts to Species of Greatest Conservation Need listed in the Pennsylvania State Wildlife Action Plan. Many of these species are not yet listed as rare, threatened or endangered; however, the state has highlighted them as conservation concerns because they are in decline. Landowners can use the Conservation Opportunities Area tool, for free, to identify potential at-risk species on their property.
- Avoid the conversion of contiguous forest lands, wetlands, and native grasslands as they provide important ecosystem services, including flood and storm water mitigation, erosion and sedimentation controls, carbon sequestration, and nutrient management.
- Co-locate near existing energy infrastructure such as transmission lines and sub-stations to reduce developmental and carbon footprints as well as impacts on wildlife habitat and migratory corridors. DCNR recommends reviewing Reducing Avian Collisions with Power Lines: The State of the Art in 2012.
- Conserve the Commonwealth's exceptional natural and cultural landscapes. Review U.S. Department of Interior Bureau of Land Management's Solar Energy Program Design Features for Cultural Resources.
- Avoid and minimize erosion and sedimentation ("E&S") to the greatest degree possible. E&S is regulated through the Department of Environment Protection (DEP). If the earth disturbance associated with the construction of a solar panel farm, over the life of the project, will be 1 acre or greater, NPDES permit coverage is required. E&S controls or permit may also be required depending on the scale of the project. Consult DEP's FAQ document on E&S Chapter 102.
- Avoid siting near recreational, historic, and environmental areas where grid-scale solar could have an impact on scenic byways and viewsheds, historic sites, recreational amenities, and other high-valued natural resources.



Sustainable Design Considerations

- Advance solar co-location that results in multiple benefits and allows integration of solar with existing agricultural operations, such as grazing livestock or growing specialty crops that perform well under solar panels. Explore Dual Use Opportunities at American Farmland Trust's Farmland Information Center.
- Actively protect and restore wildlife habitat to support native species. Inventory habitat features and seek to protect and/or reintroduce native vegetation, buffers, wetlands, forested areas through the design and maintenance of the site. Consider incorporating natural nesting and foraging features for species that may be displaced or impacted by the installation.
- Avoid fragmenting habitat and/or migratory corridors. Grid-scale solar development could significantly impede the movement of terrestrial-based plant and animal species, which rely on continuous habitat to move whether for migration, breeding, or feeding. The best method for allowing movement of terrestrial species is to omit structural barriers, retain unfenced passageways, or utilize wildlife-friendly fencing. DCNR recommends A Landowner's Guide to Wildlife Friendly Fences: How to Build Fence with Wildlife in Mind and Fencing with Wildlife in Mind as well as Multi-agency Avian-Solar Science Coordination Plan. In addition, the Western Pennsylvania Conservancy, with funding from DCNR, developed the regional connectivity analysis for Pennsylvania that highlights connected and resilient high biodiversity value areas.
- Actively reduce risk of wildfires during the planning, construction, and operations of the facility. Coordinate with local fire organizations to integrate appropriate mitigation measures, including appropriate firebreaks as part of the system design.
- Design and implement a Beneficial Vegetation Plan for the project (within the footprint of the facility and along right of ways) that utilizes deep-rooted native plants that will prevent the spread of invasive species (see DCNR list of invasive plants) improve soil health, improve water retention and infiltration, and provide habitat for native fauna, especially pollinators that can benefit yield of local farms.
- Seek opportunities to mitigate impacts to the natural environment such as fragmentation of forests, wildlife corridors, and critical habitat after all other avoidance opportunities have been exhausted. For example, to compensate for the removal of a healthy tree, plant a proportionate number of replacement trees based on the species and size of each existing tree lost. Environmental impact efforts can also include taking specific actions to restore and enhance existing green space.
- Avoid and minimize impacts upon floodplains by following all state and local floodway and floodplain protections. Consider placement and maintenance of riparian corridors and vegetated areas to reduce runoff. Designate the necessary impervious cover and runoff areas and complete any necessary hydrology/hydrological studies that are needed.
- Landowners should consider a decommissioning clause that would require the solar panel owner to restore the land to essentially the same condition as it was in before panel installation began. Landowners may want to consult with service foresters or a forest consultant to determine best plant and/or tree species that match the soil, grading, and other landscape conditions of the property.

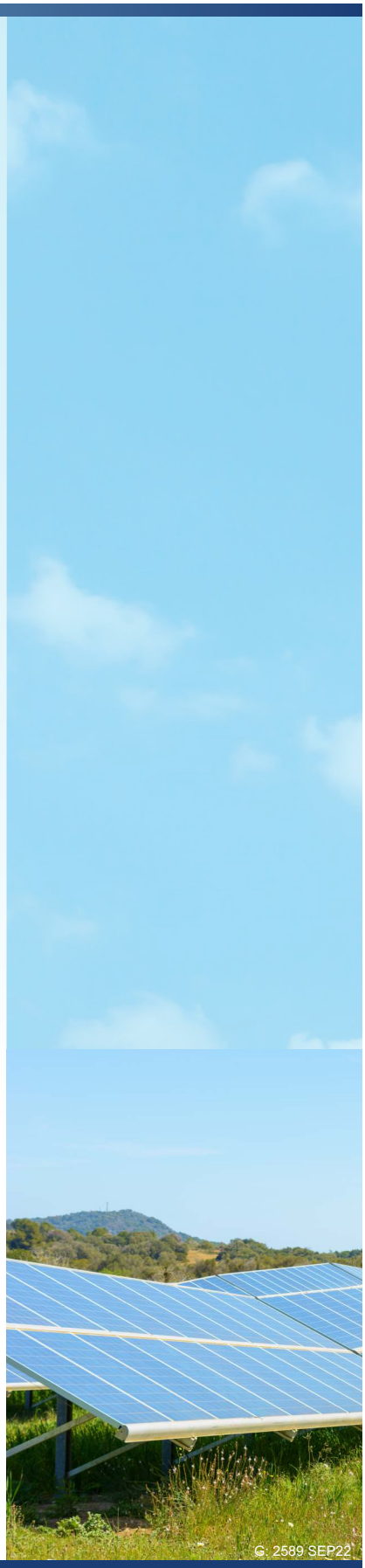
Key Resources

- Amplifying Clean Energy with Conservation (Center for Rural Affairs)
  This report highlights the benefits, value, and policy considerations of pollinator-friendly solar. It also explains methods to building a pollinator-friendly site. The report covers planning, costs and seeding practices as well as timing impacts for wildlife and pollinators. Policy considerations for public and private stakeholders are also discussed in this report.
- The Chesapeake Bay Foundation's Principles and Practices for Realizing the Necessity and Promise of Solar Power
  Chesapeake Bay Foundation advocates for solar development that follows best practices to safeguard water quality and promote community well-being in the Chesapeake Bay watershed.
- Decommissioning Solar Energy Systems: A Resource Guide (Center for Rural Affairs)
  This resource guide discusses strategies for decommissioning solar energy operations. The guide includes details on extending performance periods, planning for decommissioning, cost examples and financial assurance mechanisms.
- Utility-Scale Solar: Land Use, Policy and Emerging Ordinances - An Interactive Q and A (Penn State Cooperative Extension)
  This recorded webinar explores the implications of solar energy in Pennsylvania within the areas of state policy, township ordinances, and overall land use.
- Impacts of Solar Energy Development and Potential Mitigation Measures
  This is Volume I, Chapter 5 of the Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States prepared by the Bureau of Land Management and the U.S. Department of energy. This Chapter discusses potential positive and negative environmental, social, and economic impacts of grid-scale solar energy development. The types of solar technologies evaluated include those considered to be most likely to be developed at the grid-scale during the 20-year study period evaluated in this programmatic environmental impact statement (PEIS), considering technological and economic limitations.
- Invasive Plant Management for Land Managers (PA DCNR)
  Best management practices and guidance for controlling invasive and non-native species of plants in Pennsylvania.
- Landscaping for Pollinators
  Provides guidance from small scale backyard gardens to large scale highway rights-of-way landscaping.
- Landowner Resources for Grid-Scale Solar (PA Department of Environmental Protection)
  Resources for landowners interested in learning more about leasing land for grid scale solar.

Key Resources (cont)

- Maximizing Land Use Benefits from Utility-Scale Solar in Minnesota (Yale Center for Business and the Environment)
  This study developed a model that quantifies costs and benefits of land used for corn and soy farming, conventional solar, and pollinator-friendly solar in Minnesota. The remainder of this paper proceeds as follows: first, discussion of methodology, assumptions and model; next, presentation of results, sensitivity analyses and sources of uncertainty; and finally, the policy implications of the findings.
- Native Vegetation Performance Under a Solar PV Array at the National Wind Technology Center (National Renewable Energy Laboratory)
  The objectives of this study are to (1) demonstrate the feasibility of successfully cultivating native vegetation underneath solar installations through demonstration plots, (2) provide methodological guidance for future demonstration plots to follow, and (3) discuss broader implications of vegetation opportunities for solar installations.
- Nature Conservancy's Principles of Low Impact Solar Siting and Design
  The primary purpose of these Principles are inform and potentially guide solar energy developers, operators, and other stakeholders to site, construct, and operate solar facilities in ways that minimize impacts to natural ecosystems and biodiversity.
- Overview of Pollinator-Friendly Solar Energy (Electric Power Research Institute)
  The primary purpose of these Principles are inform and potentially guide solar energy developers, operators, and other stakeholders to site, construct, and operate solar facilities in ways that minimize impacts to natural ecosystems and biodiversity.
- Pennsylvania Landowners Guide to Utility-Scale Solar Leasing (Penn State Cooperative Extension)
  This guide is intended to inform landowners on terminology, background information, and Common practices to consider when approached to lease their land for utility-scale solar.
- Planning for Utility-Scale Solar Energy Facilities (American Planning Association)
  This PAS Memo examines grid-scale solar facility uses and related land-use issues. It defines and classifies these facilities, analyzes their land-use impacts, and makes recommendations for how to evaluate and mitigate those impacts.
- Pollinator-Friendly Solar (Penn State University Center for Pollinator Research)
  The open plan of solar sites provides high light levels for diverse pollinator meadows that can turn an otherwise plant-depauperate area into a thriving landscape for floral and pollinator diversity.

MORE RESOURCES AT DCNR.PA.GOV



G: 2589 SEP22