Parcel-Scale Solar Suitability Assessment

Solar Radiation & Land Cover Screening Analysis

Prepared by: Touch of Green Environmental GIS, 2026
Location: Subject Parcel – Rock Island, IL
Scale: Parcel-level, screening analysis

---

1. Purpose of Analysis

This analysis evaluates parcel-scale solar suitability using modeled solar radiation and land cover constraints to identify feasible locations for ground- or roof-mounted solar panel installation.

The objective is to determine where within the parcel sufficient solar exposure coincides with suitable land cover, while accounting for obstructions such as tree canopy and developed surfaces.

This assessment is intended to support:

- Preliminary solar feasibility screening
- Site planning and homeowner decision-making
- Visual communication of constraints and opportunities
- Portfolio-level demonstration of parcel-scale solar analysis

This analysis is screening-level only and does not replace structural engineering review, roof load analysis, shading studies using LiDAR, or final system design.

---

2. Study Area & Data Overview

2.1 Study Extent

The analysis was conducted at the parcel scale only, using the subject parcel boundary provided by the client.

An earlier 150-foot buffer was used during exploratory analysis; however, for reporting clarity and site-specific interpretation, all final datasets were re-clipped to the parcel boundary only. This ensures the results reflect conditions strictly within the property limits and avoids misinterpretation from adjacent land cover.

2.2 Data Sources

The following datasets were used:

- **USGS 1-meter Digital Elevation Model (DEM)**
    - Used as the elevation input for solar radiation modeling
- **Area Solar Radiation raster** (ArcGIS Pro Spatial Analyst)
    - Modeled annual solar insolation based on terrain, latitude, and sky conditions
- **National Land Cover Database (NLCD) – Land Cover**
    - Used to identify tree canopy, developed surfaces, and vegetated areas
- **Parcel boundary geometry**
    - Used for final masking and visualization

All datasets were projected into a common coordinate system and aligned prior to analysis.

Figure 1. Subject parcel and clipped solar radiation surface used for suitability analysis.

---

3. Analytical Approach

3.1 Solar Radiation Modeling

The Area Solar Radiation tool was used to model relative solar exposure across the parcel using the 1-meter DEM. Default radiation parameters were retained to represent generalized sky conditions appropriate for screening-level analysis.

Raster statistics were recalculated after generation to support consistent classification and visualization.

3.2 Solar Suitability Classification

The continuous solar radiation surface was classified into relative suitability categories using a two-stage approach:

1. **Initial classification** using equal-area slicing to separate low, moderate, and high relative solar exposure
2. **Reclassification** into three discrete suitability classes:
    - Low Solar Suitability
    - Moderate Solar Suitability
    - High Solar Suitability

This approach ensures each class represents a meaningful portion of the parcel's solar exposure distribution while remaining interpretable for non-technical audiences.

3.3 Land Cover Constraint Analysis

To account for real-world installation constraints, NLCD Land Cover data were incorporated to identify areas unsuitable for solar placement due to vegetation or non-buildable surfaces.

The NLCD layer was clipped to the parcel, which produced clean, geometry-conforming results and avoided raster edge artifacts observed during earlier clipping attempts.

Land cover classes relevant to this analysis include:

- Developed land (structures, impervious surfaces)
- Forested areas (tree canopy)
- Herbaceous and vegetated surfaces

Forested and heavily vegetated areas were interpreted as solar-limited due to shading, while developed surfaces—particularly roof structures—were considered potential installation locations subject to structural feasibility.

Figure 2. NLCD land cover clipped to the subject parcel.

3.4 Final Suitability Overlay

The final suitability interpretation integrates:

- Reclassified solar suitability raster
- Parcel-clipped NLCD land cover
- Visual inspection of aerial imagery

This overlay allows direct identification of where high or moderate solar exposure coincides with suitable land cover, and where shading or vegetation limits feasibility.

---

4. Results & Interpretation

The final parcel-scale overlay reveals that:

- Much of the parcel exhibits moderate to high modeled solar exposure

- However, tree canopy and vegetation dominate most of the parcel, substantially limiting feasible installation locations
- The only clearly suitable area for solar panel placement is the garage roof located at the southern edge of the property

This location benefits from:

- Reduced shading relative to surrounding areas
- Favorable solar exposure classification
- Existing developed surface suitable for rooftop installation

No ground-mounted solar locations were identified as suitable within the parcel due to vegetation and shading constraints.

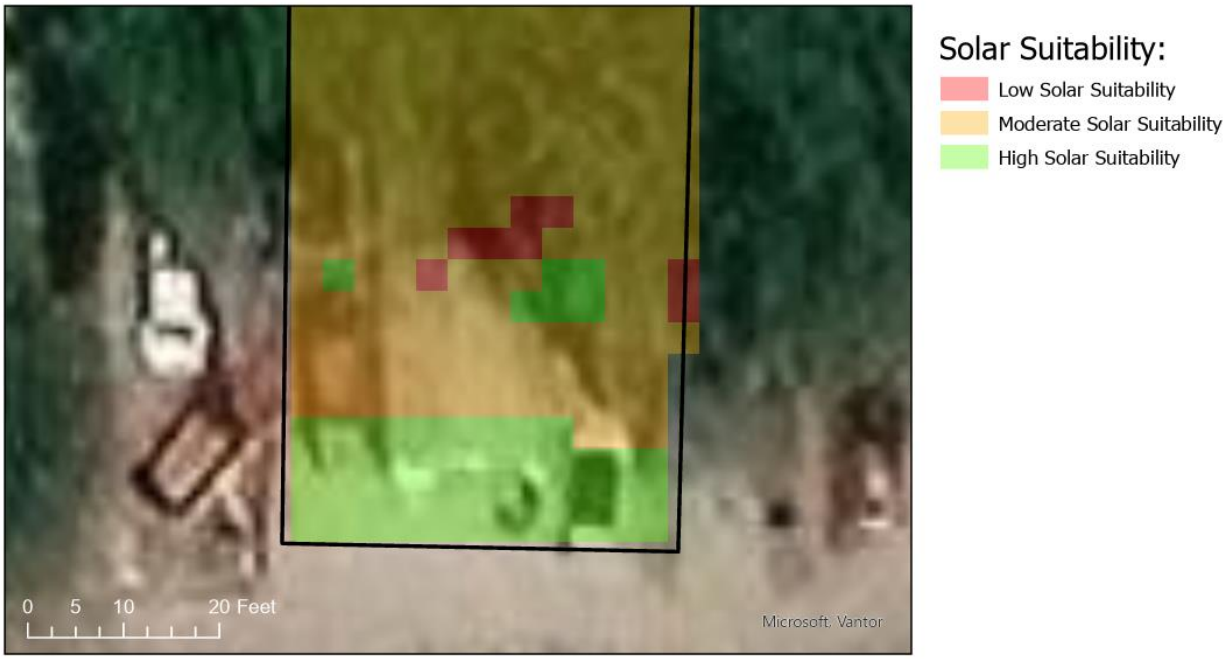

Figure 3. Final solar suitability overlay showing feasible installation area limited to the southern garage roof.

---

5. Summary of Findings

- Solar radiation modeling indicates sufficient solar exposure across portions of the parcel
- Land cover analysis reveals extensive tree canopy coverage
- Vegetation significantly constrains ground-level solar feasibility

- The garage roof at the southern edge of the parcel is the only suitable location for potential solar panel installation
- Parcel-only clipping improved clarity and interpretability of results

---

6. Limitations & Data Considerations

6.1 Solar Modeling Resolution

Although a high-resolution DEM was used, the solar radiation model:

- Does not account for fine-scale roof pitch and potential current roof obstructions.
- Represents relative solar exposure rather than exact system output

---

6.2 Land Cover Classification Limitations

NLCD land cover data:

- Generalizes vegetation and canopy at a national scale
- May not capture individual tree pruning, recent removals, or seasonal leaf-off conditions

As a result, suitability should be interpreted conservatively.

6.3 Scope of Analysis

This analysis does not evaluate:

- Roof structural capacity
- Electrical interconnection feasibility
- Local zoning or HOA restrictions
- Economic cost-benefit analysis

These factors must be assessed separately prior to installation.

---

7. Conclusion

This parcel-scale solar suitability assessment demonstrates that, while modeled solar exposure is adequate across portions of the property, land cover constraints sharply limit feasible installation locations.

At a screening level, the analysis identifies the southern garage roof as the sole viable location for solar panel placement within the parcel.