

## Prairie Restoration Suitability Analysis

**Prepared by:** Touch of Green Environmental GIS, 2025

**Location:** Loud Thunder Forest Preserve, Rock Island County, Illinois

**Scale:** Preserve-level, screening analysis

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### 1. Purpose of Analysis

This analysis evaluates the suitability of land within Loud Thunder Forest Preserve for prairie restoration using a spatial, multi-criteria GIS approach. The objective is to identify areas where existing land cover, soil conditions, and terrain characteristics are most favorable for successful prairie establishment and long-term management.

This is a screening-level analysis, not a site design or implementation plan. Results are intended to support:

- Preliminary prairie restoration planning
  - Identification of priority restoration zones
  - Resource allocation and management phasing
  - Grant applications and conservation planning
  - Concept-level ecological assessment
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### 2. Study Area & Data Overview

The analysis covers the spatial extent of Loud Thunder Forest Preserve as defined by a GIS-based area of interest. All datasets were processed using a consistent projection, spatial resolution, and raster alignment to ensure accurate overlay and comparison.

Data sources included:

- National Land Cover Database (NLCD)
- Digital Elevation Model (DEM)
- Derived slope surface
- USDA gSSURGO soil data



*Figure 1. Loud Thunder Forest Preserve location within Rock Island County, Illinois.*

- Preserve boundary geometry

All raster datasets were clipped to the preserve extent and standardized prior to analysis.

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### **3. Analytical Approach**

A weighted suitability model was developed using three primary environmental criteria relevant to prairie restoration success.

#### **3.1 Land Cover Suitability**

Existing land cover was evaluated to identify areas where prairie restoration would be most feasible. Developed areas, open water, and incompatible land cover types were assigned lower suitability values, while open or transitional land cover types more conducive to restoration were assigned higher suitability scores.

Land cover suitability reflects both ecological feasibility and anticipated management effort.

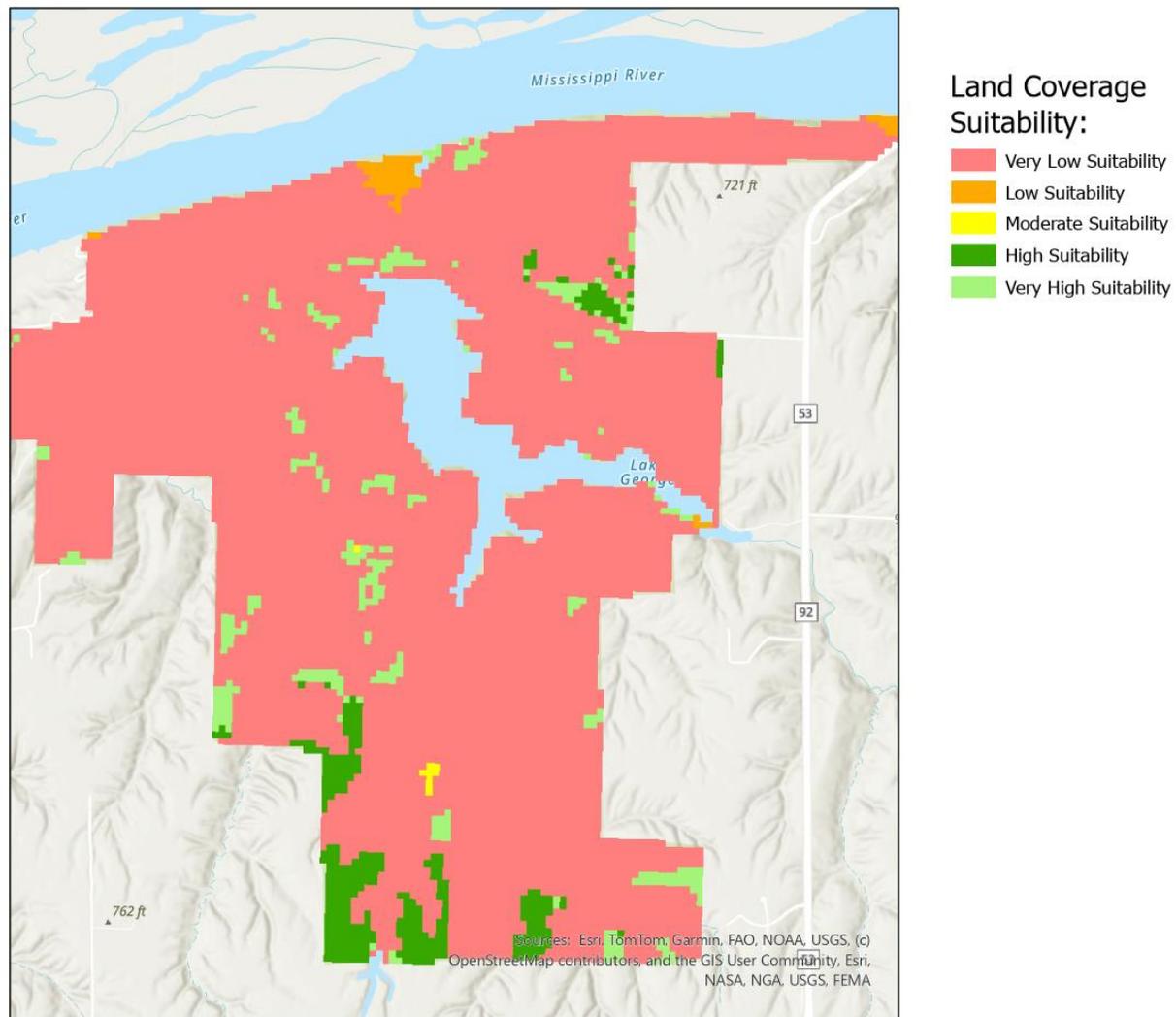


Figure 2. Land cover suitability classification derived from NLCD data.

### 3.2 Soil Suitability

Soil conditions were evaluated using USDA gSSURGO data, with drainage class serving as the primary indicator of prairie restoration suitability. Well-drained soils were assigned higher suitability scores due to their compatibility with native prairie species, while poorly drained soils were assigned lower scores.

Soil data were spatially joined to mapped soil units and converted to a raster surface consistent with other analysis layers.

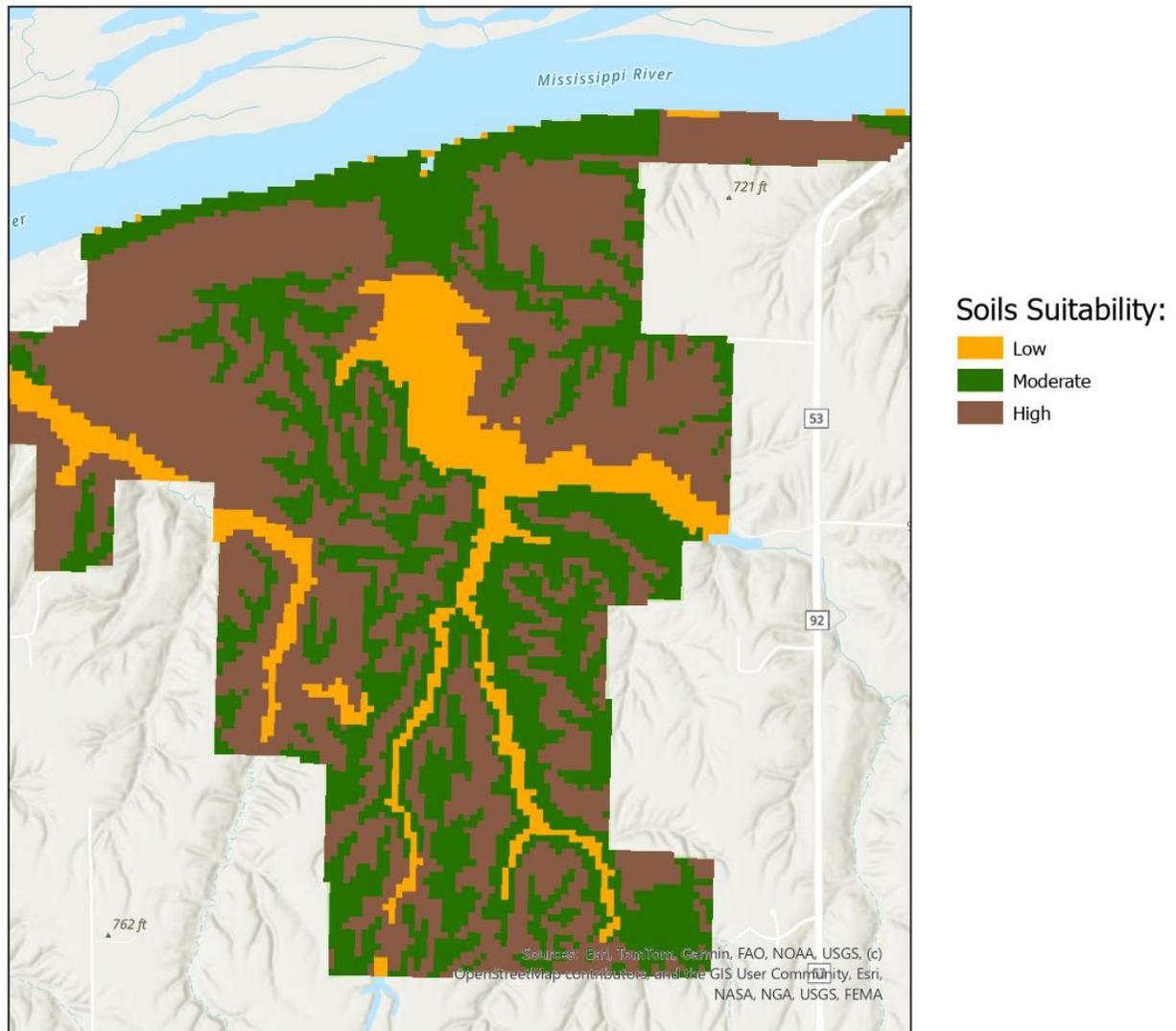


Figure 3. Soil suitability classification based on drainage characteristics.

### 3.3 Terrain & Slope Suitability

Slope was derived from the elevation surface to identify terrain conditions that may influence restoration feasibility and long-term maintenance. Gentle slopes were assigned higher suitability due to lower erosion risk and easier management access, while steeper slopes received lower suitability scores.

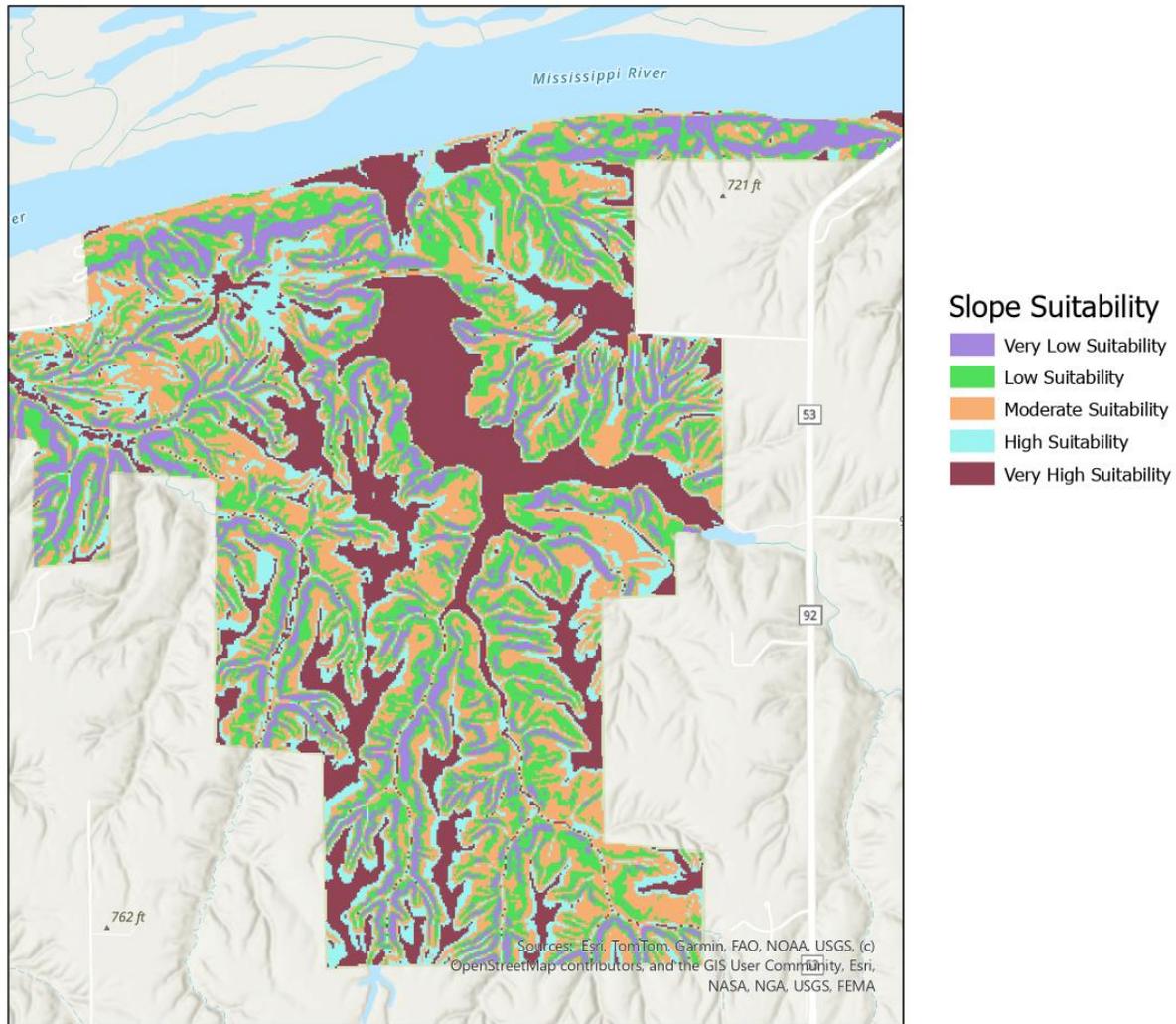


Figure 4. Slope-based suitability classification across the preserve.

#### 4. Composite Prairie Suitability Model

The land cover, soil, and slope suitability layers were combined using a weighted overlay approach to produce a composite prairie restoration suitability surface.

Relative weights were assigned based on their importance to restoration feasibility:

- Land Cover: 40%
- Soil Conditions: 35%
- Slope: 25%

The resulting raster represents overall prairie restoration suitability, classified into three categories: low, moderate, and high suitability.

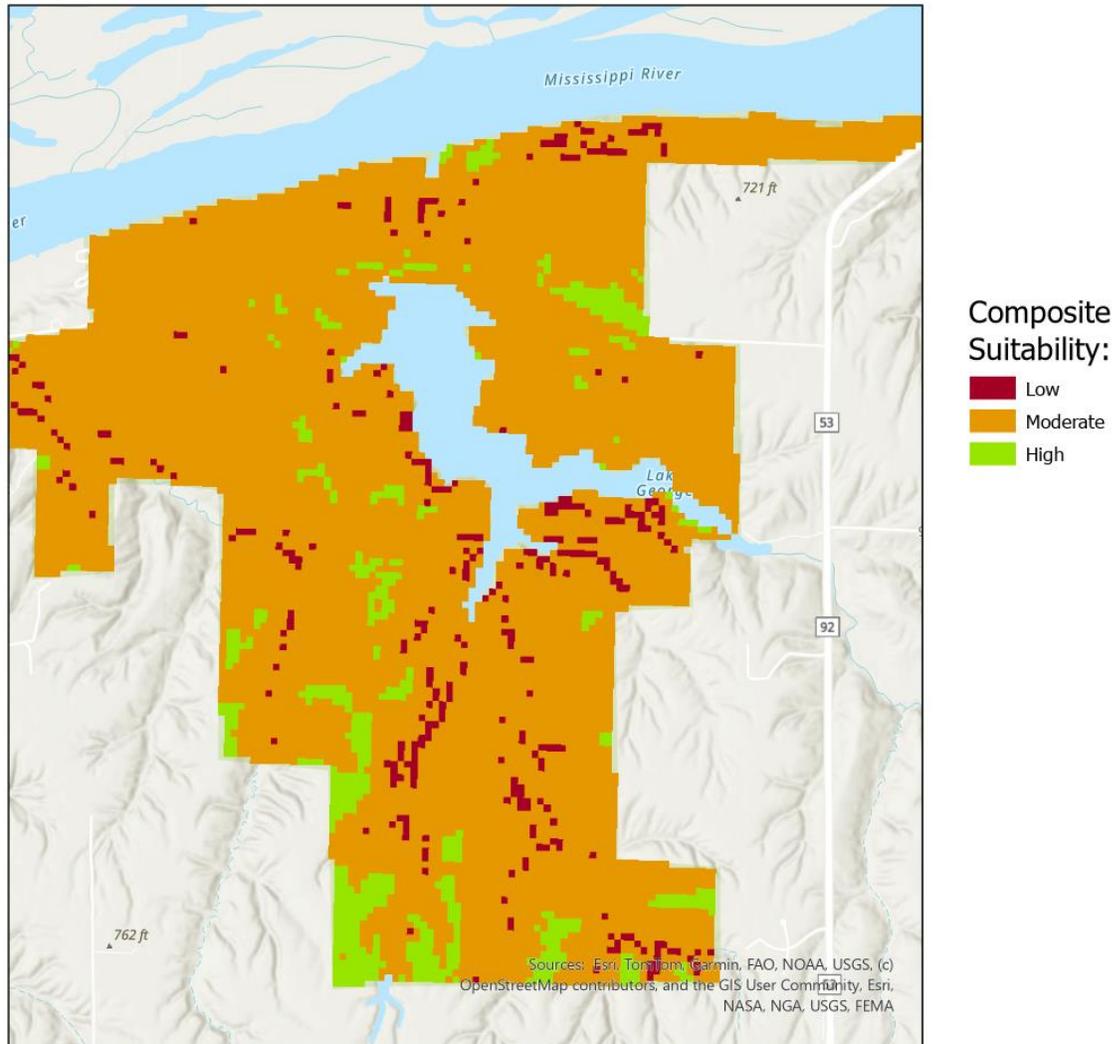


Figure 5. Composite prairie restoration suitability surface derived from weighted overlay analysis.

## 5. Management Zone Delineation & Area Summary

The final suitability raster was converted to vector polygons and dissolved by suitability class to delineate distinct management zones. Acreage was calculated for each suitability category to support planning and reporting.

The analysis indicates that the majority of the preserve falls within the **moderate suitability** category, with smaller but spatially distinct areas identified as **high suitability** for prairie restoration.

These results suggest that prairie restoration efforts may be most effective when focused on targeted high-suitability zones, with moderate-suitability areas considered for phased or adaptive management approaches.

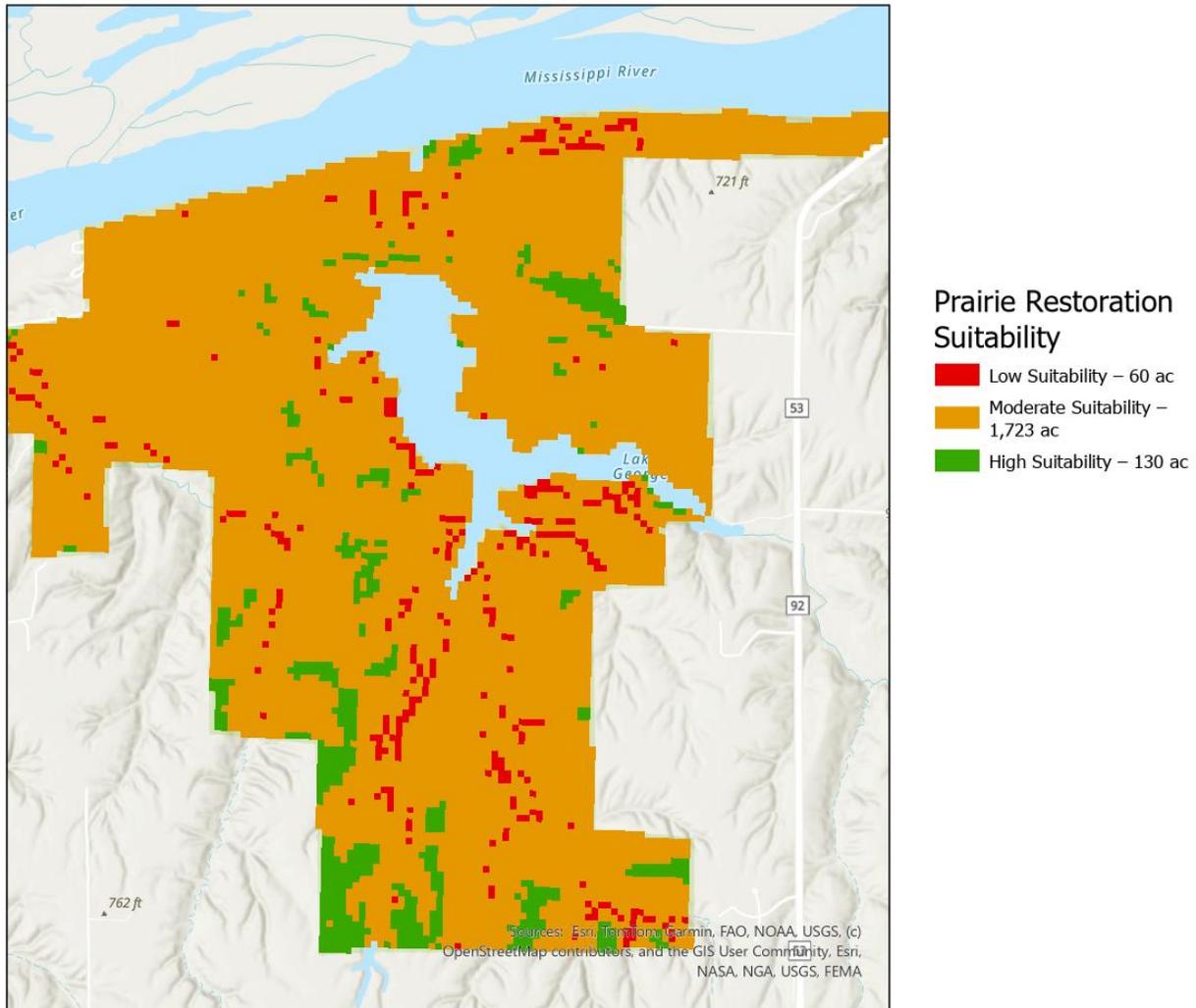


Figure 6. Prairie restoration management zones with calculated acreage by suitability class.

## 6. Interpretation of Results

The suitability analysis reveals a landscape where prairie restoration potential is spatially variable but clearly defined. High-suitability areas tend to occur where favorable land cover, well-drained soils, and gentle terrain coincide.

Moderate-suitability areas dominate the preserve and may require additional site preparation or adaptive management strategies. Low-suitability areas are generally associated with steeper terrain, less favorable soils, or existing land cover constraints.

Overall, the results support a targeted, data-driven approach to prairie restoration planning within Loud Thunder Forest Preserve.

## 7. Limitations & Considerations

This analysis is subject to the following limitations:

- Results are based on generalized raster datasets and represent relative suitability, not site-specific conditions.
- Soil and land cover data may not reflect recent management actions or fine-scale variability.
- The analysis does not account for species-specific requirements, hydrologic modification, or cultural constraints.
- This screening does not replace field verification or detailed ecological assessment.

Despite these limitations, the spatial patterns identified provide a reliable foundation for preliminary prairie restoration planning and prioritization.