Utilizing GIS to Locate Unknown Gravel Hill Prairies of the Wabash River Valley

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Introduction

Prairies once covered a large portion of northwestern Indiana and consisted of Wet Prairies, Sand Prairies, and Hill Prairies. The Gravel Hill Prairies (GHP) in the vicinity of Lafayette, Indiana are a state endangered habitat with four locations known and protected. In an otherwise mesic environment, these steep, gravelly slopes provide optimal growing conditions for a number of state-endangered plants. These ecosystems have been found to occur almost exclusively on soils classified as Rodman Gravelly Loams and Strawn-Rodman complexes which occur along the Wabash River's and its tributaries outwash terraces **(Fig. 1**). A previous study conducted in 1980 located and helped protect three Gravel Hill Prairie remnants **(Fig. 1**). Today's GIS technology and high resolution spatial datasets have never been used to uncover this ecosystem that has all but disappeared.

Hypothesis - Prior work done in 1980 done by Post, Bacone, and Aldrich, ID'd only three GHP remnants, each remnant holding between three and seven State Endangered plant species: Remnant Name (# endangered plants) –Wabash Breaks (3), Lookout Point (5), and Wea Creak (7). Spatial analysis with GIS and gSSURGO can uncover previously unknown remnants to conserve.

Significance - Seven state-endangered species found almost exclusively on these GHP remnants: *Muhlenbergia cuspidate* – plains muhlenbergia, (**Fig. 9**) *Lithosperum incisum* – narrow-leaved Stoneseed**,** *Erysimum asperum* – prairie-rocket wall flower, (**Fig. 4)** *Besseya bullii* – kittentails, *Aster oblongifolius* – aromatic aster, *Arenaria patula* – Pitcher's stitwort, and *Androsace occidentalis* – western rock jasmine.

Materials and Methods

Materials

- Software: ArcGIS v.10.3
- Data:
  - USDA's gridded Soil Survey Geographic (gSSURGO) database of Indiana
  - DEM and Ortho-photos

Methods

- Geospatial habitat suitability model developed to ID Rodman soils on south (157°) to west (293°) slopes

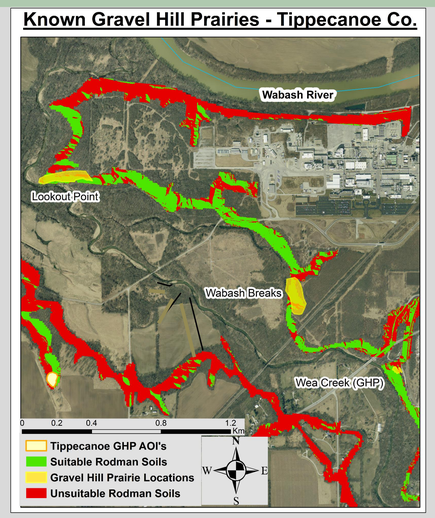


Fig. 1: Locations of three Gravel Hill Prairies (GHP) south of Lafayette, IN, along the Wea Creek. Overlaid on the layer of suitable vs. unsuitable Rodman soils.

Gravel Hill Prairie Remnants and Rodman Soils

Fig. 2 (Top) - This picture displays an outwash bluff at the Lookout Point GHP and a cross section of the Rodman soil (Sandy/Gravelly loams and Strawn-Rodman Complexes). Fig. 3 (Bottom) - Looking west along the main prairie area at Lookout Point.
Fig. 4 (Left) - *Besseya bullii* – kittentails

Results

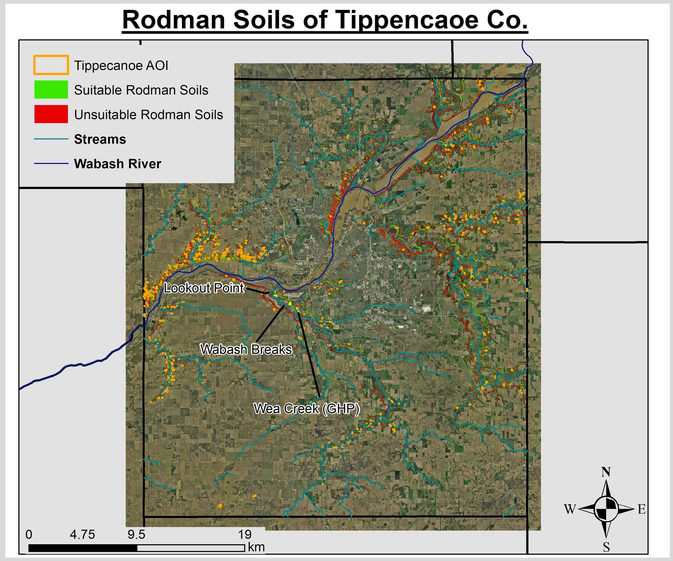


Fig. 5: Map of the extent of Rodman soils (*Sandy-skeletal, mixed, mesic Typic Hapludolls)* in Tipp. Co., IN. Green areas indicate Rodman map units (MU) with an aspect between 157° and 293° (S – SW – W), red areas are Rodman MU's with any other aspect. A south to west aspect creates xeric conditions on these gravelly slopes.

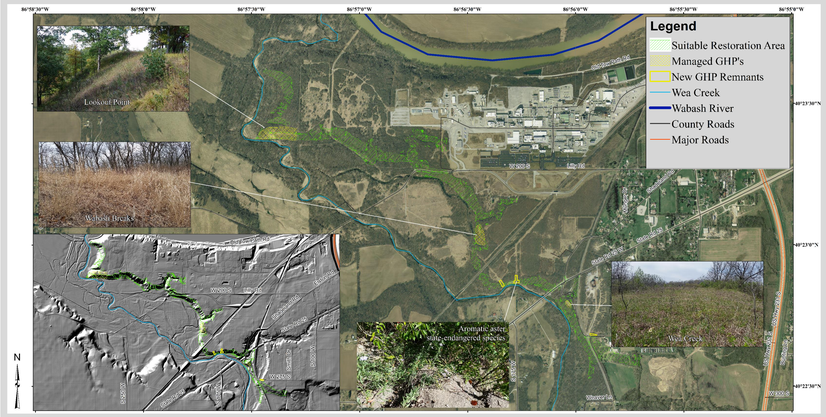
Results cont.

- Tippecanoe, Fountain, and Warren Co.'s analyzed (**Fig. 6**)
- 972 AOI's Identified
- 53 AOI's scouted in eight (8) field scouting trips
- Six (6) remnants located – varying degrees of degradation
- One new remnant holds state-endangered aromatic aster
- Three new remnants along Wea Creek ridgeline **(Fig. 7**), one on N. Fork of Wildcat Creek, two in Warren County

GIS Analysis Results of Tippecanoe, Fountain, and Warren Co.'s

County	Total Area (hectares)	Potential Area (hectares)	Potential area (% of total by Co.)	Areas of Interest (Locations | Hectares)	
Tippecanoe	4,430	1,354	31	550	46.5
Fountain	2,163	813	38	259	64
Warren	387	133	34	163	9.7
Total	6,980	2,300	33	972	120.2

Fig. 6 (Above): Table of Rodman Soil Series Map Units Analyzed. Fig. 7 (Below): Proposed restoration area holding the three newly discovered remnants along the Wea Creek.



Future Research Plans/Goals

- Develop conservation and restoration plans for the six newly located remnants
- Scout additional AOI's
- Conduct analysis on remaining counties with Rodman soils
- Refine analysis methods and expand scope
- Pass project to new student as I move-on to graduate school

Fig. 8: Aromatic aster (*Aster oblongifolius*)

Acknowledgements

I would like to thank the people of NICHES Land Trust (nicheslandtrust.org) for the wealth of knowledge on this subject and advice based on field observations; Derek Luchik with The Nature Conservancy for providing me the inspiration to pursue this project along with his advice and field guidance; and Dr. Darrell Schulze and Dr. Songlin Fei for being my advisors on this independent study for Purdue University