Lab Report

Title: <mark>Lab 2 – PART</mark> 2
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Date: October 29, 2024

Project Repository: /kylejsmith4/GIS5571/Lab1
Time Spent: 118.33 hours (all of Lab 2)

Abstract

Dory is trying to get to Whitewater State Park from her farm in Southeast Minnesota. While it is not a long walk, Dory is seeking a path that avoids potentially muddy farm fields, water bodies without bridges, and steep slopes. This Lab uses ArcPy and ArcGIS Pro to develop a cost surface model for Dori by using advanced spatial modeling techniques.

Problem Statement

Dory wants to get from her farm to the North Picnic area in Whitewater State Park's North Picnic area via a route avoiding mud, water, and slopes. The following table summarizes the datasets and operations required to produce this model:

| #	Requirement	Defined As	(Spatial) Data	Attribute Data	Dataset	Preparation
1	Minnesota County Boundary Data	.shp	County boundaries within MN	County name, geometry	MN DNR County Boundary Dataset	- Download from MN Geo Commons - Clip Winona, Wabasha, and Olmsted counties - Save & export
2	Land Use/Land Cover Data	Raster	NLCD land cover classification	Land use codes, geometry	MN DNR Landcover NLCD	- Download land cover data from NLCD data (via MN DNR) - Clip raster to target counties - Reclassify farm fields - Save & export
3	Hydrology Data	Shapefile, Raster	Water bodies and bridge locations	Water body class, geometry	MN DNR Hydrography and MN DOT Bridges	- Download hydrology and bridge datasets from MN DNR and MN DOT - Clip to target counties - Convert hydrology and bridge data to raster format and reclassify - Save & export
4	Digital Elevation Model (DEM)	Raster	Elevation and slope for study area	Elevation, slope degrees	MN DNR Digital Elevation Model	- Download DEM - Clip to target counties - Reclassify slope - Save & export
5	Cost Surface Model	Raster	Combined slope, land use, and hydrology data	Cost values based on walking preference	Cost Surface Model	- Combine slope, land cover, and water bodies - Adjust weights - Export varied cost surfaces based on preference

| 6 | Cost Distance & Least-Cost Path | Raster | Distance from Dory's Farm to North Picnic Area | Cost distance, backlink values | Cost Surface Model | - Calculate cost distance
- Least-cost path analysis
- Save & export |

Input Data

#	Title	Purpose in Analysis	Link to Source
1	Minnesota County Boundaries	Define the boundaries for target counties (Winona, Wabasha, Olmsted)	County Boundaries
2	NLCD Land Cover Data	Classify land use types, specifically farm fields	Landcover NLCD
3	MN DNR Hydrology and MN DOT Bridges	Identify water bodies and bridge locations for route planning	Hydrology Bridges
4	Digital Elevation Model (DEM)	Provide slope and elevation data for determining walking preference	MN DNR

Methods

The following are a series of maps detailing various attributes of Dory's Path:

Dory's Farm

WABASHA | WINONA

WABASHA
OLMSTED

North
Picnic

Whitewater

OLMSTED | WINONA

N
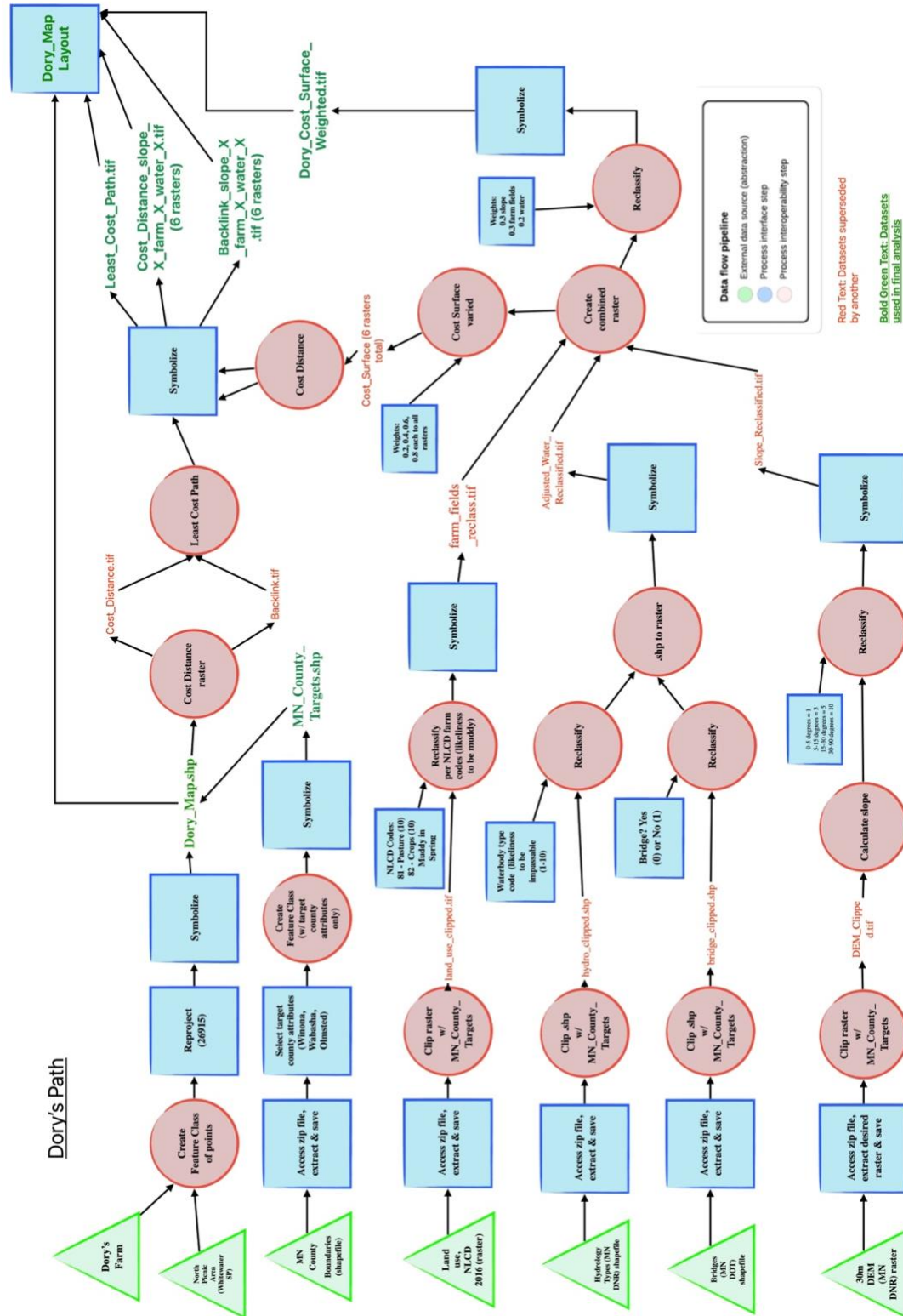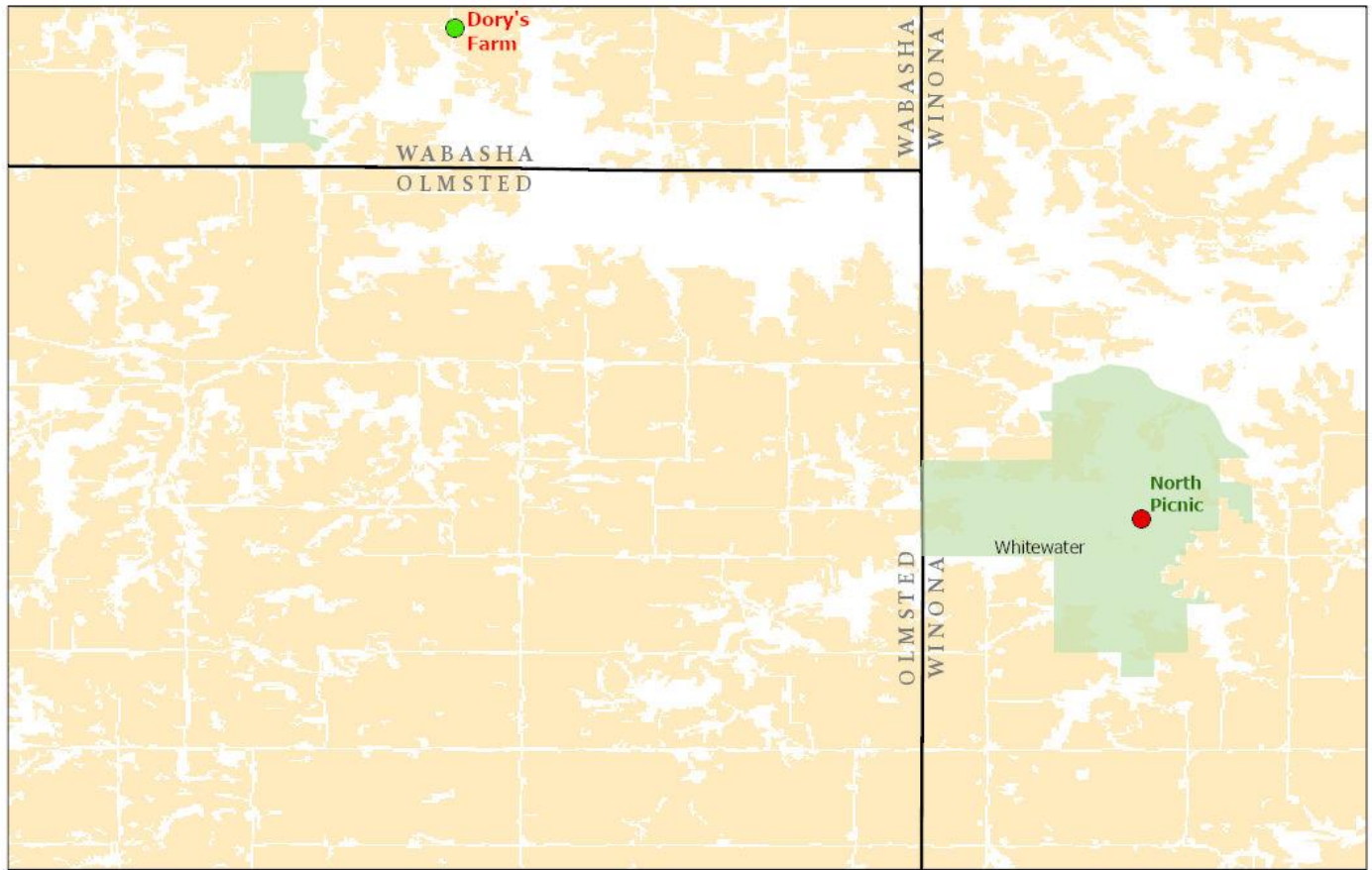
Dory's Route
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0   0.55 1.1   2.2
Miles

Farm Fields

North Picnic Area

Dory's Farm

Legend

Whitewater State Park

County Boundaries

Pasture or Crops (Farm land use)

Dory's
Farm

WABASHA
WINONA

WABASHA
OLMSTED

North
Picnic

Whitewater

OLMSTED
WINONA

Esri, NASA, NGA, USGS, FEMA

N
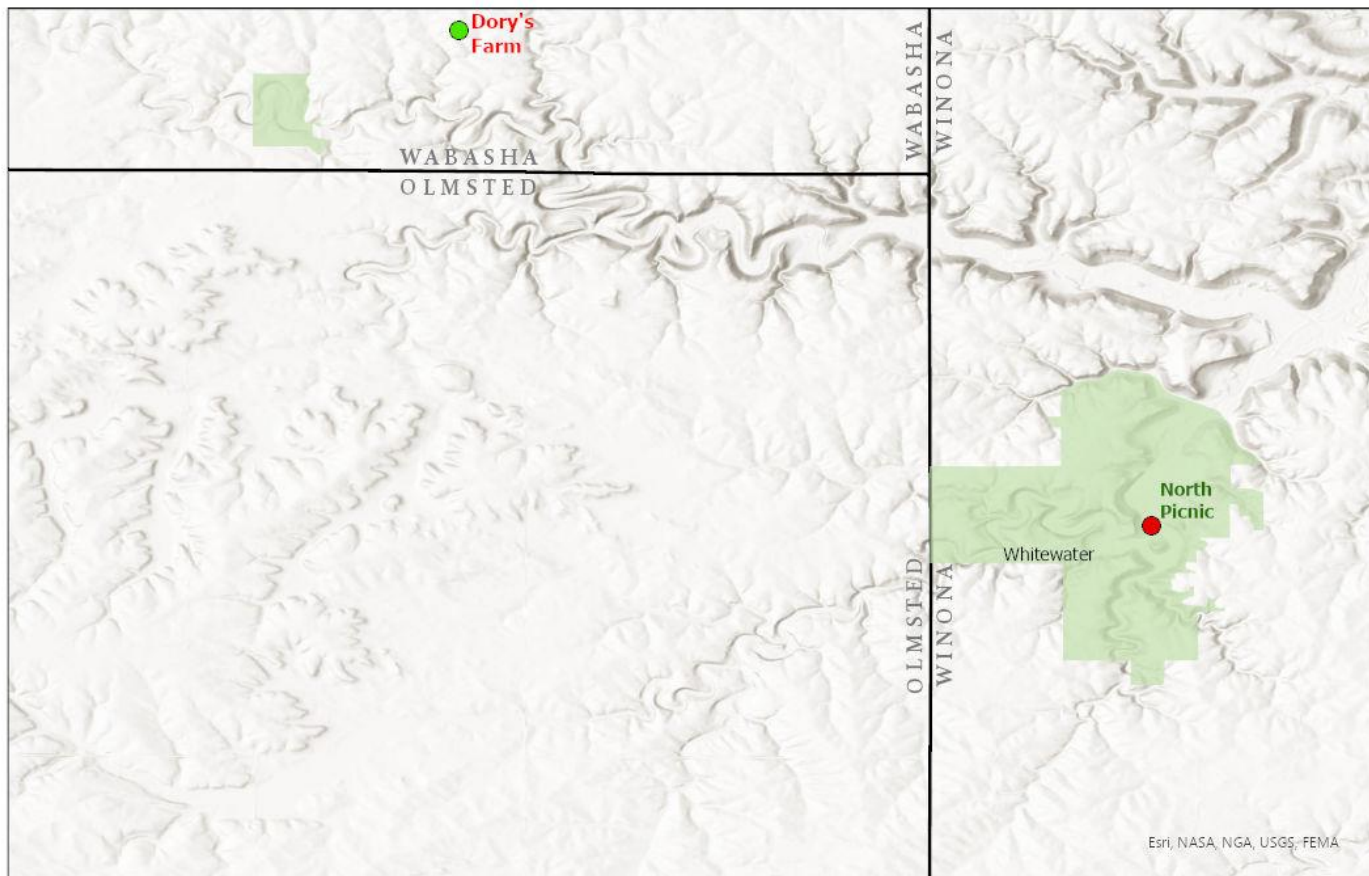
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Overview Map

0   0.55 1.1   2.2
                        Miles

Legend

North Picnic Area   Whitewater State Park

Dory's Farm   County Boundaries

Dory's
Farm

WABASHA
WINONA

WABASHA
OLMSTED

North
Picnic

Whitewater

OLMSTED
WINONA

N
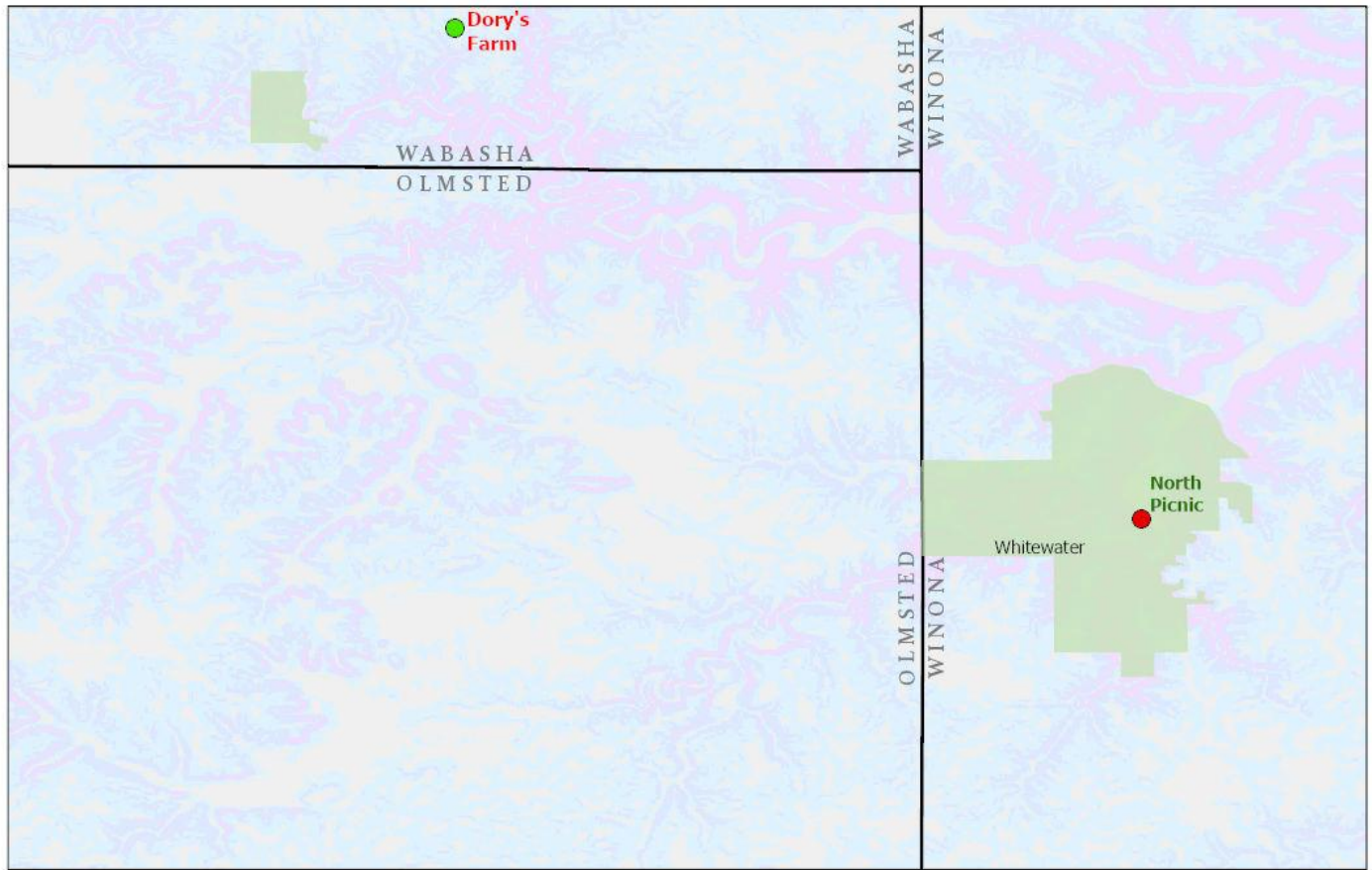
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Slope

North Picnic Area

Dory's Farm

0   0.55 1.1   2.2
                          Miles
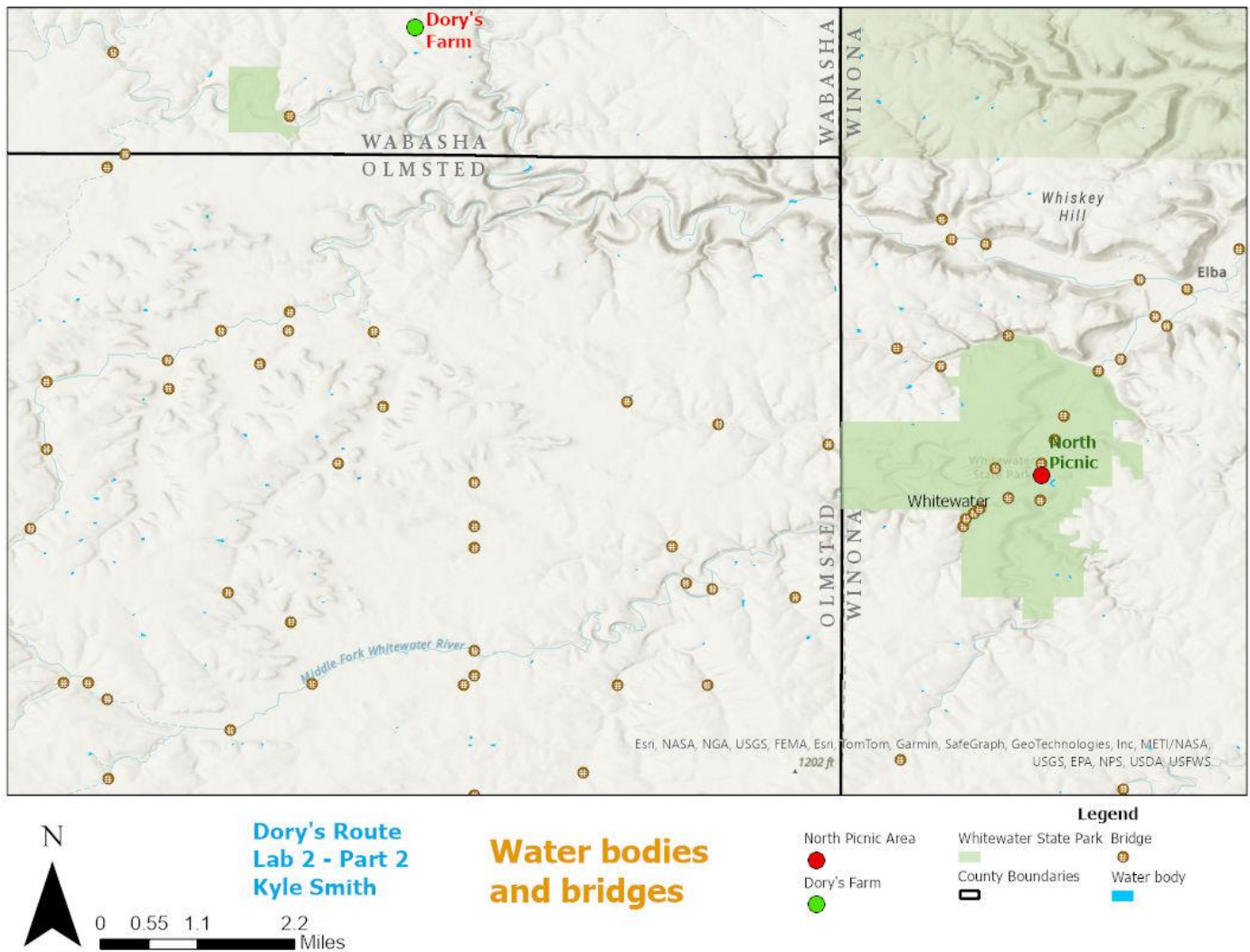
Legend

Whitewater State Park

County Boundaries

0 -5 degree slope

5 - 15 degree slope

15 - 30 degree slope

30 - 90 degree slope

Dory's Route
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0 0.55 1.1   2.2
                 Miles

Water bodies
and bridges

Legend

North Picnic Area   Whitewater State Park Bridge

Dory's Farm   County Boundaries   Water body

Results Verification

Verification was conducted by recalculating statistics and double checking output to aerial photos and other maps to ensure accuracy.

Discussion and Conclusion

The Lab demonstrated the optimal path for Dory between her farm and Whitewater State Park. I completely ran out of time to complete the final step – the optimal path for Dory! However, as this report, the attachments, and the code show – I was able to get far in to this project and come away with many new skills.

References

Esri. (n.d.-a). Reclassify (Spatial Analyst). ArcGIS Pro Tool Reference. https://pro.arcgis.com/en/pro-app/latest/tool-reference/spatial-analyst/reclassify.htm

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Self-score

Fill out this rubric for yourself and include it in your lab report. The same rubric will be used to generate a grade in proportion to the points assigned in the syllabus to the assignment.

Category	Description	Points Possible	Score
Structural Elements	All elements of a lab report are included (**2 points each**): Title, Notice: Dr. Bryan Runck, Author, Project Repository, Date, Abstract, Problem Statement, Input Data w/ tables, Methods w/ Data, Flow Diagrams, Results, Results Verification, Discussion and Conclusion, References in common format, Self-score	28	**25**
Clarity of Content	Each element above is executed at a professional level so that someone can understand the goal, data, methods, results, and their validity and implications in a 5 minute reading at a cursory-level, and in a 30 minute meeting at a deep level (**12 points**). There is a clear connection from data to results to discussion and conclusion (**12 points**).	24	**22**
Reproducibility	Results are completely reproducible by someone with basic GIS training. There is no ambiguity in data flow or rationale for data operations. Every step is documented and justified.	28	**23**
Verification	Results are correct in that they have been verified in comparison to some standard. The standard is clearly stated (**10 points**), the method of comparison is clearly stated (**5 points**), and the result of verification is clearly stated (**5 points**).	20	**15**
		100	**85**

<mark>I didn't complete the least-cost path analysis properly and fully!</mark>