An aerial black and white photograph of a river valley. A multi-lane road with a few cars runs along the river. A railroad with several tracks runs parallel to the road. Two truss bridges cross the river. The surrounding hills are densely forested. The text 'Allegheny County Land Suitable for Urban Development' is overlaid in the upper right quadrant.

Allegheny County Land Suitable for Urban Development

Allegheny County GIS Office
Elizabeth Stahlman

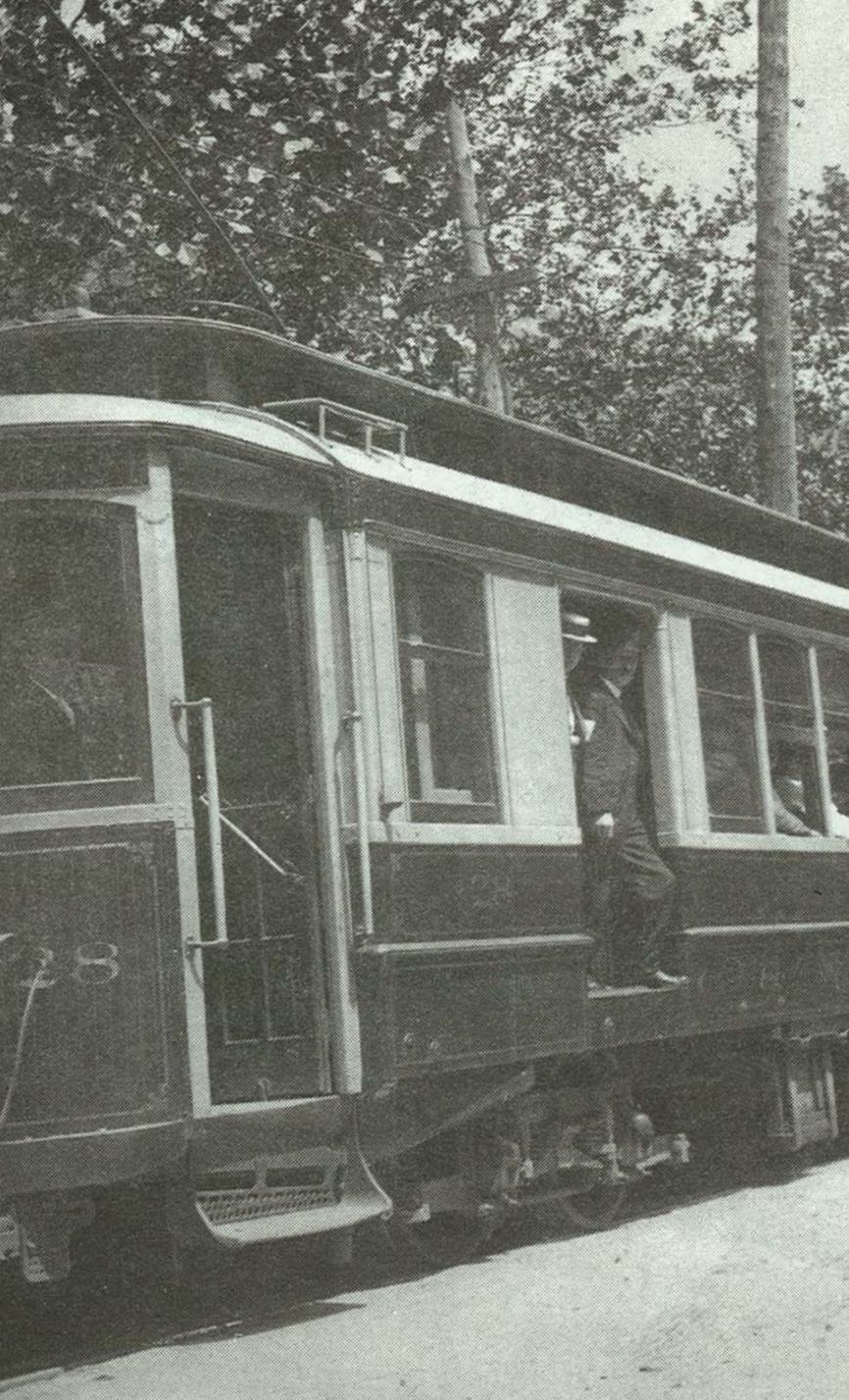
- **Background**
- **Purpose**
- **Methodology**
- **Results**
- **Conclusion**



Background

- Scheduled delivery of new spatial data products
- Upcoming comprehensive planning
- Financial support from ARC/CTA grant
- Need for baseline analysis
 - Future informed planning decisions
 - Analyze historical development patterns





Purpose

- Conduct a suitability analysis to model lands suitable for urban development
- Use GIS so that:
 - Input is based on regulations, current trends, and/or increased cost of development
 - Multiple spatial variables are incorporated in analysis
 - Results are *objective*

Methodology

Overview:

- Collect data
- Establish numerical values for each feature of each data layer based on attributes
- Assign each feature class a weight representing its relative overall influence on land suitability.

Methodology

Data Layers:

Soils

Slope

Streams & buffer

Floodplains

Wetlands

Landscape Limitations

Water Service

Sewer Service

Roads

Schools

Hospitals

Infrastructure Constraints

Methodology

Suitability for development:

5- no limitations

4- few limitations

3- moderate limitations

2- many limitations

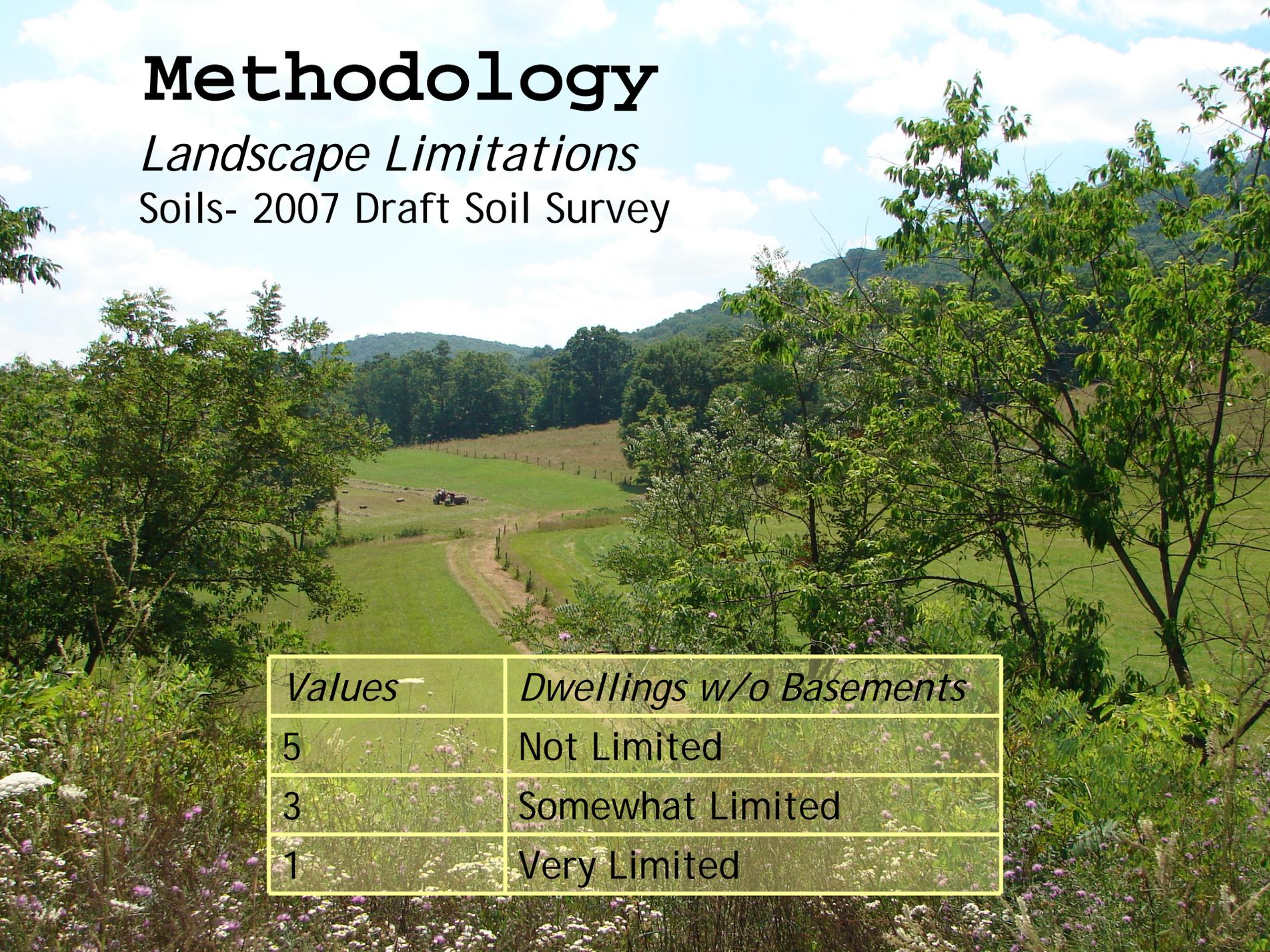
1- severe limitations

0- cannot be developed

Methodology

Landscape Limitations

Soils- 2007 Draft Soil Survey



<i>Values</i>	<i>Dwellings w/o Basements</i>
5	Not Limited
3	Somewhat Limited
1	Very Limited

Methodology

Landscape Limitations

Slope	
Values	percent slope
5	0-13.9
3	14-24.9
1	>25

Streams	
Values	distance from feature (ft)
5	> 100
3	50-100
1	0-50

Floodplains	
Values	zone
5	outside of floodplain
1	within floodplain

Wetlands	
Values	distance from feature (ft)
5	>25
1	0-25
0	within wetland

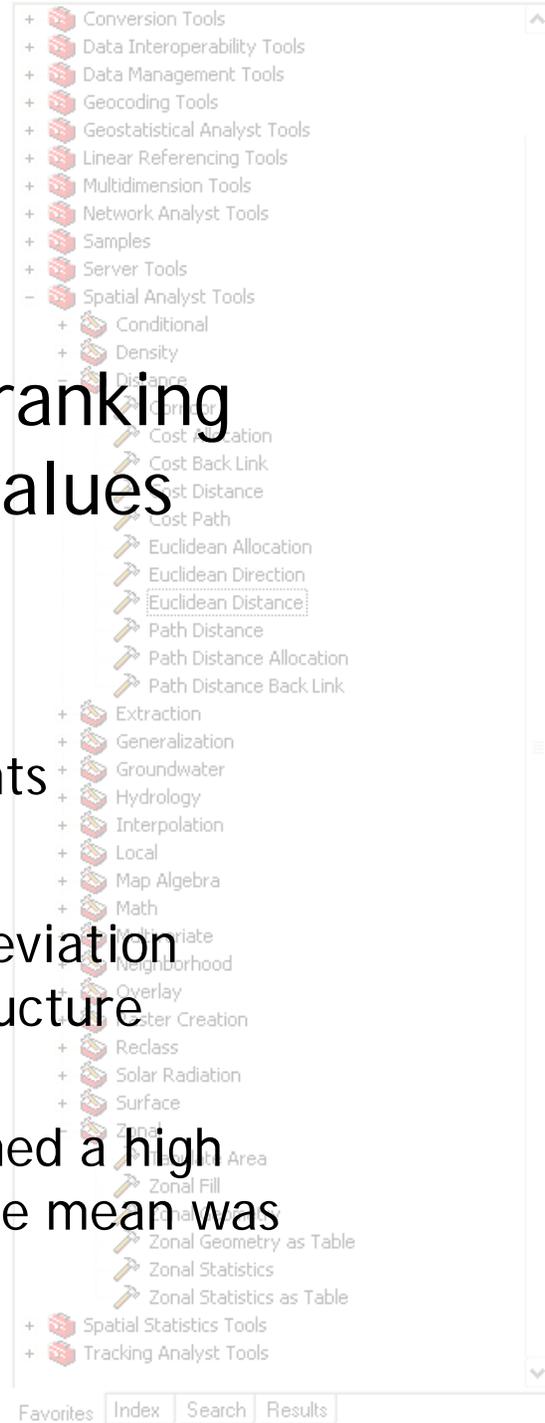
- based on regulations



Methodology

Infrastructure Constraints

- Used GIS calculations to determine ranking values, rather than using arbitrary values
- Spatial Analyst:
 - Euclidean distance
 - the straight line distance between two points
 - Zonal statistics
 - calculated mean distance and a standard deviation between existing development and infrastructure (Euclidean distance results)
 - Areas within the mean distance were assigned a high value of 5, each standard deviation from the mean was assigned a corresponding lower value.



Methodology

Infrastructure Constraints

Water Service

mean	3,105.0
Values	distance from feature (ft)
5	within service area
3	0-3,105.0
1	>3,105.0

Sewer Service

mean	4,329.8
Values	distance from feature (ft)
5	within service area
3	0-4,329.8
1	>4,329.8

Roads

mean	161.2
std. dev.	189.7
Values	distance from feature (ft)
5	0-161.2
4	161.3-350.9
3	351.0-540.7
2	540.8-730.4
1	>730.4

Schools

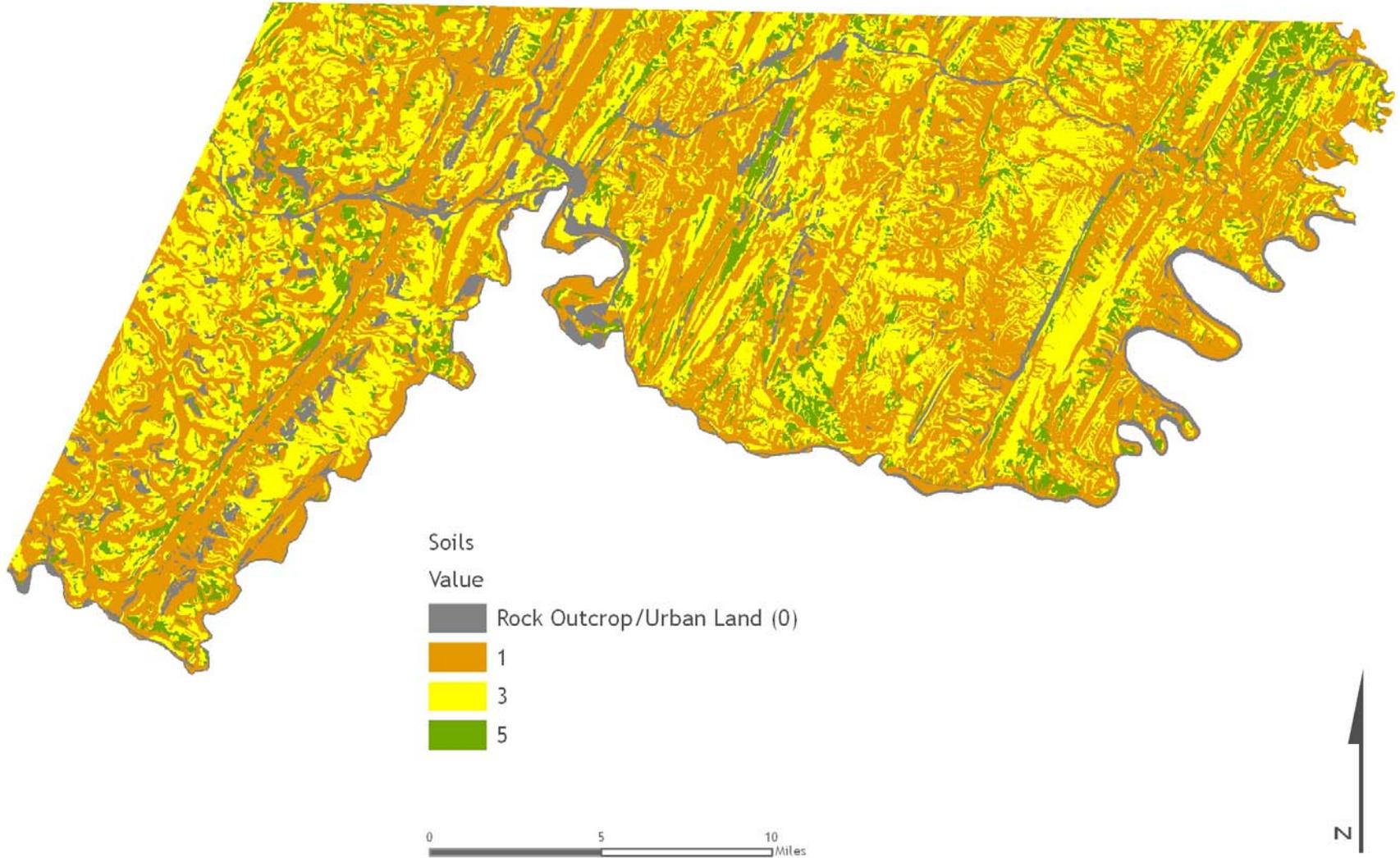
mean	35,840.7
std. dev.	29,183.8
Values	distance from feature (ft)
5	0-35,840.7
4	35,840.8-65,024.5
3	65,024.6-94,208.3
2	94,208.4-123,392.1
1	>123,392.1

Hospitals

mean	10,188.2
std. dev.	10,277.8
Values	distance from feature (ft)
5	0-10,188.2
4	35,840.8-65,024.5
3	65,024.6-94,208.3
2	94,208.4-123,392.1
1	>123,392.1

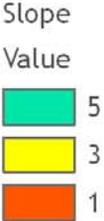
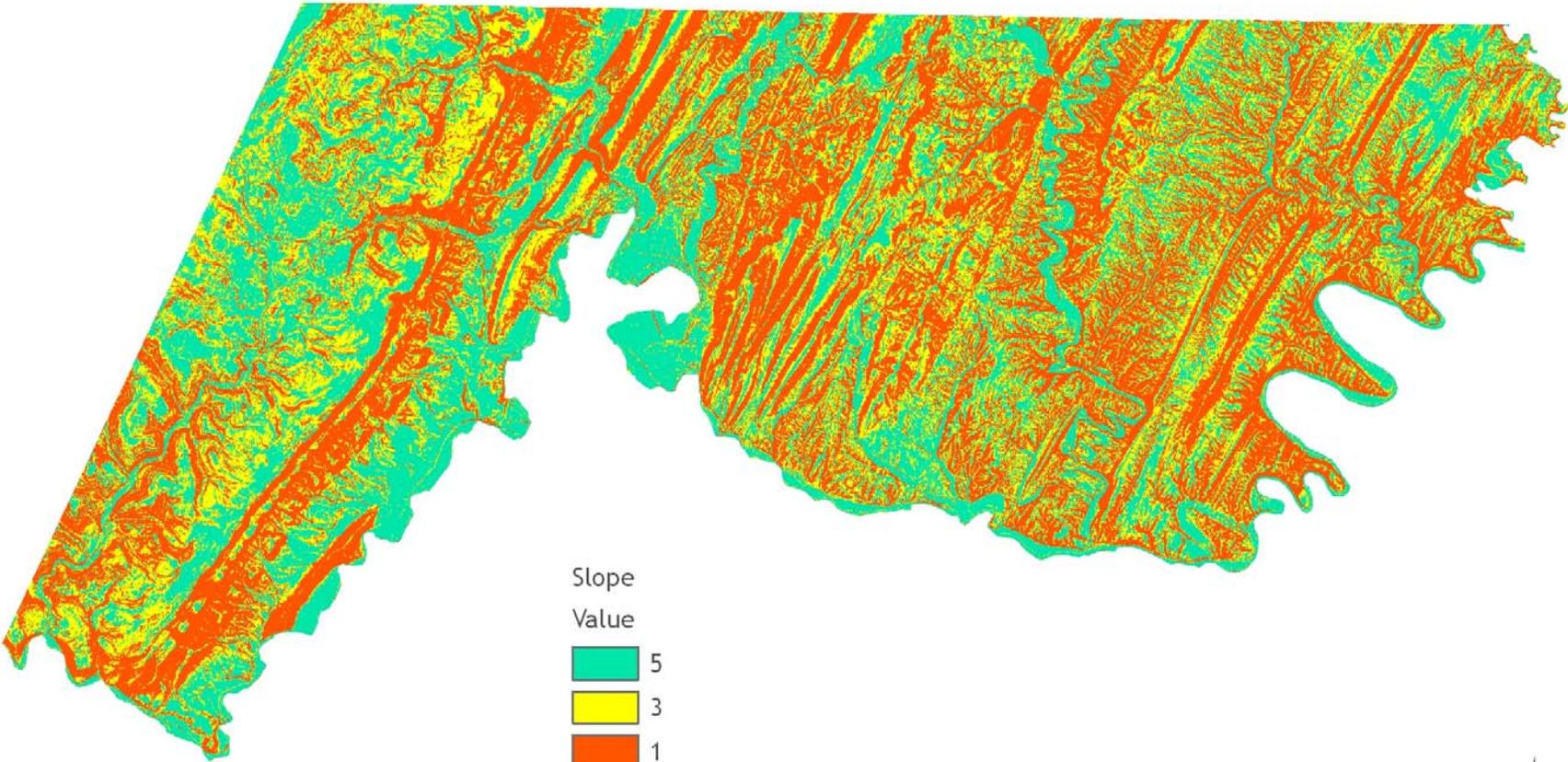
Soils 0.50

Landscape Limitations: Soils



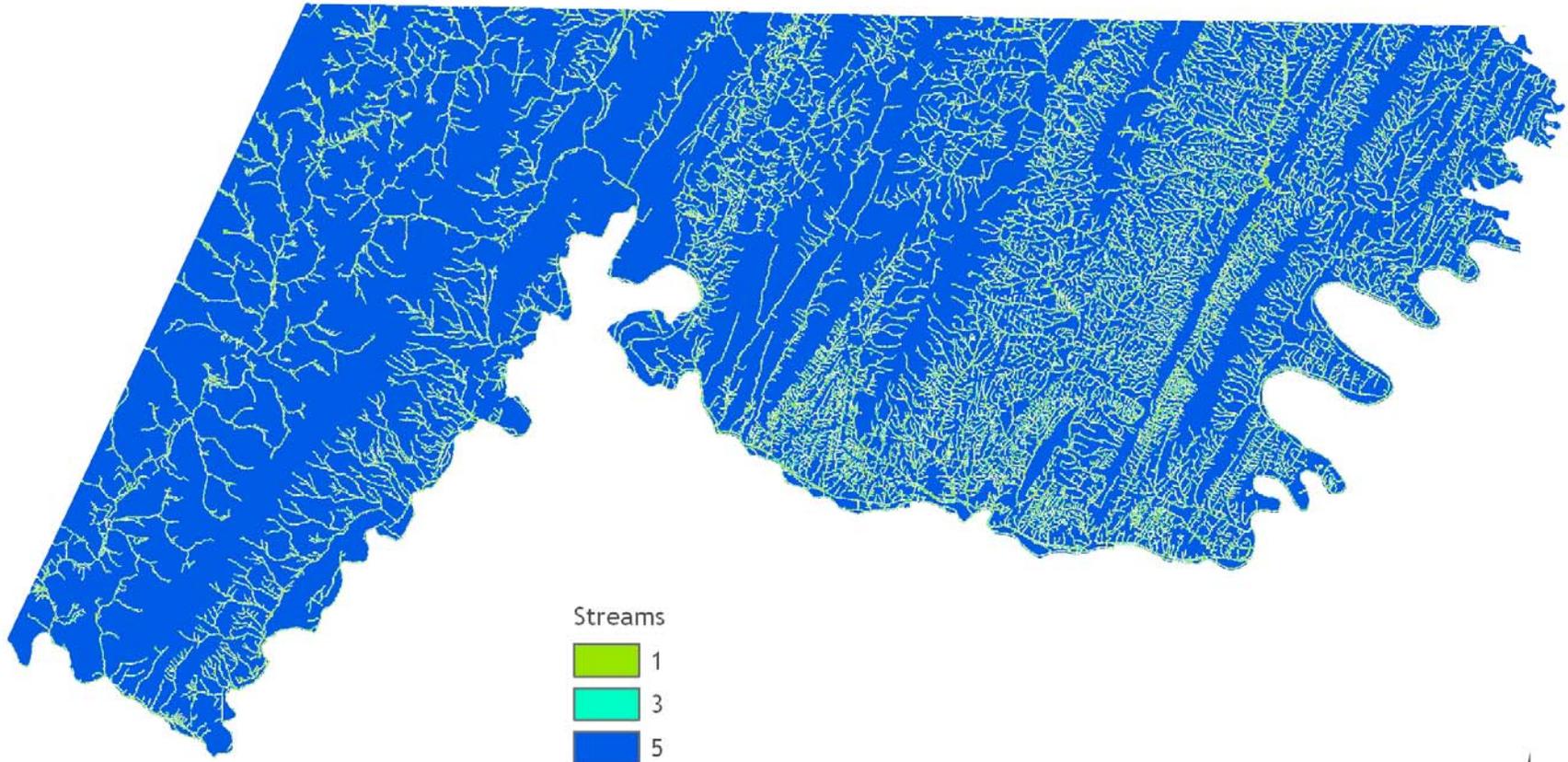
Slope
0.35

Landscape Limitations: Slope



Streams- 0.05

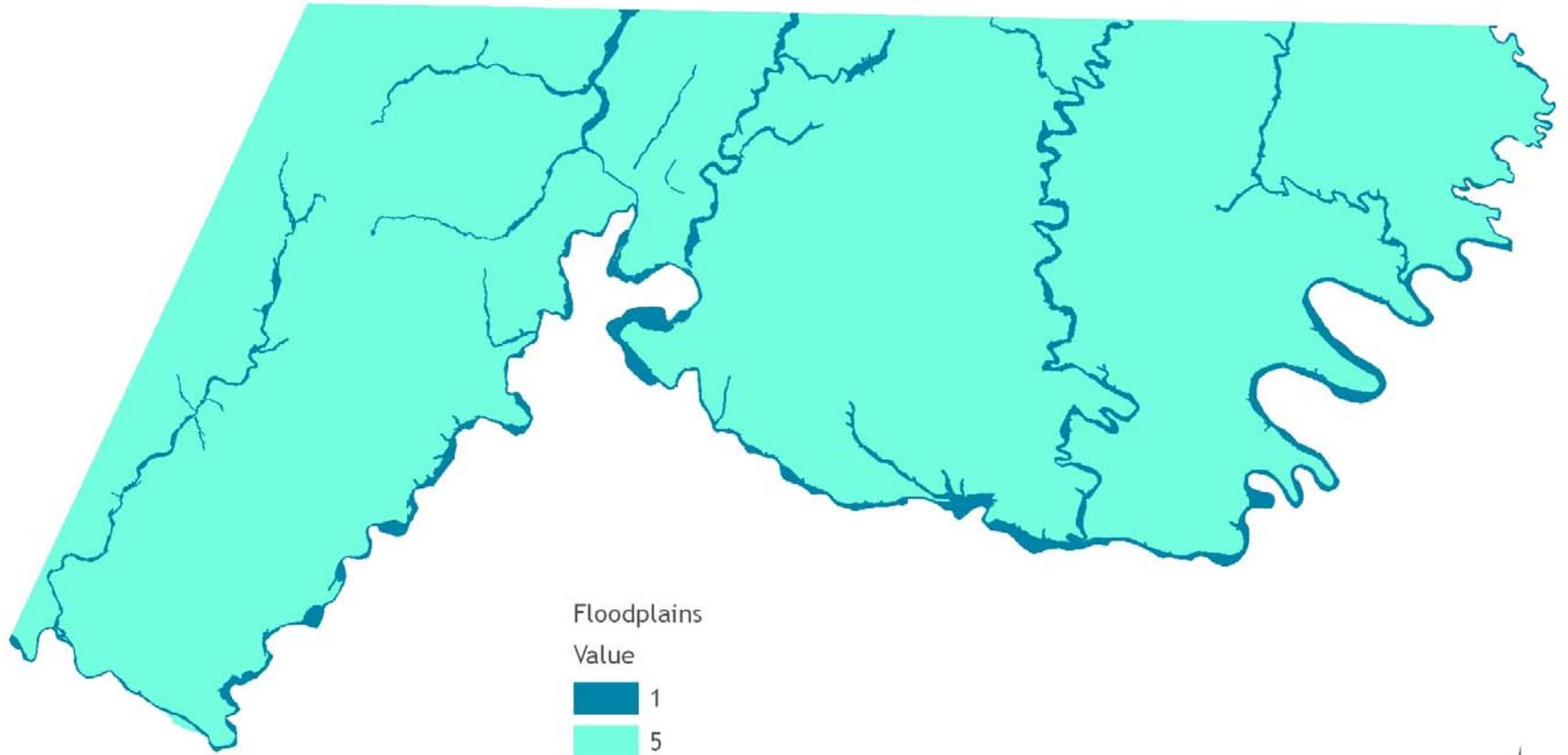
Landscape Limitations: Streams



0 5 10 Miles



Landscape Limitations: Floodplains



Floodplains
0.05

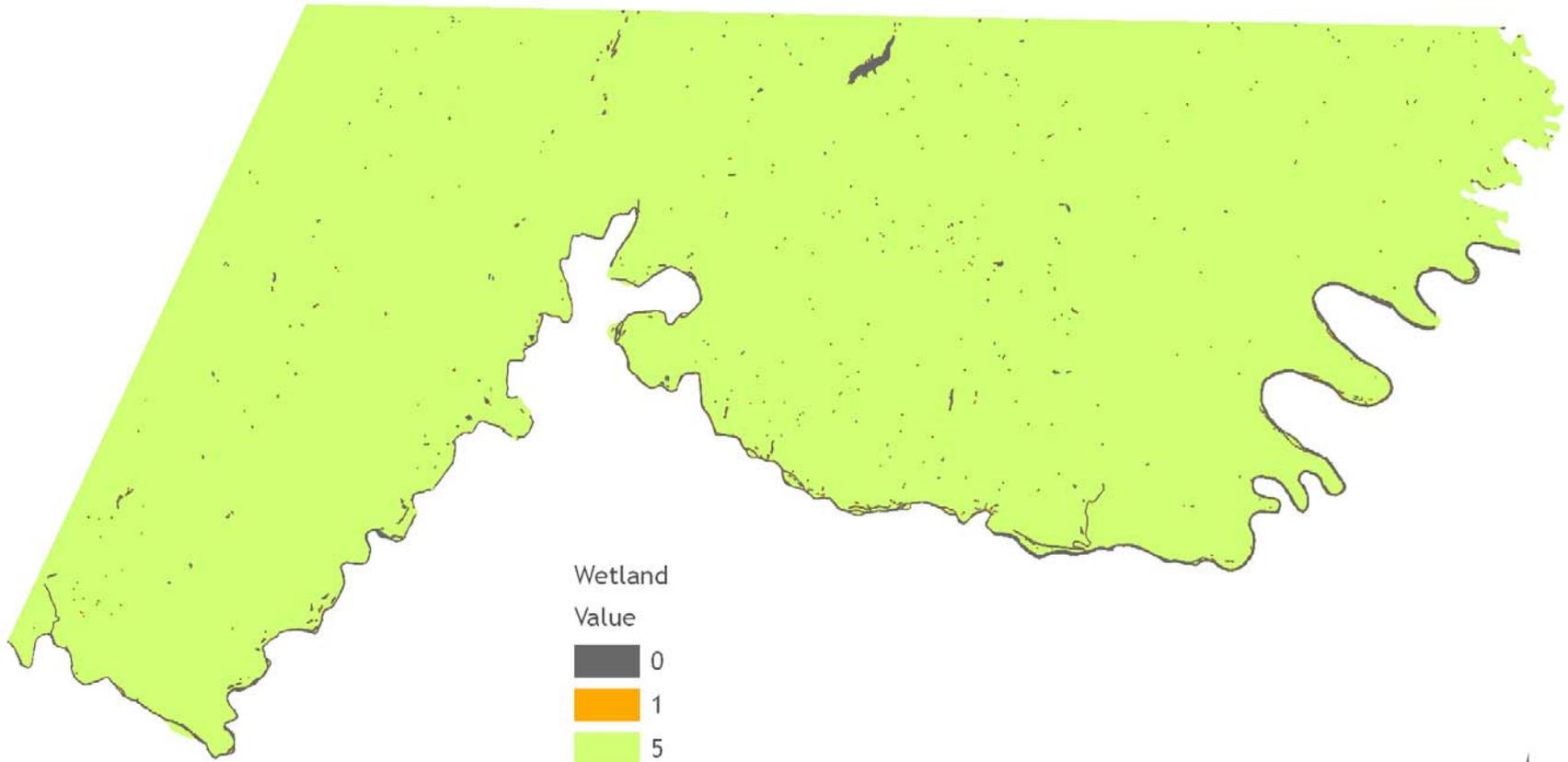
0 5 10 Miles



Wetlands

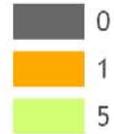
0.05

Landscape Limitations: Wetlands



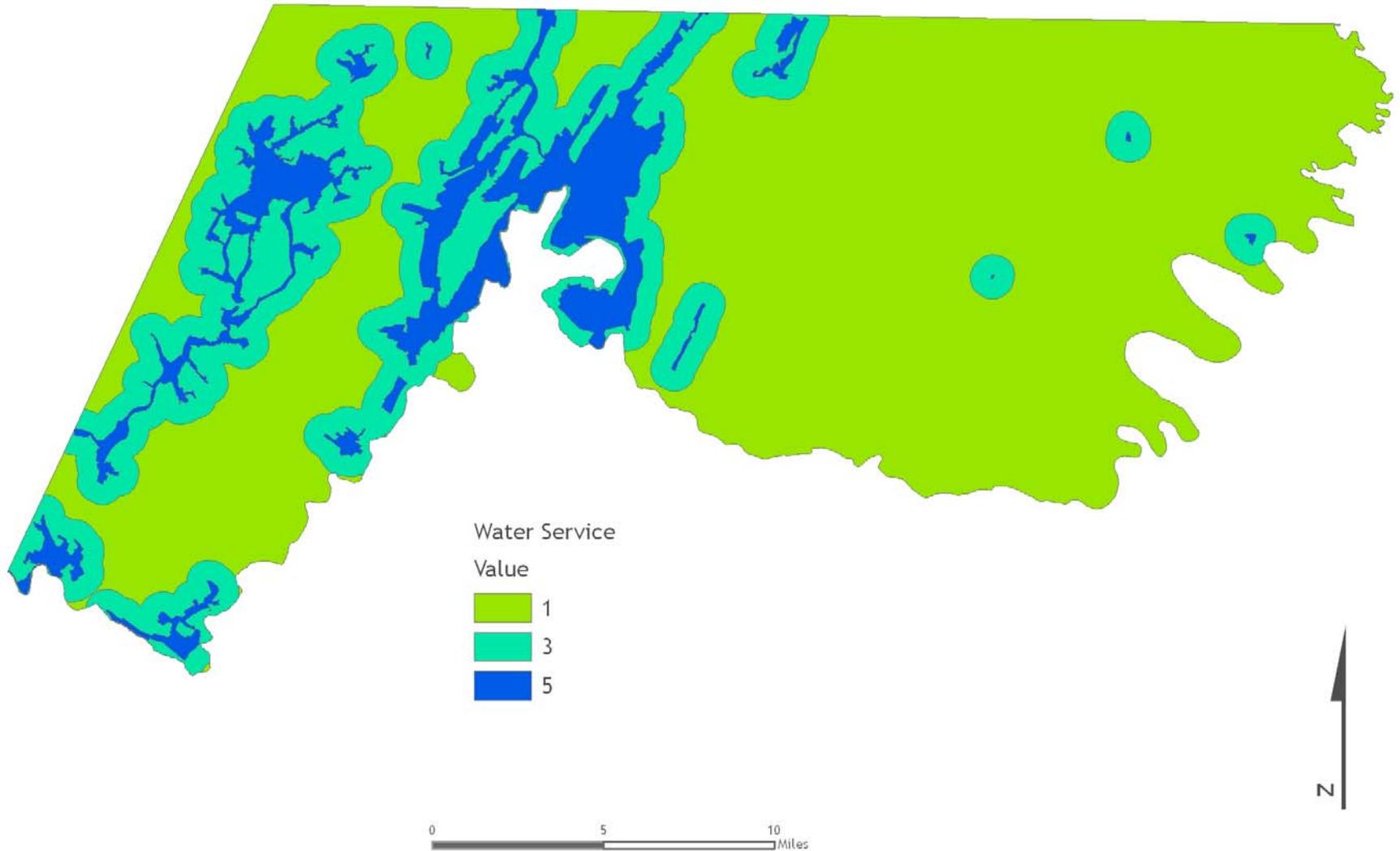
Wetland

Value



Water Service - 0.30

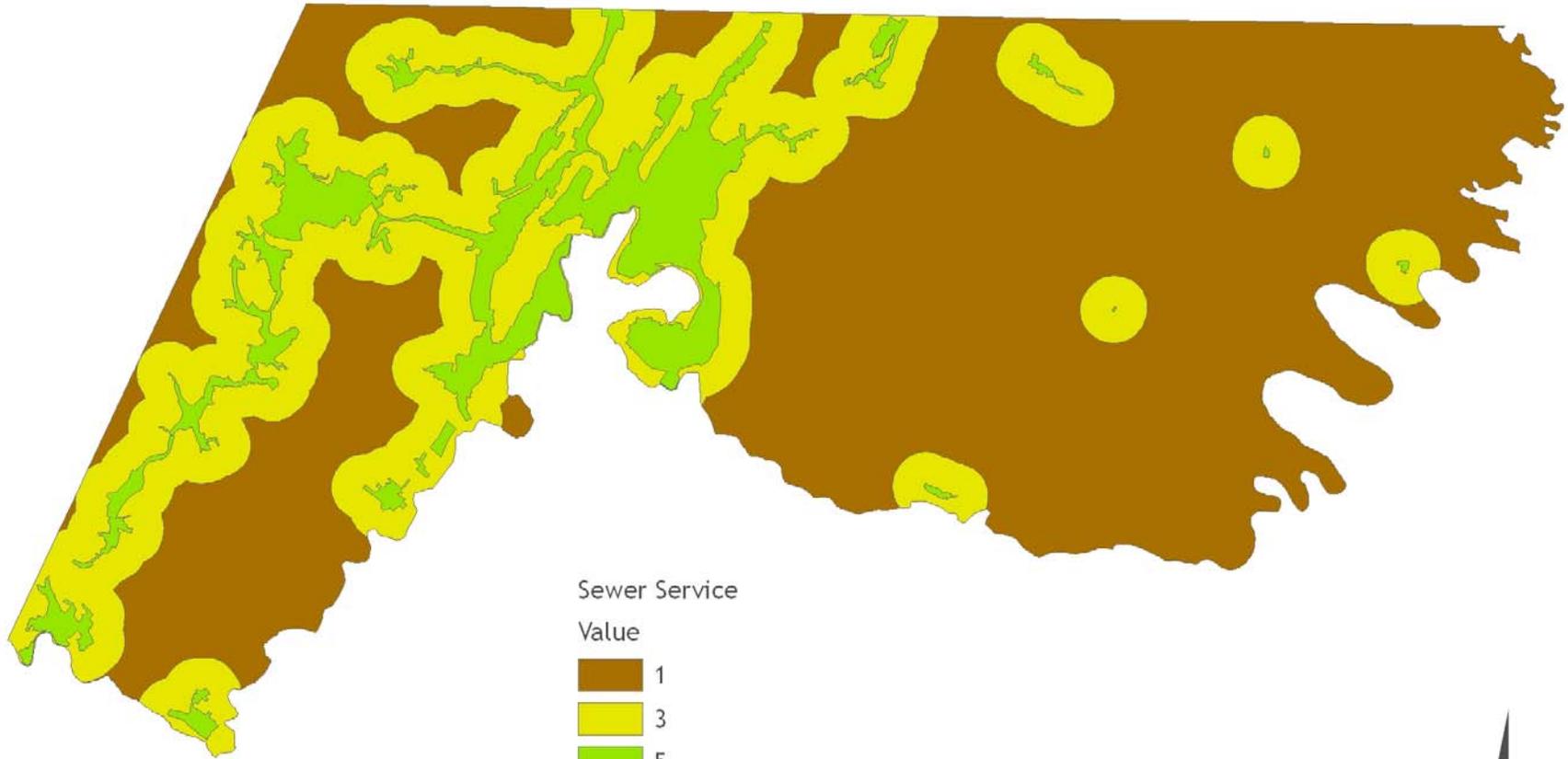
Infrastructure Constraint: Water Service



Sewer Service

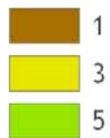
0.30

Infrastructure Constraint: Sewer Service



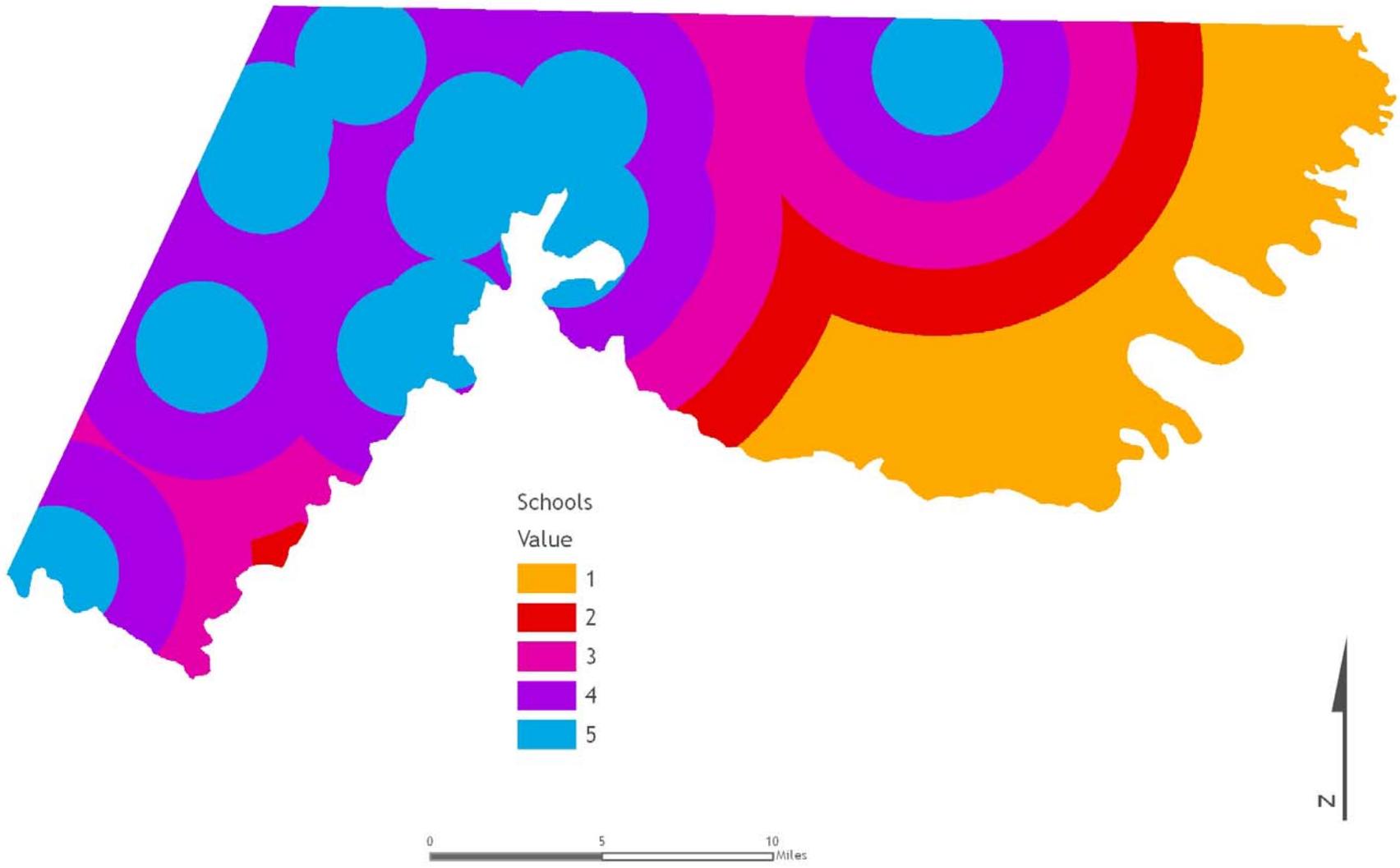
Sewer Service

Value



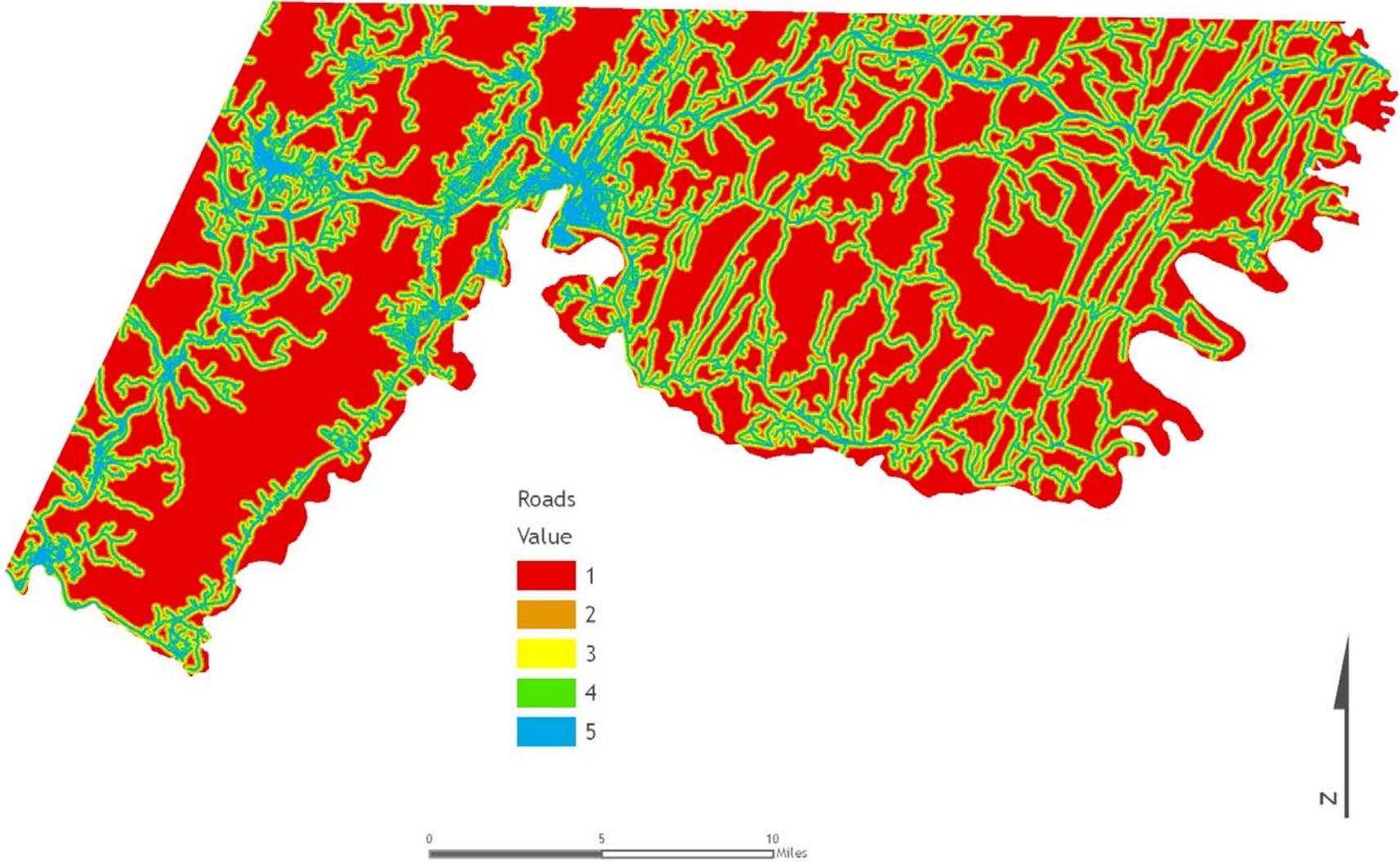
Schools - 0.10

Infrastructure Constraint: Schools



Roads - 0.25

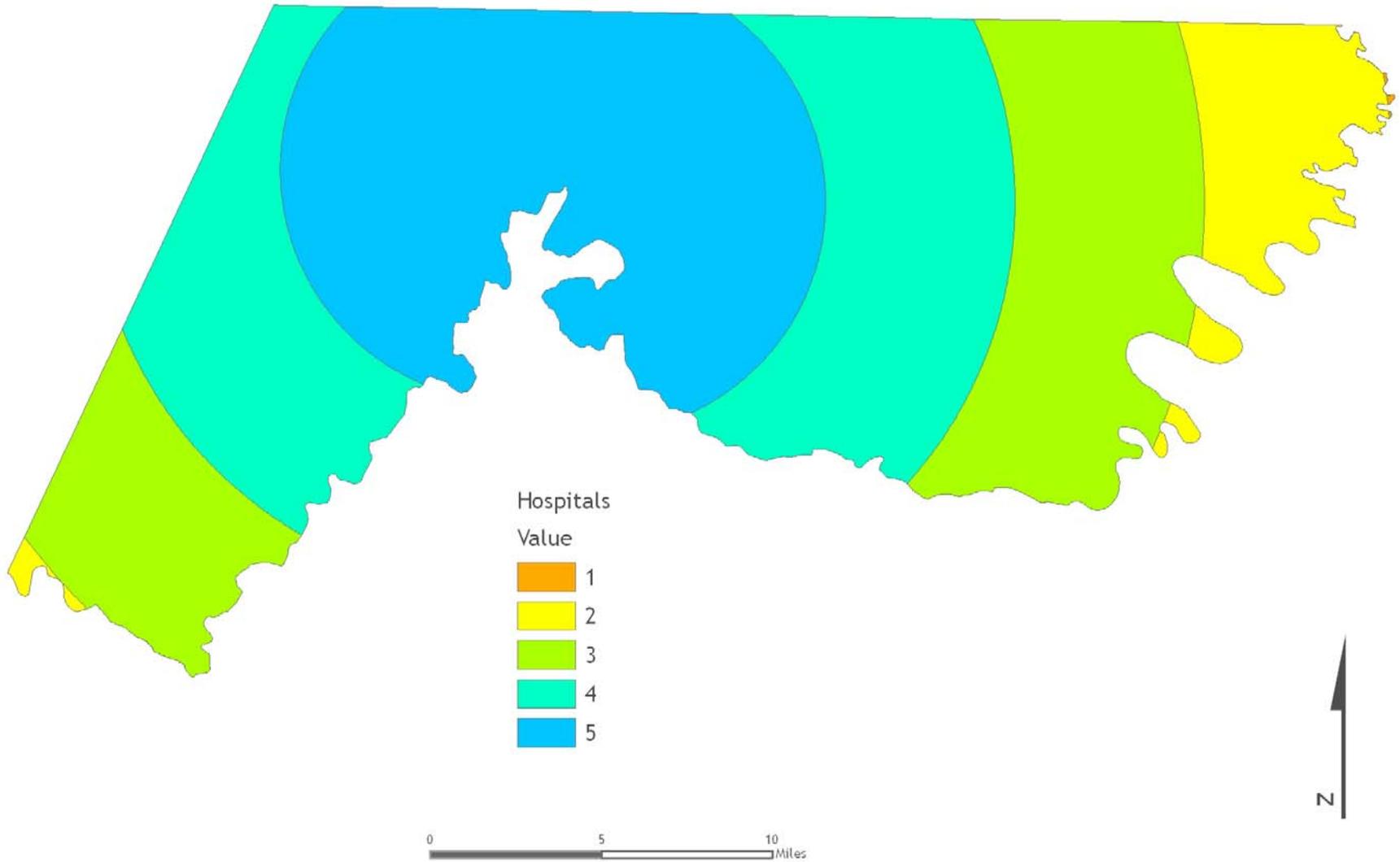
Infrastructure Constraint: Road Access



Hospitals

0.05

Infrastructure Constraint: Hospitals



Methodology

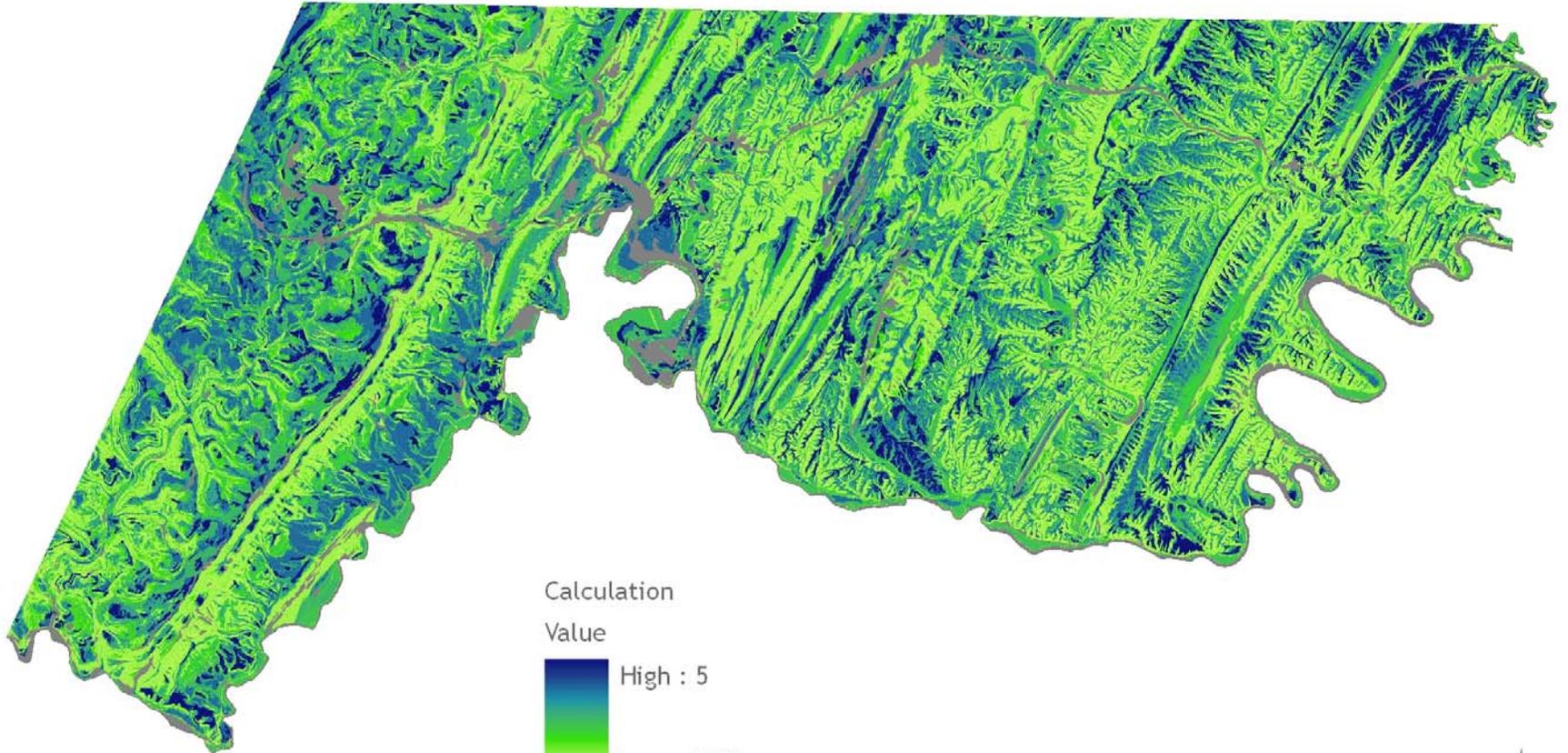
Landscape Limitations	Weight	Infrastructure Constraints	Weight
Soils	0.50	Water Service	0.30
Slope	0.35	Sewer Service	0.30
Streams	0.05	Roads	0.25
Floodplains	0.05	Schools	0.10
Wetlands	0.05	Hospitals	0.05

$$\sum_{i=0}^k \text{Class}_i \cdot \text{Weight}_i$$

Where

class_i = feature class
weight_i = feature weight

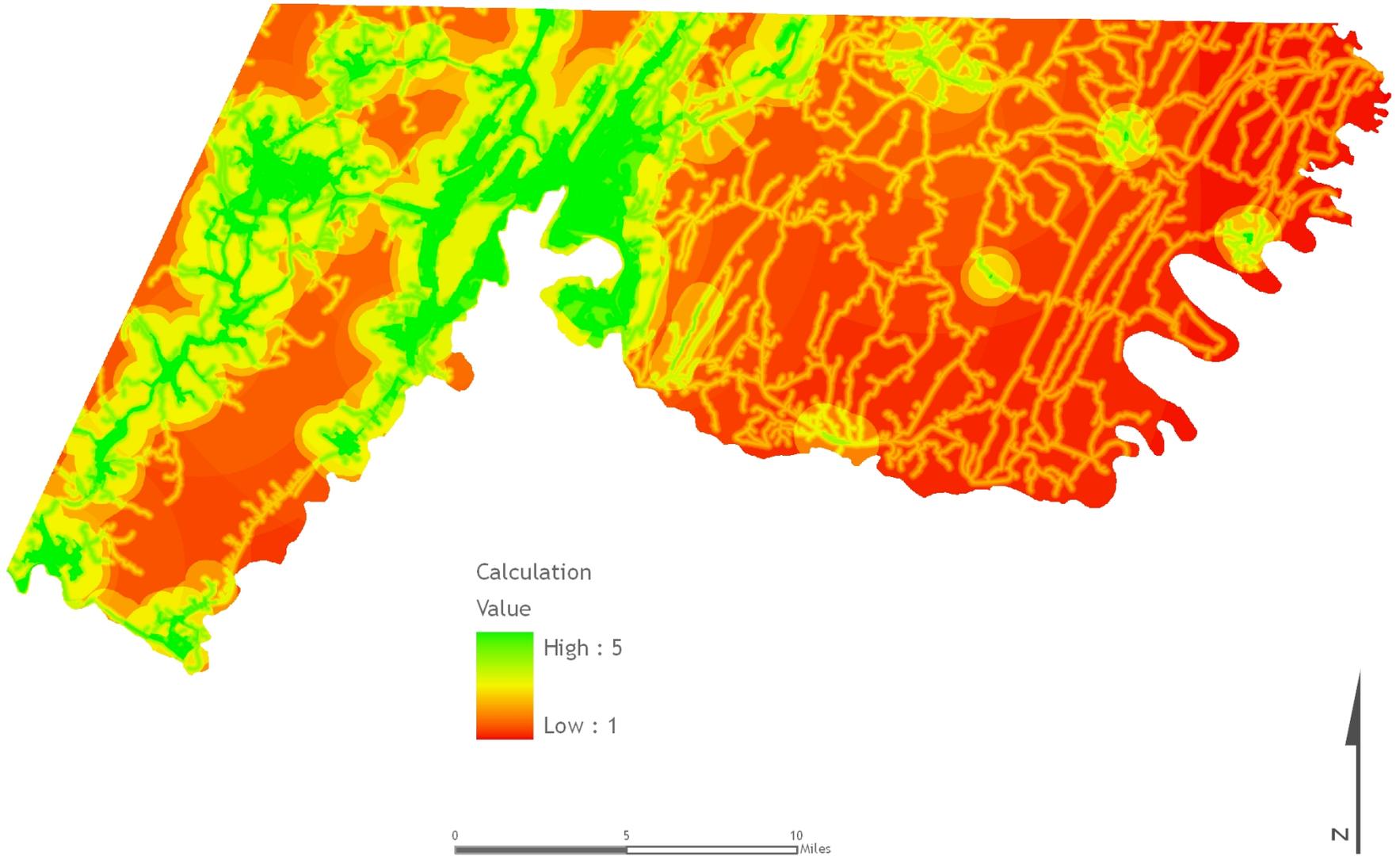
Results: Landscape Limitations



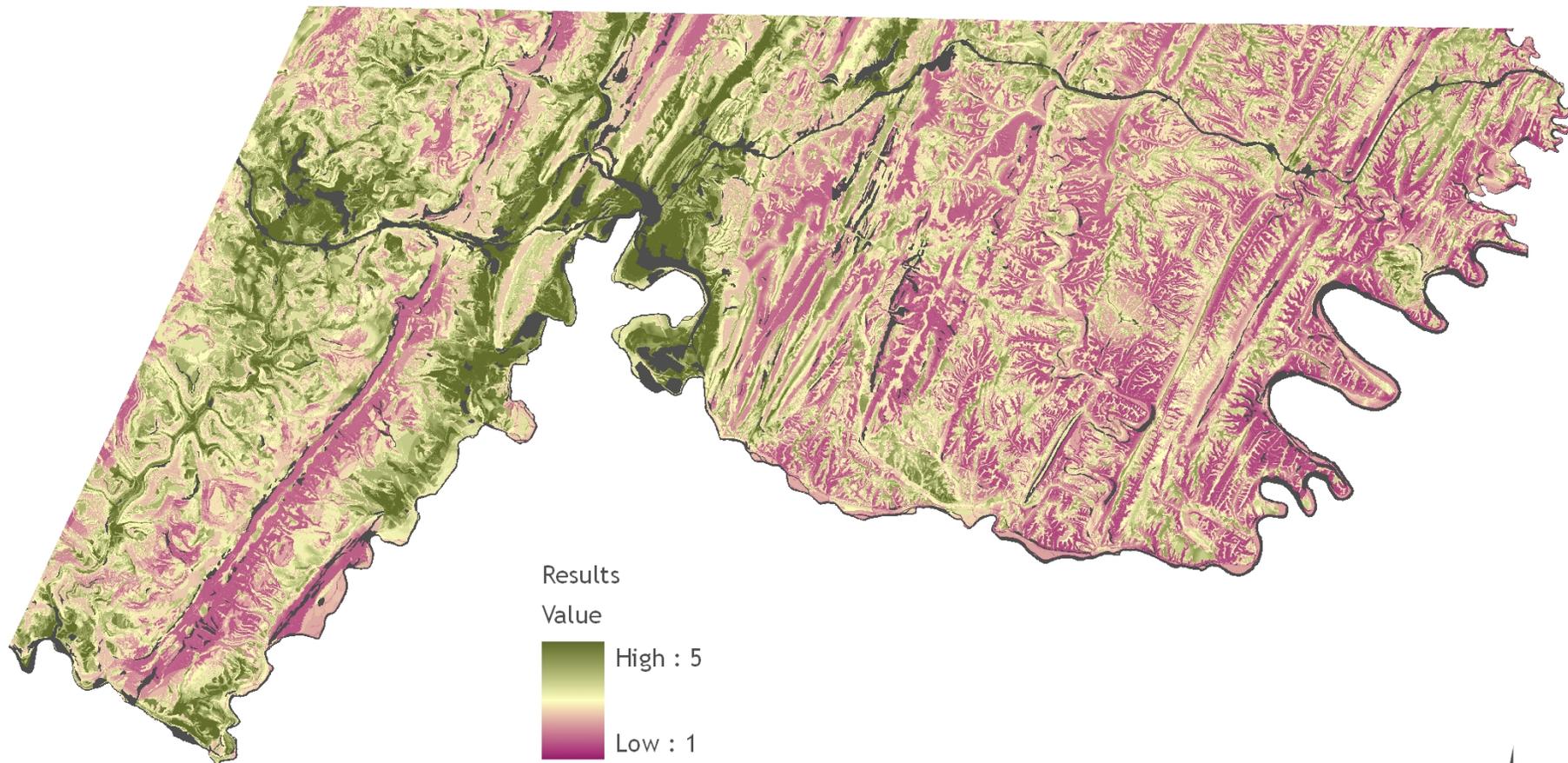
0 5 10 Miles



Results: Infrastructure Constraints



Final Results



Results
Value
High : 5
Low : 1

0 5 10 Miles



Results

Final Results Map Classification

Natural Breaks (Jenks)

Class	Values	Acres	% of County
0	0/null	15350.16	5.6
1	1 - 1.184	60668.25	22.2
2	1.841 - 2.47	74729.50	27.3
3	2.471 - 3.07	62076.76	22.7
4	3.071 - 3.82	43727.46	16.0
5	3.821 - 5	17176.57	6.3

* only 2.4% of the County's prime land remains undeveloped



Conclusion

- Valuable planning tool
- Encourage thoughtful and informed decision making to make best use of land
- Areas with lacking infrastructure but few landscape limitations have been identified for potential future demand
- Identify & protect lands not suitable for development
- Advanced analysis for a rural county

