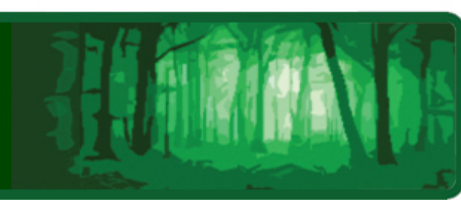




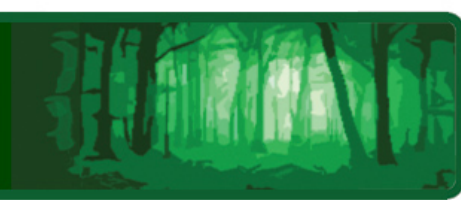
WATERSHED RESOURCES REGISTRY



*Introductory Workshop, October 16th and 17th 2014*

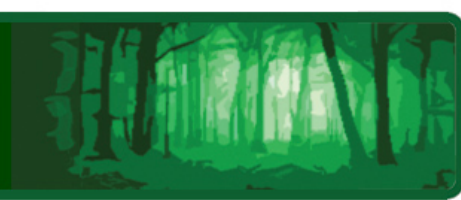
Ellen Bryson  
USACE, Baltimore District  
Baltimore, MD

# **GIS UNDERPINNINGS**



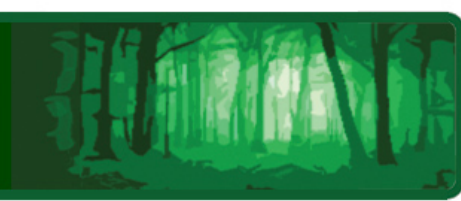
# Goals of GIS Presentation

- Provide an understanding of how GIS was used to create the eight suitability analyses
- Present findings outside the web site—so you can see them in isolation
- Discuss the limitations of the GIS analyses



# What is a GIS

- GIS is Geographic information system
- Contains tabular data, spatial data, satellite imagery, aerial imagery and other information in a single system
- Spatial information—where features are on the earth's surface, along with descriptive information about the features
- A means to look at information about the earth in an integrated fashion
- Supports sophisticated analysis, including suitability analysis



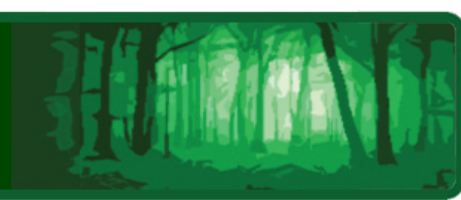
# Goals of the Eight GIS Analyses

- To find and score areas opportunity areas
- Opportunity: a place where some specific action beneficial to the resource, watershed, or environment might be undertaken
- Examples:
  - find mitigation sites for a transportation project impacts
  - find areas to create riparian buffer zones
  - evaluate which of three proposals has least impact
  - find areas to re-create a former wetland
  - find areas to construct new stormwater management system or degraded infrastructure systems



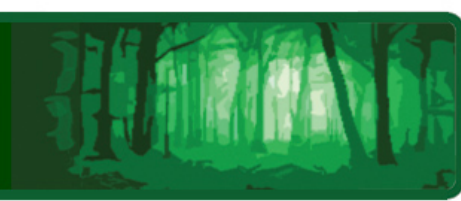
# Eight 'Desirability' Analyses

- Preserve Wetlands
- Restore Wetlands
- Preserve Riparian Zones
- Restore Riparian Zones
- Preserve Uplands
- Restore Uplands
- Preserve Healthy Stormwater Systems
- Restore Degraded Stormwater Infrastructure Systems and Areas



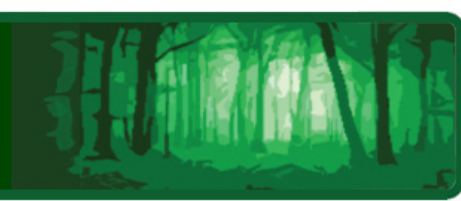
# Suitability Analysis

- Well known, generic term used in GIS for a specific type of analysis
- Better term as used in the WRR might be 'desirability analysis'



## Suitability Analysis: Similar to Searching for a New Home

Absolute Factors	Relative Factors
<p data-bbox="121 686 658 782">Must be in a specific school district</p> <p data-bbox="121 858 542 901">Must be under \$300k</p> <p data-bbox="121 976 596 1072">Must have at least three bedrooms</p>	<p data-bbox="855 708 1296 751">Would like a two-story</p> <p data-bbox="855 843 1595 886">Would like it within 1,000 feet of park</p> <p data-bbox="855 979 1727 1093">Would like it within 10-minute drive to train, 5-minutes from a grocery store, etc.</p>



# WRR Factors

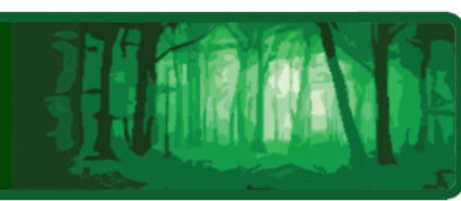
- Decided upon by WRR Technical Advisory Committee
- Partners included USACE, EPA, MD SHA, MD DNR, MDE, US FWS, FHA and others
- Identified land characteristics or qualities that matter most for each ecological goal
- Different set of factors for each of the eight analyses
- Had to be 'mappable'





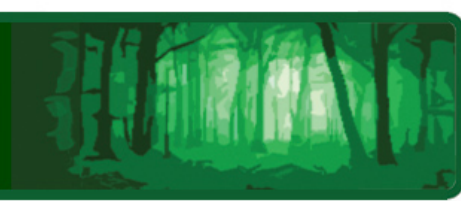
## More On WRR Factors

- Some factors were absolutes: ‘had to be a wetland’, ‘could not be a wetland’; ‘could not be in open water’;
- Some factors were relative: ‘better if a wetland’; ‘better if on poorly drained soil’; ‘better within 500 feet of water’
- No weighting across the factors – each factor contributed a maximum of one point
- Most factors were simple presence or absence: is or is not a wetland; is or is not forested; is or is not already protected



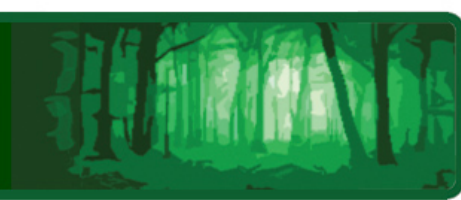
## Example : Wetland Preservation

Absolute Factors	Relative Factors
<p>Must be a wetland Cannot already be protected</p>	<p>High Bionet Score In Blue Infrastructure In Biologic Restoration Initiative Watershed In Chesapeake Bay Critical area In Flood Plain Is Forested In Green Infrastructure Hubs and Corridors Is “Healthy” watershed Is near but not in a protected area Is a Wetland of Special State Concern Is Near but not in a stream or open water</p>



# Steps in the Analysis

- Processed all input data for overlay analysis
- Summed up (totaled) how many of the relative factors were found at each location across the state
- Removed areas that did not meet one or more of the absolute requirements
- Created regions where certain scores were concentrated, using one to five stars and 'not eligible'

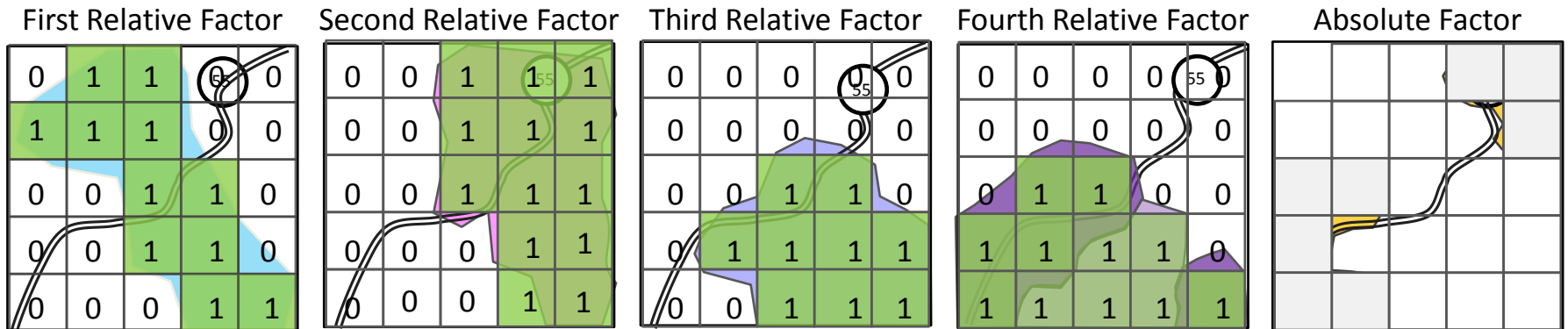


# Acquire Spatial Data

Nationally available datasets	Maryland state-specific datasets
<p>Land use / land cover</p> <p>Streams, lakes, water bodies</p> <p>NWI Wetlands mapping</p> <p>Impaired (303 d listed) streams</p> <p>Flood Plains</p> <p>Hydric soils</p>	<p>Maryland wetlands mapping</p> <p>High Bionet Score</p> <p>In Blue Infrastructure</p> <p>In Biologic Restoration Initiative Watershed</p> <p>In Chesapeake Bay Critical area</p> <p>In Green Infrastructure Hubs and Corridors</p> <p>Is “Healthy” watershed</p> <p>Is near but not in a protected area</p> <p>Is a Wetland of Special State Concern</p> <p>Is Near but not in a stream or open water</p>



## Detailed View: How It Works

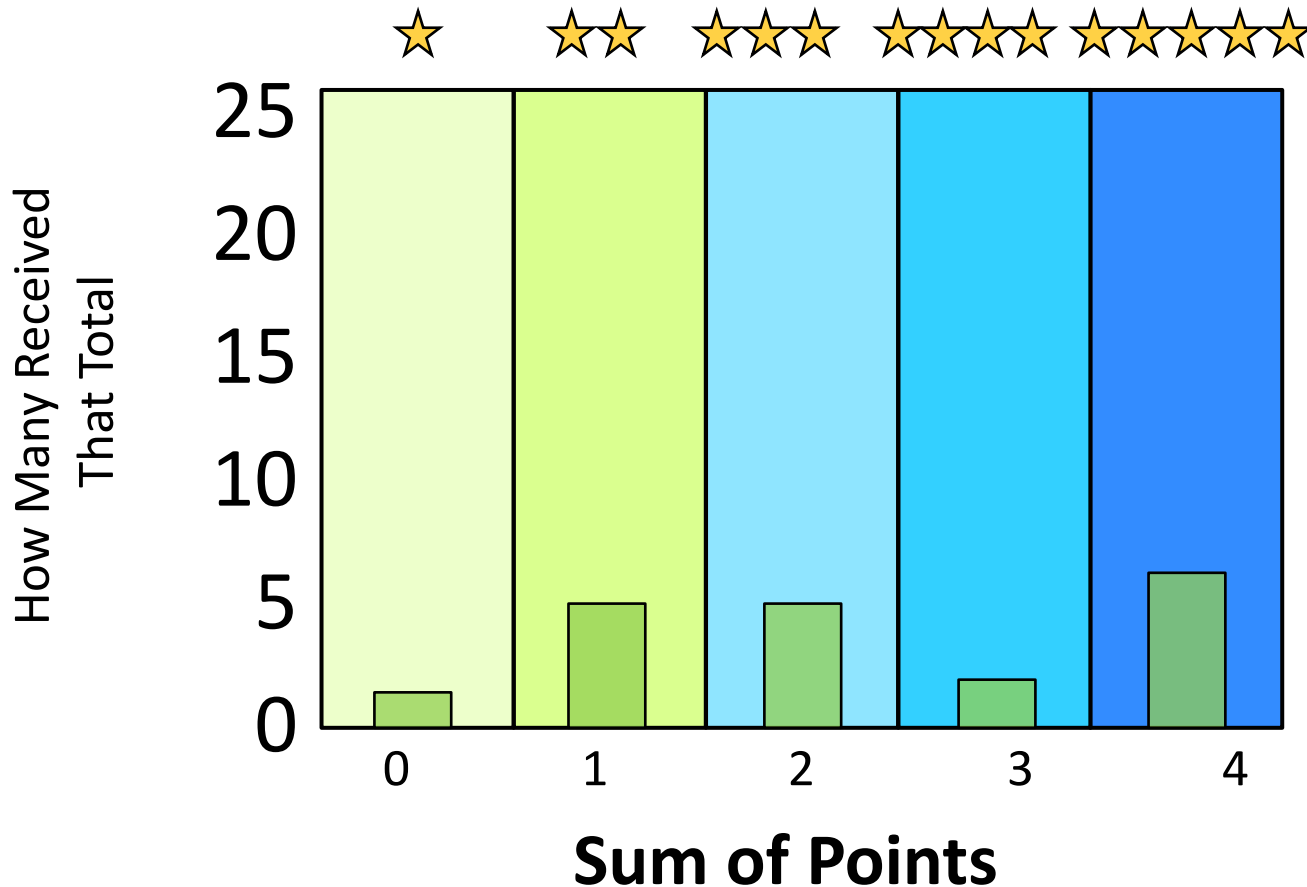


Simple Overlay:  
Sum Up All Desirable Factors  
Found in each area

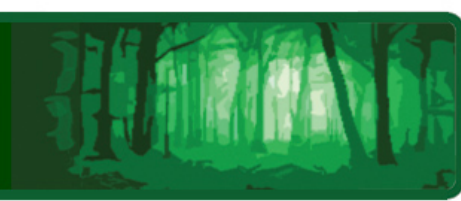
0	1	2		
1	1	2	1	
		4	3	1
	2	3	4	2
		2	4	4



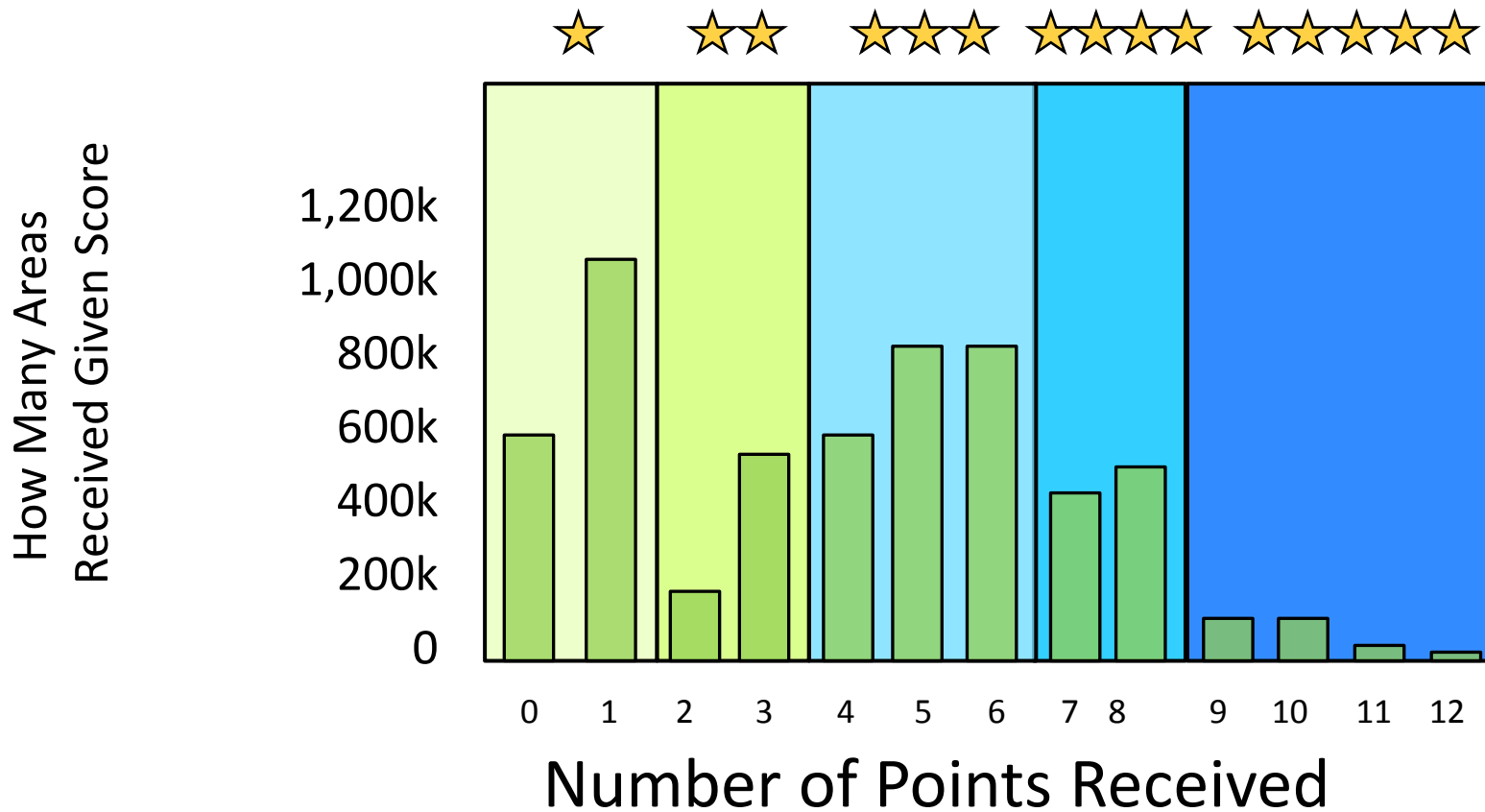
# Put In Classes of One to Five Stars



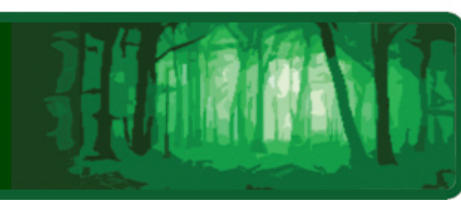
Varies from 0 to 4 in this example, which is the total number of factors in this hypothetical suitability analysis



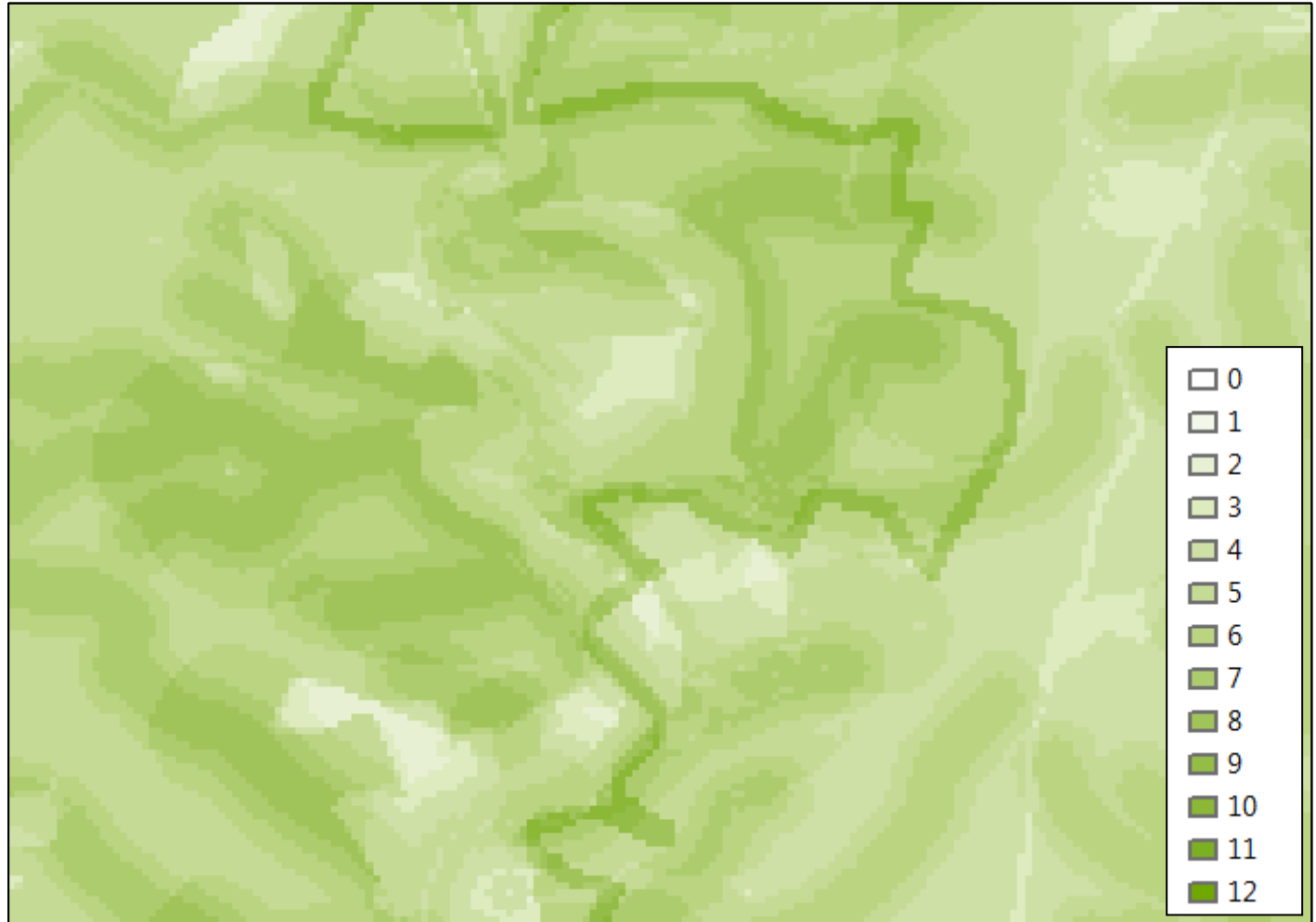
# Put Into Classes of One to Five Stars



Number varies from 0 to the maximum points observed across the State



- Summed up factors across the entire state
- Deepest green shows where the most factors were found
- White shows where none were found
- Fourteen factors, so that was the maximum score possible. But observed maximum was twelve

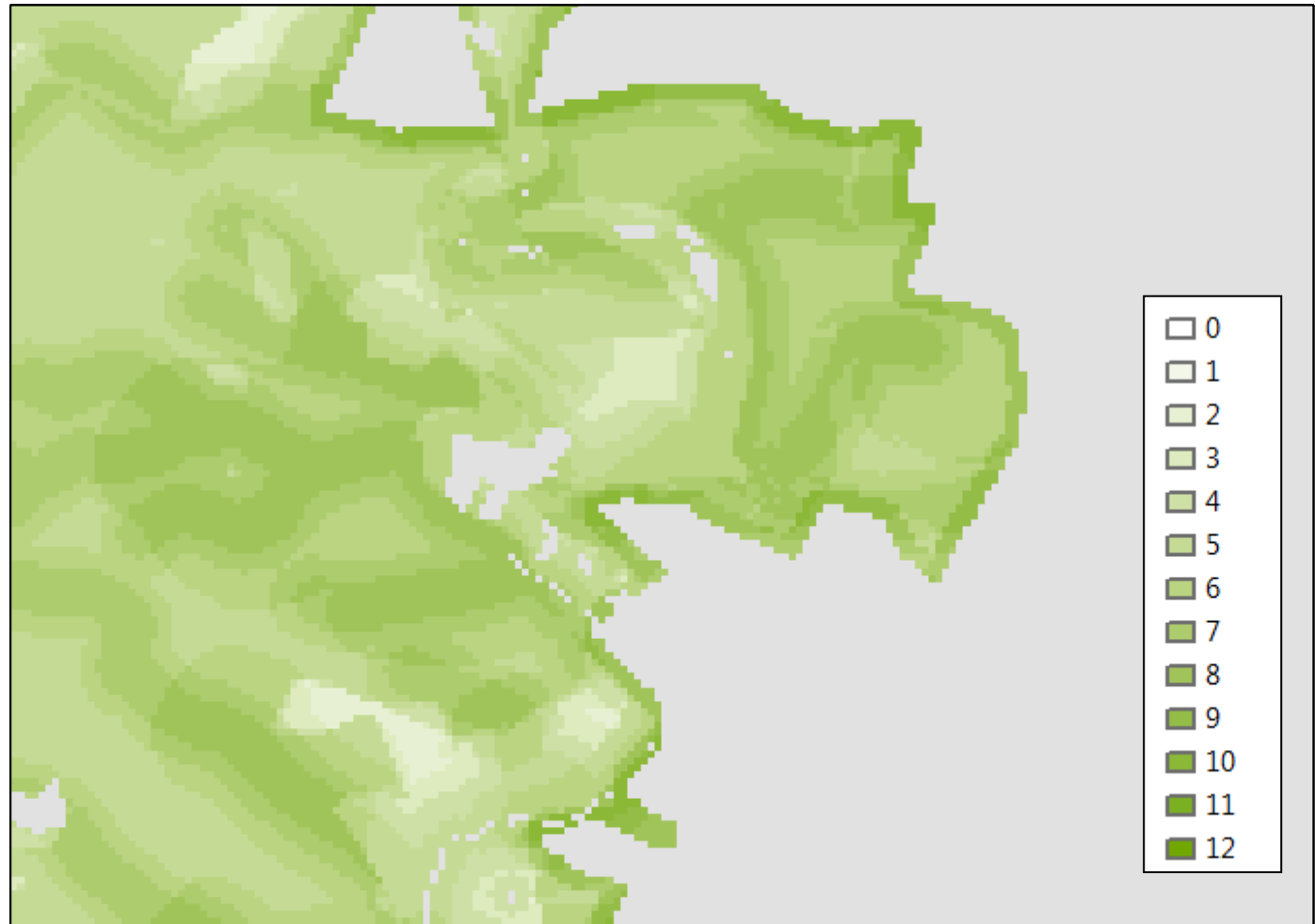




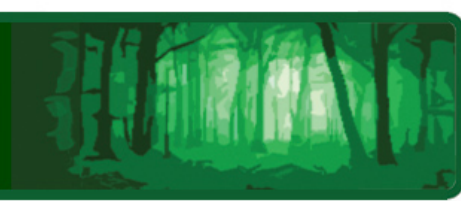


# Remove Ineligible Areas

- Areas that don't meet absolute factors are removed from consideration
- Shown in gray
- Total points received in eligible areas is not changed





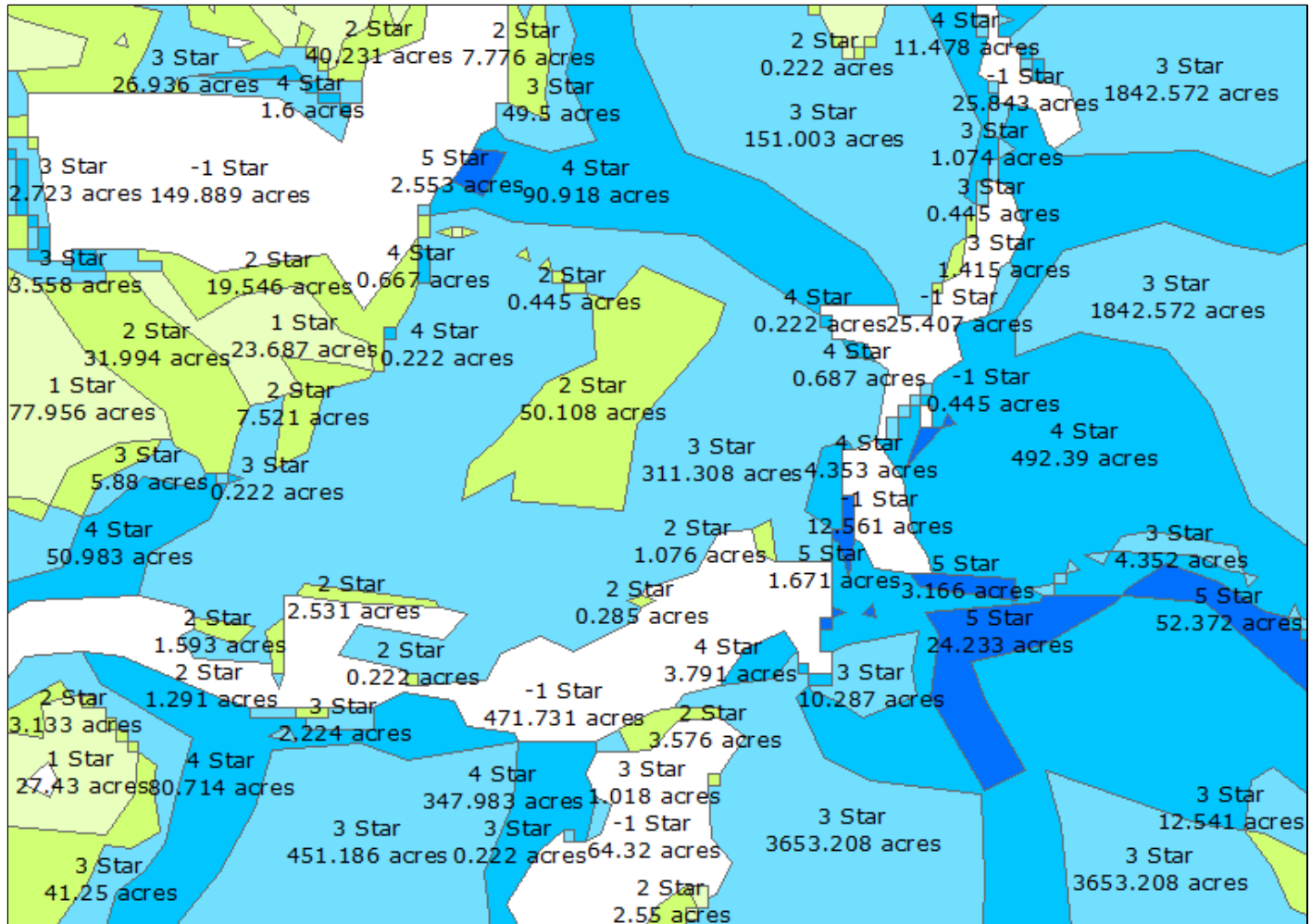


# Details of “Star” System

- All eight analyses use 1 through 5 stars
- Assignment of zone scores looked at data across entire state. Therefore, there is a 1, 2, 3, 4, and 5 star *somewhere* in the state.
- For any area smaller than the state, you might not find a five star
- Five stars is great, but one star is acceptable and might be the best achievable
- Every single point a given zone might agree with the overall score—the scores indicate that strong predominance fit that ‘star’
- Two zones might not have identical qualities but represent comparable zones
- Web site will allow you to find the *best* opportunity in your given area. The highest scoring areas for a given score will appear first.

# One Through Five Stars

- Now have zones or areas of varying sizes and scores. Zones are areas where a given score predominates
- For each opportunity zone, we have a score—one to five stars.
- Also know the size of the zone. How large is this 'opportunity'?





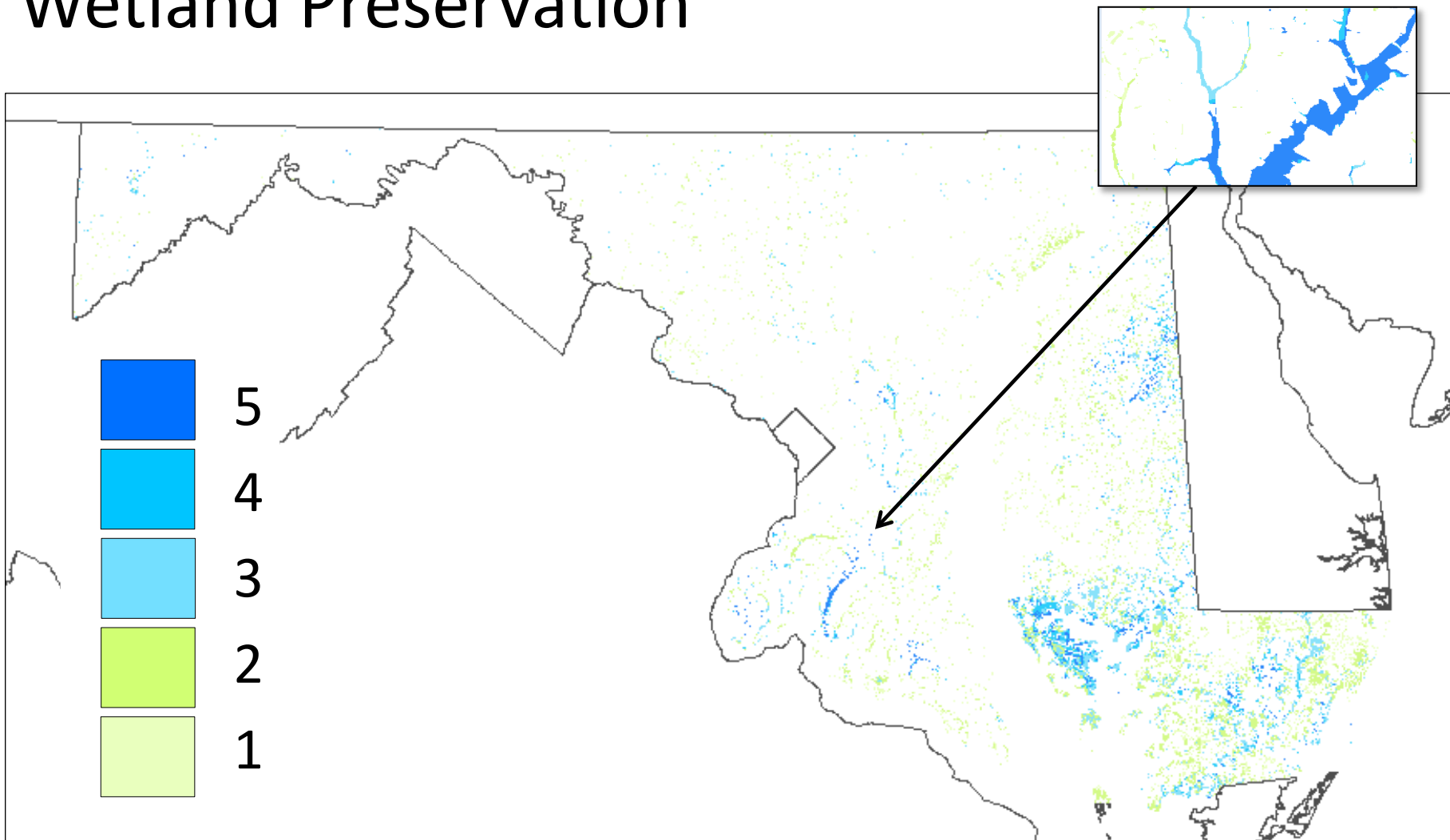
WATERSHED RESOURCES REGISTRY

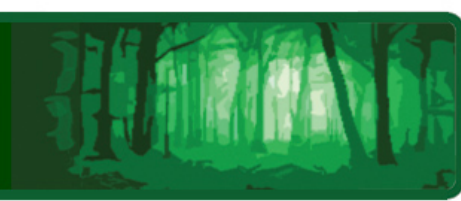


# Some Sample Findings

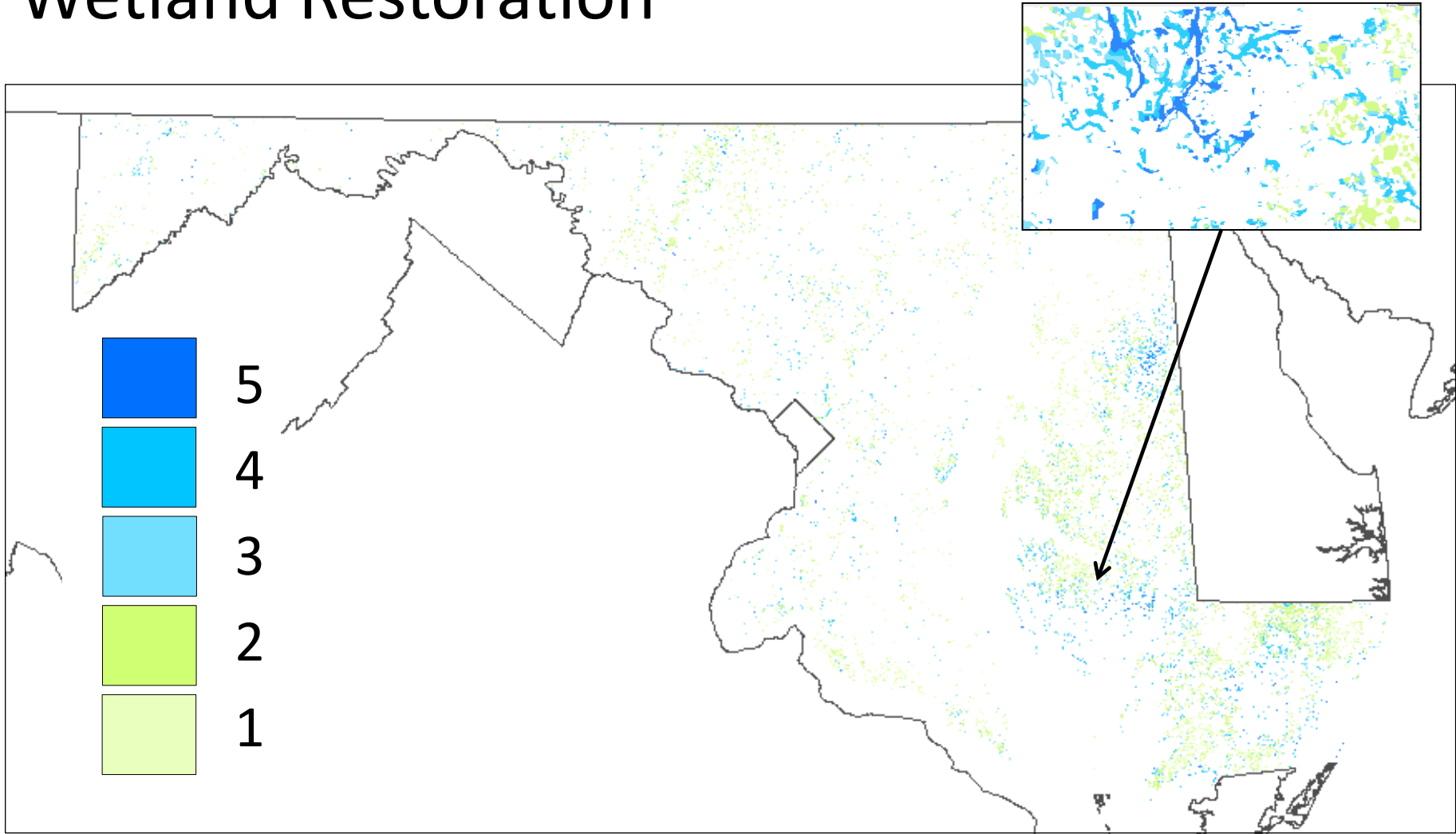


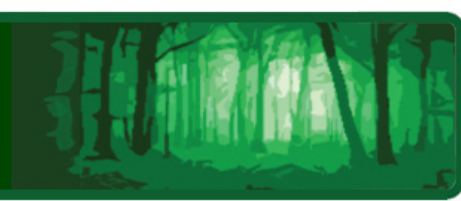
# Wetland Preservation



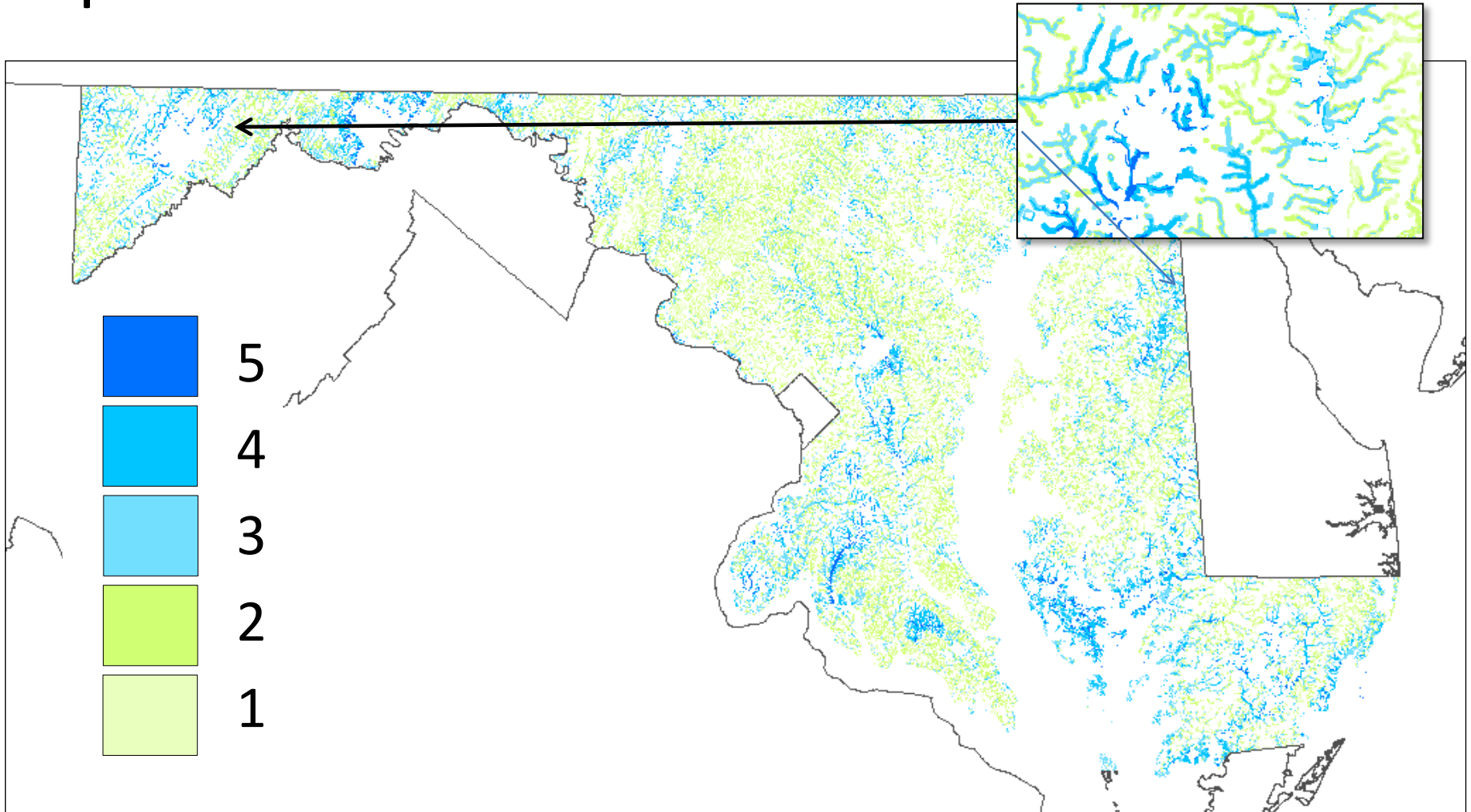


# Wetland Restoration





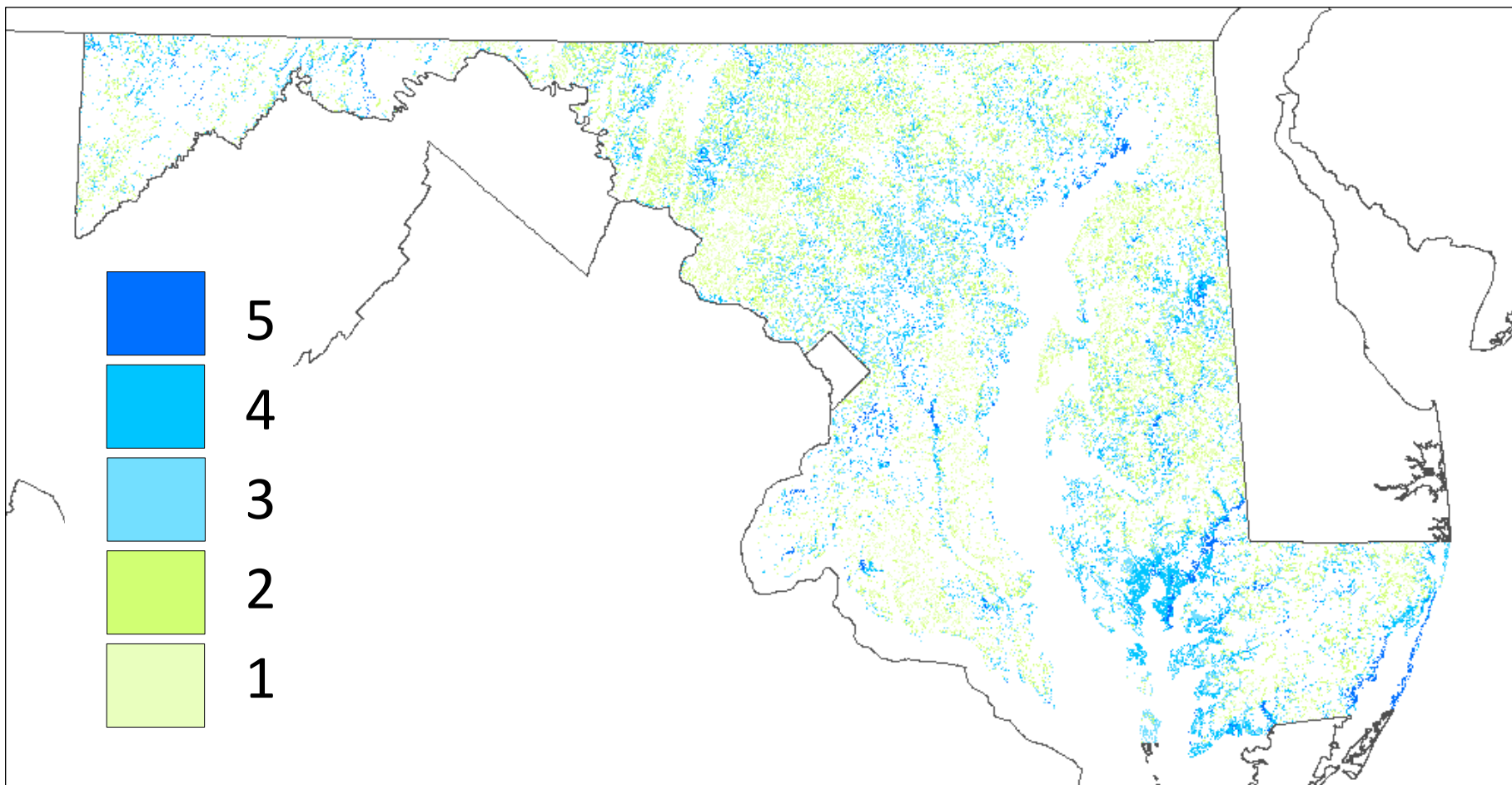
# Riparian Zone Preservation

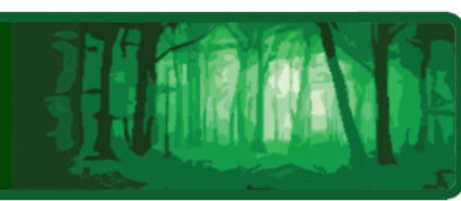




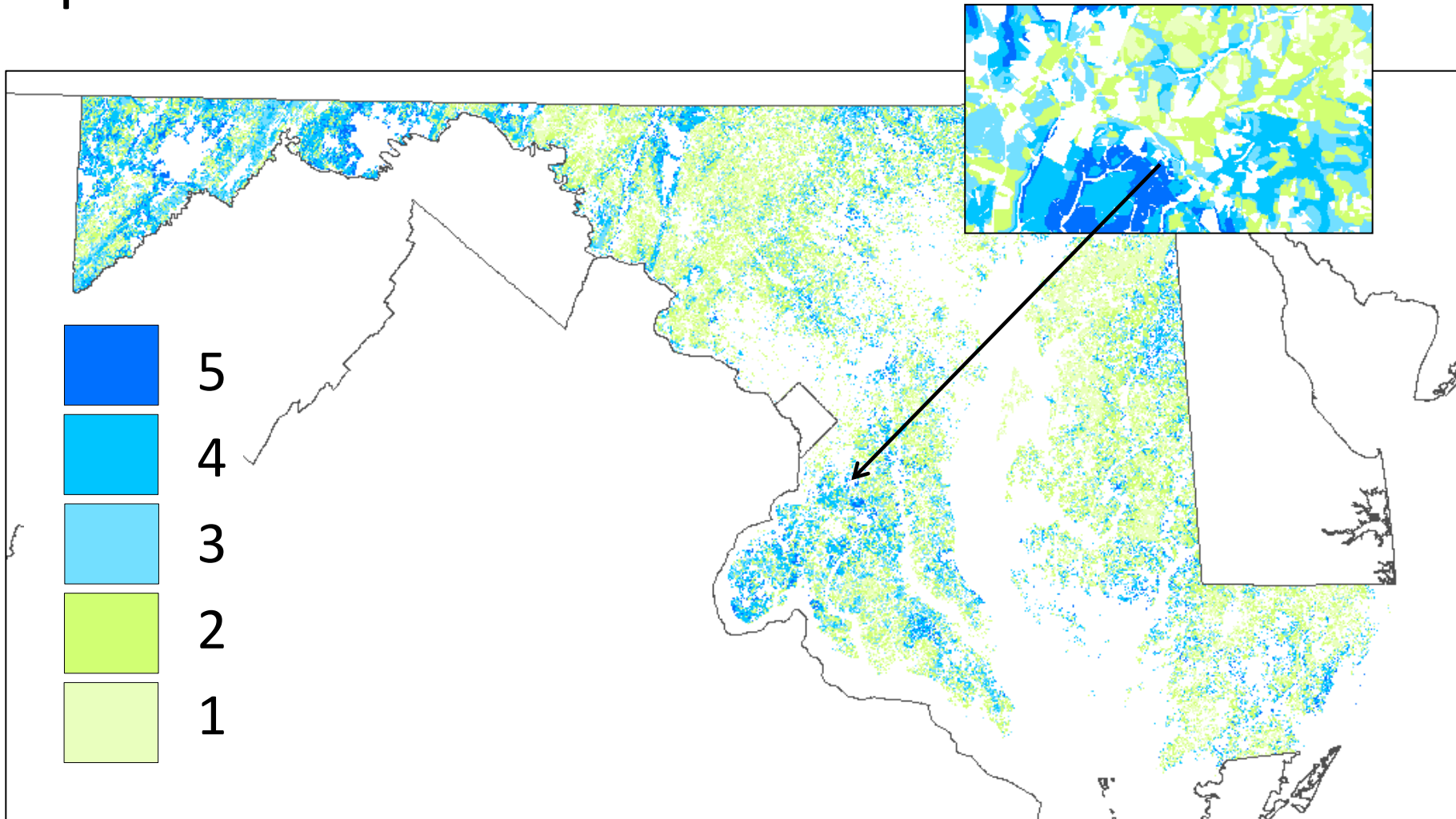


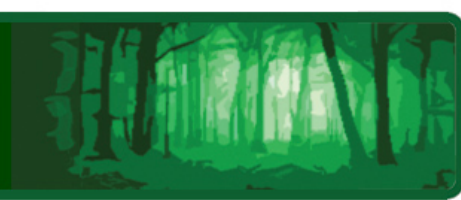
# Riparian Zone Restoration





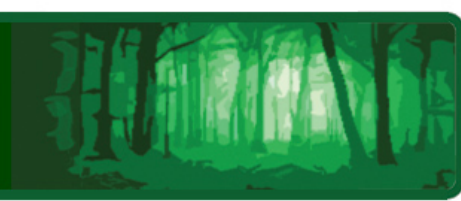
# Upland Preservation





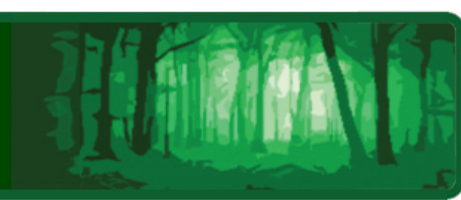
# Important Points

- The more stars the better
- Five stars is best—a really great opportunity
- But one star is not ‘bad’
- Use WRR to find the best opportunity—the highest rated area that’s big enough to meet your needs



# Potential Limitations

- Data are not perfect: errors in interpreting imagery and recording attribute data
- Some information won't be correct
  - small wetlands
  - recent land developments
  - property owners with no interest
- Resolution is about 100 feet square—not as detailed as we'd like
- Interval between data updates can be long



# Summary

- WRR finds candidate areas—good ‘neighborhoods’ in which to start looking
- Not guaranteed—need a site visit to confirm
- Other factors, like an interested property owner, are not factored in.
- Not prescriptive; project managers, applicants and others are free to reject or accept the suggested areas to search