# Interpretations:
## Inside or outside NASIS

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# Outline

- Define soil survey interpretations
- The NASIS system interpretations system
- Where can we go?
  - Other data
  - Other methods

# Soil survey interpretations

According to Charles Kellogg:

Soil survey interpretations are predictions

Soil survey interpretations are predictions of soil behavior under stated conditions, not recommendations for specific tracts. Interpretations of the soils indicate the reasonable alternatives for their use and management and the expected results. Decisions depend partly on the economic characteristics of the farm or other land tract, not simply on the physical and biological environment.

"Soil Interpretation in the Soil Survey" C. Kellogg, 1961

**We cannot predict the behavior of individual soil characteristics since each one influences the others. We do need to study these individual characteristics, however, to help us understand the whole soil. But neither an individual soil nor a kind of soil is a simple sum of characteristics. Each is a unique combination of characteristics with many potentials for interactions resulting in a unique and predictable behavior.**

**Thus the direct predictions of soil behavior, or their implication in interpretive groupings, requires the careful synthesis of many data. This is hard work.**

"Soil Interpretation in the Soil Survey" C. Kellogg, 1961

# Introduction to Soil Survey

United States Department of Agriculture
Natural Resources Conservation Service

USDA

## Core Mission of the Soil Survey Program

- *make an inventory of the soil resources of the United States;*
- *keep the soil survey relevant to ever-changing needs*
- *interpret the information and make it available in a useful form; and*
- *promote the soil survey and provide technical assistance in its use for a wide range of community planning and resource development issues related to non-farm and farm uses.*

# Introduction to Soil Survey Interpretations

- Interpretations are predictions of soil behavior under defined conditions
- The effects of various soil properties on the proposed, narrowly defined land use are examined in detail
- The degree of limitation (or suitablity) can be estimated by determining how far an observed soil property deviates from an optimal level
- Expert knowledge from a variety of disciplines is needed to accurately predict how a soil will respond to land use  (Part 617 of the NSSH)

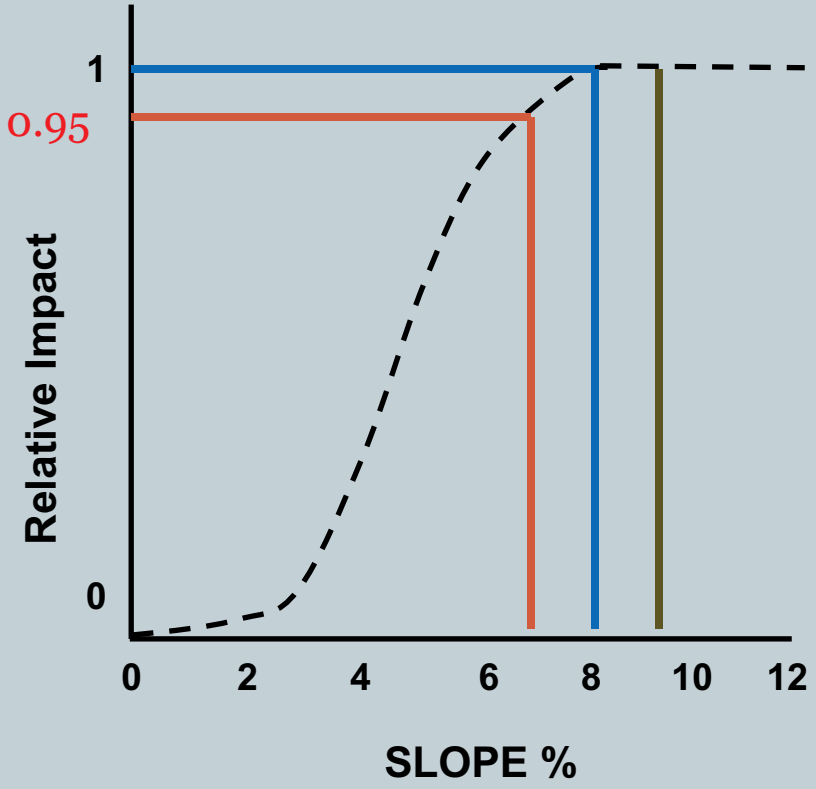
# Introduction to Soil Survey Interpretations

A “criteria table” for a home site:

| Soil property | Not limiting | Moderate limitation | Severe limitation | Limiting feature |
|---|---|---|---|---|
| Slope (%) | <3 | 3 to 30 | >30 | Too steep |
| Depth to water table (cm) | > 150 | 100 to 150 | <100 | Too wet |
| Depth to hard bedrock (cm) | >200 | 120 to 200 | <120 | Too shallow |
| Shrink-swell (%) | <2 | 2 to 8 | >8 | Too much pressure |

# NASIS Interpretations System

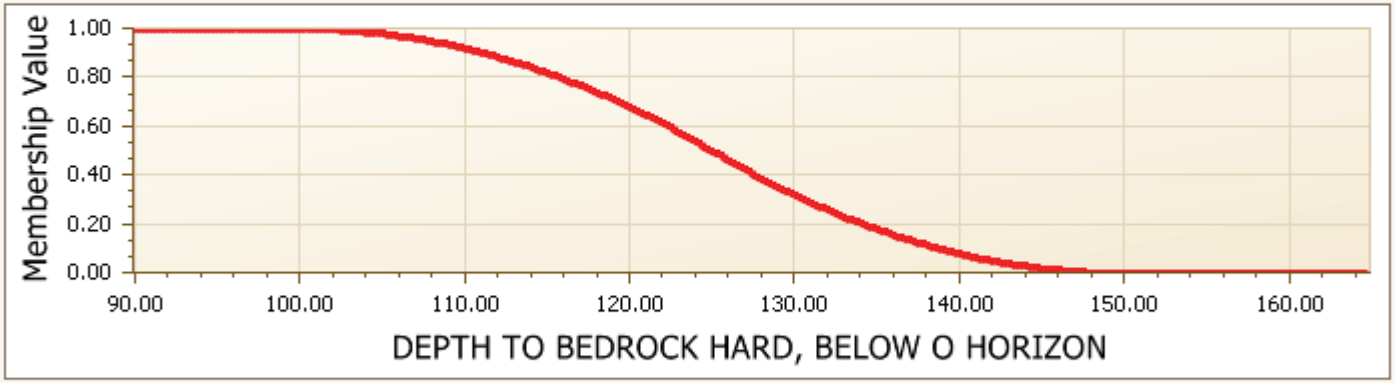
- In order to overcome the low accuracy of the three class system, we use a graph to depict the impact of a soil or site property on land use
- Thus, we can see that 7 percent slope is nearly "severely limited" and its relative impact is close to that of 9 percent slope



# NASIS Interpretations System

| | Low Value | High Value |
|---|---|---|
| Data | 99.9 | 149.9 |

Membership Graph

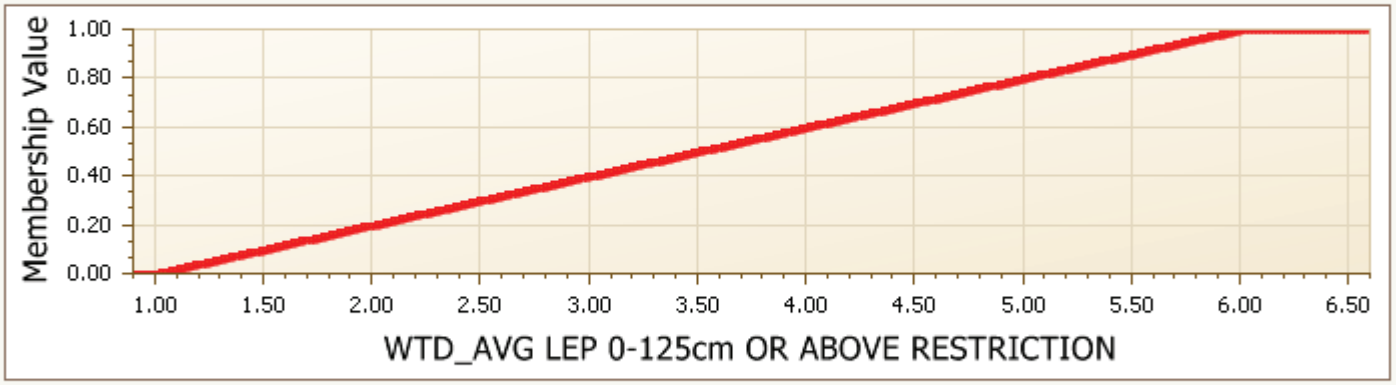



Sigmoidal Curve

# NASIS Interpretations System

| | Low Value | High Value |
|---|---|---|
| Data | 1 | 6 |

Membership Graph

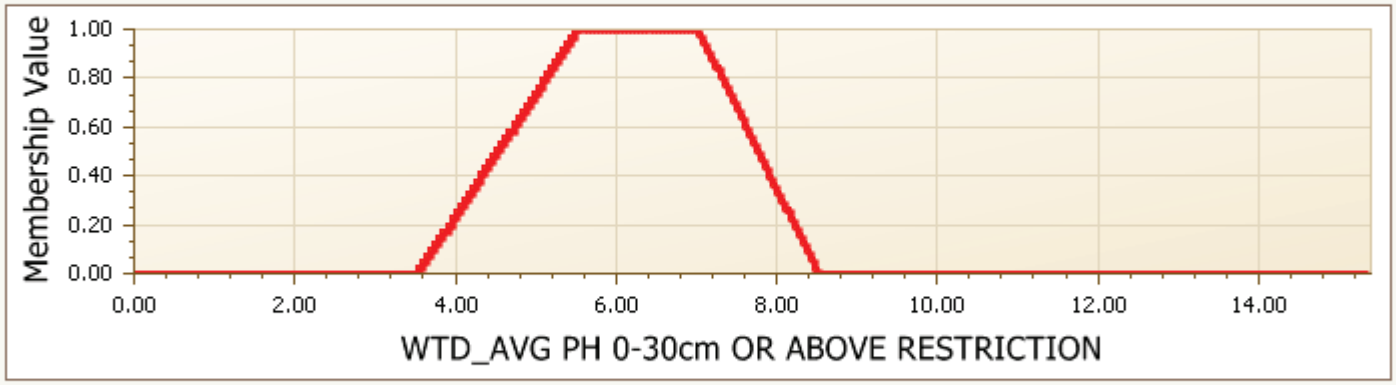



Linear

# NASIS Interpretations System

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X Value | 0 | 3.5 | 5.5 | 7 | 8.5 | 14 | | | | | | | | | | | | | | | | | | | |
| Y Value | 0 | 0 | 1 | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | |

Membership Graph

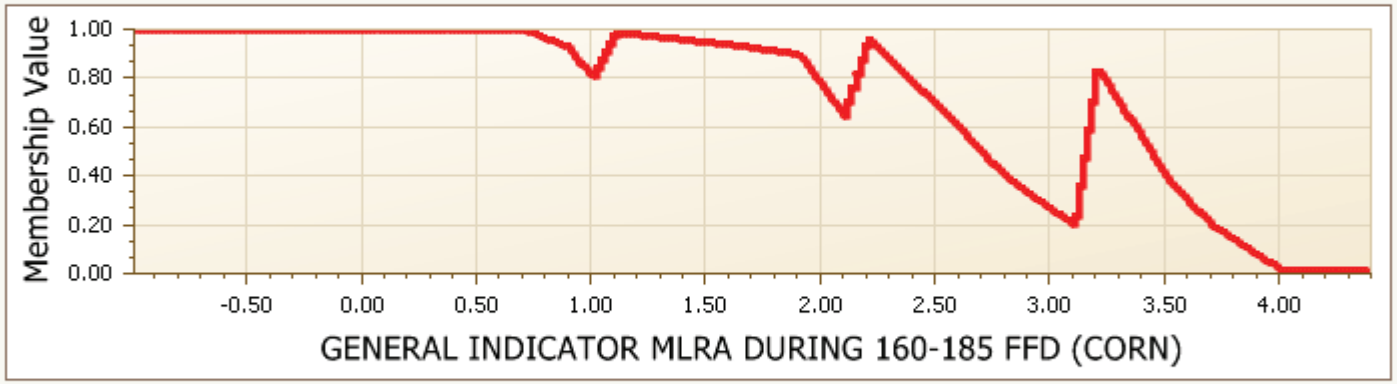



Trapezoid

# NASIS Interpretations System

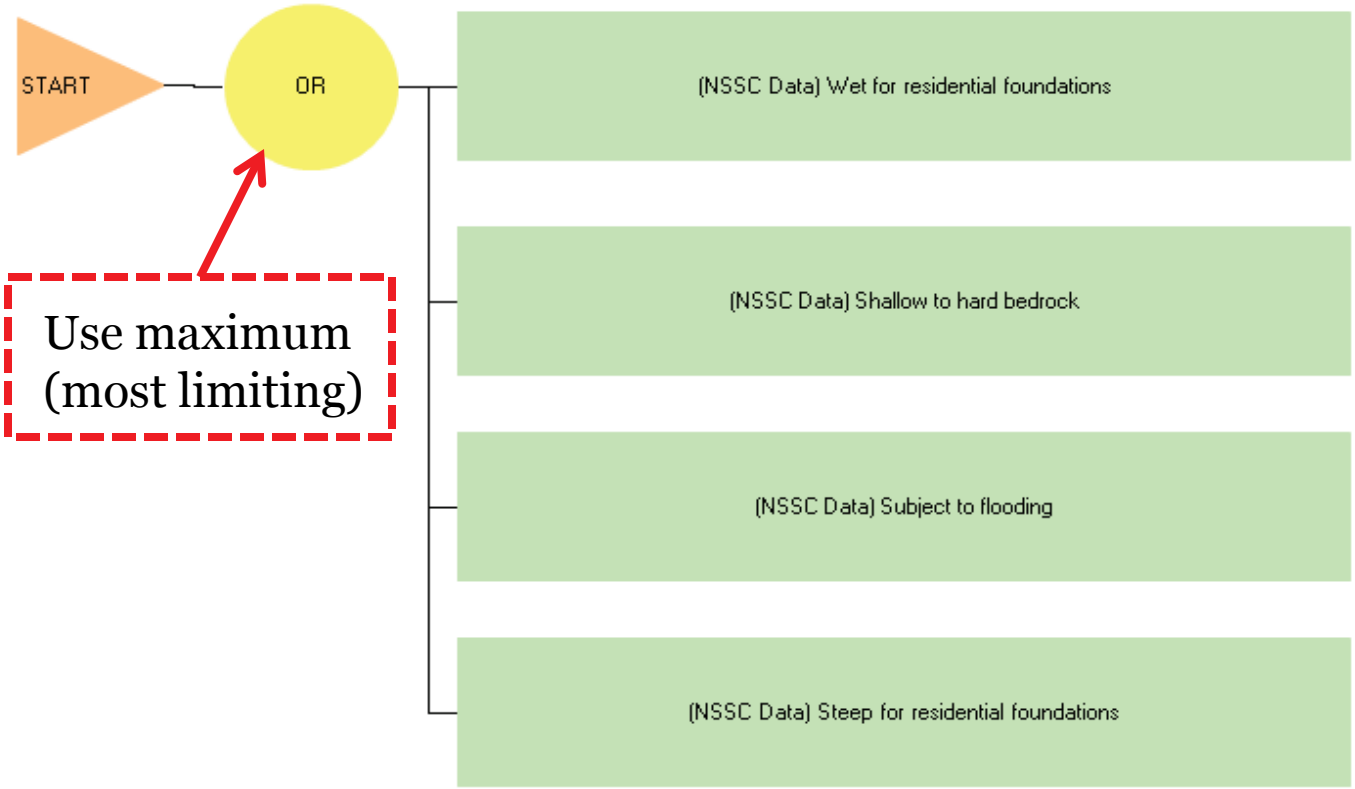
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ... | 12 | 13 | 14 | 15 | 16 | 17 | 18 | ... | ... | ... | ... | ... | ... | ... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X Value | ... | 0 | ... | ... | ... | ... | 1 | 1.1 | 1.2 | 1.6 | ... | 2.1 | 2.2 | 2.6 | 2.8 | 3.1 | 3.2 | 3.5 | ... | 4 | | | | | |
| Y Value | 1 | 1 | 1 | 1 | 1 | ... | ... | 0.99 | 0.98 | 0... | ... | 0.65 | 0.97 | 0.6 | 0.4 | 0.2 | 0.85 | 0.4 | ... | ... | | | | | |

Membership Graph




Arbitrary Line

# Introduction to Soil Survey Interpretations




Residential Foundations

# Features of the NASIS Interpretations System

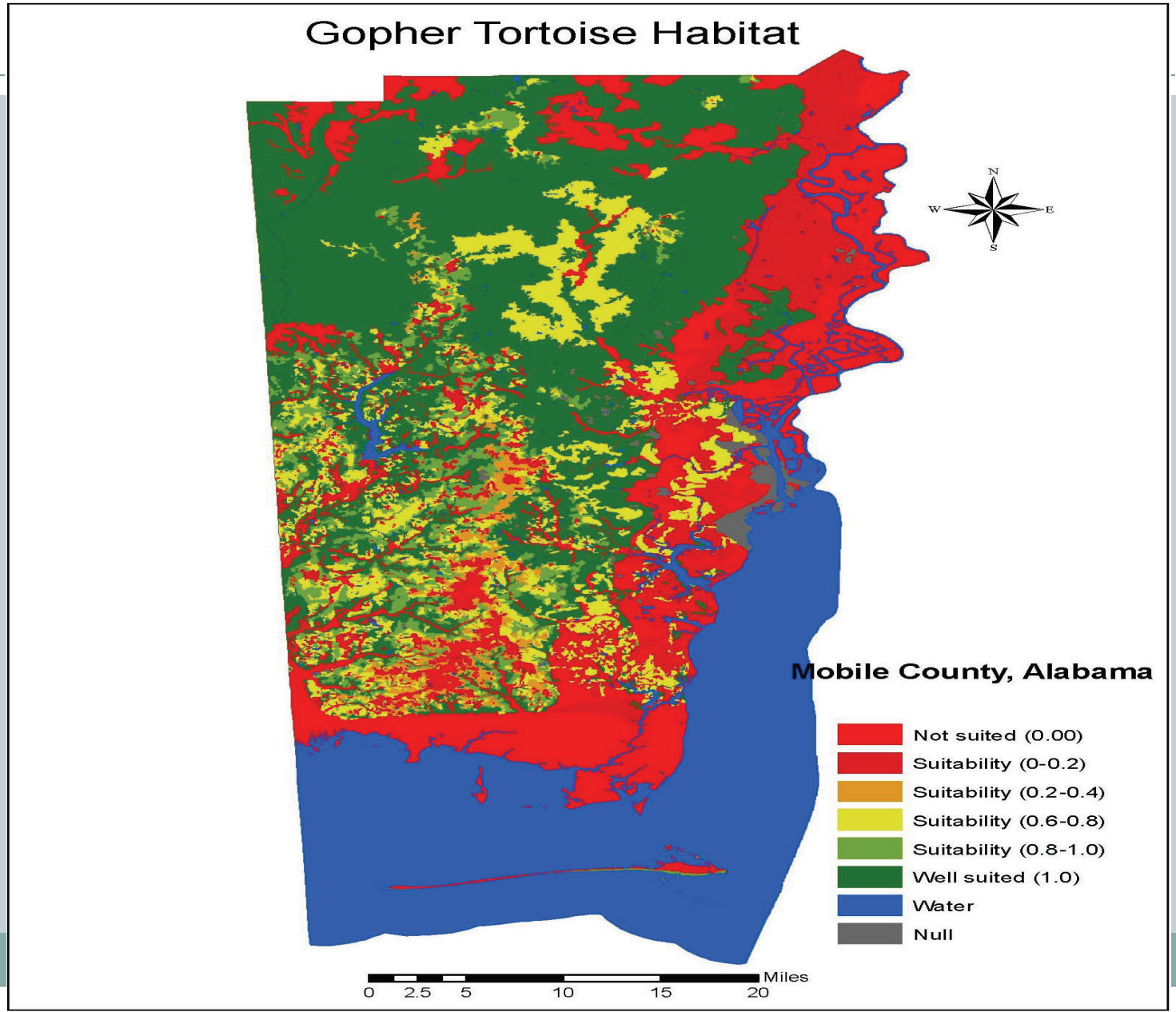
## Advantages

- Interpretations are fairly easy to create and maintain
- All data is in one place
- We own the data
- Data is populated according to nationwide standards
- Very easy to link interpretive output to SSURGO spatial data to make a map

## Disadvantages

- Not currently an agile data system
- Not all the data users might like to have is in the system
- Not real easy to push data into the system
- General public does not have access to the fuzzy system

# State and Local Interpretation



# Where can we go?

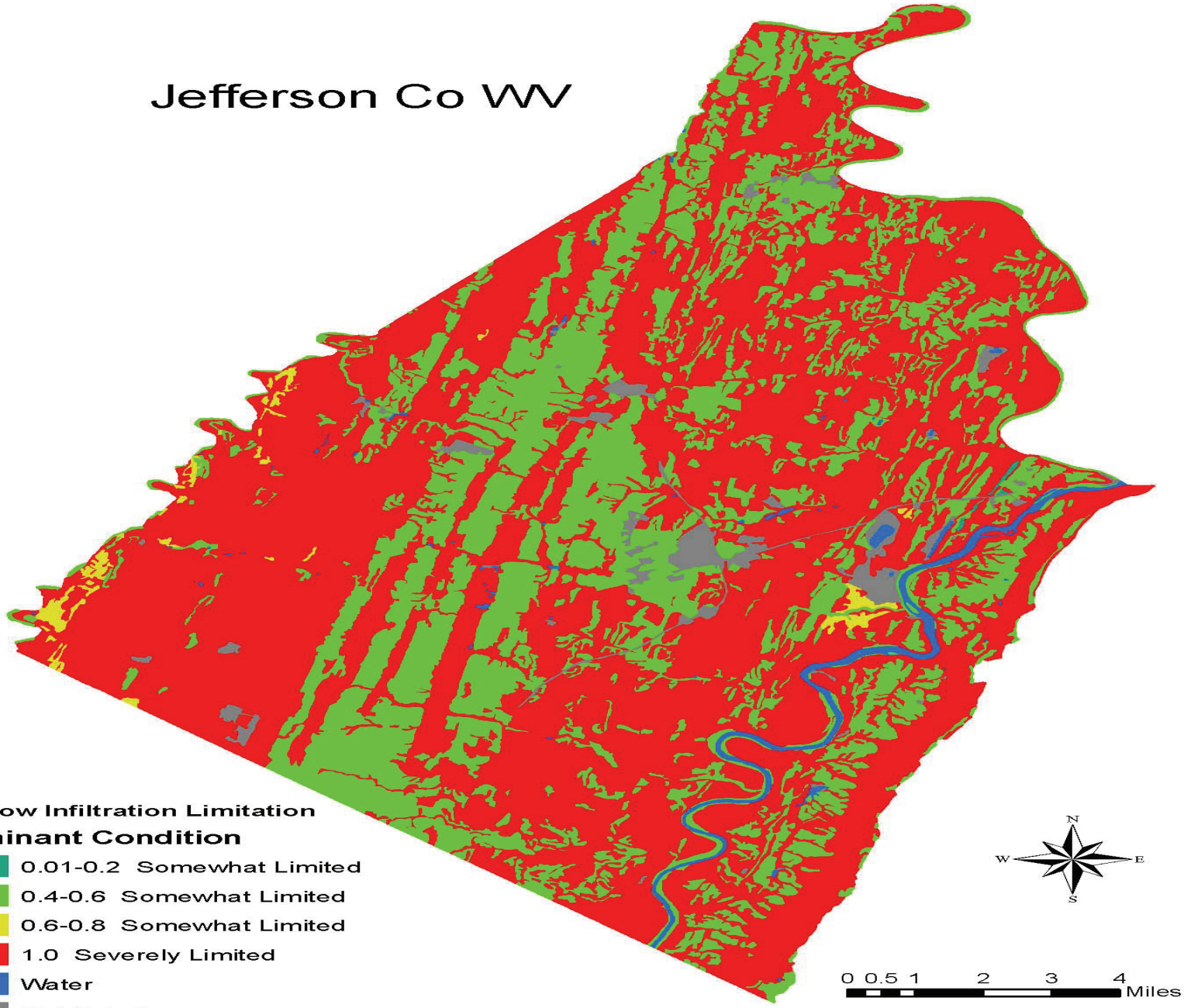
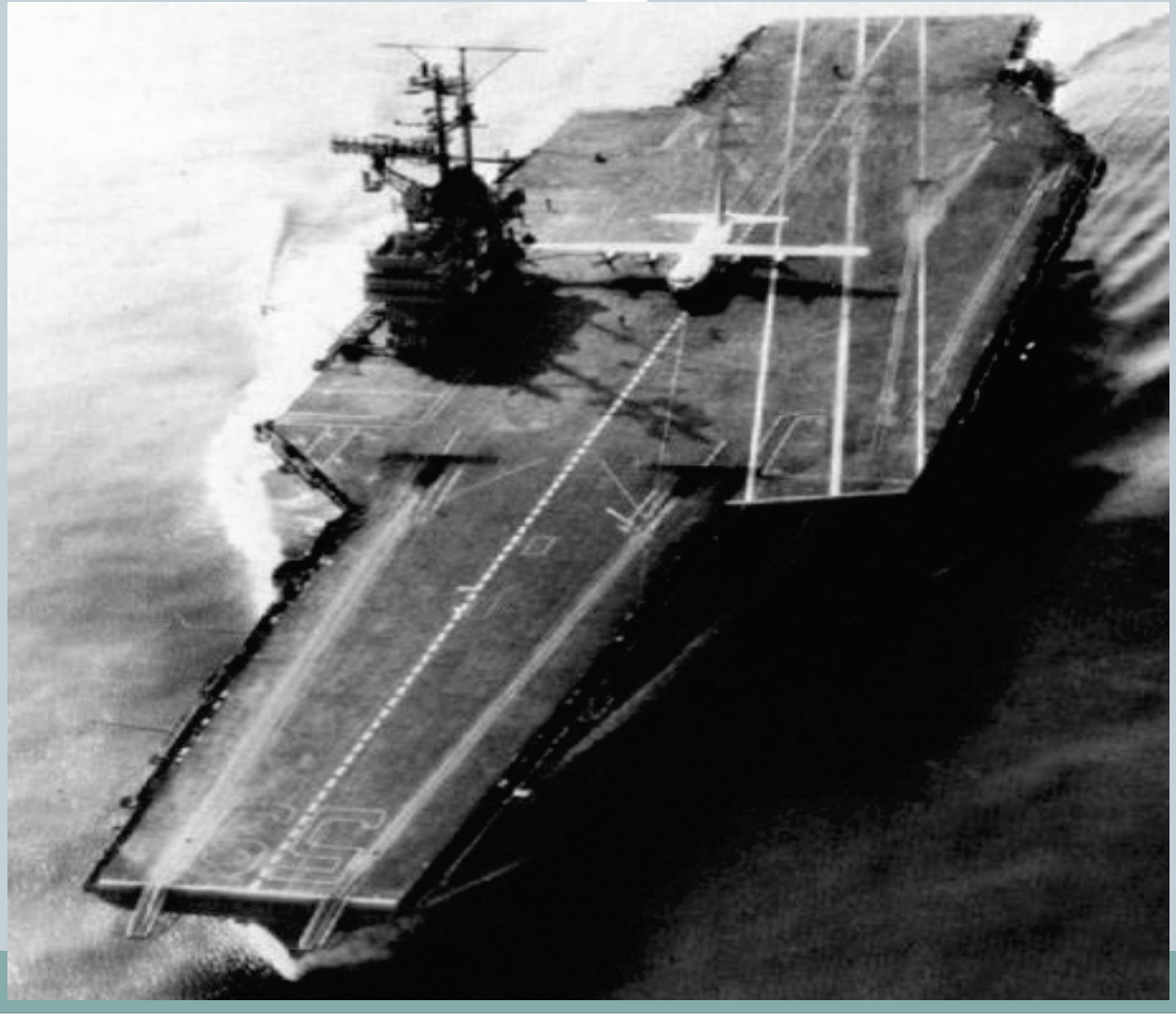
- Raster interpretations
- Enhanced climate data using PRISM
- Include other data layers, like land ownership or sinkholes
- LIDAR
- Public-facing fuzzy system
  - Write your own Oxycontin?
- Field iPhone decision support system
- Interpret the Earth's Critical Zone
  - Where/How to get data?
  - How to model?
- More than 3 colors?

# Can we do better?

**ASCE 7-05 TABLE 20.3-1**
**SITE CLASSIFICATION**

| SITE CLASS | Soil Shear Wave Velocity, vs, (ft/s) | Standard Penetration Resistance, N | Soil Undrained Shear Strength ,su, (psf) |
|---|---|---|---|
| A. Hard Rock | vs > 5000 | Not Applicable | Not Applicable |
| B. Rock | 2500 <= vs <= 5000 | Not Applicable | Not Applicable |
| C. Very Dense Soil & Soft Rock | 1200 <= vs <= 2500 | N > 50 | su > 2000 |
| D. Stiff Soil | 600 <= vs <= 1200 | 15 <= N <= 50 | 1000 <= su <= 2000 |
| E. Soft Clay Soil | vs < 600 | N < 15 | su < 1000 |
| | Any profile with more than 10 feet of soil having the following characteristics:<br>1. Plasticity Index, PI > 20<br>2. Moisture Content, w >= 40% and<br>3. Undrained shear strength, su < 500 psf | | |
| F. Soils requiring site response analysis per Section 21.1 | See Section 20.3.1 | | |

*See Section 1.5 and Table 1-1.


Jefferson Co WV
Shallow Infiltration Limitation
Dominant Condition
0.01-0.2 Somewhat Limited
0.4-0.6 Somewhat Limited
0.6-0.8 Somewhat Limited
1.0 Severely Limited
Water
Not Rated
N
W
E
S
0 0.5 1 2 3 4
Miles

# Thanks