



# WETLAND MAPPING FROM THE SOILS PERSPECTIVE

Understanding soil mapping & available GIS data

# Using soil maps to locate *POTENTIAL* wetlands

- Remember you need to have ALL 3 factors present – to rate as a wetland
  1. **Soils**
  2. **Hydrology**
  3. **Vegetation**
  
- A number of soil attributes provide an indication of wetland areas:
  - Hydric soil rating
  - Drainage Class
  - Depth to Water Table

# Hydric Soils



## □ Critical factors

- Saturation
- Reduction
- Redoximorphic features

## □ Two types

- Organic
  - Peat or muck (Histosols)
  - Decomposition is inhibited under waterlogged conditions
- Mineral



# Hydric soils

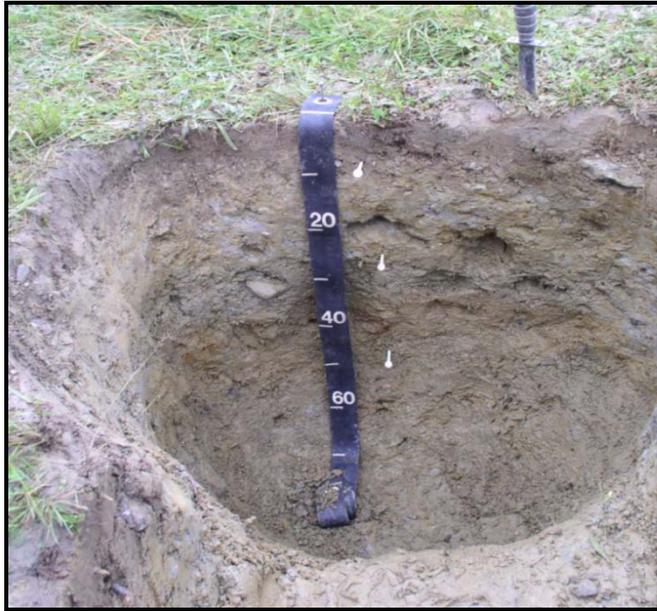
soil that formed under conditions of **saturation**, **flooding** or **ponding** long enough during the growing season to develop *anaerobic* conditions in the upper part of the soil profile



# Terminology: Drainage Class

- Used to describe **amount** of water present and effect on potential **use** of that soil
- Indicates frequency and duration of wet periods
- Seven drainage classes:
  - Very poorly drained
  - Poorly drained
  - Somewhat poorly drained
  - Moderately well drained
  - Well drained
  - Somewhat excessively drained
  - Excessively drained
- **Poorly drained** and **very poorly drained** often = **hydric**

# Many types of wet soils



Scale is metric



Scale is metric



Scale is in inches



Scale is in inches



# Understanding how Soil Maps are created



# Things to remember about digital Soil Surveys in Vermont

- Done at 1:20,000 **scale**
  - ▣ GIS allows you to zoom in – beware!
- The smallest sized map-unit is **3 acres in size**
- The ***age of the survey*** influences the quality of the mapping
  - ▣ The original intent of soil surveys in the 1940s was to help farmers prevent soil erosion
  - ▣ The many current applications of soil survey were not envisioned in the early days of soil mapping
- Using GIS technology to create surveys is quite recent



Note the **SIZE**  
of the mapunit  
(Rk) for Snake  
Mountain in  
Addison County —

then compare  
to the mapunits  
in the valley

**Older surveys have many inconsistencies**

It used to take **20 years!** to complete the mapping & publish a survey

-- so for example, the actual mapping in Grand Isle County was done in the 1930's & '40's

We are moving into improving the quality of mapping by physiographic areas (MLRAs) to erase county-centric biases

### Chronology of Vermont Soil Survey Publications

County	Publication Date	Photobase for Publication	Scale of Publication Photography
Grande Isle	1959	photo-mosaic (non ortho)	1:20,000
Addison	1971	photo-mosaic (non ortho)	1:15,840
Chittenden	1974 re-issued 1989	photo-mosaic (non ortho)	1:15,840
Orange	1978	photo-mosaic (non ortho)	1:20,000
Franklin	1979	photo-mosaic (non ortho)	1:20,000
Lamoille	1981	1/3 topo quad orthophoto	1:20,000
Windham	1987	VMP orthophoto	1:20,000
Rutland	1998 (one of <i>first</i> digitally map finished surveys in the country)	VMP orthophoto reconfigured to 1/3 topo quad orthophoto	1:20,000
Washington	2005	VMP orthophoto reconfigured to full topoquad	1:24,000

In terms of aerial imagery as the base map of soil surveys -- the technology has come a long way!



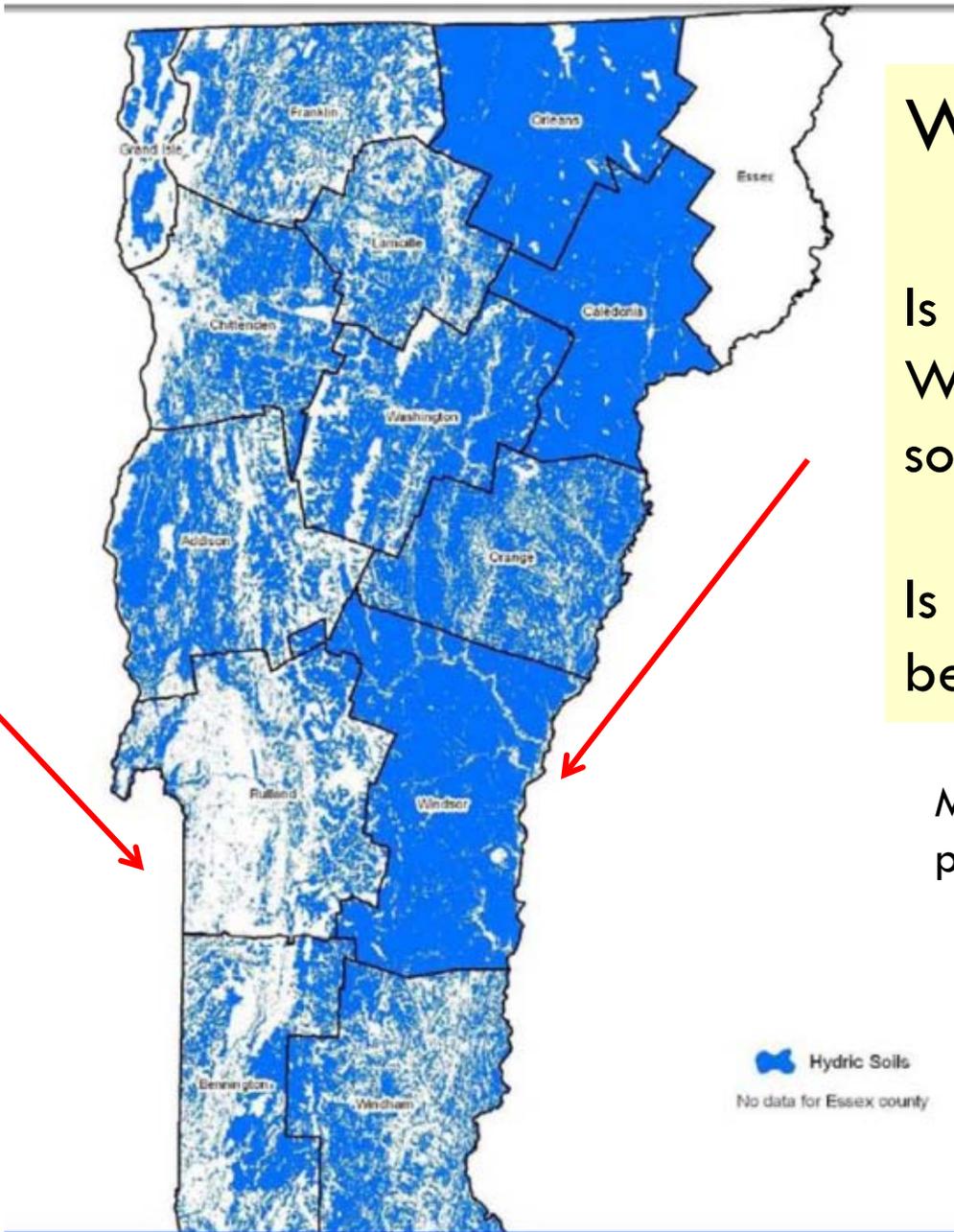
**Digital images that are geo-referenced**

**vs.**

**Putting distorted photos together  
by hand**

# Make sure you understand how to use the attribute data

- **Different sources** of soils data may give you **different results**
- **Your interpretation** of the data may also lead to **vastly different results**

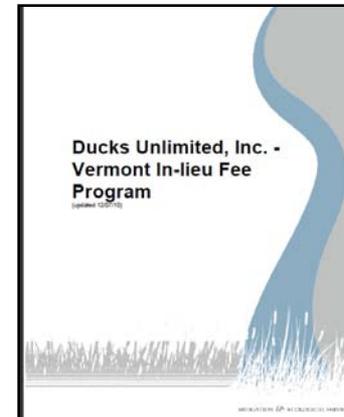


What is going on here?

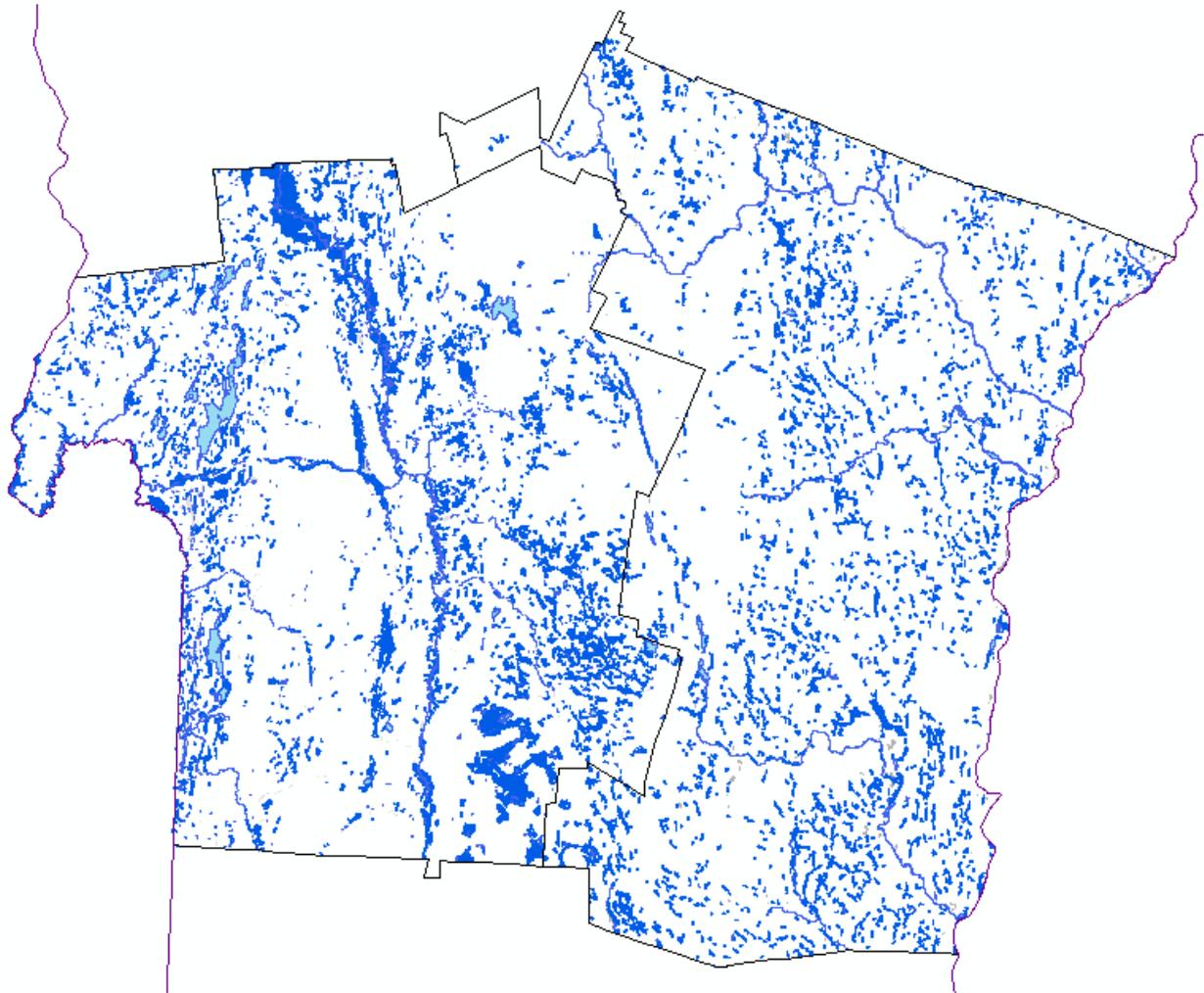
Is Rutland County very dry and Windsor dominated by hydric soils?

Is it suspicious that there seems to be a county-centric bias?

MAP of HYDRIC SOILS from this publication:



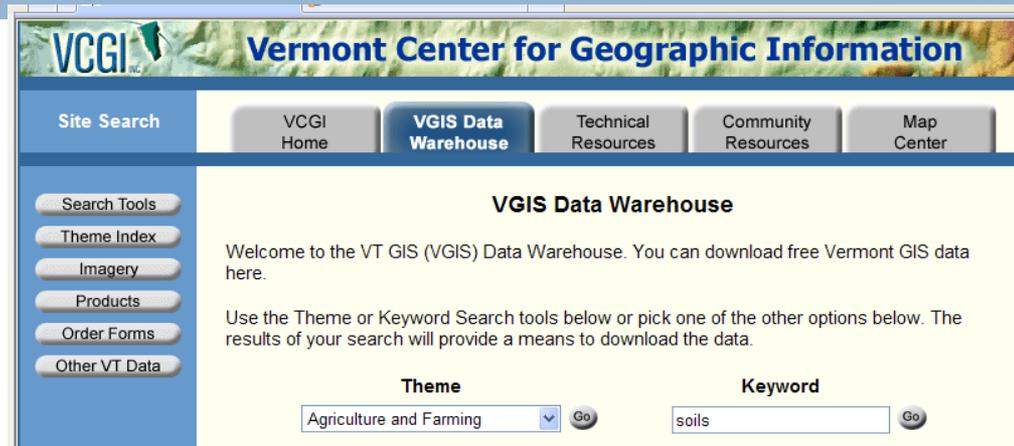
Using *different* soils data you get this  
(more reasonable) result:



So what is  
up????????

# It depends where you download the data & utilize / interpret the attribute data

## □ VCGI



Products (1 selected) (red = new green = updated)

Product Name	Description	More Info	Download
SOILATTR	NRCS soils attributes in DBF-format tables available by county		

Be sure to get the attribute data

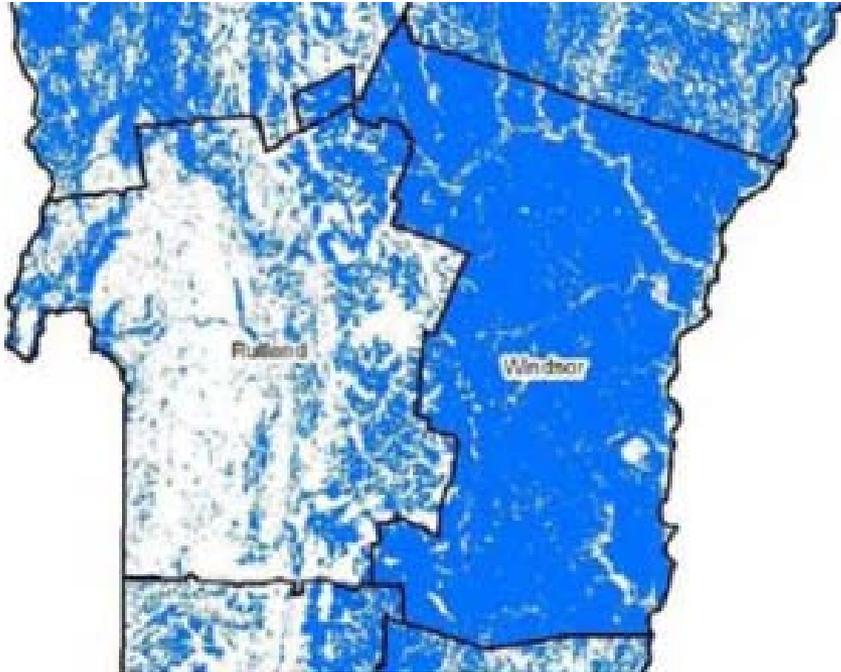
## □ DataMart



# Why should this matter?

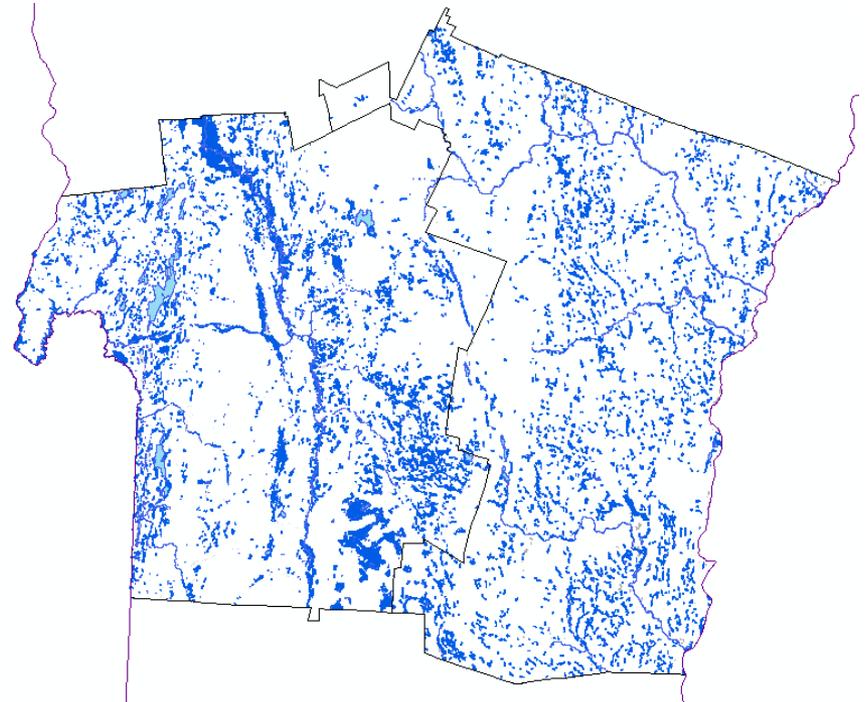
- **VCGI** – has limited & simplified attribute data but in a very **easy to use** format –
  - a **1 to 1** match between attribute rating & map-unit symbol
  - Hydric rating is only given if the map-unit as a whole is a hydric soil
- **DataMart** involves downloading the myriad Excel tables & requires extensive knowledge of the database structure –
  - You will have to link numerous tables
  - There are **1 to many** relationships in much of the data that need to be pared down

Data source = **DataMart**



Rutland and Windsor Counties *seem* to have *hugely* different proportions of Hydric soils in the map on the left

This map uses only map-units where the entire mapunit is rated hydric



Data source = **VCGI**



# It depends how you assign the hydric rating of the various categories

The screenshot displays a web-based soil survey interface. On the left, a 'Map Legend' window is open, listing various map features. Under the 'Soil Ratings' section, the 'Partially Hydric' category is highlighted with a red arrow. The main map area, titled 'Map - Hydric Rating by Map Unit', shows a map with various soil units color-coded according to their hydric rating: blue for 'Not Hydric', green for 'Partially Hydric', and light blue for 'Unknown Hydric'. A scale bar at the bottom indicates 1133 feet. The interface also includes a 'Shopping Cart (Free)' button and several menu options like 'Properties and Qualities', 'Ecological Site Assessment', and 'Soil Reports'.

**Map Legend**

- Area of Interest (AOI)
  - Area of Interest (AOI)
- Soils
  - Soil Survey Areas
  - Soil Map Units
  - Soil Ratings
    - All Hydric
    - Partially Hydric
    - Not Hydric
    - Unknown Hydric
    - Not rated or not available
  - Special Point Features
  - Special Line Features
- Political Features
  - States
  - Counties
  - Urban Areas
  - Cities
  - Postal Code
  - PLSS Township and Range
  - PLSS Section
- Federal Land

Table

**Map - Hydric Rating by Map Unit**

Scale (not to scale)

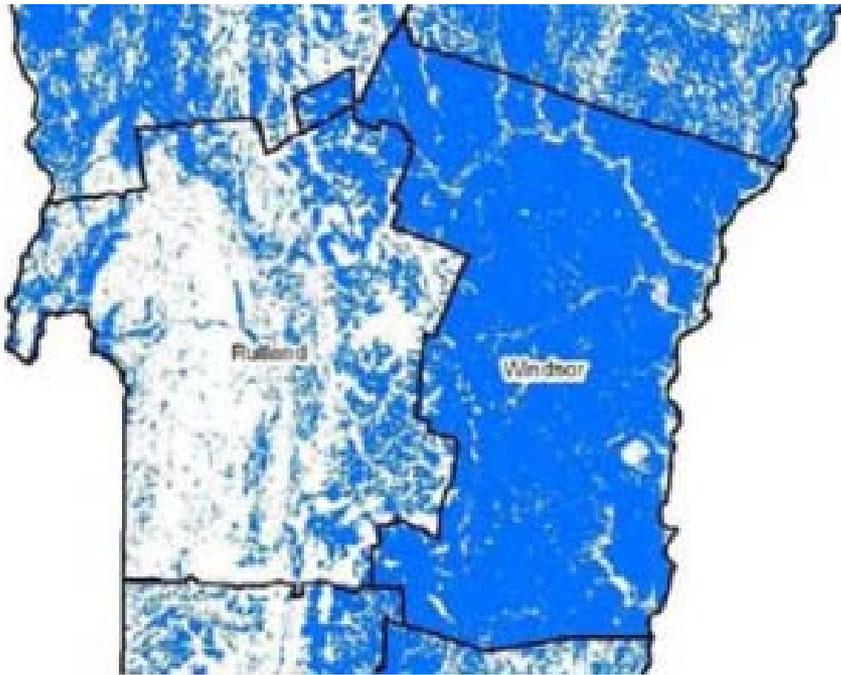
0 1133ft

**Beware of assigning  
“partially hydric” = hydric**

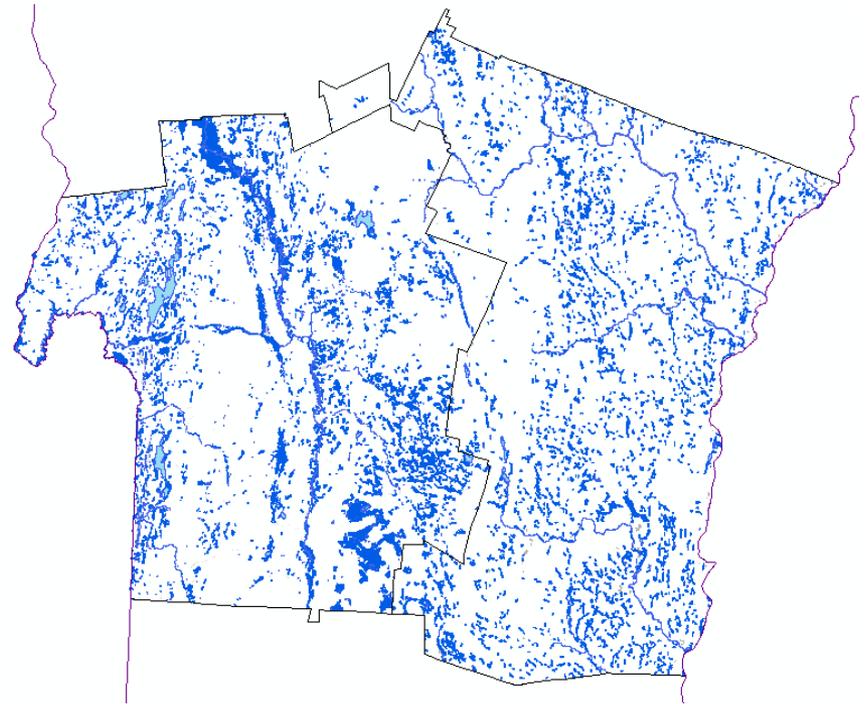
It is better to use “all hydric”

In Web Soil Survey any soil that has a hydric *inclusion* will be called “partially hydric”

# So what is up?



This map shows map-units with the rating as “all hydric” & “partially hydric” being lumped into a **hydric** category

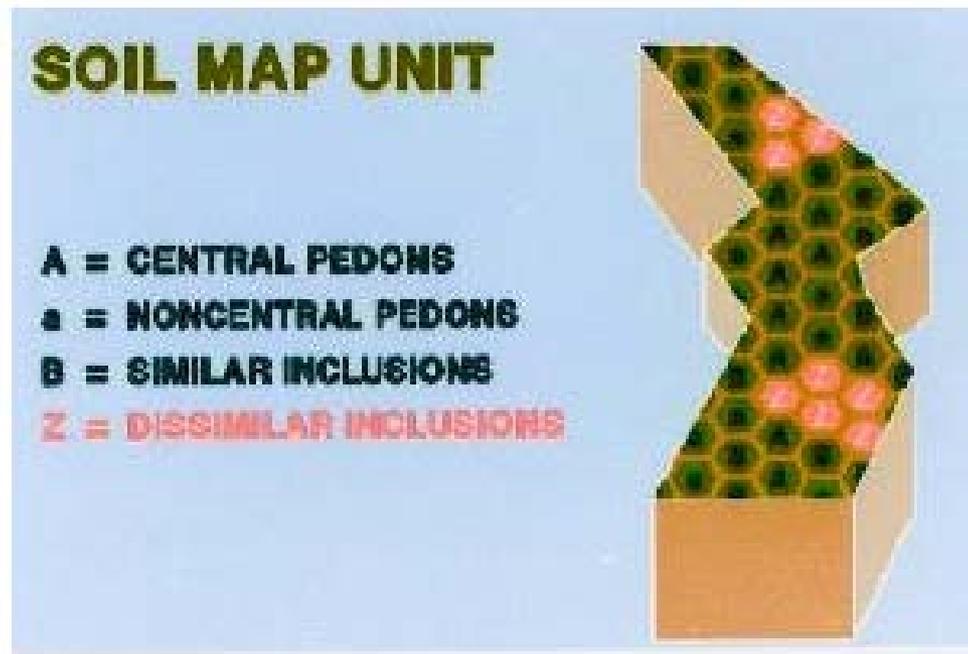


This map shows only the “all hydric” category

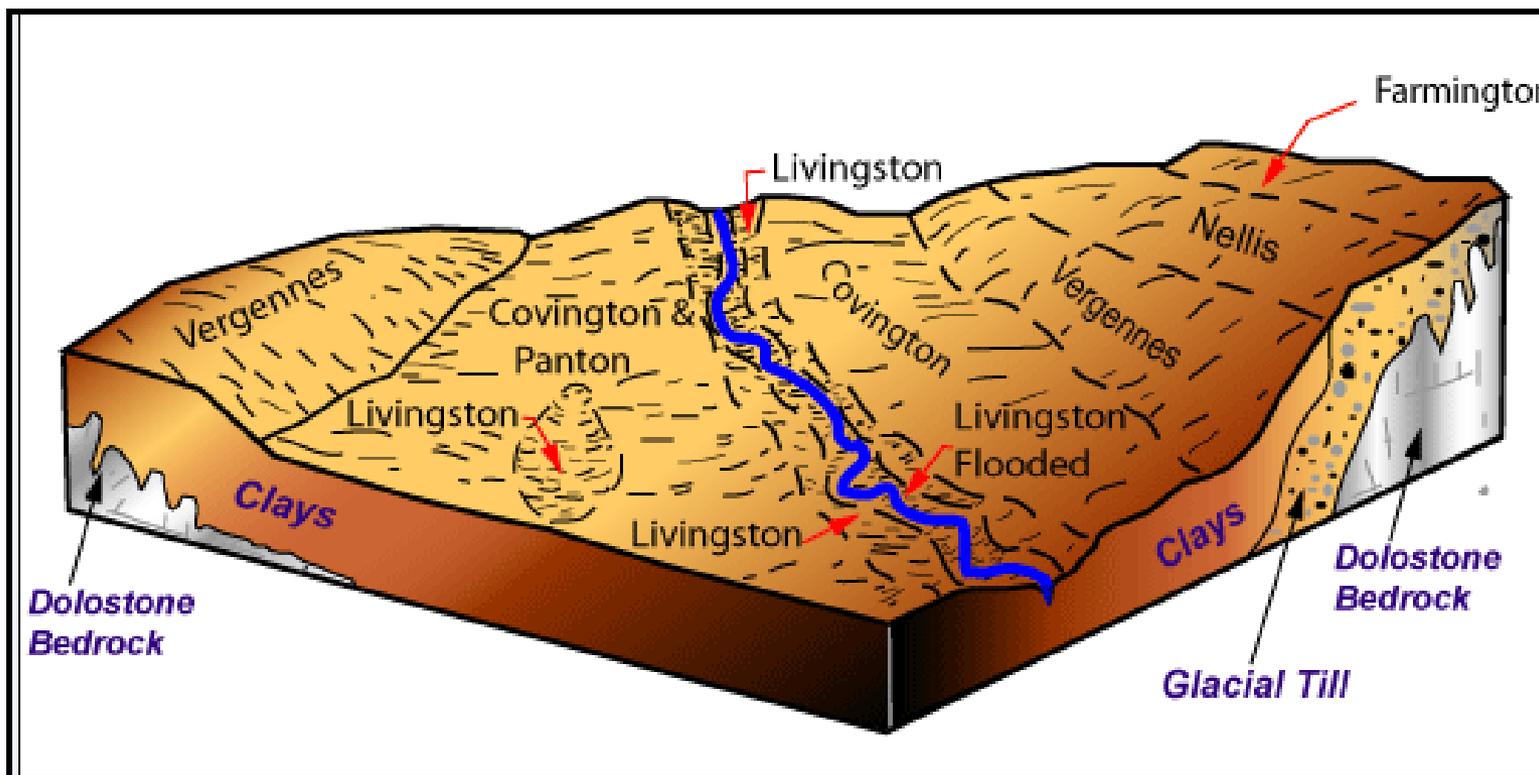
It looks like there needs to be better consistency between counties in how hydric inclusions are taken into account

It is important to understand  
**mapunit composition**

The units on a soil map are **not** perfectly homogenous - there are *inclusions*



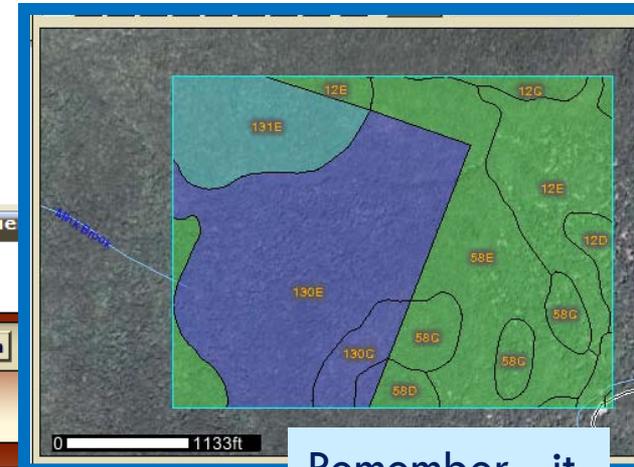
Soil map-units occur in a certain pattern in the landscape – if there is a small area of a dissimilar unit that is not big enough to delineate is it considered an *inclusion* – the descriptions of mapunits explain the “components”



In the Covington-Panton Map-unit the smaller area of Livingston in the depression may be too small to cut out as a separate unit – in theory no units should be smaller than 3 acres

When looking at **Soil Drainage** all these mapunits are actually “well drained” - bedrock units are almost always rated well drained

That hydric soils map we saw earlier



Remember - it came out as “partially hydric” -- Yet it is well drained hmmm

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Shopping Cart (Free)

Printable Version

Soil Properties and Qualities | Ecological Site Assessment | Soil Reports

Map Legend

- Area of Interest (AOI)
- Area of Interest (AOI)
- Soils
  - Soil Survey Areas
  - Soil Map Units
  - Soil Ratings
    - Excessively drained
    - Somewhat excessively drained
    - Well drained
    - Moderately well drained
    - Somewhat poorly drained
    - Poorly drained
    - Very poorly drained
    - Subaqueous
    - Not rated or not available
  - Special Point Features
  - Special Line Features
- Political Features
  - States
  - Counties
  - Urban Areas

Map — Drainage Class

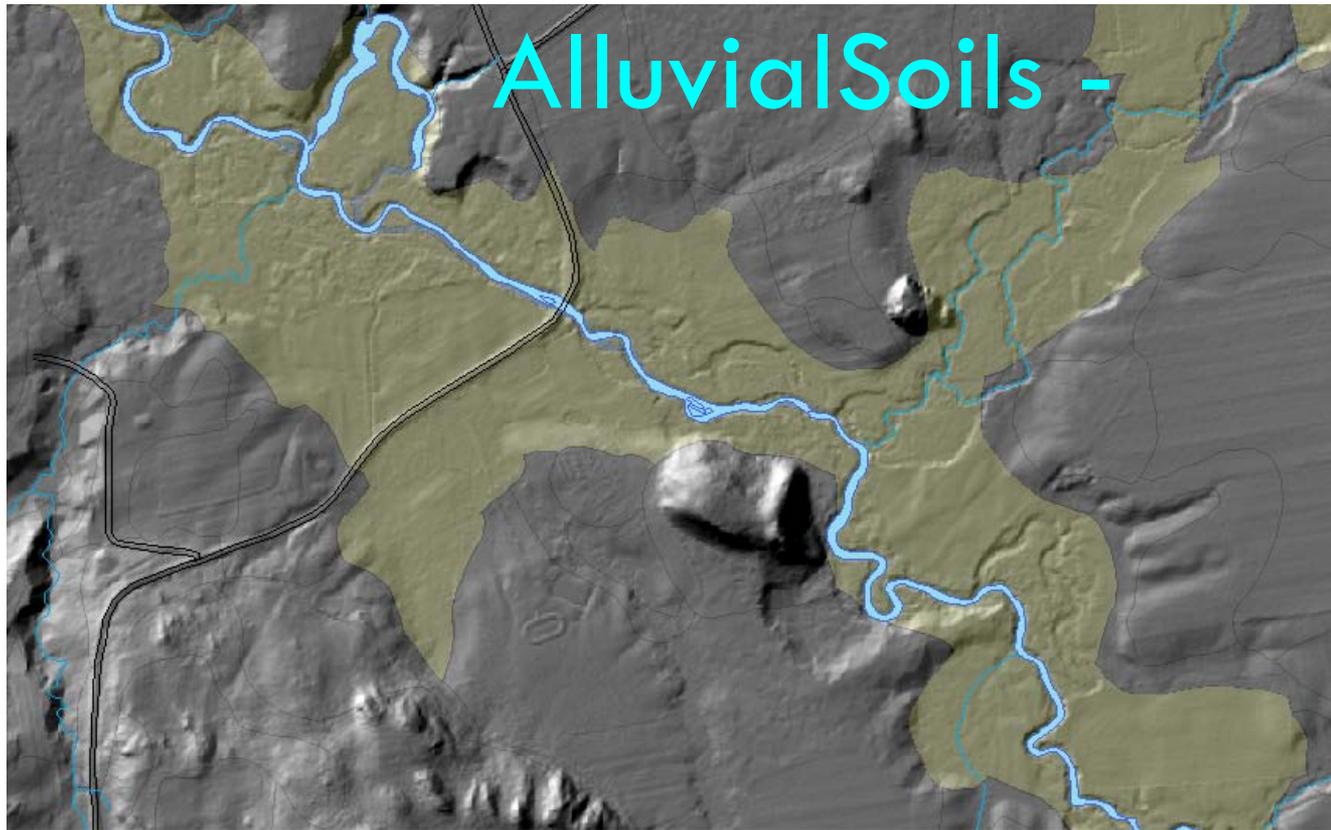
Scale (not to scale)

Warning: Soil Ratings Map may not be valid at this scale

You have zoomed in beyond the scale at which the soil map for this area is intended to be used. Mapping of soils is done at a particular scale. The soil surveys that comprise your AOI were mapped at 1:20,000. The level of map units and the level of detail shown in the resulting soil map is not appropriate for this scale.

# More cautions with soil maps

The dynamic environment of the riverine environment has been greatly simplified when it comes to soil maps



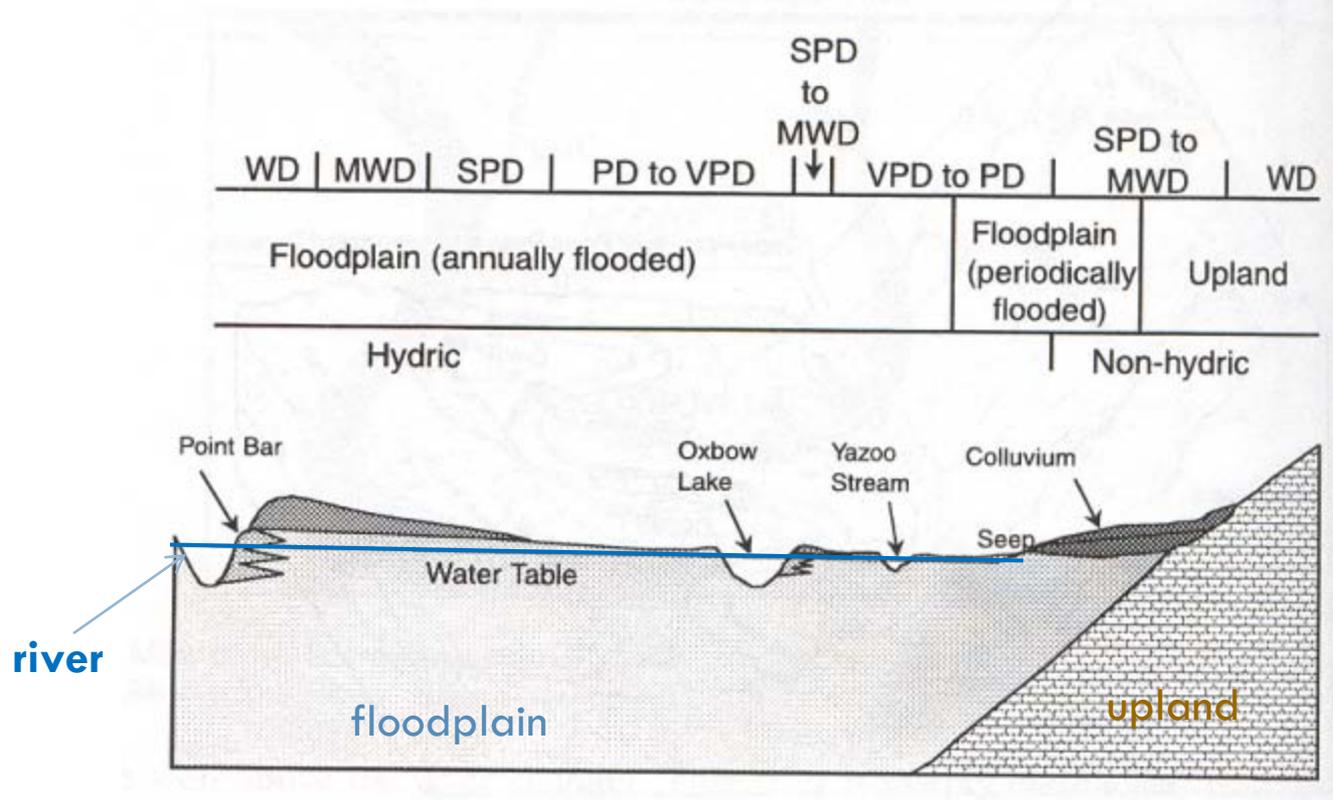
## Alluvial Soils -

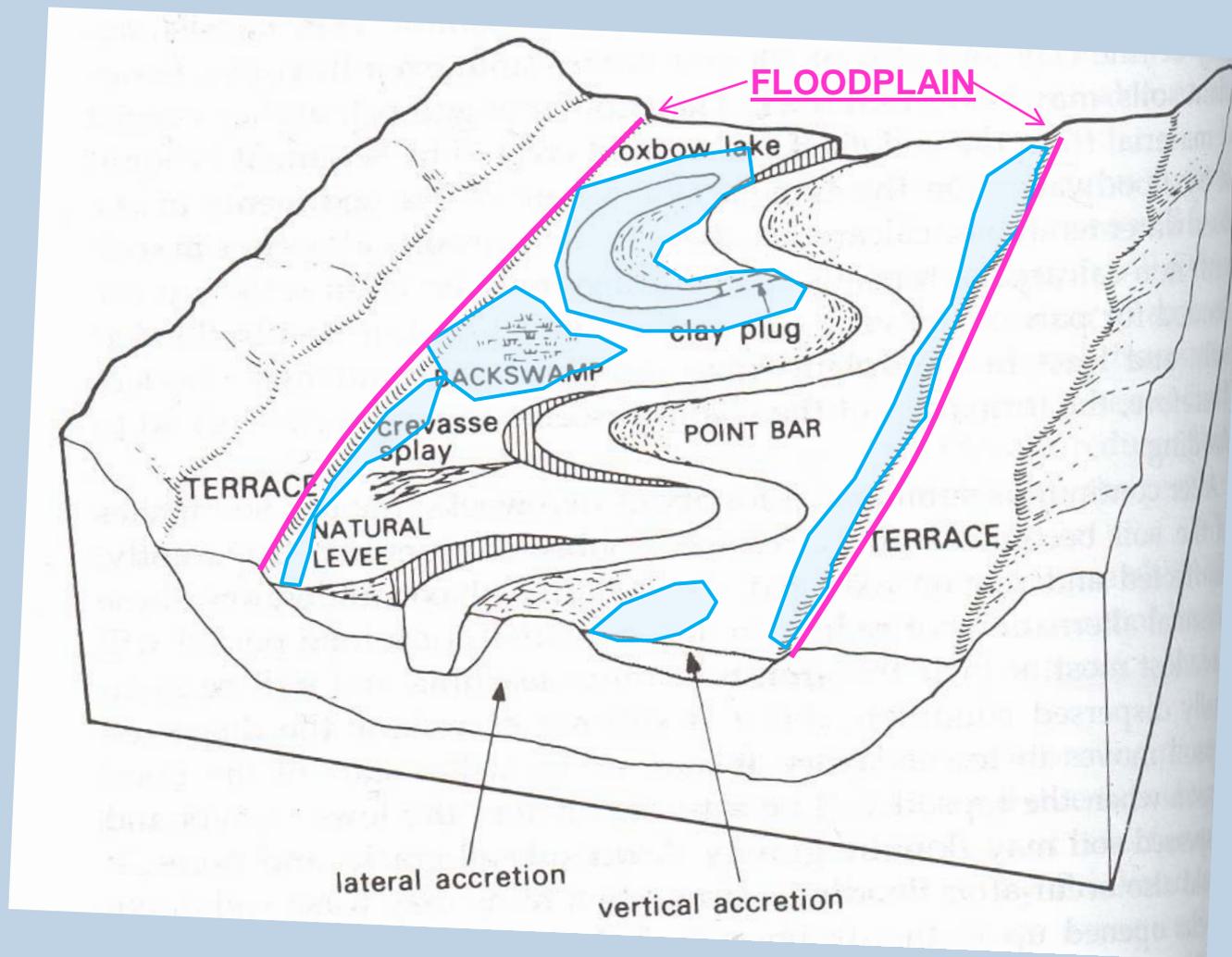
Soil maps show the areas that are prone to flooding -- but the complex pattern of soils can't be captured at 1:20,000 scale

# Cross-section of floodplain grading up to upland terrace

NOTE: *all the different* drainage classes

## Distribution of Soil Internal Drainage





acting as if there is only one *dominant drainage class* in a floodplain is unrealistic  
- There is a complex mosaic of soil drainage classes in floodplain soils



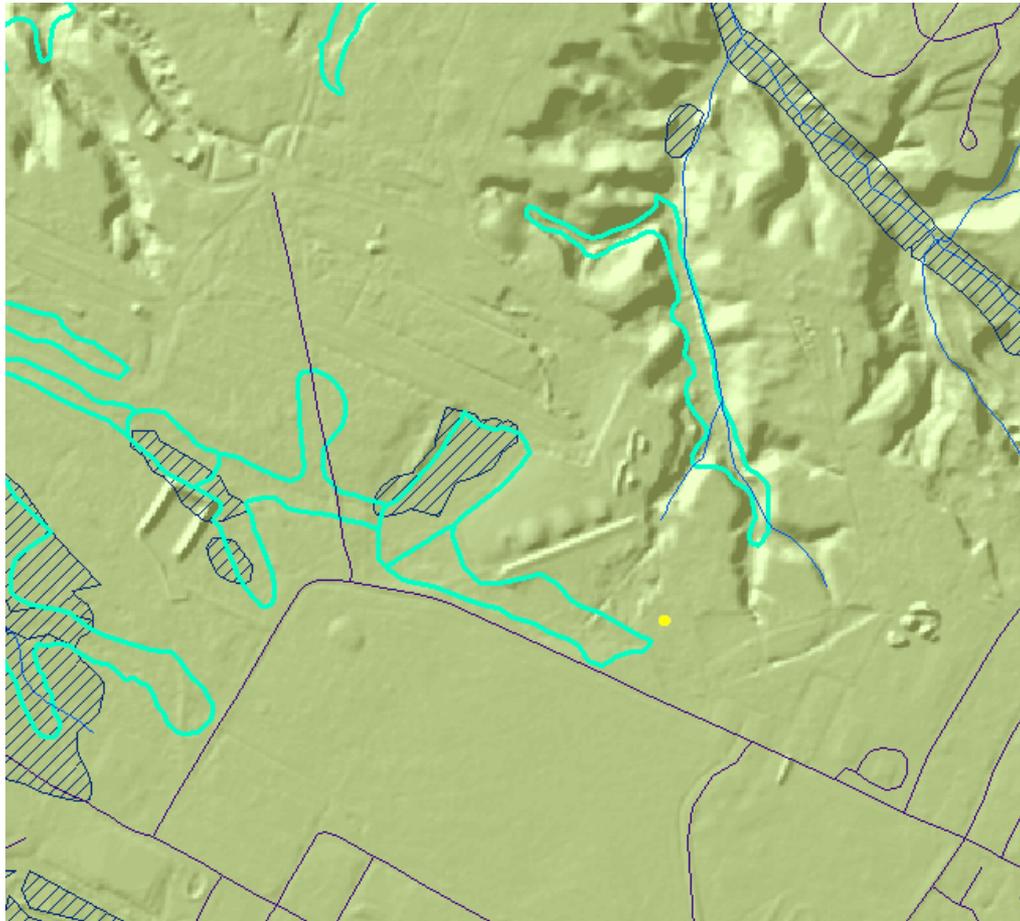
PD soils



There is lots of digital data out there – put it  
all together

Combining maps give the most complete picture

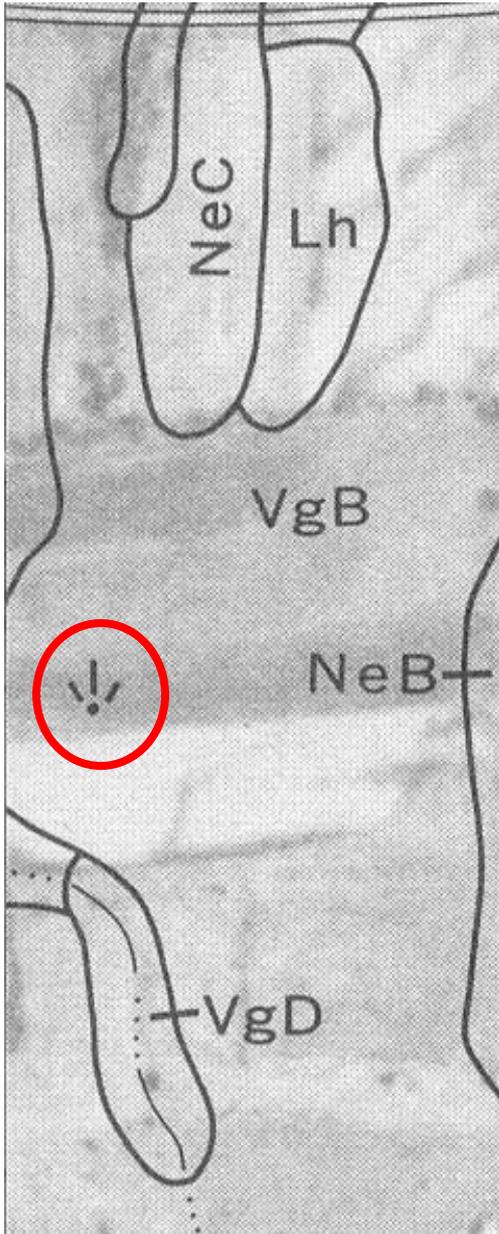
# Use as many maps for background information as possible



- **Hydric soils** - turquoise
- **NWI** - dark blue stripes
- **Lidar** – shaded relief shows the micro-topography

# Point Data is used to flag some dissimilar areas in Soil Surveys

- These features vary county to county but some examples are:
  - ▣ Wet spots
  - ▣ Bedrock areas
  - ▣ Sand spots
  
- VCGI no longer provides this point data but you can get it from **DataMart**



Take note of ---

## Spot Symbols

The symbol in the red circle is a “wet spot” and this is an area *too small* to map out at 1:20,000 scale yet significant enough to cause the soil scientist to make note of it on the map

Were these features used consistently by all mappers?

Were they used consistently from county to county?



No water table at 12 feet down!  
Note how the upper layer looks  
very grey could be mistaken for a  
hydric soil – when in doubt keep  
digging



Questions?