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
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.

<table>
<thead>
<tr>
<th>County</th>
<th>Publication Date</th>
<th>Photobase for Publication</th>
<th>Scale of Publication Photography</th>
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<tr>
<td>Grande Isle</td>
<td>1959</td>
<td>photo-mosaic (non ortho)</td>
<td>1:20,000</td>
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<td>Addison</td>
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<td>Chittenden</td>
<td>1974 re-issued 1989</td>
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<td>Lamoille</td>
<td>1981</td>
<td>1/3 topo quad orthophoto</td>
<td>1:20,000</td>
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<td>Windham</td>
<td>1987</td>
<td>VMP orthophoto</td>
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<tr>
<td>Rutland</td>
<td>1998</td>
<td>VMP orthophoto reconfigured to 1/3 topo quad orthophoto</td>
<td>1:20,000</td>
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<tr>
<td>Washington</td>
<td>2005</td>
<td>VMP orthophoto reconfigured to full topoquad</td>
<td>1:24,000</td>
</tr>
</tbody>
</table>
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**

  - Welcome to the VT GIS (VGIS) Data Warehouse. You can download free Vermont GIS data here.
  - Use the Theme or Keyword Search tools below or pick one of the other options below. The results of your search will provide a means to download the data.

  - **Products** (1 selected) (red = new green = updated)
    - SOILATTR NRCS soils attributes in DBF-format tables available by county

  - Be sure to get the attribute data

- **DataMart**

  - United States Department of Agriculture Natural Resources Conservation Service

    - Soil Data Mart

    - Home | Select State | State Contacts | Template Databases | SSURGO Metadata | Status Map | Logon/Register | Help
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
Rutland and Windsor Counties seem to have hugely different proportions of Hydric soils in the map on the left.
It depends how you assign the hydric rating of the various categories.

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 map units 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.

Remember - it came out as “partially hydric” -- Yet it is well drained hmmm
More cautions with soil maps

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