

Classroom Resources: Soil as a Window on Politics, Economics, and Society

The following quote has been attributed to many sources, as Nobel Conference Director Lisa Heldke notes, including the prolific publisher known as “anonymous”:

"Humankind, despite its artistic abilities, sophistication and accomplishments, owes its existence to a six-inch layer of farmable soil—and the fact that it rains!"

As this quote notes, what we call “civilization” exists because of the development of agriculture and hence because of soil. Many authors have explored how soil, and our management of this vital resource, has shaped our societies. See, for example, Daniel Hillel’s [Out of the Earth: Civilization and the Life of the Soil](#) or the more recent work [Dirt: The Erosion of Civilizations](#) by Nobel 2018 speaker David Montgomery.

The resource presented in this guide encourage teachers and students to explore how soil shapes the political, economic and social world they live by using the “primary” source of the soil itself, or at least our organized way of viewing soil known as the soil survey..

Anyone with a geographical bent will recognize that Geographical Information System (GIS) tools might be useful for this kind of work. But since not all of us have had the time or inclination learn how to use GIS software (let alone the money to buy a software license), fortunately US residents have a publicly available website, the [USDA Web Soil Survey](#), with tools for finding soil maps and other data. International soil data resources are noted [below](#).

The following resource guide demonstrates how to use the USDA Web Soil Survey to support the exploration of social, economic and political topics. It gives step-by-step for accessing data on the USDA Web Soil Survey and a couple of examples of what the soil survey can reveal.

Want to know more about conference framing? Check out [this 12-page summary](#) by Jim Dontje. For more conference-related resources, go to our [conference database](#).

Relevant Speakers: [Rattan Lal](#), [Frank Uekotter](#), [David Montgomery](#)

Guide to Using the [USDA Web Soil Survey](#).

Note that there is an [alternate web interface called SoilWeb](#) for this data from the University of California-Davis that is easier to use (more like Google Maps) but may not be as useful for detailed reports.

1. **Zoom the map to locations of interest.** Starting with soil survey [page](#), click on the zoom “+” button, then drag a rectangle over the area you are interested in looking at. This can be repeated to focus in on an area. Or the zoom “-” button can be used to zoom back out. The “hand” tool can be used to drag the window to different areas of the map. Here are a series of screen shot images as we zoom in on the area discussed in the first example below, Kossuth County, IA:

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Search

Area of Interest

Import AOI

Quick Navigation

Address

State and County

Soil Survey Area

Latitude and Longitude or Current Location

PLSS (Section, Township, Range)

Bureau of Land Management

Department of Defense

Forest Service

National Park Service

Hydrologic Unit

Area of Interest Interactive Map

View Extent

Contiguous U.S.

Scale (not to scale)

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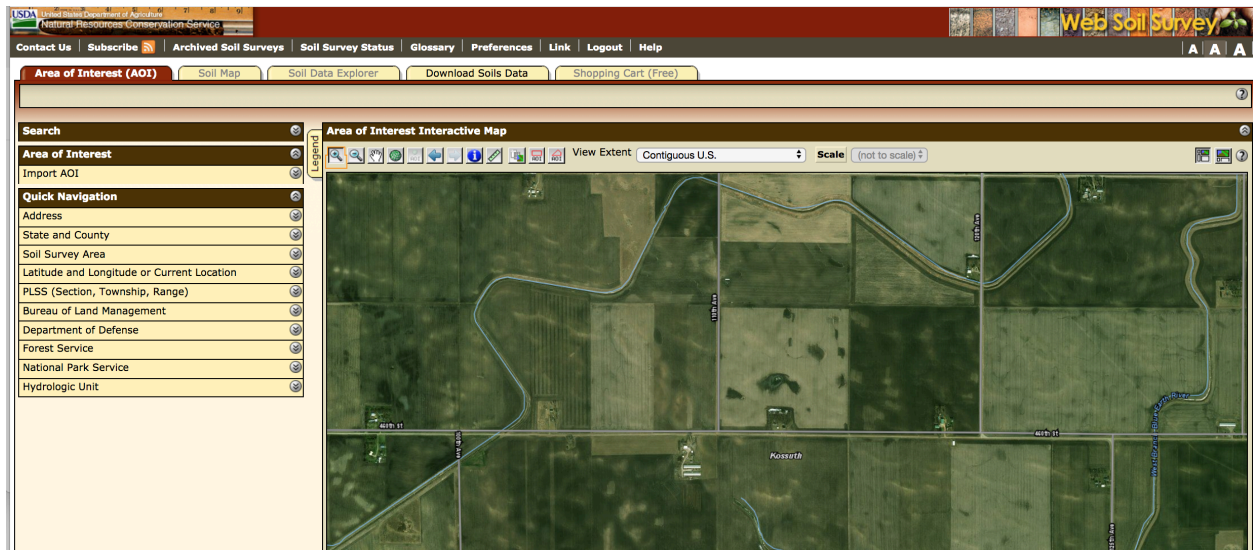
Hydrologic Unit

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Contiguous U.S.

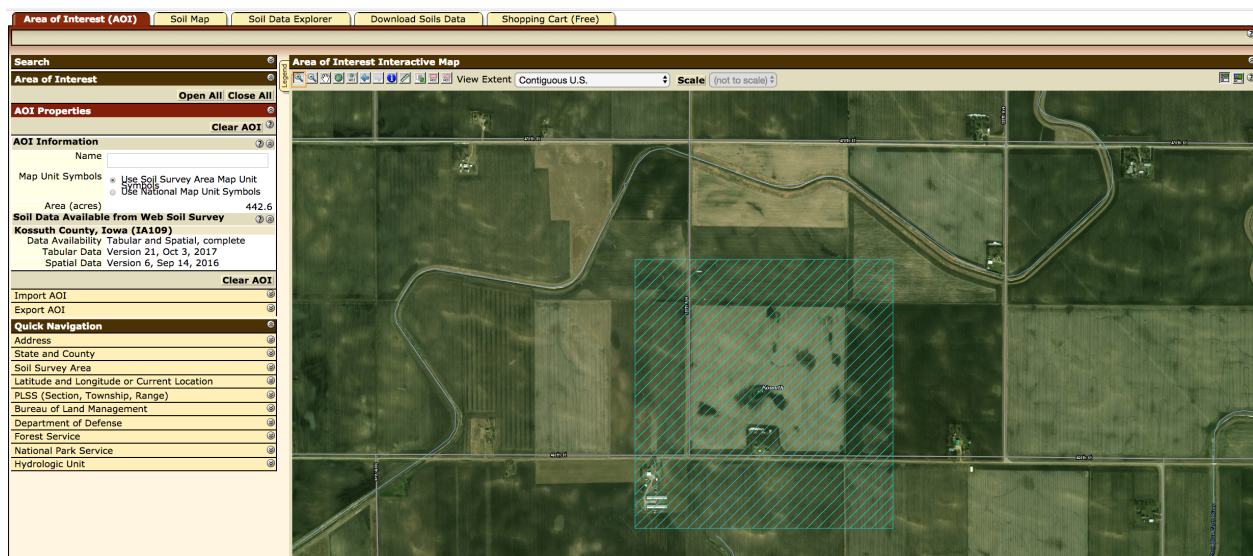
Scale (not to scale)



2. **Select an area of interest (AOI).** Click on one of the AOI buttons. The one with the rectangle lets you drag a rectangle to select the area of interest; the other lets you create a more irregular polygon shape (by clicking on corners and then double clicking to complete the polygon). You may see one of two messages when you try to create the AOI:

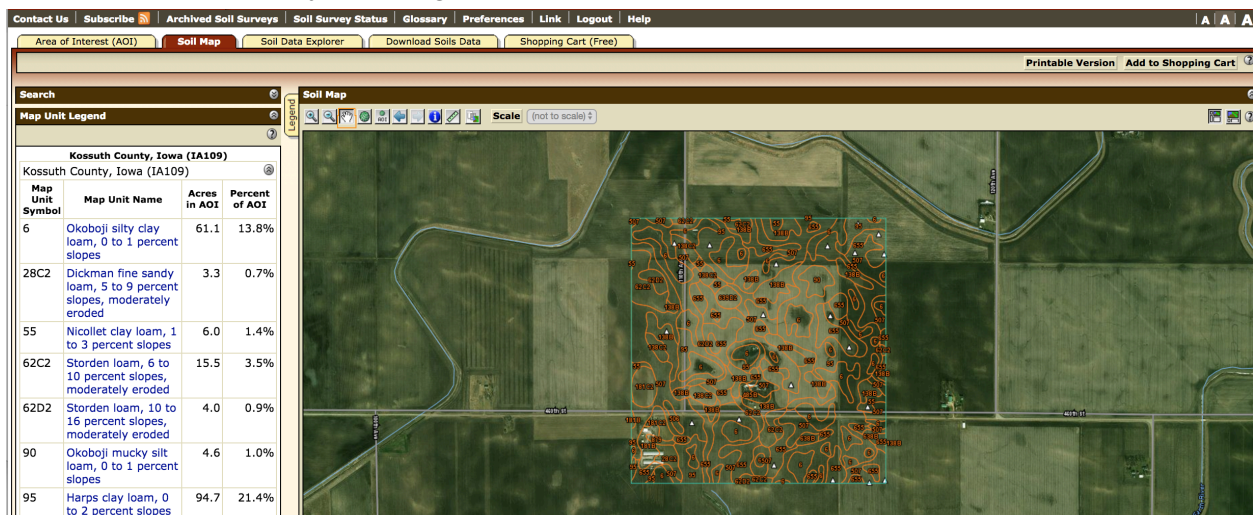
- a. One will be a warning that you have selected an area including more than one soil survey area. This means that your area crossed the boundary between two different soil survey division (e.g. Nicollet and Le Sueur county, for example, and may see some discontinuities in the data due to, for example, the timing of when the two survey efforts took place).
- b. The other is an error message saying that your AOI is too large. The maximum size allowed is 100,000 acres or about 156 sq. miles. If this happens, you just need to select again and choose a smaller area.

When you are done, the AOI will show with colored hatching over it, like this:



If at any time you want to change the AOI, you can click on the Area of Interest tab above the map and then click the "Clear the AOI" button to the left to start over.

3. **View the soil map.** Now you can click on the Soil Map tab on the menu bar. You will now see the areas of the different types of soils labeled on the map and a legend with live links to descriptions to the soil types designated on the map:



At this point, one can dive in deeper on the properties of the various soils using the “Soil Data Explorer” tab. The data tends to be focused on the utility of the land for various purposes. One can also use the “Download Soils Data” tab to export data for various purposes.

Obviously, much of the informations is oriented towards agricultural and engineering purposes. But as we will see in the examples below, even without diving too deeply into the minutia of the data, the soil maps can offering interest insights and avenues for exploring social, political and economic topics. A relevant historical note illustrates this: soil survey expeditions in Russia that were influential in the development of soil science were commissioned as part of an effort to make the property tax system more efficient.¹

Examples

Even without a deep dive into engineering data, the soil map and data collection offer some interesting insights.

Names, topography and MN politics

Note the name of the soil types in the soil map generated above (or another one from a place of your choosing). The soil survey naming system seems to be based on the names of places, probably reflecting where the soil was first studied or where it is most predominant. In the soil type list in the example above, you will find soils that have connections to St. Peter (Nicollet, for example) or the Iowa lakes area (Okoboji).

¹ Evtuhov, Catherine. “The Roots of Dokuchaev’s Scientific Contributions: Cadastral Soil Mapping and Agro-Environmental Issues”. In: *Footprints in the Soil: People and Ideas in Soil History*. Elsevier

Notice that the two soil types with the Okoboji name (designated 6 and 90 on the map above) are associated with dark areas on the map. If you look up these soil types by clicking in the links, and look at the “Properties and qualities, you will find that these are very poorly drained soils. Before European settlement, these round areas were “pothole” wetlands. Why are they no longer wetlands? If you look closely, will see some faint green lines connecting those “pothole” wetlands. These are most likely the result of slight vegetation changes caused by an old disturbance--the digging and burying of subsurface drainage tile lines.

Until the installation of those drain tiles, it would have been almost impossible to grow a crop in those “pot holes” and much of this land would have been unsuitable for European-style agriculture. This was the case for much of the midwest, particularly for northern Iowa and southern Minnesota.

If you go back to the original soil map image, you will note that there are curved blue lines, one above (to the north) and one to the south (below) of the AOI. These are drainage ditches. Once they were a series of connected wetlands, maybe even something that looked like a stream. To allow the drainage tiles they installed to carry the water away, channels or ditches were dug to convey the water to rivers.

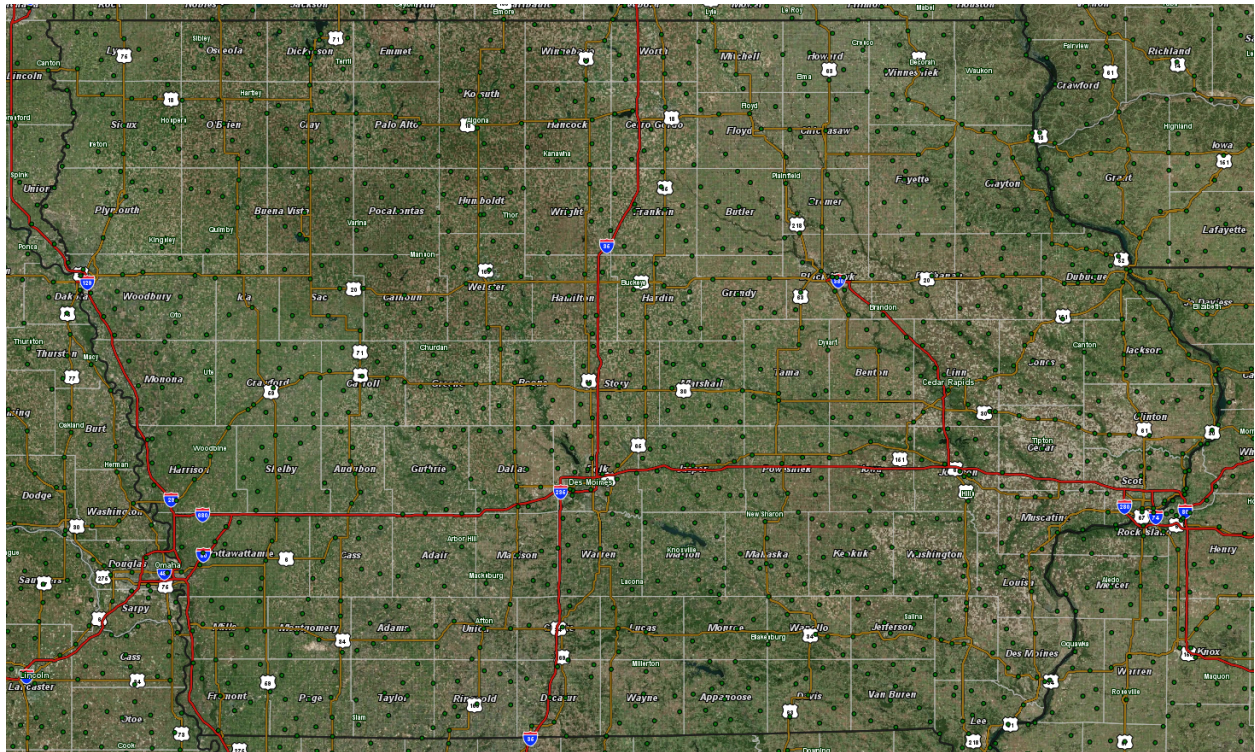
This is particular set of drainage ditches are significant for St. Peter. You are actually looking at a watershed divide. Water in the southern ditch feeds into the Des Moines River basin and flows south to join the Mississippi River in the very southeast corner of Iowa. Water in the northern ditch ends up in the Blue Earth River, joins the Minnesota River in Mankato and ultimately joins the Mississippi River in the south metro area.

If you have paid any attention to Minnesota political discussions in recent years, you will know that disputes over efforts to improve water quality have been heated in recent years. Minnesota farmers, for instance, have been chafing against new regulations that require them to leave vegetated buffer strips along waterways like the drainage ditches discussed above. If you dig into the debates, as this [article](#)² does, you will learn the the subsurface drainage systems described here play a disputed role in water quality. Some scientist think they increase river pollution by moving water more quickly from the land to the rivers, while others blame changes in rainfall.

Soil, settlement, and political boundaries

If you “shadowed” the example for using the USDA Web Soil Survey or looked at the first example, you may have noticed that the Iowa county featured there is larger than the adjacent counties. In fact, by inspection of the following image (and by fact check) it is the largest county in Iowa:

² Ness, E. 2016. Phosphorus in the Minnesota River Basin: The debate over its source and ways to mitigate impacts. CSANews 61:4-11. doi:10.2134/csa2016-61-6-1



Why the anomalous size, almost twice that of most other counties? The answer, political wrangling and power consolidation kicked off by Asa and Ambrose Call, two of the first settlers in the area of what is now the county seat. Asa became a judge and Ambrose edited the first newspaper in the county. There were several steps in this process, including some back and forth with neighboring counties to the south, the abolition of Bancroft County which once covered the north half of Kossuth County, and a legal judgement blocking the formation of a replacement for Bancroft County called Crocker County. You can read all about it in this [1912 history of Kossuth County](#).

What were they fighting over? Do a search in that history on the word soil and look at the words around each instance. While you will find a few places where soil is used as a surrogate for land or territory as in "...the first white men known to have trod the soil now constituting this county?", you will find many more references to the depth, the blackness, the fertility, the richness, and so on. Despite the challenges of the pothole wetlands, or sloughs as they were called, Kossuth County had rich farmland in abundance (once the Native Americans were driven away or defeated in armed conflict) and settlers of European origins saw opportunity.

Dakota peoples, treaties and the river bottom

[The 1851 Traverse de Sioux and the 1962 U.S-Dakota War](#) were significant events of St. Peter history. The also virtually eliminated all Dakota people from southern MN, either through starvation and disease, death in conflict or forced removal. Originally, the 1851 treaty gave the Dakota a 10-mile strip of land on either side of the Minnesota River upstream of New Ulm. But the US Senate striped that allotment out of the treaty.

Using the USDA Web Soil Survey, look at a section of land adjacent to the river somewhere between New Ulm and the western border of Minnesota. Use the AOI button for irregular polygon to select an area that extends for 10 miles from the river (Hint: keep the area on one side of the river and make it narrow so it doesn't get too large. Staying within a single county makes it easier, too). Look at the soil map and the accompany table of soil types. What fraction the land is either frequently flooded or very steep. What do you think this says about how the US Senate handled the treaty?

International Soil Data

[Soil Atlas of Europe](#)

[European archive of soil maps from around the world](#)

[United Nations Food and Agriculture Organization \(FAO\) Soils Portal](#)