

Soil Survey Interpretive Ratings for Subsurface Water Management

Northern Great Plains Major Land Resource Area Regional Office, USDA
Natural Resource Conservation Service, Bismarck, ND

The Subsurface Water Management Interpretation is a soil suitability rating designed to be used as a tool in evaluating and identifying soil limitations related to the installation and performance of underground agricultural drainage systems. It was developed by the USDA-NRCS Regional Soil Survey Office in Bismarck, ND. It is derived from the detailed soil survey and is available interactively through the Web Soil Survey.

Subsurface water drainage systems are designed to remove excess water from the soil and reduce soil saturation. Removal of excess soil moisture has the potential to enhance management options, increase productivity, and reduce salinity. (See pictures to the right on this page.) However, planning an effective drainage system must take into consideration soil and site information. This Soil Suitability Rating considers the impact various soil and site parameters have on subsurface drainage. The ratings are for soils in their natural condition and do not consider present land use.

This interpretation only considers soil and site properties available through the NRCS Soil Survey program. It does not evaluate any of the other aspects involved in agricultural drainage systems such as: *design, location of outlets, water quality, downstream water users, wetland issues, farm programs, flooding, or economic concerns.*

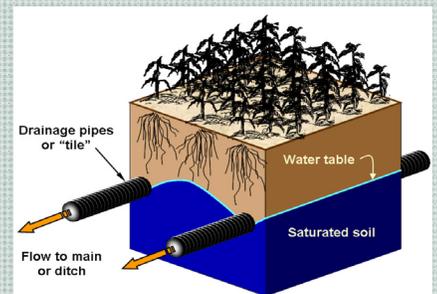
The Subsurface Water Management suitability rating will produce a rating for any soil that has seasonal saturation in most years above ~125 cm (about 48 inches.) Soils without seasonal saturation will not receive a ranking. Soils are rated on Installation, Outflow Quality (evaluates soils potential to allow contaminants into water), and Performance.

USDA-NRCS Web Soil Survey

Web Soil Survey provides agricultural producers, consultants, and others electronic access to soil survey information needed to make land-use and management decisions. It is an alternative to traditional hardcopy soil surveys and provides electronic access to the most current soils data. Maps or interpretive tables can be created for fields or areas up to 10,000 acres in size.

<http://websoilsurvey.nrcs.usda.gov>

Basic Drainage Concept



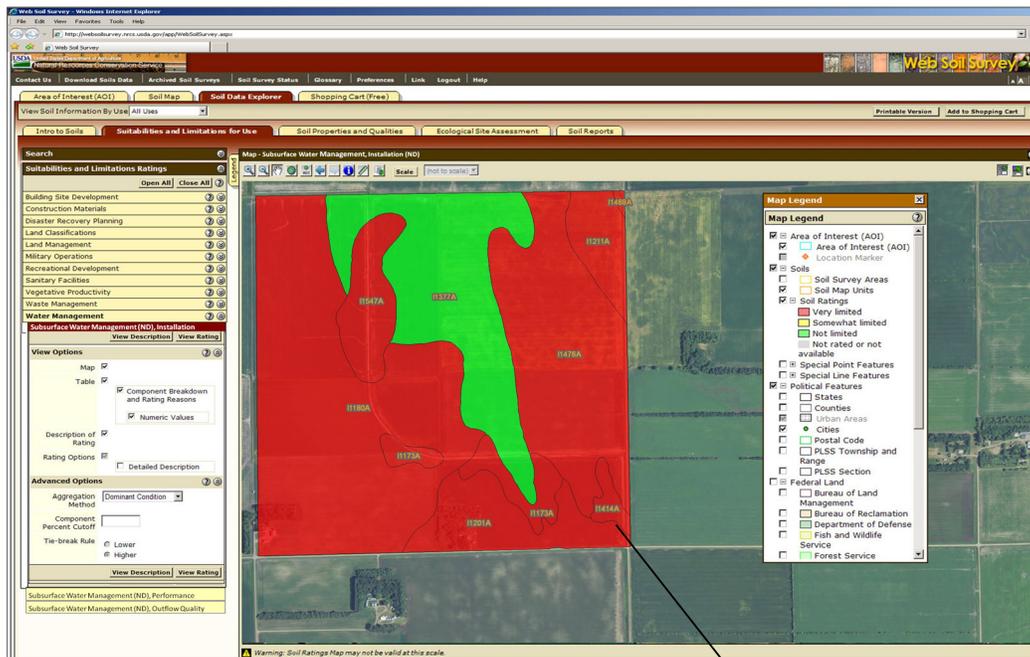


Figure 1

The Subsurface Water Management **Installation** Interpretation evaluates a soil's limitations for the installation of subsurface drains. This interpretation evaluates:

- Depth to bedrock or cemented pan
- Stability of excavations
- Amount of soil clay
- Presence of stones
- Slope gradient

Figure 1 shows a Web Soil Survey view of the limitations for installing tile drainage on a field in north central Trail County, ND. The green indicates a **Not Limited** rating and the red indicates a **Very Limited** rating. In this case, the limitation is related to the stability of excavations and the potential for cut banks to cave or slough. This limitation can be overcome by using proper excavation safety procedures and avoiding excavating when the soil is saturated.

Figure 2 shows a regional view of this interpretation, useful for broad resource planning. Many of the soils in the Red River Valley have limitations for the installation of subsurface drains. These limitations are mostly related to the impact high clay content and high water tables have on stability of excavations and the potential for excess compaction.

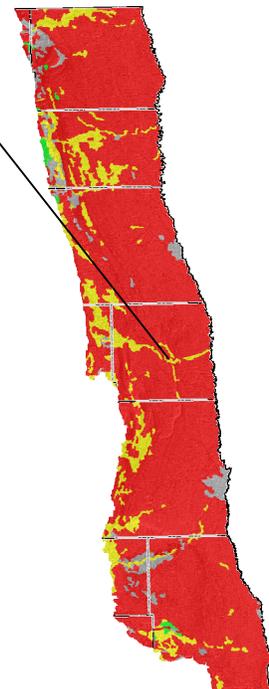


Figure 2

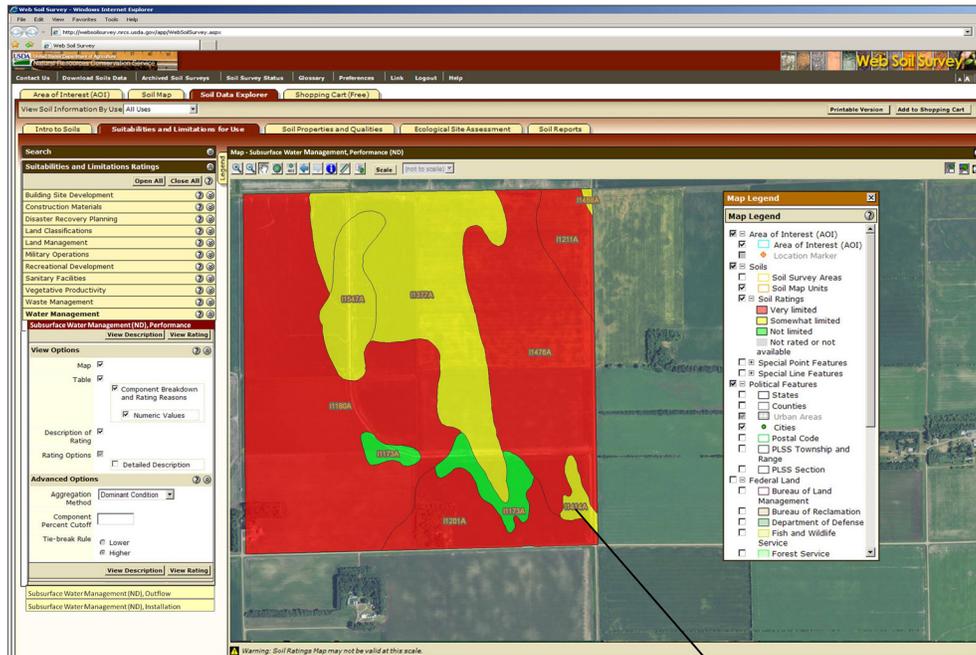


Figure 3

The Subsurface Water Management **PERFORMANCE** Interpretation evaluates a soil's potential to remove excess subsurface water and reduce soil saturation. It also evaluates the potential for a soil to corrode infrastructure or subside after drainage. This interpretation evaluates:

1. Presence of dense layers in the soil
2. Soil permeability or the ability of a soil to transmit water
3. Flooding
4. Surface pH
5. Soil sodium content
6. Soil gypsum content
7. Subsidence
8. Sedimentation

Figure 3 shows the Web Soil Survey ratings for the Performance interpretation for a field in Traill County, ND. In this image, green is **Not Limited**, yellow is **Somewhat Limited**, and red is **Very Limited**. The limitations are due to either restricted permeability, excess sodium, or the potential for sedimentation of silt and very fine sand in the pipe.

Figure 4 shows results from the Performance Interpretation on the Red River Valley in North Dakota. This map is useful for broad regional planning. On a watershed basis, many areas in the Red River Valley need to address various soil concerns before initiating a subsurface drainage system.

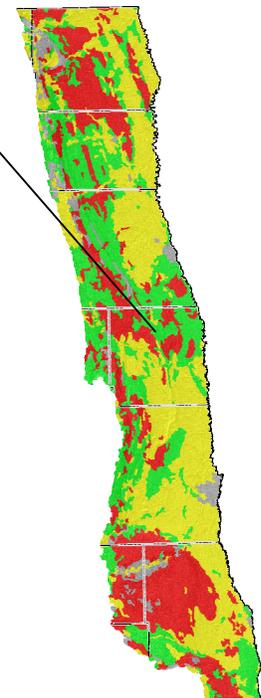


Figure 4

Outflow Quality

Considering Tile?

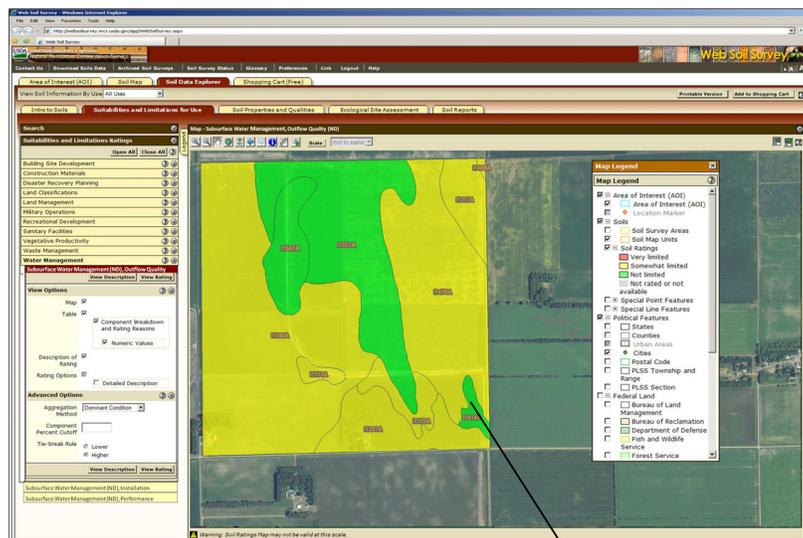


Figure 5

The Subsurface Water Management **Outflow Quality** interpretation evaluates a soil's inherent physical and chemical properties that may impact the quality of discharge from underground drainage systems. It does not consider temporal properties, climatic conditions, or nutrient and pesticide management systems.

This interpretation considers:

1. Soil salinity
2. Potential for pesticide and nutrient leaching
3. Potential for a soil to develop deep cracks

Figure 5 shows the Web Soil Survey ratings for the Outflow Quality interpretation for a field in Traill County, ND. In this image, green is **Not Limited** and yellow is **Somewhat Limited**. The Somewhat Limited rating is due to soil salinity and the potential for a soil to leach nutrients or pesticides. These limitations can be overcome with adequate nutrient and moisture management.

Figure 6 shows the Outflow Quality Interpretation for the Red River Valley. Outflow quality may be affected by the presence of saline soils, rapid permeability, and soils that develop deep, wide cracks. Maps such as these can be used in regional planning or in identifying areas needing additional evaluation.

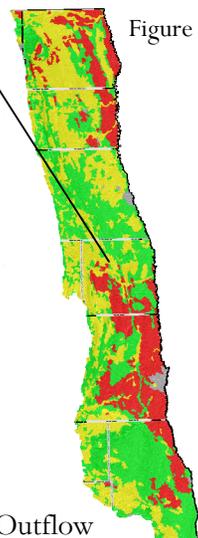


Figure 6

Regional Suitability

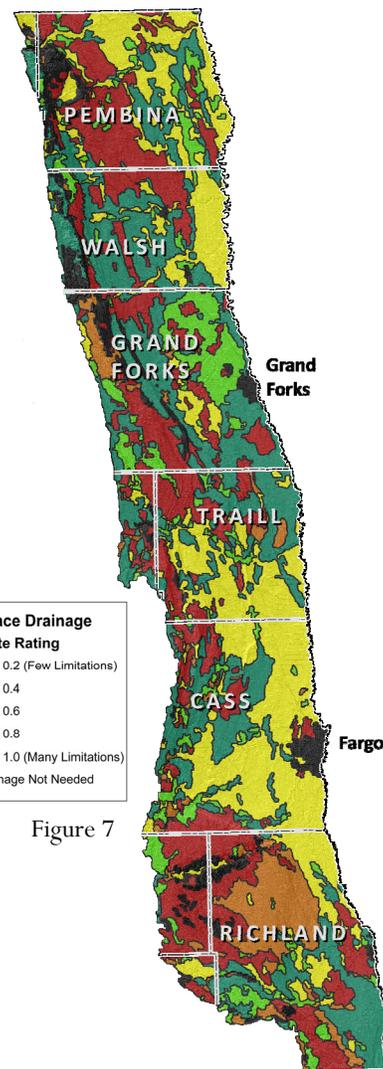


Figure 7

Regional Suitability Maps

Figure 7 shows a composite suitability map for Subsurface Water Management for the Red River Valley in North Dakota. This map evaluates all the criteria for Installation, Performance, and Outflow Quality and creates a weighted rating. It can be useful in regional planning studies and identifying areas that need additional evaluation.