



Hydrologic Soil Group for Phosphorus Index 2.0 and Nitrate Leaching Index Determination

Introduction

Hydrologic soil group (HSG) is an input needed to derive the New York Phosphorus Index (NY-PI 2.0) and Nitrate Leaching Index (NLI) for a field. The USDA-NRCS classifies all soils of the US into four HSGs (A, B, C, D) based on runoff and percolation potential, determined using the rate of water infiltration when soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. The depth and hydraulic conductivity of any water impermeable layer and the depth to any high-water table are used to assign a HSG to a map unit. Runoff potential increases from A to D while under identical precipitation levels, soils with a HSG A have the greatest percolation potential and are most conducive to leaching. Some group D soils can have a dual class (A/D, B/D or C/D) to reflect reduced runoff risk if a group D soil is artificially drained (Figure 1).

This factsheet describes each of the four HSGs and includes information on use of dual HSG assignments for soils where artificial drainage changes the runoff potential of a field. See Chapter 7 (Hydrologic Soil Groups) of the National Engineering Handbook Part 630 of the USDA-NRCS for more detailed information on the classification of HSGs. The HSG descriptions are taken from Chapter 7 of the Handbook.

Four Hydrologic Soil Groups

- **Group A:** Soils in this group have a low runoff and high leaching potential (water is transmitted freely through the soil). Group A soils typically have less than 10% clay and predominantly gravel or sand textures, although some soils with loamy sand, sandy loam, loam, or silt loam texture may also be placed in this group if they are well aggregated, of low bulk density, or contain >35% rock fragments. Saturated hydraulic conductivity (K_{sat}) exceeds 5.67 inches per hour. The depth to any water impermeable layer exceeds 20 inches; depth to water table exceeds 24 inches. Soils that are deeper than 40 inches to a water impermeable layer are in group A if K_{sat} of all soil layers exceeds 1.42 inches per hour.
- **Group B:** Soils in this group have a moderately low runoff potential when thoroughly wet. Water transmission through the soil is unimpeded. Group B soils typically have between 10 and 20% clay, 50 to 90% sand, and loamy sand or sandy loam textures. Some soils having loam, silt loam, silt, or sandy clay loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35% rock fragments.

Hydrologic Soil Groups of Map Unit Major Components in New York Soil Survey Areas					
NRCS-NY November 2021					
Area Symbol	Area Name	Map Unit Symbol	Component Percent	Component Name (major components)	Hydrologic Soil Group
NY121	Wyoming County, New York	CcA	80	Canaseraga	C
NY121	Wyoming County, New York	CcB	80	Canaseraga	C
NY121	Wyoming County, New York	CcC	80	Canaseraga	C
NY121	Wyoming County, New York	CdA	80	Caneadea	D
NY121	Wyoming County, New York	CdB	80	Caneadea	D
NY121	Wyoming County, New York	CdC	80	Caneadea	D
NY121	Wyoming County, New York	CeD3	80	Caneadea	D
NY121	Wyoming County, New York	CeE3	80	Caneadea	D
NY121	Wyoming County, New York	CgA	80	Castile	A/D
NY121	Wyoming County, New York	CgB	80	Castile	A/D
NY121	Wyoming County, New York	ChA	80	Castile	A/D

Figure 1: Hydrologic soil groups of map units in New York can be obtained from the electronic Field Office Technical Guide (NRCS eFOTG at <https://efotg.sc.egov.usda.gov/#/>) Chose New York, submit. Click Section II. Click Soil Information. Click on: Hydrologic Soil Group Data for New York. The file is an Excel file that is downloadable.

The K_{sat} of the least transmissive layer in the top 20 inches ranges from 1.42 to 5.67 inches per hour. The depth to any water impermeable layer exceeds 20 inches; depth to water table exceeds 24 inches. Soils deeper than 40 inches to a restrictive layer or water table are in group B if the K_{sat} of all soil layers within 40 inches is between 0.57 and 1.42 inches per hour.

- **Group C:** Group C soils have a moderately high runoff potential. Water percolation is somewhat restricted. Group C soils typically have 20 to 40% clay and less than 50% sand, and have loam, silt loam, sandy clay loam, clay loam, or silty clay loam textures. Some soils with clay, silty clay, or sandy clay textures may also be placed in this group if they are well aggregated, of low bulk density, or contain 35% or more rock fragments. The K_{sat} in the least transmissive layer in the top 20 inches is between 0.14 and 1.42 inches per hour. The depth to any water impermeable layer exceeds 20 inches; depth to the water table is 24 inches or more. Soils with 40 inches or more to a restriction or water table are in group C if the K_{sat} in the top 40 inches is between 0.06 and 0.57 inches per hour.
- **Group D:** Group D soils have high runoff potential when wet while water movement through the soil is (very) restricted. Group D soils typically have >40% clay, <50% sand, and clayey textures. In some areas, they also have high shrink-swell potential. Soils with a depth to a water impermeable layer <20 inches and soils with a water table within 24 inches are in this group. For soils with a water impermeable layer at a depth between 20 and 40 inches, the K_{sat} in the least transmissive soil layer is ≤ 0.14 inches per hour. For soils deeper than 40 inches to a restriction or water table, the K_{sat} of all soil layers within 40 inches of the surface ≤ 0.06 inches per hour.

Dual Hydrologic Soil Groups

Some soils with high permeability are assigned HSG D based solely on the presence of a water table within 24 inches of the surface even though the K_{sat} may be favorable for water percolation. When adequately drained, the runoff potential of these soils is reduced while leaching potential is increased, and as a result these map units are assigned a dual HSG (e.g., A/D, B/D, C/D), with the first letter representing the adequately drained condition, defined as

seasonal-high water table at least 24 inches below the soil surface. For NY-PI 2.0 and NLI planning purposes, when a planner determines that adequate drainage is installed in a field, the first HSG letter in the pairing can be used.

Access and Updates

Each year, on October 1, the NRCS official soils database is updated. Web Soil Survey (WSS) reflects the updated soil data. However, NY-NRCS also makes available a statewide data file to make it easier to retrieve HSG designations for multiple regions. Access the spreadsheet at the electronic Field Office Technical Guide (eFOTG at <https://efotg.sc.egov.usda.gov/#/>). Chose New York, submit. Click Section II. Click Soil Information. Click on: Hydrologic Soil Group Data for New York.

In Summary

The NY-PI 2.0 and NLI use HSG as an input. For soils with dual HSG assignments, if adequate drainage is installed, the first HSG letter in the pairing can be used in the NY-PI 2.0 or NLI.

Additional Resources

- NY Phosphorus Index User Manual and Documentation. http://nmsp.cals.cornell.edu/publications/extension/NYP_I_2_User_Manual.pdf.
- The New York Nitrate Leaching Index. http://nmsp.cals.cornell.edu/publications/extension/nlea_chingindex.pdf.
- USDA-NRCS. Hydrologic Soil Groups. Chapter 7 Part 630. Hydrology National Engineering Handbook. <https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=22526.wba>.
- Web Soil Survey. <http://websoilsurvey.nrcs.usda.gov/>.

Disclaimer

This fact sheet reflects the current (and past) authors' best effort to interpret a complex body of scientific research, and to translate this into practical management options. Following the guidance provided in this fact sheet does not assure compliance with any applicable law, rule, regulation or standard, or the achievement of discharge levels from agricultural land.

For more information



Cornell University
Cooperative Extension

Nutrient Management Spear Program
<http://nmsp.cals.cornell.edu>

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