

MAPSS method for onsite assignment of Hydrologic Soil Group (HSG).*

This is a proposed method for assigning Hydrologic Soil Groups (HSG) to sites or High Intensity Soil Survey (HISS) map unit components based on observed soil properties of Representative Pedons.

Abbreviations:

HSG	Hydrologic Soil Group
RP	Representative Pedon
HISS	High Intensity Soil Survey
SHWT	Seasonal High Water Table
NEH CH7	National Engineering Handbook, Part 630 Hydrology, Chapter 7 https://www.wcc.nrcs.usda.gov/ftpref/wntsc/H&H/NEHhydrology/ch7.pdf

Background and proposal:

1. HSG is assigned using Chapter 7 of the NRCS National Engineering Handbook (NEH), Part 630. It uses depth to **water impermeable layer**, depth to seasonal high water table (SHWT), and Ksat of the least transmissive layer above the **water impermeable layer** to determine HSG.
2. Soil series' HSG assignments are based on a single pedon by NRCS, 1 HSG per series.
3. But soil series' ranges in depths to **water impermeable layers** and SHWT mean that HSG can vary.
4. HSG is arguably the single most sought-after soil attribute from soils consultants.
5. HSG assignment based on actual site characteristics would add significant accuracy and value to that product.
6. Two methods have been explored:
 - A. The Rhode Island Triangle
 - B. Using CH7 NEH
7. The triangle method cannot be defensibly promoted due to issues with separation of SHWT depths, and using inexact groups of soil textures as proxies for Ksat.
8. The MAPSS Technical Committee is proposing a method using the NEH CH7 method.

*If you are not experienced in using this methodology, or do not have a representative pedon description for your site or map unit component, then stop here.

What is a “water impermeable layer”?

See Footnote 1/ below **Table 7.1**, p. 7-4. The various diagnostic horizons are defined in *Keys to Soil Taxonomy*, USDA (Chapter 3).

“Fragipan” is equivalent to the Cd-horizon in lodgement till.

“Densic materials have, at their upper boundary, a densic contact if they have NO CRACKS or if the spacing of the cracks that roots can enter is 10 CM OR MORE.”

“An impermeable layer has a $K_{sat} < 0.01$ micro-meters/second*
*micro-meter = micron = 0.001 mm

SAND	_____	0.050 microns
SILT	_____	0.002microns
CLAY		

What is “Depth to high water table”?

See Footnote 2/ below **Table 7.1**, p. 7-4.

This is the Seasonal High Water Table (SHWT)

What is “Ksat of least transmissive layer in depth range”?

This is the layer or horizon with that will be least transmissive ABOVE THE WATER IMPERMEABLE LAYER.

Table 7-1

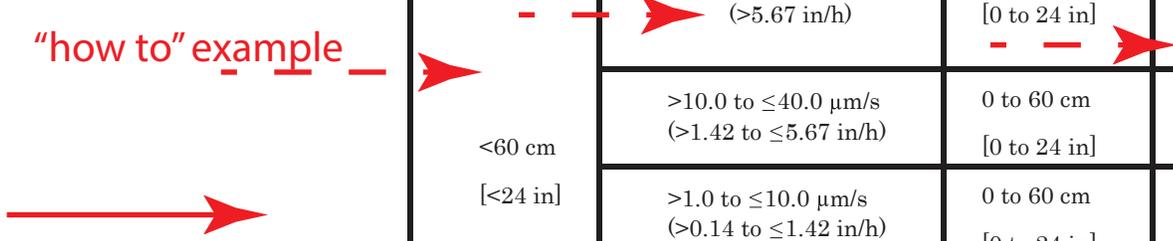
Depth to water impermeable layer ^{1/}	Depth to high water table ^{2/}	K _{sat} of least transmissive layer in depth range	K _{sat} depth range	HSG ^{3/}
<50 cm [<20 in]	—	—	—	D
50 to 100 cm [20 to 40 in]	<60 cm [<24 in]	>40.0 μm/s (>5.67 in/h)	0 to 60 cm [0 to 24 in]	A/D
		>10.0 to ≤40.0 μm/s (>1.42 to ≤5.67 in/h)	0 to 60 cm [0 to 24 in]	B/D
		>1.0 to ≤10.0 μm/s (>0.14 to ≤1.42 in/h)	0 to 60 cm [0 to 24 in]	C/D
		≤1.0 μm/s (≤0.14 in/h)	0 to 60 cm [0 to 24 in]	D
	≥60 cm [≥24 in]	>40.0 μm/s (>5.67 in/h)	0 to 50 cm [0 to 20 in]	A
		>10.0 to ≤40.0 μm/s (>1.42 to ≤5.67 in/h)	0 to 50 cm [0 to 20 in]	B
		>1.0 to ≤10.0 μm/s (>0.14 to ≤1.42 in/h)	0 to 50 cm [0 to 20 in]	C
		≤1.0 μm/s (≤0.14 in/h)	0 to 50 cm [0 to 20 in]	D
>100 cm [>40 in]	<60 cm [<24 in]	>10.0 μm/s (>1.42 in/h)	0 to 100 cm [0 to 40 in]	A/D
		>4.0 to ≤10.0 μm/s (>0.57 to ≤1.42 in/h)	0 to 100 cm [0 to 40 in]	B/D
		>0.40 to ≤4.0 μm/s (>0.06 to ≤0.57 in/h)	0 to 100 cm [0 to 40 in]	C/D
		≤0.40 μm/s (≤0.06 in/h)	0 to 100 cm [0 to 40 in]	D
	60 to 100 cm [24 to 40 in]	>40.0 μm/s (>5.67 in/h)	0 to 50 cm [0 to 20 in]	A
		>10.0 to ≤40.0 μm/s (>1.42 to ≤5.67 in/h)	0 to 50 cm [0 to 20 in]	B
		>1.0 to ≤10.0 μm/s (>0.14 to ≤1.42 in/h)	0 to 50 cm [0 to 20 in]	C
		≤1.0 μm/s (≤0.14 in/h)	0 to 50 cm [0 to 20 in]	D
>100 cm [>40 in]	>10.0 μm/s (>1.42 in/h)	0 to 100 cm [0 to 40 in]	A	
	>4.0 to ≤10.0 μm/s (>0.57 to ≤1.42 in/h)	0 to 100 cm [0 to 40 in]	B	
	>0.40 to ≤4.0 μm/s (>0.06 to ≤0.57 in/h)	0 to 100 cm [0 to 40 in]	C	
	≤0.40 μm/s (≤0.06 in/h)	0 to 100 cm [0 to 40 in]	D	

"how to" example

Start here in this column

Start here in this column

Start here in this column



Method:

Using the included HSG worksheet or equivalent:

1. From your site and/or HISS: use the pedon description information for the map unit component **Representative Pedon (RP)**.

For each RP; identify 1) the depth to **water impermeable layer**, 2) depth to **seasonal highwater table**, and 3) **least transmissive layer** above the **water impermeable layer**.

2. Using Web Soil Survey (download PDF instructions from MAPSS website if needed):

Identify the analogous soil series (component) used in the most relevant published soil survey.

Identify the appropriate layer from that NRCS pedon to use for your RP least transmissive layer.

Note: the NRCS pedon layer should be the least transmissive layer above any impermeable layers in most cases.

Use the Ksat data for the NRCS layer to attribute to your RP least transmissive layer.

Record the **High**, **Low** and **Representative Value (RV)** for the Ksat of the NRCS pedon least transmissive layer.

Either: Use the RV for Ksat for that layer and go to (3).

or: Deviate from the NRCS RV value based on RP properties, using the guidance in (2A).

2A. Deviating from the NRCS pedon layer RV for Ksat.

1. If RP layer **Rock Fragment (RF)** % exceeds NRCS reference pedon layer, then the RP Ksat RV may be increased or decreased by the percentage deviation from the NRCS layer RF %, to a maximum of 20 percent.

Example: NRCS reference pedon layer has 5% RF, RP layer has 15% RF, and NRCS Ksat RV is 10, then it may be increased to 11 for your RP layer.

2. If the fine earth texture is one class or more different than the NRCS reference layer, then the Ksat may be adjusted up to 10% (up for a coarser RP, down for a finer RP).

Example: NRCS reference pedon layer is L, RP layer is CL, and Ksat RV is 10, then it may be decreased to 9 for your RP layer.

3. If the NRCS reference layer consistence *and* structure are at least one class different from the RP layer, then the Ksat may be adjusted up to 10% from the NRCS layer.

Example A: NRCS reference pedon layer is firm and weak, RP layer is friable and strong, and Ksat RV is 10, then it may be increased to 11 for your RP layer.

Example B: NRCS reference pedon layer is firm and weak, RP layer is very firm and strong, then they offset and no deviation from the RV is allowed.

--these may be applied cumulatively for a maximum of 40% deviation from the NRCS pedon layer Ksat RV--

Establish Ksat and go to (3).

3. Use table 7.1 from the NEH CH7, Part 630 to attribute the HSG for your RP.

Example:							
Using CH7:							
Representative Pedon (RP): Kennebec Chesuncook (Dixmont)							
	Bottom depth	Redoximorphic features	Texture	% Rock fragments.	Consistence	Structure	
Oa	5cm		sil	20	fr	1FGR	
E	10cm		sil	20	fr	1FPL	
Bs	45cm		sil	25	fr	2FMGR	
Bs2	75cm		l	30	fr	2FMSBK	
BC	85cm	yes	l	40	fr	2FMSBK	
Cd							
Soil survey BC horizon on top of pan Ksat 1.41-14.11 um/sec, Representative Value (RV) = 7.76							
Based on texture and RF%, use Ksat=10.09 (30% above RV) based on rocks, texture.							
HSG = B							
Using Rhode Island Triangle, the HSG = C							
Using soil survey data, the HSG = C/D.							

