Hydrology of Soil Types

Data Bundle

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Introduction

The Hydrology of Soil Types (HOST) classification describes the dominant pathways of water movement through the soil and, where appropriate, the underlying substrate. Eleven drainage models are defined according to the permeability of the soil and its substrate and the depth to a groundwater table, where one is present. These are further subdivided into 29 HOST classes to which all soil series have been assigned. These classes identify the way soil water flows are partitioned, with water passing over, laterally through, or vertically down the soil column. Analysis of the river hydrograph and the extent of soil series for several hundred gauged catchments allowed mean values for catchment hydrological variables to be identified for each HOST class.

Data Bundle contents

1. **Hydrology of Soil Types**
    - Map file - either ESRI shapefile* (.shp) or MAPINFO** (.tab)
    - File named 000000_HOST.shp where 000000 is the order no of your data request.
2. **HOST Class percentages**
    - Map file - either ESRI shapefile* (.shp) or MAPINFO** (.tab)
    - File named 000000_HOST_PC.shp where 000000 is the order no of your data request.
3. **HOST_classes.csv** – Text file – lists the 29 HOST classes and their attributes
4. **Hydrology of Soil Types data Bundle.pdf** – This document
5. **Hydrology of Soil Types.lyr** – A layer file (.lyr) is a file that stores the path to a source dataset and other layer properties, including symbology.

* ESRI shapefiles also include a .dbf, a .shx and a .prj file.
** MAPINFO files also include a .dat, a .id and a .map file.

Key Facts and Statistics about the Hydrology of Soil Types

- Simplified rendition of the national soil map with a focus on soil hydrology
- 29 distinct classes
- The HOST Classification was defined jointly by Cranfield University, CEH and The James Hutton Institute
- Details of the model are published in Hydrology of Soil Types: a hydrologically-based classification of the soils of the United Kingdom - IH Report 126

Data Bundle

Hydrology of Soil Types map file

Attributes	Description
HOST	Hydrology of Soil Type classification
HOST_T	Description of the HOST class
BFI	Base Flow Index. Dimensionless variable (range 0 to 1) that expresses the fraction of the average flow volume (in a river), represented by the contribution from groundwater storage
SPR	Standard Percentage Run-off. Dimensionless variable (range 0 to 100 %) that represents the percentage of rainfall that causes the short-term increase in flow at the catchment outlet seen after the storm event
IR_FRAC	Intermediate Run-off Fraction. Dimensionless variable (range 0 to 100%) that accounts for the proportion of the flow not contributed by base flow (BFI) or rapid-response run-off (SPR)
MSRV	Minimum Standard Rainfall Volume (mm). Defined as that amount of rainfall required to displace solute from the topsoil and impact directly on streams. No solute from the topsoil is predicted to contribute to stream response unless this amount of rainfall or more is received during a single event

An ESRI layer file accompanies this shapefile “Hydrology of Soil Types.lyr” You can use this to colour the map according to the standard colour scheme defined in IH126.

HOST Class Percentages map file

Attributes	Description
HOST	The dominant HOST Class in the polygon
HOST1	Percentage of the polygon in HOST Class 1: Free draining permeable soils on chalk and chalky substrates with relatively high permeability and moderate storage capacity.
HOST2	Percentage of the polygon in HOST Class 2: Free draining permeable soils on 'brashy' or dolomitic limestone substrates with high permeability and moderate storage capacity.
HOST3	Percentage of the polygon in HOST Class 3: Free draining permeable soils on soft sandstone substrates with relatively high permeability and high storage capacity.
HOST4	Percentage of the polygon in HOST Class 4: Free draining permeable soils on hard but fissured rocks with high permeability but low to moderate storage capacity.
HOST5	Percentage of the polygon in HOST Class 5: Free draining permeable soils in unconsolidated sands or gravels with relatively high permeability and high storage capacity.
HOST6	Percentage of the polygon in HOST Class 6: Free draining permeable soils in unconsolidated loams or clays with low permeability and storage capacity.
HOST7	Percentage of the polygon in HOST Class 7: Free draining permeable soils in unconsolidated sands or gravels with groundwater at less than 2m from the surface.
HOST8	Percentage of the polygon in HOST Class 8: Free draining permeable soils in unconsolidated loams or clays with groundwater at less than 2m from the surface.
HOST9	Percentage of the polygon in HOST Class 9: Soils seasonally waterlogged by fluctuating groundwater and with relatively slow lateral saturated conductivity.
HOST10	Percentage of the polygon in HOST Class 10: Soils seasonally waterlogged by fluctuating groundwater and with relatively rapid lateral saturated conductivity.
HOST11	Percentage of the polygon in HOST Class 11: Drained lowland peaty soils with groundwater controlled by pumping.
HOST12	Percentage of the polygon in HOST Class 12: Undrained lowland peaty soils waterlogged by groundwater.
HOST13	Percentage of the polygon in HOST Class 13: Soils with slight seasonal waterlogging from transient perched water tables caused by slowly permeable subsoil or substrate layers.
HOST14	Percentage of the polygon in HOST Class 14: Soils seasonally waterlogged by

Attributes	Description
	perched water tables caused by impermeable subsoil or substrate layers.
HOST15	Percentage of the polygon in HOST Class 15: Permanently wet, peaty topped upland soils over relatively free draining permeable rocks.
HOST16	Percentage of the polygon in HOST Class 16: Relatively free draining soils with a moderate storage capacity over slowly permeable substrates with negligible storage capacity.
HOST17	Percentage of the polygon in HOST Class 17: Relatively free draining soils with a large storage capacity over hard impermeable rocks with no storage capacity.
HOST18	Percentage of the polygon in HOST Class 18: Slowly permeable soils with slight seasonal waterlogging and moderate storage capacity over slowly permeable substrates with negligible storage.
HOST19	Percentage of the polygon in HOST Class 19: Relatively free draining soils with a moderate storage capacity over hard impermeable rocks with no storage capacity.
HOST20	Percentage of the polygon in HOST Class 20: Slowly permeable soils with slight seasonal waterlogging and moderate storage capacity over impermeable clay substrates with no storage capacity.
HOST22	Percentage of the polygon in HOST Class 22: Relatively free draining soils with low storage capacity over hard impermeable rocks with no storage capacity.
HOST23	Percentage of the polygon in HOST Class 23: Slowly permeable soils with slight seasonal waterlogging and low storage capacity over impermeable clay substrates with no storage capacity.
HOST24	Percentage of the polygon in HOST Class 24: Slowly permeable, seasonally waterlogged soils over slowly permeable substrates with negligible storage capacity.
HOST25	Percentage of the polygon in HOST Class 25: Slowly permeable, seasonally waterlogged soils over impermeable clay substrates with no storage capacity.
HOST26	Percentage of the polygon in HOST Class 26: Permanently wet, peaty topped upland soils over slowly permeable substrates with negligible storage capacity.
HOST27	Percentage of the polygon in HOST Class 27: Permanently wet, peaty topped upland soils over hard impermeable rocks with no storage capacity.
HOST28	Percentage of the polygon in HOST Class 28: This soils type, eroded peat, is not mapped separately in England and Wales.
HOST29	Percentage of the polygon in HOST Class 29: Permanently wet upland blanket peat.

About the HOST map

HOST is an hydrologically-based classification of the soils of the United Kingdom that describes both the soils and their distribution, and the hydrological response of catchments. The classification is based on conceptual models of the processes that occur in the soil and, where appropriate, the substrate. The resulting scheme has 29 classes, based on eleven response models; Soils are assigned to classes on the basis of their physical properties, and with reference to the hydrogeology of the substrate.

To understand the soil component of the HOST models, it would be helpful for you to know about 3 types of soil classifications

- Soil Associations: there are over 296 soil associations in England and Wales. Most soil associations contain between 3 and 7 soil series that are commonly found in association with each other in the landscape. The National Soil Map shows the distribution of soil associations at 1:250,000 scale.

- Soil Series: there are over 700 soil series in England and Wales, and 3-7 in most soil associations. Soil series are the most detailed taxonomic class of soil. The same soil series can be found in multiple soil associations. The likely proportion of each series in an association is given as a percentage in NATMAP_Associations.csv file.

- Hydrology of Soil Type (HOST) class: we have classified each of the soil series into one of 29 HOST classes.

As each unit on the map represents an association of soils they therefore represent a variety of HOST classes. The main HOST map file gives the HOST class that dominates the unit. It also shows the attributes of the class (BFI, SPR, IR_FRAC and MSRV). The HOST Class Percentage map shows the breakdown by percentage of other HOST classes that exist in the unit as well as highlighting the dominant class.

Hydrology of Soil Types Key

1 - *Free draining permeable soils on chalk and chalky substrates with relatively high permeability and moderate storage capacity.*

2 - *Free draining permeable soils on 'brashy' or dolomitic limestone substrates with high permeability and moderate storage capacity.*

3 - *Free draining permeable soils on soft sandstone substrates with relatively high permeability and high storage capacity.*

4 - *Free draining permeable soils on hard but fissured rocks with high permeability but low to moderate storage capacity.*

5 - *Free draining permeable soils in unconsolidated sands or gravels with relatively high permeability and high storage capacity.*

6 - *Free draining permeable soils in unconsolidated loams or clays with low permeability and storage capacity.*

7 - *Free draining permeable soils in unconsolidated sands or gravels with groundwater at less than 2m from the surface.*

8 - *Free draining permeable soils in unconsolidated loams or clays with groundwater at less than 2m from the surface.*

9 - *Soils seasonally waterlogged by fluctuating groundwater and with relatively slow lateral saturated conductivity.*

10 - *Soils seasonally waterlogged by fluctuating groundwater and with relatively rapid lateral saturated conductivity.*

11 - *Drained lowland peaty soils with groundwater controlled by pumping.*

12 - *Undrained lowland peaty soils waterlogged by groundwater.*

13 - *Soils with slight seasonal waterlogging from transient perched water tables caused by slowly permeable subsoil or substrate layers.*

14 - *Soils seasonally waterlogged by perched water tables caused by impermeable subsoil or substrate layers.*

15 - *Permanently wet; peaty topped upland soils over relatively free draining permeable rocks.*

16 - *Relatively free draining soils with a moderate storage capacity over slowly permeable substrates with negligible storage capacity.*

17 - *Relatively free draining soils with a large storage capacity over hard impermeable rocks with no storage capacity.*

18 - *Slowly permeable soils with slight seasonal waterlogging and moderate storage capacity over slowly permeable substrates with negligible storage.*

19 - *Relatively free draining soils with a moderate storage capacity over hard impermeable rocks with no storage capacity.*

20 - *Slowly permeable soils with slight seasonal waterlogging and moderate storage capacity over impermeable clay substrates with no storage capacity.*

21 - *Slowly permeable soils with slight seasonal waterlogging and low storage capacity over slowly permeable substrates with negligible storage capacity.*

22 - *Relatively free draining soils with low storage capacity over hard impermeable rocks with no storage capacity.*

23 - *Slowly permeable soils with slight seasonal waterlogging and low storage capacity over impermeable clay substrates with no storage capacity.*

24 - *Slowly permeable; seasonally waterlogged soils over slowly permeable substrates with negligible storage capacity.*

25 - *Slowly permeable; seasonally waterlogged soils over impermeable clay substrates with no storage capacity.*

26 - *Permanently wet; peaty topped upland soils over slowly permeable substrates with negligible storage capacity.*

27 - *Permanently wet; peaty topped upland soils over hard impermeable rocks with no storage capacity.*

28 - *This soils type (eroded peat) is not mapped separately in England and Wales.*

29 - *Permanently wet upland blanket peat.*

The HOST Framework

	Slowly permeable layer >100 cm; Gleyed layer > 100 cm	Gleyed layer at 40 -100 cm, OR gleyed layer at > 100 cm and slowly permeable layer < 100 cm		Gleyed layer at < 40 cm	Raw peaty topsoil present
Aquifer substrate. Groundwater At > 2 m Depth	**1**. Weakly consolidated microporous, by-pass flow uncommon (chalk)	**13**. (no hydrogeological subdivision)		**14**. (no hydrogeological subdivision)	**15**. (no hydrogeological subdivision)
	2. Weakly consolidated microporous, by-pass flow uncommon (limestone)				
	3. Weakly consolidated macroporous, by-pass flow very uncommon.				
	4. Strongly consolidated non- or weakly porous, by-pass flow normal				
	5. Unconsolidated macroporous, by-pass flow very uncommon				
	6. Unconsolidated microporous, by-pass flow common.				
Aquifer substrate. Groundwater at ≤ 2 m depth	**7**. Unconsolidated macroporous, by-pass flow very uncommon.			**9**. Mean drainable pore space <12.5 % volume (< 1 m/day)	**12**. Undrained peat
	8. Unconsolidated microporous, by-pass flow common.			**10**. Mean drainable pore space ≥12.5 % volume (≥1 m/day)	
				11. Drained peat	
Non-aquifer. No significant groundwater present		Mean drainable pore space > 7.5 %	Mean drainable pore space ≤ 7.5 %		
	16. Weakly consolidated, slowly permeable	**18**. Weakly consolidated, slowly permeable.	**21**. Weakly consolidated, slowly permeable.	**24**. Weakly consolidated, slowly permeable	**26**. Weakly consolidated, slowly permeable
	17. Strongly consolidated, impermeable	**19** Strongly consolidated, impermeable	**22** Strongly consolidated, impermeable		**27** Strongly consolidated, impermeable
		20. Weakly consolidated, impermeable	**23**. Weakly consolidated, impermeable	**25**. Weakly consolidated, impermeable	
					28. Eroded peat
					29. Blanket peat

Full details of the model are published in Hydrology of Soil Types: a hydrologically-based classification of the soils of the United Kingdom - IH Report 126