# Natural Flood Management

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- **Natural Flood Management (NFM)** works with natural processes to manage sources and pathways of flood waters.
- **NFM techniques** include restoration, enhancement and alteration of natural hydrological and morphological processes and features.
- **NFM** takes a catchment-wide approach to:
  - reduce runoff rates and/or amounts, slowing down peak river flows;
  - improve the ability of rivers and floodplains to manage flood water.
- **Integrated catchment research** is needed to better understand hydrological connectivity between surface water, soil and groundwater, and ensure the most effective land use and flood management measures.



**Figure 1** – Combined surface water and groundwater flooding in the Tweed valley.



① Dominant groundwater flow down-valley
② Flow from river to groundwater
③ Subsurface flow from hillslope to floodplain
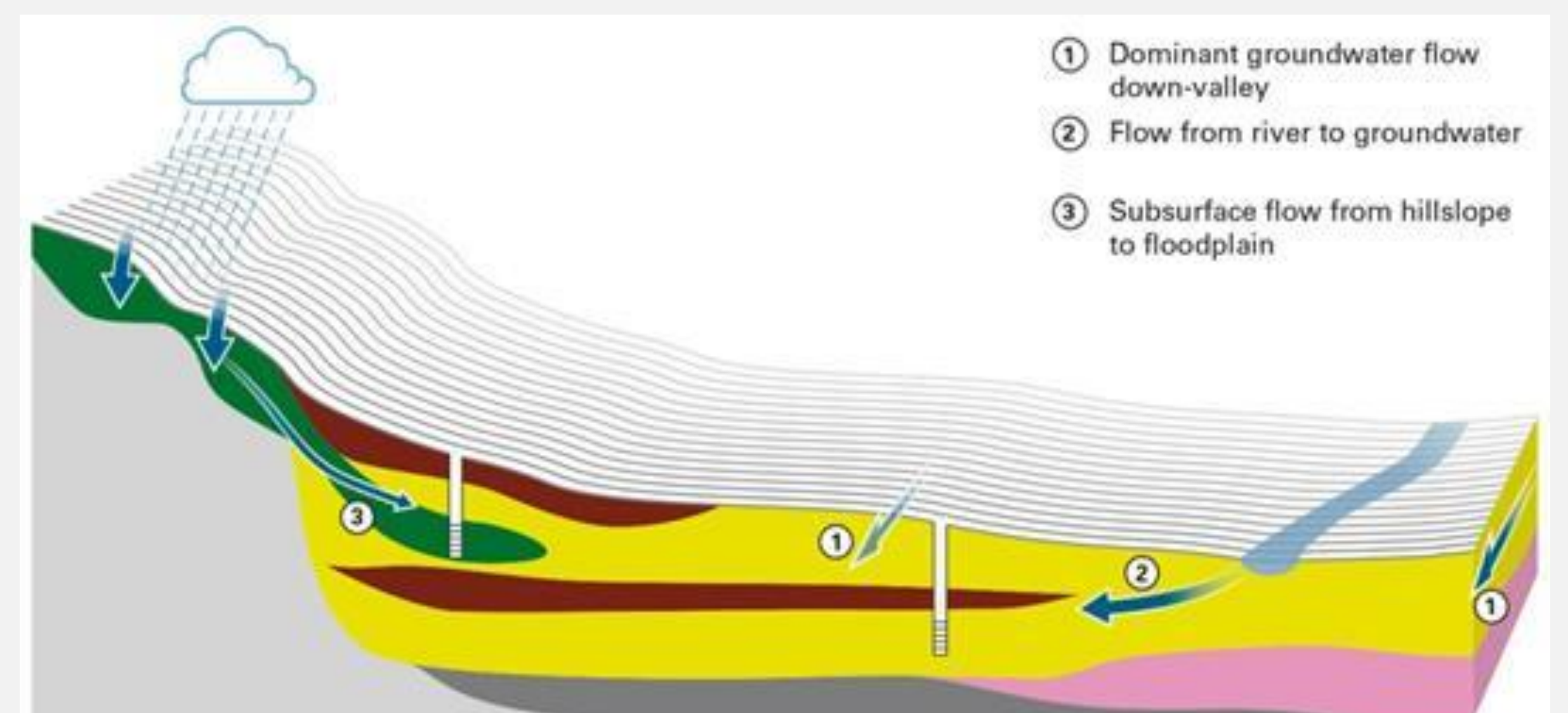
**Figure 2** – Subsurface flows are important in transferring water through hillslopes and floodplains
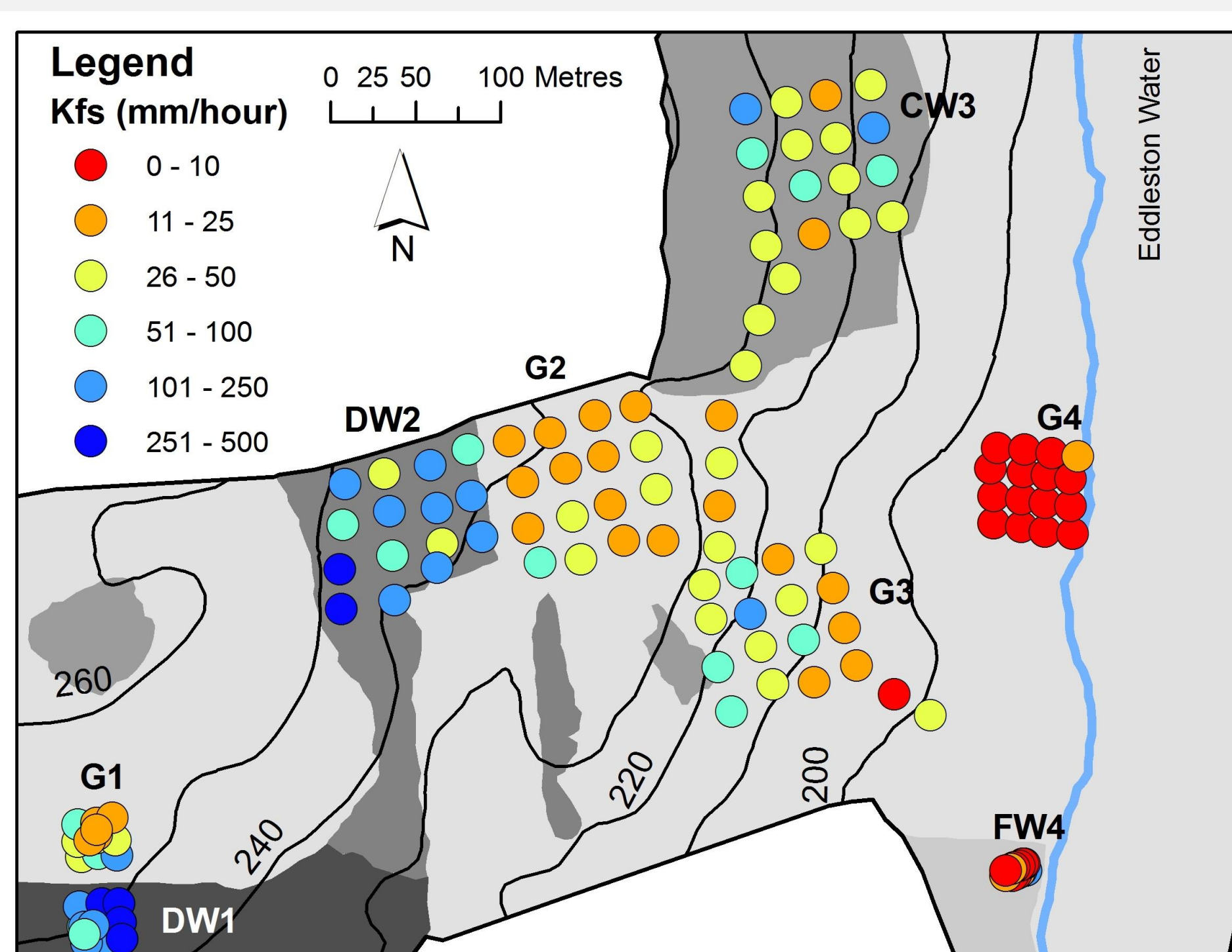


Legend:
Kfs – field saturated hydraulic conductivity
G – improved pasture grassland
DW – mature, mixed deciduous woodland
CW – coniferous woodland
FW – willow deciduous woodland

**Figure 3** – Soil permeability under mature deciduous woodland is 10–15 times higher than under neighbouring coniferous woodland and improved grassland.
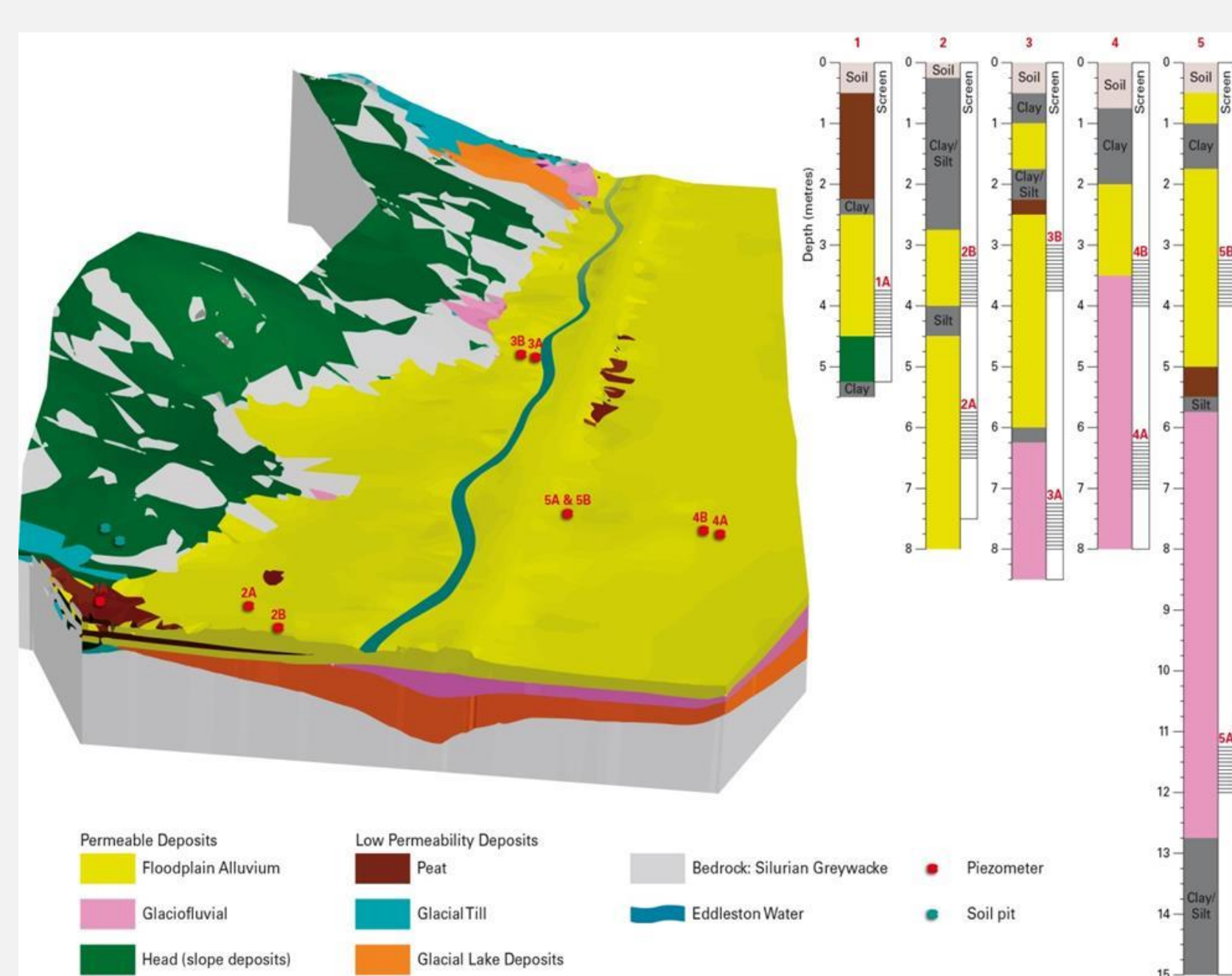


**Figure 4** – The 3D geology of the hillslope and floodplain is a key control on hydrological storage and connectivity.

BGS is working with other researchers including Forest Research, the Universities of Dundee, Edinburgh and Abertay; and with SEPA and the Scottish Government. We are investigating how hydraulic characteristics of soil and aquifers vary across floodplains and wider catchments; how rainfall, surface water, soil water and groundwater interact; and how this influences flooding.

**References**
Archer et al. 2016, Ecohydrology 9 (4), 585-600.
MacDonald et al. 2014, Hydrology Research 45 (6), 755-773.
Archer et al. 2013, Journal of Hydrology 497, 208-222.