


British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Applied geoscience for our
changing Earth


Measuring the contribution of groundwater and soil water to flooding

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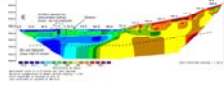

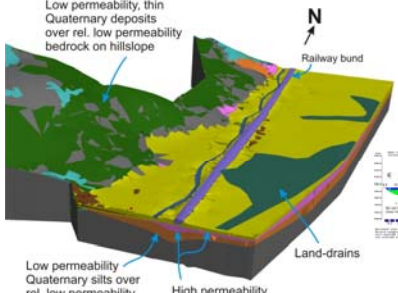


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SFG: The Eddleston Water Project 30 Oct 2014




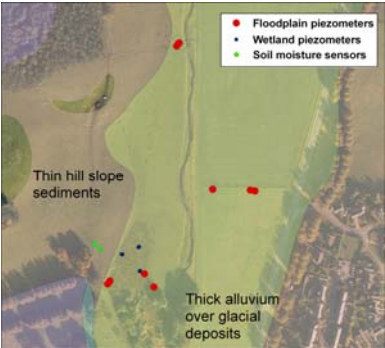


Phase 1: Characterising the floodplain in 3D



Source:
<http://www.bgs.ac.uk/research/groundwater/catchment/Eddleston/home.html>


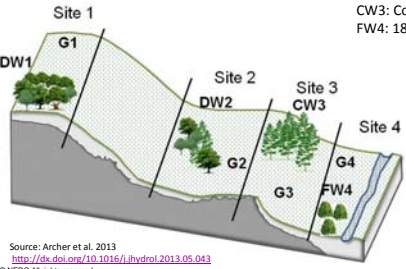
Phase 2: Dynamic monitoring



Source:
<http://www.bgs.ac.uk/research/groundwater/catchment/Eddleston/home.html>

Hill slope soil permeability

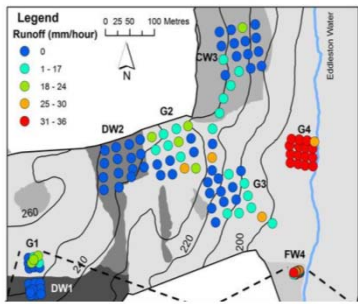
Measure soil K in paired grid areas within the hillslope and floodplain of grassland and forest areas



DW1: 500 yr old deciduous forest
DW2: 180 yr old deciduous forest
CW3: Conifer forest 45 yr old
FW4: 180 yr old Wetland woodland

Source: Archer et al. 2013
<http://dx.doi.org/10.1016/j.jhydrol.2013.05.043>

Infiltration capacity



Runoff from a 1 in 10 rainfall event

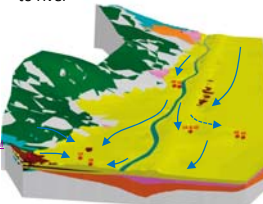

Source: Archer et al. 2013
<http://dx.doi.org/10.1016/j.jhydrol.2013.05.043>

Old broadleaf woodland have 10-15 times higher permeability than soils under neighbouring coniferous forest and pasture land.

Soil K also related to parent geology

Soils on flood plain: low permeability

Groundwater - Baseline



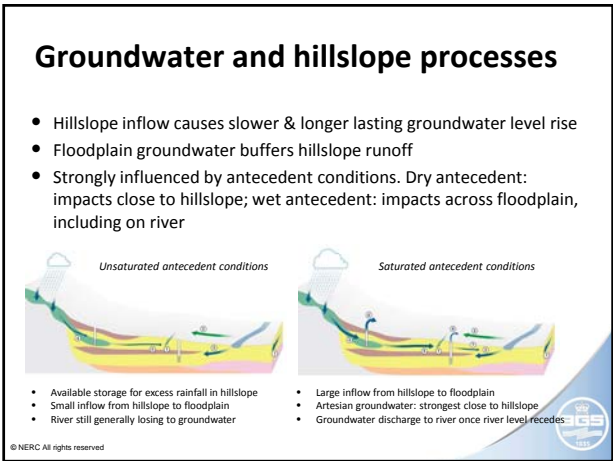
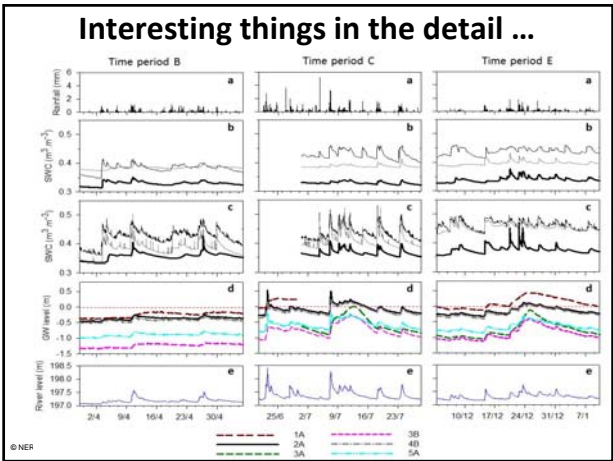
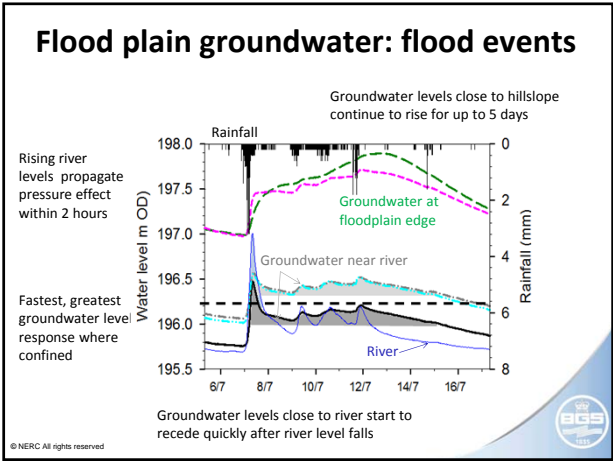
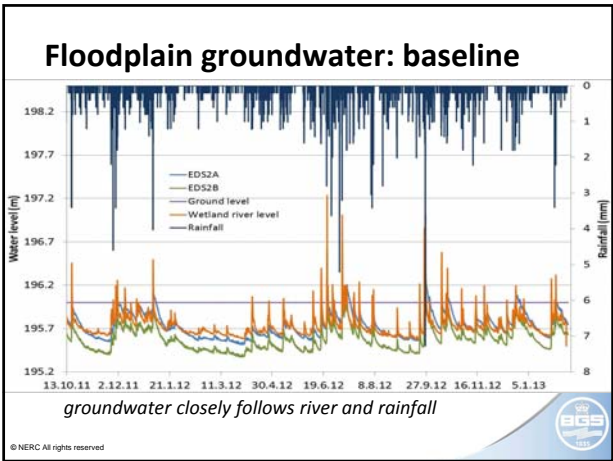
River losing water to gw

Dominant gw flow along valley

Some older anoxic confined gw

Chemistry of shallow gw similar to river

Source:
<http://www.bgs.ac.uk/research/groundwater/catchment/Eddleston/home.html>



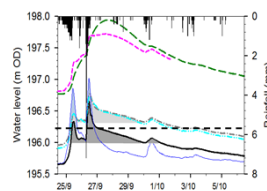
Lessons learned

1. There is a strong relationship between soil permeability and land use – established deciduous forests most permeable
2. Groundwater across most of the floodplain, except near its edges, is more closely coupled to river flow than local rainfall
3. Groundwater at the edge of the floodplain is weakly coupled to river flows, but strongly connected to rainfall infiltrating on adjacent hillslopes
4. The combination of soil water storage on hillslopes and groundwater storage in floodplain aquifers acts as an important buffer to flooding



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Still learning !



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