

PRELIMINARY RESULTS FROM THE BROAD-SCALE FIELD SURVEY

Landwise 2nd annual event
20 February 2020

UK Centre for Ecology & Hydrology,
University of Reading, British Geological Survey,
Forest Research & Partners (Farm Advisors and
Working Group)

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and Gareth Old, UKCEH



Introduction

- Broad-scale field survey
 - overview
 - initial results
 - field observations



Broad-scale field survey



- Survey aim: Quantify land use/management impact on near-surface soil properties which affect water infiltration/storage

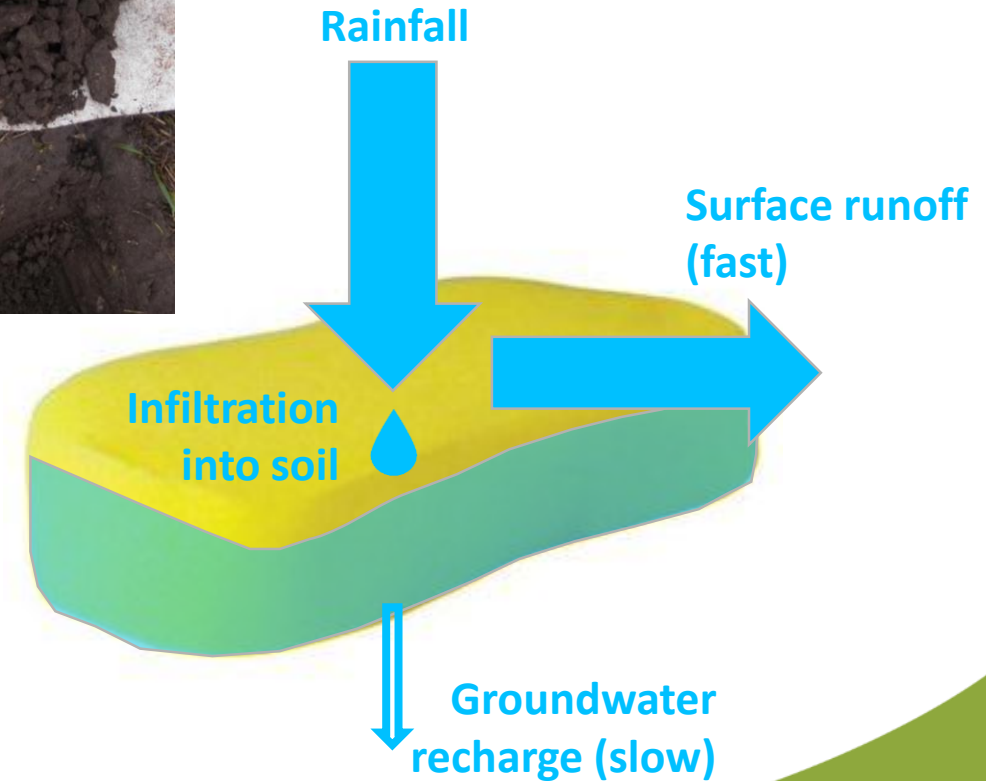
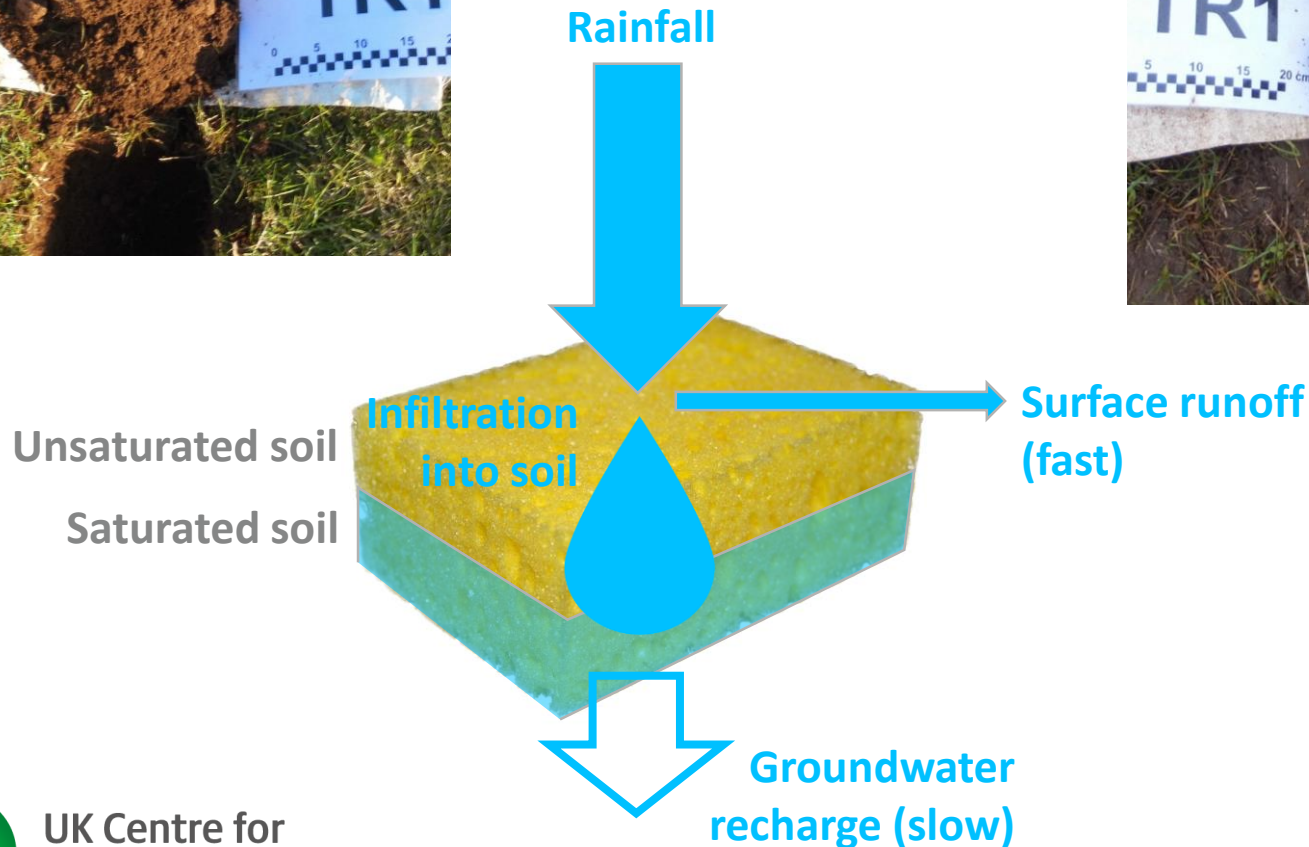
Soil hydrology – simplified rainfall-runoff



Larger soil pores,
good structure,
limited compaction



Smaller soil pores,
poor structure,
higher compaction

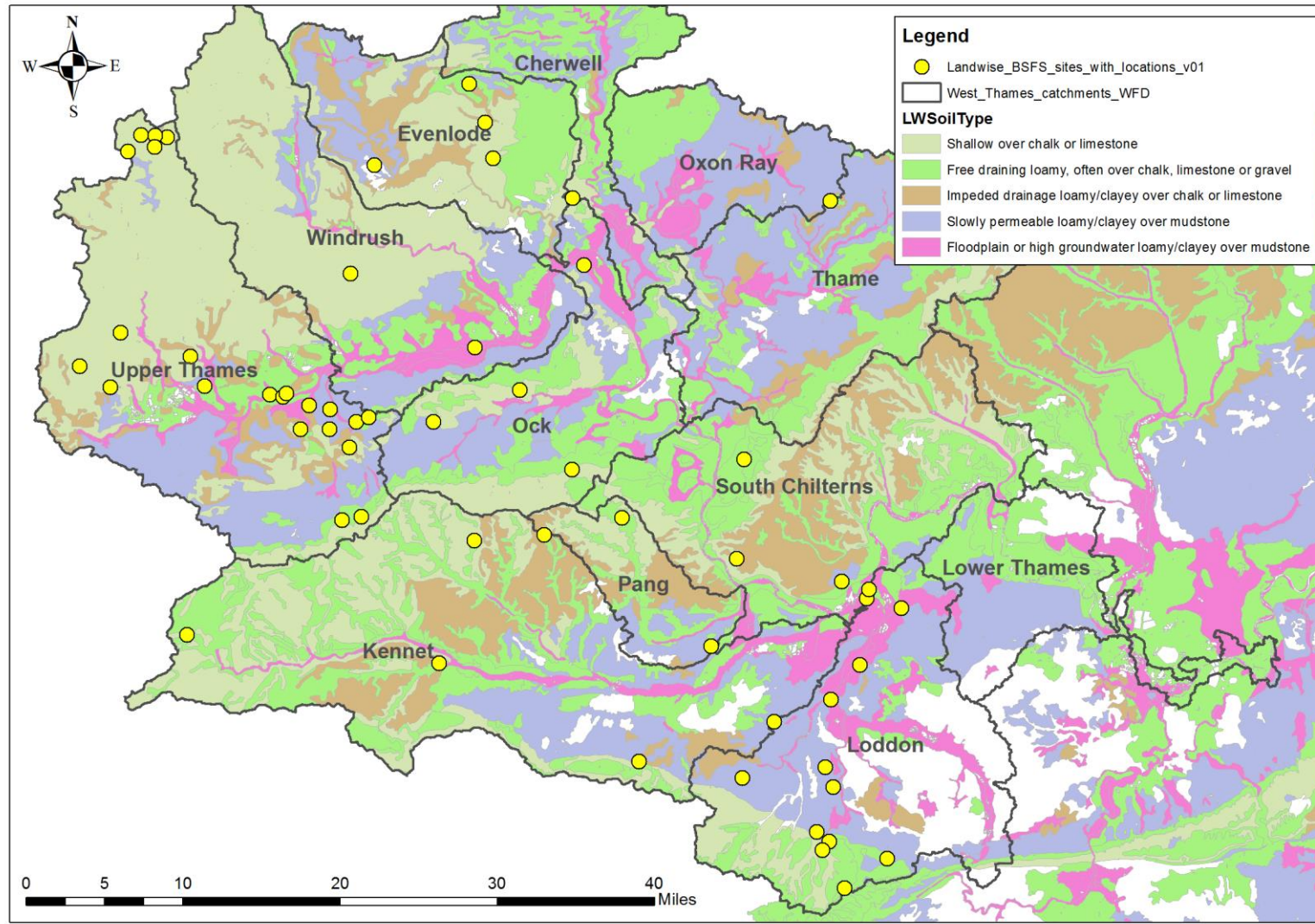


Broad-scale field survey

- Survey aim: Quantify land use/management impact on near-surface soil properties which affect water infiltration/storage
- Soil bulk density (porosity), organic matter, texture, structure, volumetric water content, aggregate stability
- Vegetation type, height and cover
- **Co-produced with Farm Advisors and Landwise Working Group**



Broad-scale field survey – W. Thames catchment



Broad-scale field survey – sampling progress

- 144 fields sampled (aim 160)
- 115 fields lab & QC finished
- Sampling taking longer than anticipated...
 - robust protocol, but time consuming...
 - weather / flooding...
 - arranging access...
- Intermittent lab issues with laser sizer

Geology	LANDWISE Soil Type	Land use and management			
		Arable		Grassland (permanent, est. 5+ yr.)	Woodland (broadleaf, mature)
		Rotation with grass*	Rotation without grass		
Carbonate (Chalk, Limestone)	Shallow over chalk or limestone	6	9	8	8
	Free draining loamy ¹	6	8	8	8
	Impeded drainage loamy/clayey	2	9	7	8
Mudstone	Slowly permeable loamy/clayey	8	7	8	8
	Floodplain or high groundwater loamy/clayey	4	7	8	7

* incl. grass only rotation (e.g. dairy), not just grass as break crop

¹ sometimes also over gravel superficial deposits overlying mudstone

Broad-scale field survey – methodology

Arable sampling - example

15 sample locations per field:

5 infield

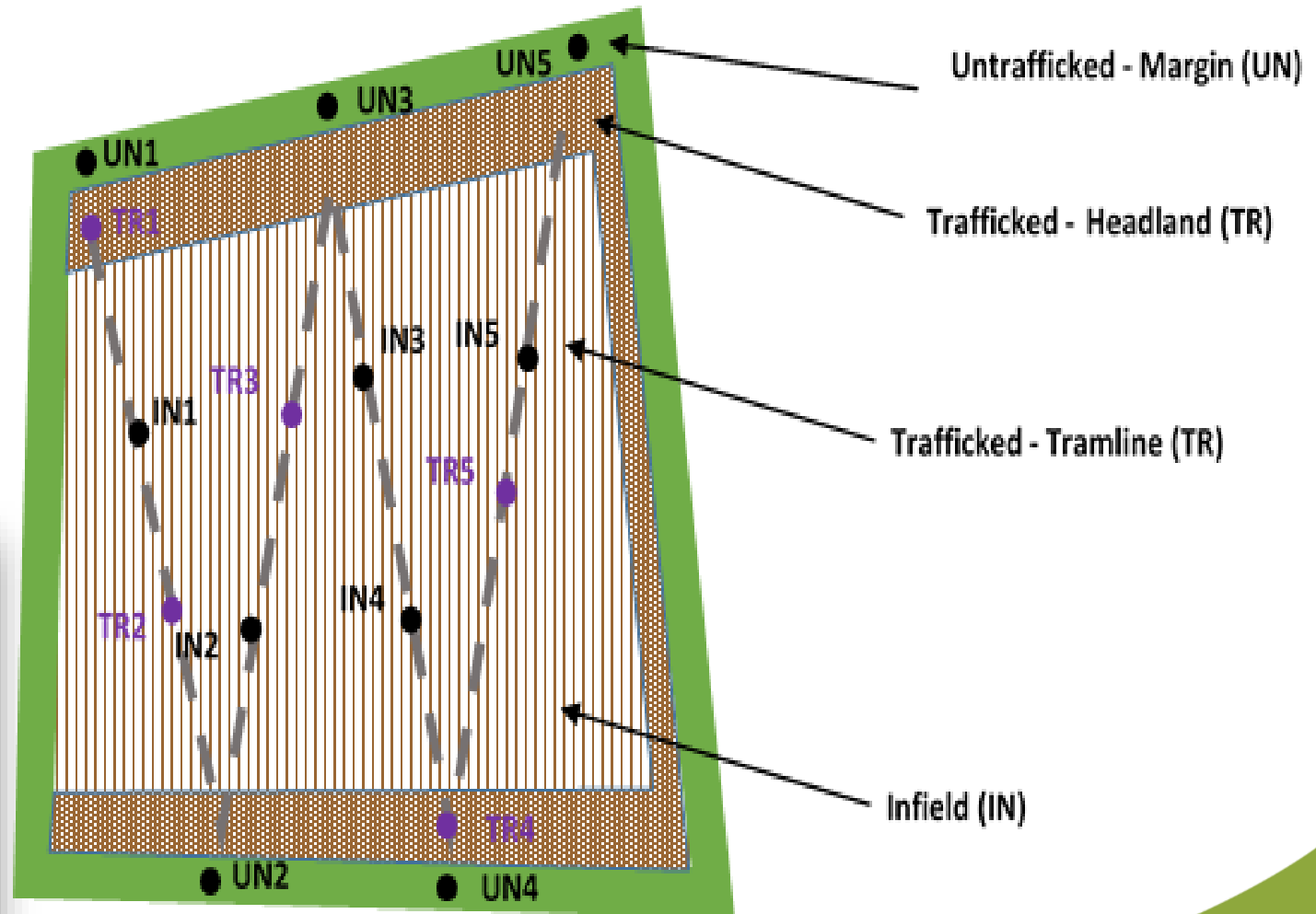
5 trafficked (*cropped headland or tramlines*)

5 untrafficked margin

(uncultivated/uncropped rough margin, avoid within 1 m of tree/hedge stems and animal burrows)

3 VESS:

one sampling location from each of infield, trafficked and untrafficked



Broad-scale field survey – data capture

- Info for participants and consent form
- Land use / management questionnaire
- Field observation record sheet

LANDWISE Broad-scale Field Survey Method Summary

Aims
The LANDWISE project (<https://landwise-nfm.org>) is looking at how effective land-based natural flood management measures (such as woodland and changes to land and soil management) may be at reducing flood risk in the West Thames catchment.

The aim of the broad scale field survey is to better understand how different land use and management practices affect key soil properties that control soil structure, infiltration and water storage. We will be making direct measurements under realistic conditions, surveying fields actively managed for commerce capture the varied and innovative practices across the local area. We will then evaluate flood risk through direct analysis.

Field Sampling & Measurements

A range of fields will be sampled to capture broad soil/geology categories within geology, freely draining loamy soil over permeable over mudstone and floodplains.

- Near-surface soil samples (top hand-texturing, at 10-15 locat)
- Visual Evaluation of Soil Structure block of soil for examination
- Collecting supplementary info locations, photographs and of

Laboratory Soil Analysis

- Soil samples will be returned to CEH
- Soil volumetric water content porosity
- Soil organic matter by furnace
- Soil aggregate stability by slak
- Soil calcium carbonate content
- Soil texture classification by h



Participant Consent Form

Please initial/tick the appropriate boxes where you give your consent, and then sign the form below.

<input type="checkbox"/> I have read and understood the Participant Information Sheet.	
<input type="checkbox"/> I have been given the opportunity to ask questions about the project / survey.	
<input type="checkbox"/> I understand that my taking part is voluntary, I can withdraw from the study at any time with no consequences, and I will not be asked any questions about why I no longer want to take part.	
<input type="checkbox"/> I agree to take part in the field survey by helping to identify fields, sharing information and management and drainage and giving permission to make field measurements and collect soil samples.	
<input type="checkbox"/> I understand that my personal details e.g., name and organisation will be recorded for internal project record keeping, but will not be revealed to people outside the research team, used in final reports or stored in the long-term data archive.	
<input type="checkbox"/> I understand that my words and data collected from the land I own and/or management may be quoted or paraphrased in publications, reports, web pages, conference presentations and other research outputs but my name and/or organisation will not be used.	
<input type="checkbox"/> I am happy for the location of my fields to be reported to the nearest 1 km ² in the project outputs and in the long-term data archive.	
<input type="checkbox"/> I am happy for the location of my fields to be reported to the nearest sub-catchment area in project outputs and in the long-term data archive.	
<input type="checkbox"/> In case I decide to withdraw AFTER the field work has taken place, I understand that I will need to inform Dr Joanna Clark before 30 April 2019 so that all the information I have provided can be removed from any publications, reports, web pages and other research outputs. I understand that if I withdraw after 30 April 2019 it will not be possible to guarantee that the information I have provided will be removed from the final project report.	

Please provide your contact details if you would like us to share a copy of the results and final report with you.

Name of Participant	Signature	Date
Name of Researcher	Signature	Date

Your contact person for this research study is Dr Joanna Clark – **Principal Investigator**
Department of Geography and Environmental Science
University of Reading
RG6 6AH
Tel: 0118 378 6561
E-mail: j.m.clark@reading.ac.uk

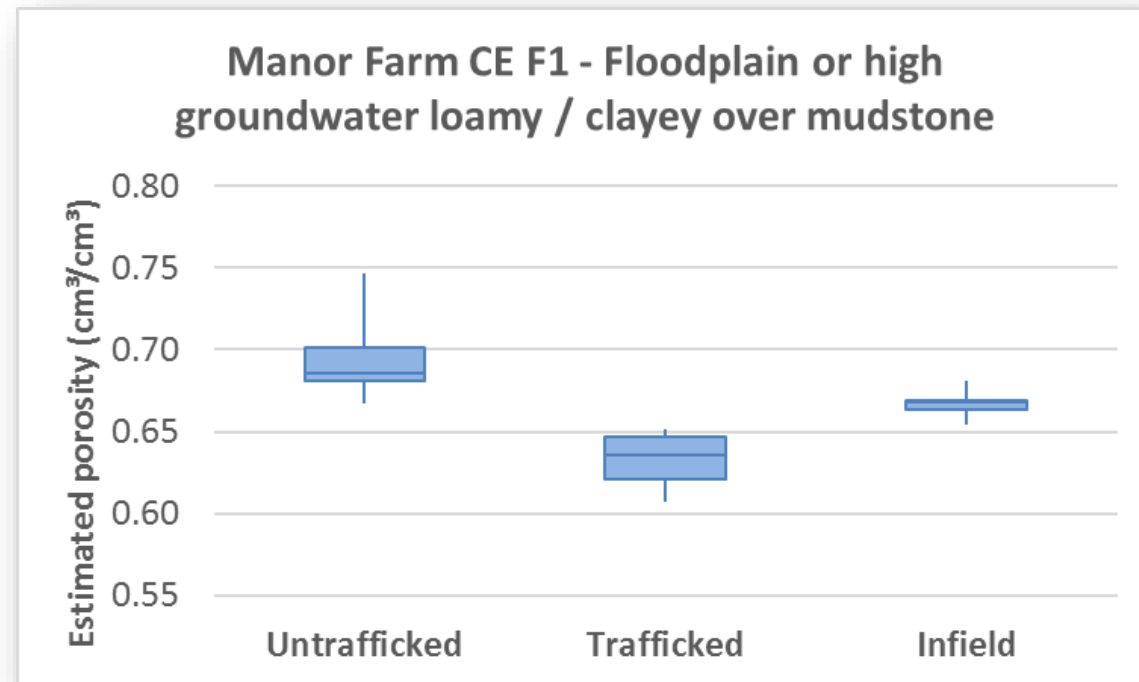
LANDWISE Broad-scale Field Survey - Record Sheet

General	
Site name	Date (DD/MM/YY)
Field name	Field no.
Field/plot information (tick boxes and/or add info)	
Land use and management	Arable rotation with grass* / Arable rotation without grass / Grassland (permanent, est. 5+ yr) / Woodland (broadleaf, mature)
* incl. grass only rotation (e.g. dairy), not just grass as break crop	
LANDWISE Soil and Geology Class	Shallow over chalk or limestone / Free draining loamy over chalk or limestone * / Impeded drainage loamy/clayey over chalk or limestone / Slowly permeable loamy/clayey over mudstone / Floodplain or high groundwater loamy/clayey over mudstone
* sometimes also over gravel superficial deposits overlying mudstone	
Current management practices (Arable)	Crop types / rotation Cover Crops? Herbal leys? Organic / conventional? Organic amendments? Lime? Tillage: conv., min., no? Last ploughed? Controlled Traffic? Tramline width & spacing? Buffer strips / zones? Field drainage? Other?
Current management practices (Grassland)	Grass species? Livestock type? Last grazed? Stocking density (hea) Stock out-wintered? Mob / paddock graz? Lime? Field drainage? Other?
Current management practices (Woodland)	Managed / unmanaged Tree species? Age? Path management? Other? <i>* to include past 5 years*</i>
Land use history?	
Flooding history?	
Waterlogged > 1 week/year? Water / sediment runoff? * within the field, or to or from adjacent	
Any unrepresentative field areas?	
Other comments?	

LANDWISE Broad-scale Field Survey - Record Sheet

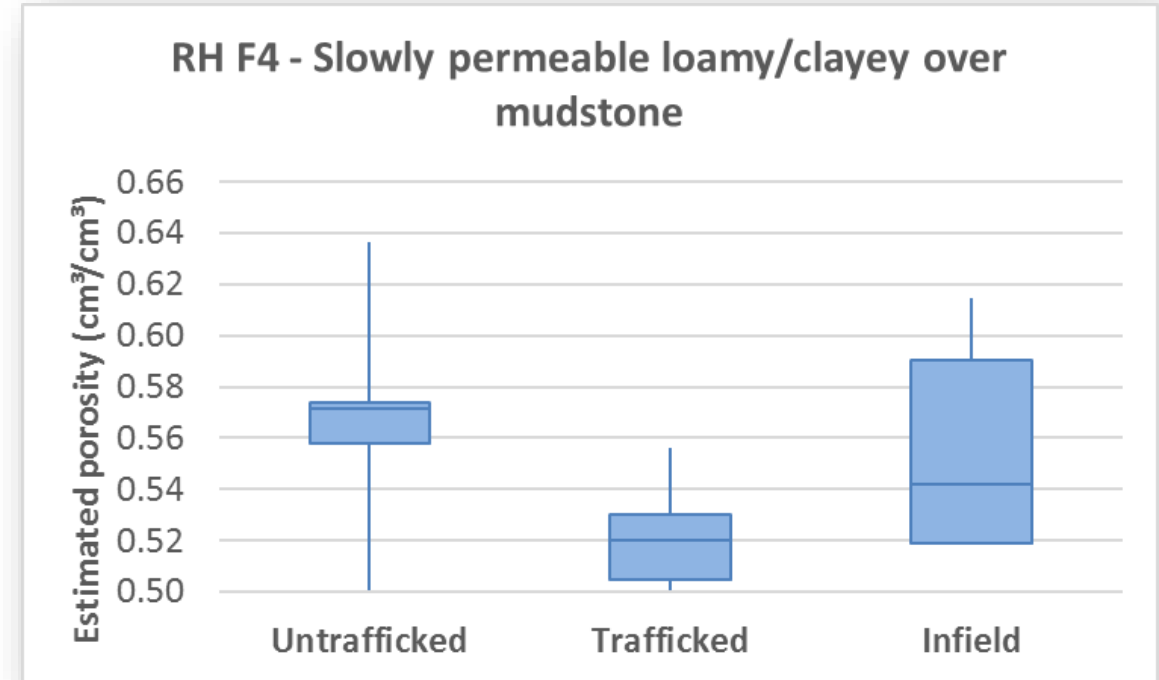
General					
Site name	Date (DD/MM/YY)				
Field name	Field no.				
Field / plot general observations (mark selections and/or add info)					
Slope gradient?	flat / gentle / steep / undulating	Slope shape?	concave / straight / convex	Erosion features?	none / sheet / rill / gully
Surface form?	furrowed / mounded / flattened	Surface water?	ponded water / brown water runoff	Deposition feat?	
Surface condition?	unsloaked/part sloaked/sloaked/capped	tramline wheelings / ruts	poached ground	Other?	
Sampling location information (add info)					
Location code	Location type	Grid Reference (BNG or lat/long)		VSS Score (1-5) if selected	Vegetation
	margin / headland / infield / transe / woodland	OS grid #4	BNG Easting or Long (decimal)		
		Texture (hand)			Type
					Height (to nearest 5 cm)
					Min
					Max

Broad-scale field survey – preliminary results



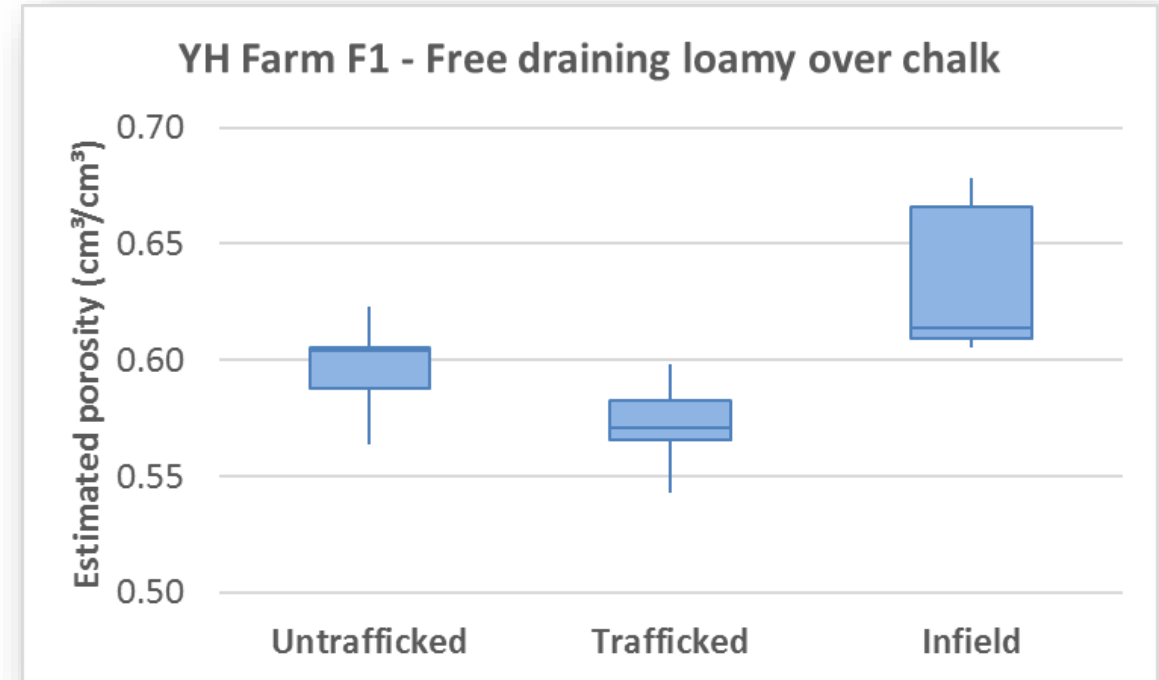
- Conventional arable without grass in rotation, min till
 - infield areas have higher porosity than trafficked but less than untrafficked margin

Broad-scale field survey – preliminary results



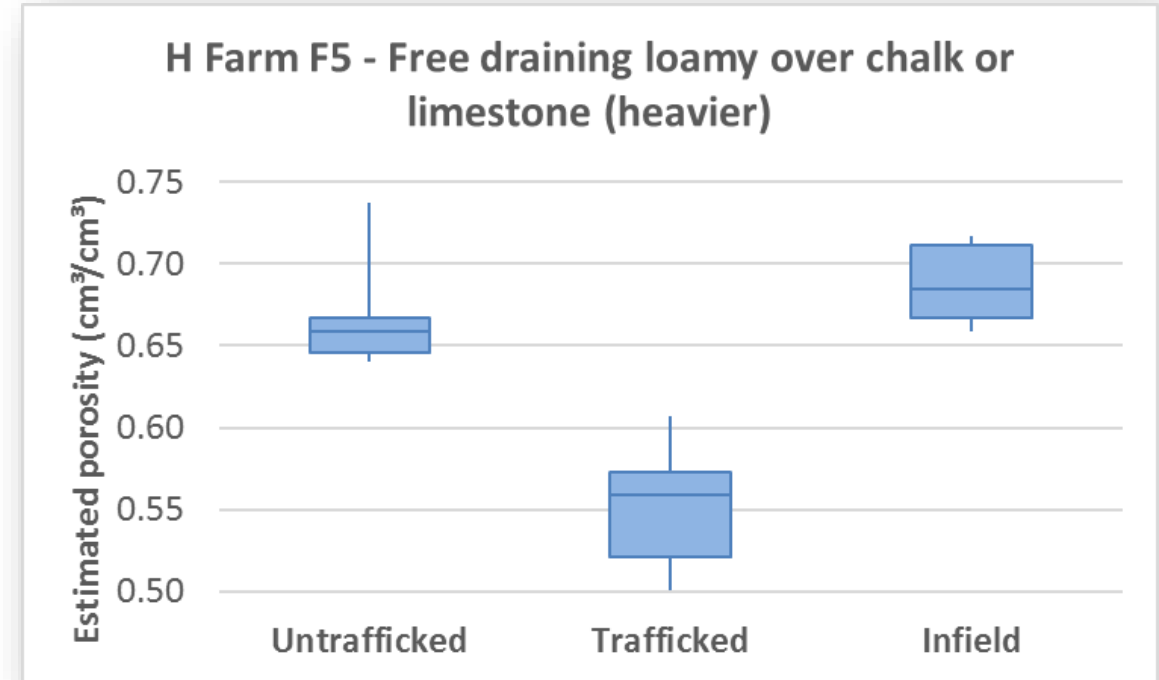
- Organic arable with grass ley in rotation, ploughed, disc & harrow, paddock grazed
 - some infield areas have similar porosity to untrafficked margin

Broad-scale field survey – preliminary results



- Organic arable with diverse ley grassland in rotation, zero tillage, limited/sensitive trafficking
 - infield areas have higher porosity than both trafficked and untrafficked margin

Broad-scale field survey – preliminary results



- Conventional arable without grass in rotation, cover crops, min till, direct drill, controlled traffic
 - infield areas have higher porosity than both trafficked and untrafficked margin

Broad-scale field survey – field observations



- Tramlines
 - compaction, runoff pathways
 - deeper soil unsaturated

Broad-scale field survey – field observations



- Heavy clay soil
 - water moving quickly downslope through soil macropore

Broad-scale field survey – field observations



- Heavy clay soil
 - near-surface saturated – water rapidly ponds and runs off
 - deeper soil unsaturated

Broad-scale field survey – field observations



- Silty loam soil
 - evidence of surface runoff down tramlines

Broad-scale field survey – field observations



- Floodplain woodland
 - slowing flood flows – moving across meander
 - natural woody debris dams, slowing surface runoff to main channel

Broad-scale field survey – summary



- Interesting results so far...
- Importance of **near-surface soil properties** and **preferential flow pathways**
- Discernible **differences** in soil bulk density / inferred porosity and organic matter **attributable to land use and management**
- **Woodland porosity and organic matter higher on same soil type**
- Trafficked porosity ~ 5-25% less than untrafficked
- **Several fields with infield porosity greater than or equal to untrafficked...**
 - tentatively appears linked to organic farming / building up organic matter / tillage / controlled traffic (**TBC!**)
 - **'MAGIC' SOIL!**
- Mixed effects **statistical analysis to draw out significance of different land management practices...**
 - crop types, rotation, organic, conventional/min/no tillage, cover crops, controlled traffic, drainage, flooding history etc.



- Thank you!
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