

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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Introduction

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









Broad-scale field survey



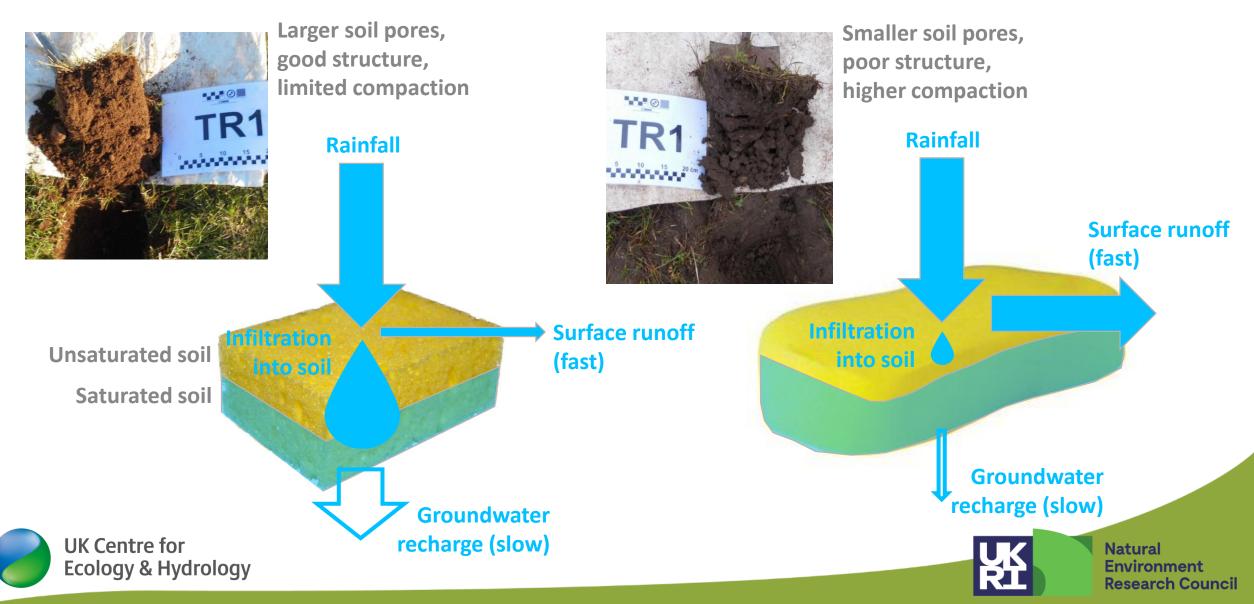
• Survey aim: Quantify land use/management impact on near-surface soil properties which affect water infiltration/storage





Soil hydrology – simplified rainfall-runoff



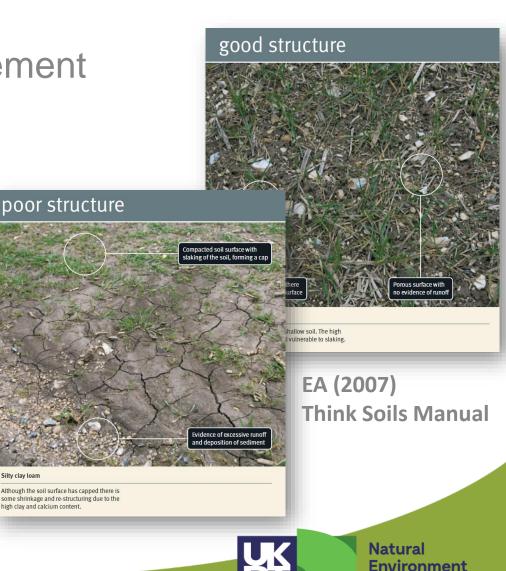


Broad-scale field survey



Research Council

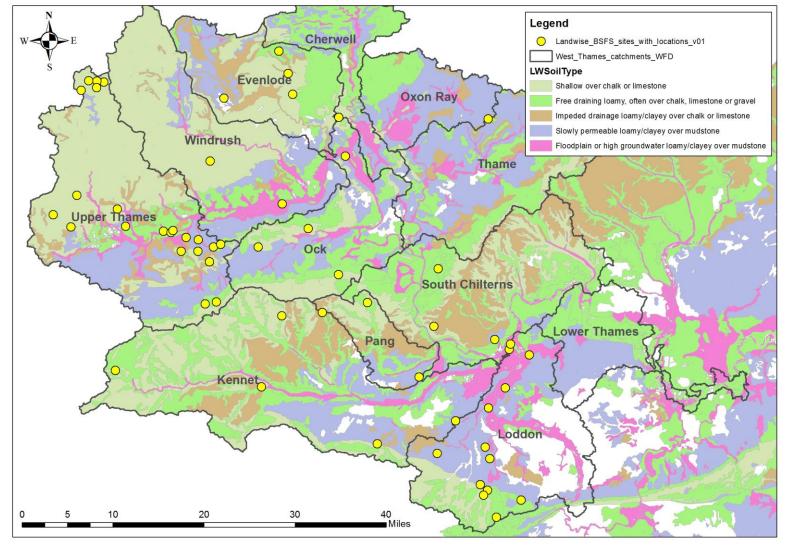
- Survey aim: Quantify land use/management impact on near-surface soil properties which affect water infiltration/storage
- Soil bulk density (porosity), organic matter, texture, structure, volumetric water content, aggregate stability
- Vegetation type, height and cover
- Co-produced with Farm Advisors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



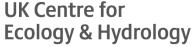


Broad-scale field survey – W. Thames catchment











Broad-scale field survey – sampling progress



Land use and management

- 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

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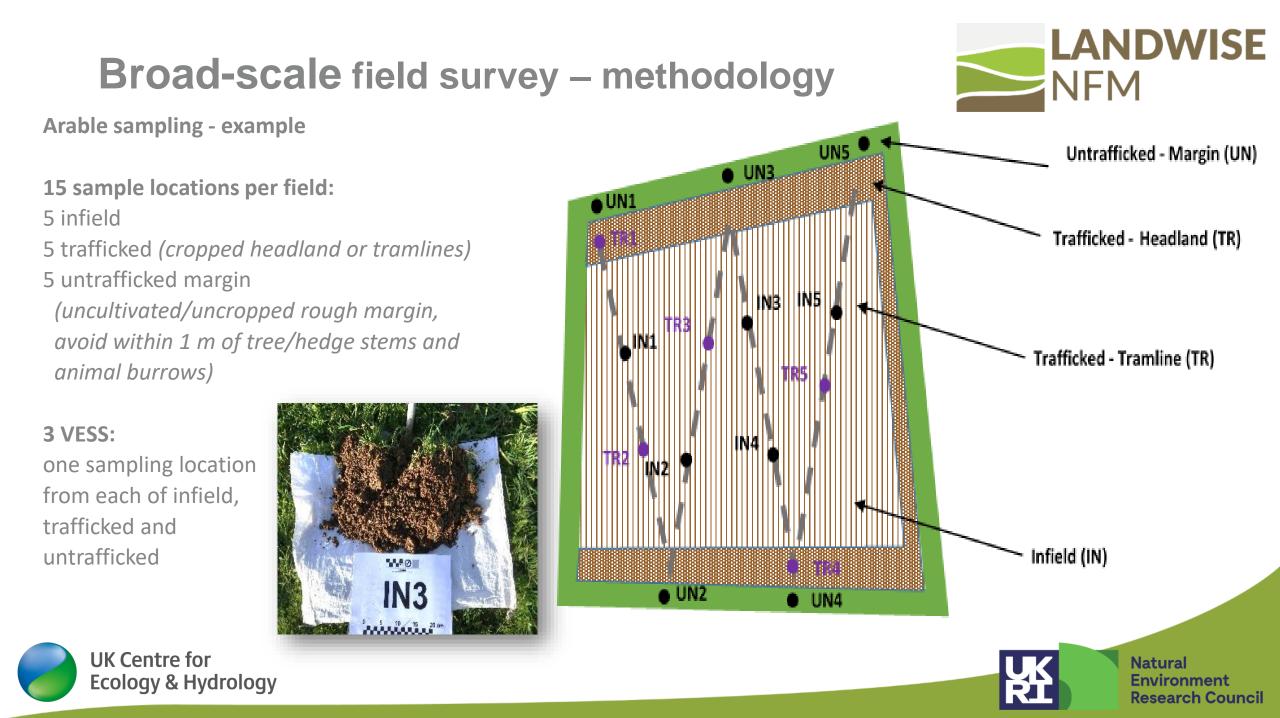
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	LANDWISE Soil Type	Arable				
Geology		Rotation with grass*	Rotation without grass	Grassland (permanent, est. 5+ yr.)	Woodland (broadleaf, mature)	
Carbonate (Chalk, Limestone)	Shallow over chalk or limestone	6	9	8	8	
	Free draining loamy ¹	6	8	8	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 – data capture

Aims

LANDWISE NFM

The LANDWISE project (https://

natural flood management mea management) may be at reduci

The aim of the broad scale field management practices affect k

water storage. We will be makin fields actively managed for cor capture the varied and innovat across the local area. We will th reduce flood risk through direct Field Sampling & Measureme

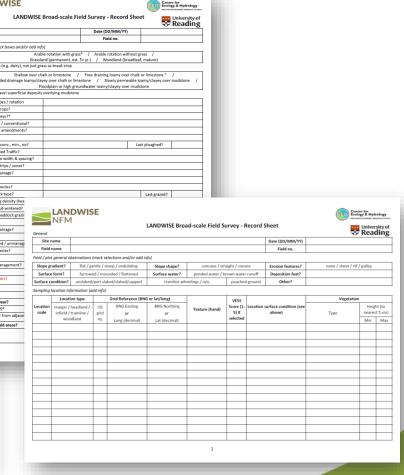
A range of fields will be sample

- Info for participants and consent form
- Land use / management questionn
- Field obset record she

	broad soil/geology categories within geology, freely draining loamy soil ov permeable over mudstone and flood
aire	In each field the following sampling/r Near-surface soil samples (tog hand-texturing, at 10-15 locat Visual Evaluation of Soil Struc- block of soil for examination
ervation	Collecting supplementary info locations, photographs and oi Laboratory Soil Analysis Soil samples will be returned to CEH I
eet	 Soil volumetric water content porosity Soil organic matter by furnace Soil aggregate stability by slak Soil calcium carbonate conten Soil texture classification by h

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LANDWISE Broad-sc	ale Field	Survey Method Summary			General						
		,			Site name					Date (D	
					Field name					Fi	1
					Land use and	mation (tick boxes and/or		tation with	grass* /	Arable	-
		rg) is looking at how effective land			management		Grassland (permanent	, est. 5+ yr.)		
		voodland and changes to land and the West Thames catchment.	soil		* incl. grass only	y rotation (e.g. dairy), not	just grass a	s break cro	P		
					LANDWISE Soil and Geology	I Shallow Impeded drainage loa	over chalk o	r limestone	e / Free	drainin	1
		ter understand how different land			Class	Impeded drainage loa			r limestone n groundwat		
		s that control soil structure, infiltra rements under realistic conditions				o over gravel superficial d					Ì
managed for commerci						Crop types / rotation					
ried and innovative pra						Cover Crops?					
al area. We will then ev						Herbal leys?*					_
isk through direct analy						Organic / conventional? Organic amendments?					-
g & Measurements	& Measurements Participant Consent Form				Current ¹ management	Limed?					-
ds will be sampled to co					practices	Tillage: conv., min., no?					1
le without grass rotatio		ni da la		and the state of t	(Arable)	Controlled Traffic?					
ology categories within		Please Initial/tick the appropriat	e boxes where you give yo	ur consent, and then sign the form belo		Tramline width & spacing	ig?				
y draining loamy soil ov er mudstone and flood		I have read and understood the Par	rticipant Information Sheet.			Buffer strips / zones? Field drainage?					-
		I have been given the opportunity	to ask questions about the p	project / survey.		Other?	-				-
he following sampling/r						Grass species?					-
urface soil samples (top		I understand that my taking part is consequences, and I will not be ask				Livestock type?					
exturing, at 10-15 locat		I agree to take part in the field surv			Current ¹	Stocking density (hea					
Evaluation of Soil Struc		management and drainage and giving permission to make field measurements and collect soil			management practices	Stock out-wintered? Mob / paddock grazir				δE	
of soil for examination		samples.			(Grassland)	Limed?		NFM			
ing supplementary info		I understand that my personal details e.g., name and organisation will be recorded for internal				Field drainage?					
ns, photographs and ol		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.				Other?	General				-
il Analysis		I understand that my words and da	ta collected from the land I	own and/or management may be	Current ¹	Managed / unmanage		name			-
ill be returned to CEH I		quoted or paraphrased in publicati			management	Tree species?			bservations	(
lumetric water content		research outputs but my name and			practices (Woodland)	Age? Path management?		radient?		entle / s	
tv		I am happy for the location of my fi outputs and in the long-term data		hearest 1 km* in the project	(woodland)	Other?		e form?		ed / mo	
ganic matter by furnace		I am happy for the location of my fi		nearest sub-catchment area in	¹ to include past	t last 5 years?		ondition?			
gregate stability by slak		project outputs and in the long-ten	m data archive.		Land use histor	γ?	Samplina	location in	formation (a	dd info)	
lcium carbonate conter		In case I decide to withdraw AFTER	the field work has taken pla	ace, I understand that I will need to	Flooding histor				ion type	1	-
cture classification by h		inform Dr Joanna Clark before 30 A	pril 2019 so that all the info	ormation I have provided can be	Waterlogged > 1 week/year? Water / sediment runoff? ²		Location		headland /	OS	ſ
		removed from any publications, re that if I withdraw after 30 April 201				d, or to or from adjacer	code		tramline /	grid	
		have provided will be removed from				ntative field areas?		woodland		sq.	Ļ
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		Please provide your contact details i	f you would like us to share	a copy of the results and final report wi	Other commen	ts?				-	ł
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				- Principal Investigator						<u> </u>	H
		Department of Geography and Env University of Reading		el: 0118 378 6581							ł
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		UREC/SREC Ethics Participant Inform	ation and Consent Form	Version 1 19/9/2017							
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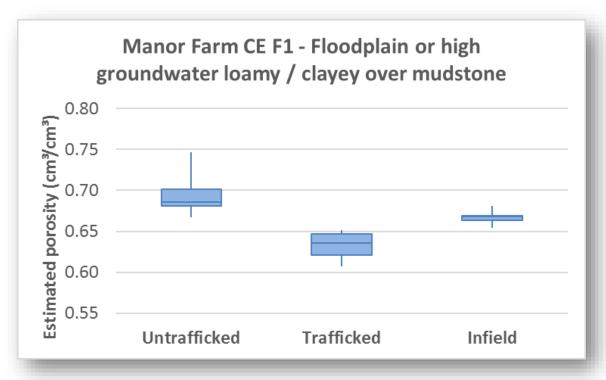












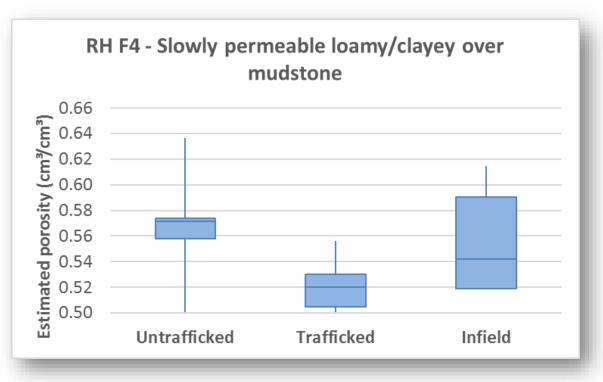
- Conventional arable without grass in rotation, min till
 - infield areas have higher porosity than trafficked but less than untrafficked margin









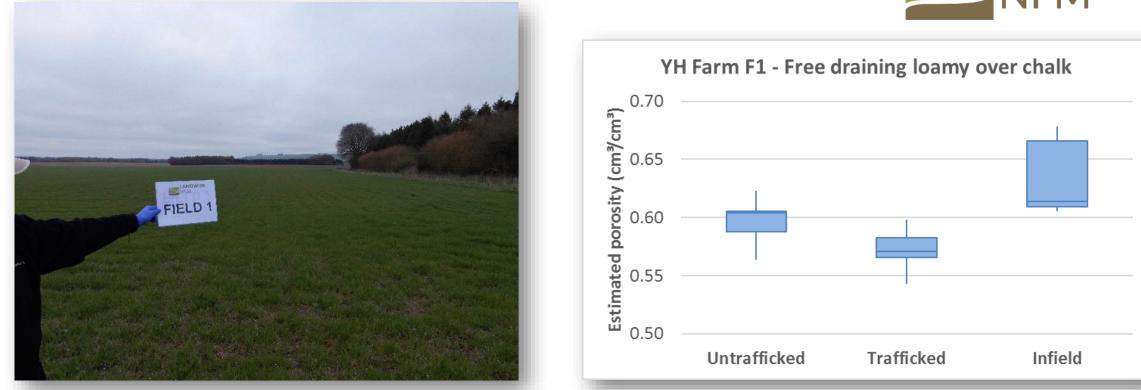


- Organic arable with grass ley in rotation, ploughed, disc & harrow, paddock grazed
 - some infield areas have similar porosity to untrafficked margin



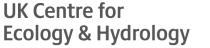






- Organic arable with diverse ley grassland in rotation, zero tillage, limited/sensitive trafficking
 - infield areas have higher porosity than both trafficked and untrafficked margin

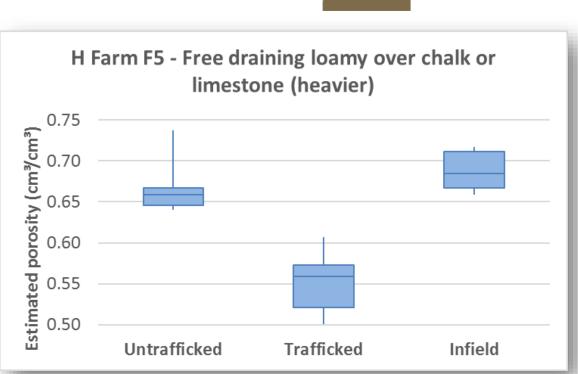












- Conventional arable without grass in rotation, cover crops, min till, direct drill, controlled traffic
 - infield areas have higher porosity than both trafficked and untrafficked margin









- Tramlines
 - compaction, runoff pathways
 - deeper soil unsaturated



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









• Heavy clay soil

<image>

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



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• Silty loam soil



• evidence of surface runoff down tramlines













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



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Broad-scale field survey – summary

LANDWISE NFM

- 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.



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• Thank you!

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