FLOW

upstream / downstream

Harriet Fraser & Rob Fraser

somewhere nowhere

FLOW
upstream / downstream

Images: Rob Fraser

Poetry: Harriet Fraser

Interviews carried out between September 2021 and April 2022:
in people's own words, with editing by Harriet Fraser.

Produced for LANDWISE, 2022

LANDWISE
NFM

At the pond, near Charlton Abbots, December 2021

"It's no great shakes on a map, nothing remarkable. Just water and the lay of the land, with rises and dips, and a copse of trees: they are guardians to a sort of source, their roots settled into wetness.

We too are wet. And cold. A dreary day, and the wind gusting, showers scudding across the land. We wouldn't have come to this pond - or even noticed it - if a nearby farmer, Robert Jackson, hadn't told us about it, and told us that the water flowed into two watersheds from here. On one side, the Severn; on the other, the Thames.

We stand with the trees, gazing at the pond. It reflects the bare branches of the trees, black against a brooding sky. Their leaves, dropped over the winter, are scattered around the pond, and fallen branches lie on its murky surface. Above us, the mewling of buzzards cuts through the sound of wind. Beneath us, water seeps somewhere unseen, to later become rivers, and one day, maybe, floods.

This is a place of beginnings, the gathering of rain waiting to pass through soil, to journey through darkness and into light. There's something so very humble about a pond, as if it has always been and will always be: here. As if the water is always the same water, but of course, it's not. So much depends on what we don't see."

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Months after that first visit to the ponds, and to several other sites in the Thames catchment, and conversations with academic researchers, farmers, land managers and people impacted by flooding, we took a four-day walk along the Thames Path, and mulled over what we'd learnt. During our 47-mile walk, we saw examples of many different types of land use (and sadly, we didn't see a single fish). Our thoughts, like water, found a way. Among our mental ramblings, we pondered a Venn Diagram that might show the overlaps between things. Like the messy surface of the humble pond, such a diagramme would be far from simple. But somehow, we'd like it to include these four themes:

What soil does | How water flows | What people do | How natural networks connect.

The sweet-spot between these four might not be far away from some of the practical land use measures that help with Natural Flood Management. But the key seems to be that nothing is ever one-sided. This booklet aims to share different perspectives and the overlaps between them, and add 'Data of the Heart' to the project's research strands.

The transcribed interviews are taken from much lengthier conversations. The poetry is a distillation of our learning from other people and from our physical experience of the landscape within the Thames catchment.

We are indebted to Joanna Clark, PI, for inviting us to join the project, and supporting us throughout, and to everyone who so generously shared their time with us. Thank you.

Harriet Fraser and Rob Fraser, 2022
somewhere-nowhere.com

RIVER

A river is never *just* a river,
no.

Let go of the painterly images
clouds in a fluid mirror
chatter from evening rowers
drifting through sunset gold.

This river is new and it is ageless
and never *just* a river:

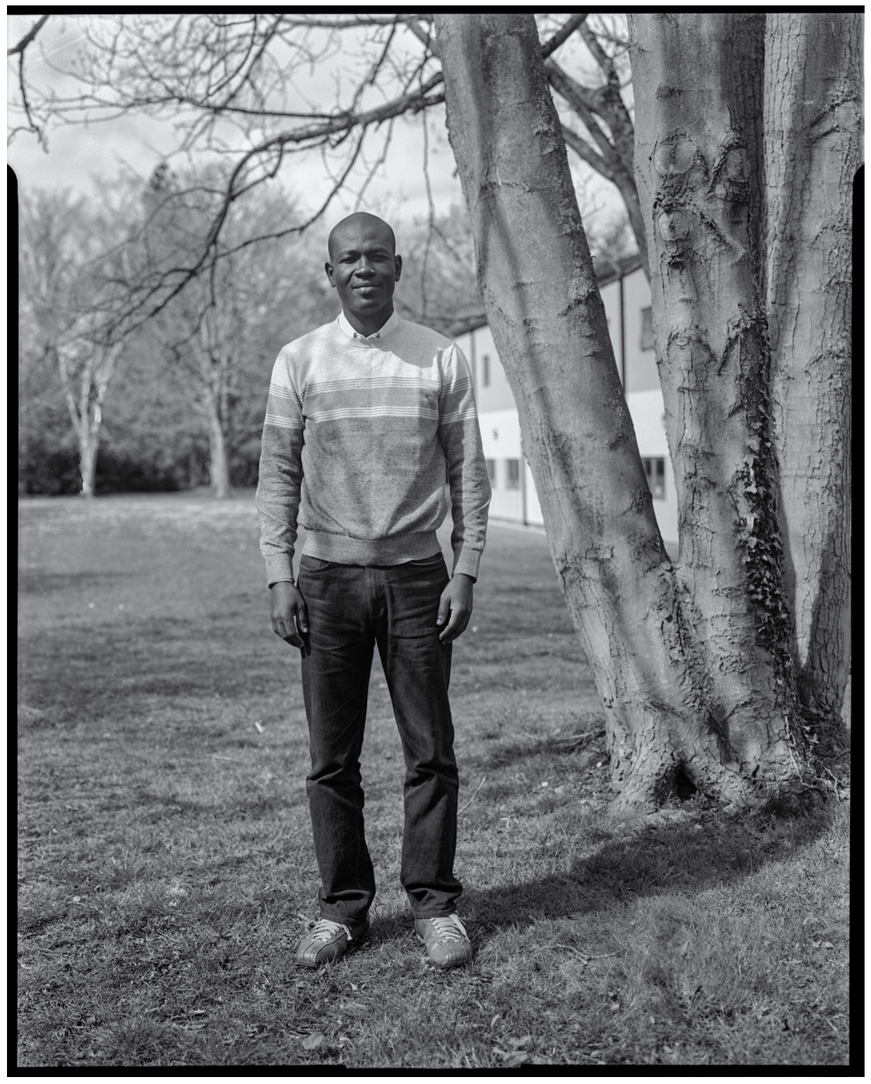
it is the legacy of land
there by the generosity of rock

it is the anthology of streams
of soil's release

it is this land's liquid tongue
speaking upstream tales
from fields and woods
walls, cities, weather

a story being written
in eddies, flushes, waves

in outpouring and floods.



"We have developed our models based on a great deal of data from past events, and using many parameter sets, and this takes a very long time. We compare the results with observations of what actually happened - this helps us to refine our models so we can look ahead and trust that the model offers a good level of confidence in its results."

Dr Heou Maleki Badjana
Postdoctoral Research Assistant in Hydrological Modelling, University of Reading

We are targeting lowland catchments, and the hydrology is not that simple. Within the project, we are adopting a strategic approach to link models for groundwater processes with land surface processes and surface water models. The groundwater model represents well what is underground, the geology and so on; land surface models represent processes such as infiltration, evapotranspiration and surface runoff; while surface water models simulate processes like surface runoff and water dynamics in the river channel. By linking these models together, we aim to simulate the whole system - what the geology is, how that impacts hydrology, and how soil behaves - and show the dynamic process of water.

With the land surface model, we want to understand the hydrology of the catchment in general: what happens when it rains, how the water moves, how much is going into the soil, or transpiring, and how much becomes discharge - either as runoff or through the groundwater system.

We focused on the Pang Catchment (179 square kilometres) and the Blackwater Catchment (358 square kilometres). In a catchment, you have a sub catchment and sub basins based on the smaller streams that flow into the river. So, in setting up the models, we combine information on elevation, soils and land use. The model aims to sum up the processes within specific areas, in order to show what is going on within the whole catchment.

When you integrate local knowledge from people, you improve your modelling. For instance, people may tell you that in one part of catchment, there is less surface runoff when compared to another part of the catchment. We can turn the parameters of the model to simulate this.

We have modelled woodland planting and crop rotation scenarios that have been identified after discussions with farmers. For instance with a crop rotation scenario, you can tell the model to change the crop each year, say with winter wheat, followed by oilseed rape, and then in the third year, corn. The model shows if this may help to reduce peak flows. We have to identify measures that are feasible and acceptable. For instance, if farmers agree to planting trees, and they show you where they'd like to plant, we will map these areas and come to the model to create the scenario: how much is this land use change likely to reduce flood risk?

We have developed our models based on a great deal of data from past events, and using many parameter sets, and this takes a very long time. We compare the results with observations of what actually happened - this helps us to refine our models so we can look ahead and trust that the model offers a good level of confidence in its results.

I think it's possible to improve productivity on farmland and reduce flood risk. With Natural Flood Management you have a kind of double advantage: if you reduce surface runoff, you're increasing infiltration in the soil, and if you increase infiltration you're helping biological processes to occur within the soil, and that will maintain biodiversity, and soil health.

My interest in modelling is motivated by a wish to help solve some of life's problems, particularly flooding and drought. It's not straightforward doing that, but I'm happy to keep going, to see if it can make a difference to people's wellbeing.

"Maps help identify where we can control floods using natural measures such as soil management, tree roots and cover crops. Woodland creation for Natural Flood Management is not just flood risk management - when water drains into the aquifer you can be both preventing flash flooding and making the catchment more resilient for drought."

Samantha Broadmeadow
Spatial Analyst, Forest Research

I love maps. I get to work with spatial data created by the Environment Agency or Natural England that encapsulate thousands of hours of work - for example, decades of work by a whole army of soil surveyors. I use the spatial data to build a map.

A map is a powerful tool to start conversations. People interpret maps differently, reflecting their experience and knowledge of the landscape, to point out the opportunities or challenges that are apparent to them.

Maps help identify where we can control floods using natural measures such as soil management, tree roots and cover crops. We know that the best soils must be used to plant crops, to feed ourselves. So for me, my work is about identifying and mapping marginal soils which are better suited for woodland.

People often think the maps are too prescriptive. But they are here to show areas where trees are feasible, and grant aid is available, so farmers and landowners can consider woodland creation - although in many places there are possible alternative land uses, such as wetland habitat creation, or on moorland, restoration of valuable open habitat. So the landowners must take all the options into consideration. You'd think we've got an easy job of it, but actually, recently tree planting rates have been really low.

With tree planting, there will be other additional benefits such as creating new habitat and also the deeper tree roots encourage more water to infiltrate the soil profile and drain to depth so the aquifers are recharged. So woodland creation for Natural Flood Management is not just flood risk management - when water drains into the aquifer you can be both preventing flash flooding and making the catchment more resilient for drought.

Currently we are preparing the new Environmental Land Management (ELM) scheme and deciding which measures will be funded to deliver Natural Flood Management and spatial prioritisation for the grants and incentives. But maybe in the next 10 or 20 years, we'll have sufficient evidence about the efficacy of Natural Flood Management measures; so we will be confident that they are a really sound solution and we can design schemes including natural flood management measures to deliver 5%, 10% or even 50% of the protection required at a location within a catchment. And then engineered solutions can be smaller, cheaper, and less intrusive.

Maps and models are part of gaining this understanding - providing you've got good data for them, they can be used as a way of explaining ideas and exploring the acceptability and function of the potential options.

FLOW // REWIND

imagine you could replay that day
in reverse

the nightmare never began

the neighbours never rallied round
never came to lift the sofa off the floor

the water never made mud of the carpet
nor crept above the skirting boards
to leave its signature on your walls

the house never needed seven months
and ten dehumidifiers
to dry out

imagine, that unexpected wave of water
never came, or rewinding, you could watch it
ebb away from your astonished feet, leave the room,
peel its sodden lips from your door and flow backwards,
revealing the neat flower beds of your garden
and dragging, in its liquid skirt, twigs and reeds
and a whole, sorry tree

and then the tree, travelling back with the water
placed upright once again, re-rooted
standing strong, and the birds
that fled, flying backwards
to settle in its branches
as if there were no cause for alarm

imagine, river water crystal clear
silt and clay and mud
held in beds and banks
and in the deep loam of fields

rewind further and magine:
soil nurtured and stable
full of roots, worms, life

trees in the right places
upright in woodlands
supine over rivers
to gently slow the flow

and downstream, you, in your house
watching heavy rain through the windows
without a single thought
of floods

"I think we need a reality check within the research world and in policy about how things actually are, and how we bring different voices and knowledges into our thinking. When you start looking at things more holistically, you see how problems are interrelated and how solutions can be joined up. And ultimately, it's the people who make the choices about what happens on the ground that will make a difference."

Joanna Clark
Principal Investigator, Landwise
Professor of Environmental Science, University of Reading University

My expertise is in soils and catchments, particularly linking carbon and water cycles, and my goal with *Landwise* was to bring farmers into the wider research around Natural Flood Management. I was hoping to try and bring more people into the conversation. Voices from the farming community are often absent in environmental projects about our farmed landscapes.

There is large scope for farmers and landowners to manipulate hydrology and runoff by how they use and manage their land. That concept is in the textbooks, but it hasn't been quantified: the research knowledge gained through *Landwise* is around providing that quantification to see what works well in different situations. I was hearing from farmers who think they can change their soil hydrology through management - and the data shows: yes, they can. Soil type is significant in affecting properties like bulk density, but the impact of land use is way more significant. It's massive. Farmers also manage carbon cycle through crops, trees and applying organic matter to soil. The carbon and water cycle are linked.

I was frustrated. There are different disciplines, silos within silos, but they're not joined up. For instance, a physical scientist may understand geology, soil texture or hydrology, but they may not understand the impact of land use on soils. Researchers tend to work on water or carbon, not on both and the links between them. And it seemed that modellers were solving equations but were not making new discoveries. I don't think the answer to improving models is to necessarily make more complicated models. It's to get better data from improved fieldwork.

I found that some researchers become stuck in solving technical problems, when they could be more open to new ideas from other disciplines, including outside academia. As an example, hydrologists were saying that you don't get runoff on chalk. But I knew, from the flood group in Pangbourne, that there was runoff from chalk during the floods of 2007. That's what local people said but they were not taken seriously because 'conventional' wisdom says it doesn't happen. And yet a closer look on the soil map shows there are pockets of clay-rich, less permeable soils on chalk. I think we need a reality check within the research world and in policy about how things actually are, and how we bring different voices and knowledges into our thinking. Being too focused reduces our knowledge, and understanding is lost.

It's been interesting working with people who live at risk of flooding. You don't necessarily have to fix the flooding problem to help people feel better about it, but you do need to listen. Sometimes it's about giving voice and platform to people, and this is true for farmers as well. If they feel heard they might feel better about talking about their circumstances, sharing knowledge, and trying new ideas. And for the technical research team, the most useful thing is often to go and meet someone on their farm or their site. The point of the project is to get technical evidence together, but I think the field evidence is massively important.

Framing problems with an over-scientific, reductionist approach works on the bench in the lab, but doesn't necessarily work in a complex catchment or on a societal scale. When we think in silos, it can seem like there are too many different problems and the solutions are too complicated. I'm not trying to simplify it, but when you start looking at things more holistically, you see how problems are interrelated and how solutions can be joined up. And when it comes to solutions, improving soil will not just impact hydrology - it can help to repair some of the environmental damage that's arisen through post-war agricultural policies, and improved soil can also store more carbon. Ultimately, it's the people who make the choices about what happens on the ground that will make a difference.

"Changes on landscape scale can take a long time, and they also take the will of the landowners to want to see that change, and understand that in putting land aside for conservation there may be a loss of income from traditional forms of revenue whether that's timber, agricultural crops, or something else. It's important that future grant schemes recognise and reward the people who are trying really hard, and have been for decades."

Richard Edwards
Forestry Manager, Englefield Estate

We were contacted by the Pang Valley Flood Forum, who accessed Environment Agency funding to carry out natural flood defence management within their catchment. They worked with Reading University, who did some modelling and identified the Bourne as a location to carry out some interventions.

We've carried out around thirty interventions. We began quite rigid and formal, then the process became more 'natural' as we understood what we wanted. Here, there's a combination of ash and hazel with some alder, cut and placed diagonally across the stream and pinned behind a tree, so they won't get washed downstream. We're not causing bank disturbance, we're using trees that are growing here, of good size and longevity. This is set just above the bed of the river, so in normal flow the river can flow through quite happily. But once the water rises, this will quite quickly begin to slow the flow.

As landowners, it is our responsibility to keep water flowing through our land - to clear out all the debris. We needed to apply to the local authority to be allowed to put wood into the river for these leaky barriers, and we got permission.

Our lowest intervention, which is around 500 metres away, just before a public road, is really big - that one is a stopper, so if anything does become dislodged during a storm event, that will stop it. We've made some using traditional hedgelaying techniques, so the trees are still alive. Lots of small interventions that are each doing a little bit seems to be an effective strategy. And the interventions have introduced a lot of dead wood habitat, which has resulted in more insects, and opened up the canopy to bring more light to the watercourse, so it's creating a more diverse habitat.

We can already see the river slowly changing, with a little more erosion on one side. That will have an impact on us: effectively, the risk of flooding the farmland here is higher than it used to be, and our access will change. So from a land management point of view, you're taking on a risk. But if we're reducing the risk of flooding in Pangbourne, that's a great thing for us to be able to do.

Changes on landscape scale can take a long time, and they also take the will of the landowners to want to see that change, and understand that in putting land aside for conservation there may be a loss of income from traditional forms of revenue, whether that's timber, agricultural crops, or something else. I think it's important that future grant schemes recognise and reward the people who are trying really hard, and maybe have been for decades.

At the moment, for a lot of landowners, taking on that risk wouldn't come with direct funding. It may happen with new schemes. I hope so. We've done some work on a nearby estate on other tributaries of the Pang. We were able to bring the landowners here, show them what we've done. It doesn't look quite so scary when someone else has done it.

I do think that for this to work it needs a much broader network of landowners doing stuff like this. Otherwise, it's not really going to make a big enough difference.

FLOOD

Who did I think I was?
Queen Canute?

I shot out to face the water
saw it coursing down Mill Lane
racing into Sulham Brook

Overwhelmed

It was like a mini tsunami

I couldn't believe it

What could I do?
Who did I think I was?

Retreat, inside

All around the house: water
For a brief moment, this house is an island

And then the water enters

I will start by saving the photographs
The neighbours will come and move the furniture
The sockets will be submerged, the kitchen ruined
And I will live upstairs for months

"Because of the dramatic change in our farming system over the last 20-30 years, I've been able to experience an enormous change in how the soil functions, and the impact of that. In the '90s, with any large amount of rainfall, you'd get flooding in the fields. And any sort of rainfall, you'd see water lying in the fields. Now we just don't get that."

Richard Gantlett
Farmer, Yatesbury Farm, Avebury

What I find exciting about *Landwise* is the breadth of the engagement and people involved and the way it connects the philosophy of farming to impacts beyond the farm. The project embraces many of the concepts or ideas that I've tried to integrate into our farm since we moved from 'conventional' to organic farming in the 1990s. I've enjoyed being involved and hope the work will, in some form, continue.

The separation of different elements of farming and the separation of farming from the 'countryside' has led to unintended consequences, especially for biodiversity. I think it's important to link elements that have been separated through farm specialization. For instance, in the past, trees have been separated from farming activities. I think their intrinsic value is being understood better now, and *Landwise* is helping with this. On our farm, we integrate cattle grazing with woodland. The woodland can benefit from the browsing and the disruption, and there are knock-on benefits of Natural Flood Management.

We were part of the initial *Landwise* soil survey done with the Centre for Ecology and Hydrology. Some interesting results came out of that. For instance, we measured 13% organic matter in the woodland soil, which is what you might expect. But in the grassland, the soil organic matter was even higher - this seemed slightly counterintuitive at the time but we saw that you can accumulate a lot of organic matter in soil from extensively grazing, and not overstocking. Cattle are really important.

In our fields, we've been using a diverse mixture of 23 species in herbal leys. We put those in for two years. We gave up ploughing in 2003, but we do cultivate, and we grow two or three cereals. We'll do rotations with a cropping phase and a pasture phase. In a five-year on-farm experiment we've increased organic matter rates two to three times global targets, which is very exciting; and we showed that by changing the system, in this case by increasing the length of the ley, we can further increase carbon in the soil.

It's taken a long time to get where we are - over 20 years. It starts by repairing the soil and dealing with the damage that we've inflicted before. The soil is quite clay-ey, and in the past when we ploughed the soil, it could turn to concrete quite quickly. That was partly as a result of the clay but also partly a result of lack of organic matter in the soil. A lot of our soil was compacted from machinery, and the roots of the plant that we'd grown conventionally weren't strong enough to repair the soil or keep the soil alive. If you've got a healthy vibrant soil, then the plants that grow in that soil will be vibrant and healthy themselves.

Because of the dramatic change in our farming system over the last 20-30 years, I've been able to experience an enormous change in how the soil functions, and the impact of that. In the 90s, with any large amount of rainfall, you'd get flooding in the fields. And any sort of rainfall, you'd see water lying in the fields and we used to just think, well, that's just how it is. Now we just don't get that. It's the same with biodiversity as it is with water: what you do in your limited area of your farm has impacts in the streams and the ditches and then the rivers, but also in the oceans - what we do on our land impacts the whole planet. All the little things add up. One of the values of modelling is that hopefully you can demonstrate the impact of lots of little things happening on a broader scale. You can bring together lots of disparate data and show people that actually, things add up to have a huge impact.

Looking at connections is valuable, not just from a farmer's point of view but for everyone. And if you're a scientist, seeing that agricultural techniques and practices can have an impact on flooding in a city miles away … it's good to see the interconnectedness of all these activities.

"Policy makers need data that demonstrate that if enough farmers farm in a way that is shown to have a positive effect on the soil, then it will have a measurable impact on flooding - and there is a reason to pay farmers to do this. It's about providing information to the policymakers to say: Look, this works."

John Hammond
Crop Scientist, University of Reading

I'm here to look at the impact that crop choice and land management have on the ability of the soil to absorb rainfall, and reduce flooding. Ultimately, farmland is managed with crops in mind. Even if it's for grazing, animals still need a crop; and that's typically a rye grass monoculture. Historically, big tractors have compacted the soil, and monocultures of crops have reduced biodiversity in the soil and its ability to hold water.

For *Landwise*, a network of farmers, farm advisors and academics, working with the Centre of Ecology and Hydrology, surveyed around 160 fields to look at soil properties, and spoke to the farmers to find out how they're managing the land. Some are doing a wheat-wheat-oilseed rape rotation, others have rotations spanning eight or nine years with three years of that in a rich grass and herbal ley with different species.

We've measured soil porosity, bulk density, and texture - whether it's a clay, or whether it's a sandy loam. We measure things in the field, to see physically how far the water is penetrating, and we analyse soil in the lab. What we can't do is see the effect of land use at the scale of the catchment. We have to rely on models which use information about rotations and soils to estimate how different approaches might affect river flow during high rainfall events. Modelling isn't a perfect solution, but it allows us to scale up in a way that we can't do experimentally in the field.

Within the agricultural industry, there is a wide diversity of individuals. At one extreme would be organic farmers who've been working with diverse rotations with long periods between different crops, for many years. At the other extreme are farmers growing short rotations, disrupting the structure and biodiversity of soil through ploughing, and relying on pesticides, fungicides, and fertilisers.

It seems that the way forward is to come away from the extreme of hitting the land hard with crop after crop after crop. Allowing a build-up of organic matter in soil is critical, not just for biodiversity, but to give the soil its structure and allow water to penetrate. But it's not straightforward. For instance, putting a grass herbal ley in for a couple of years might not work for an arable farmer - they might be able to rent it to a local livestock farmer, but it's not going to give the profit of a wheat crop. For farmers who own their land, they're investing in their family's future by looking after the soil. For tenants, there's less incentive to do this if there's a lower income. And the next generation of farmers who are learning about new methods, it may be 10 or 20 years until they get the reigns of the farm. Change doesn't happen rapidly.

We, as scientists and academics, and a lot of farmers, knew that land management practices that look after soil can help to reduce flooding. But we weren't previously able to demonstrate at scale, with data, that if a certain percentage of farmers in the catchment adopted specific practices, it should have an impact. That's what the policy makers need: they need data that demonstrate that if enough farmers farm in a way that is shown to have a positive effect on the soil, then it will have a measurable impact on flooding - and there is a reason to pay farmers to do this. It's about providing information to the policymakers to say: Look, this works.

DOWNSTREAM

a pond, nothing remarkable
murky, unpleasant even
pass it by, without a thought

this wet imprint reflects trees
and wind-rushed clouds
gifts a slow seep of water
into earth

beneath the buzzard's mewl
and the chatter of rooks
this silent pond is a beginning

water finds a way

to one side : The Severn
to the other : The Thames

it's all downstream from here

"We're trying to get nature back in balance. We were told it would take four or five years for no till to bring a real benefit to the bank balance and the land. And it did: where once your wellies would become clogged with earth when you walked across a field, now you can just walk with shoes."

Lydia and Clive Handy
Lower Hampen Farm, Andoversford

Lydia: We have slowly, over the last eight-to-ten years, changed our rotation and gone to no till. We trying to get nature back in balance, where we don't have to use so many chemicals. We took advice, and were told it would take four or five years for no till to bring a real benefit to the bank balance and the land. And it did: where once your wellies would become clogged with earth when you walked across a field, now you can just walk with shoes. And you can drive on it and not leave a mark - these are really good indicators.

Clive: Like everywhere in the Cotswolds, you can have different soils depending on which height you are: easy draining sandy stuff, and then a belt of clay, and then Fuller's earth. You could have three types, even in one field.

People from the *Landwise* team came to sample soil in some of our fields. One was down in the bottom, where the water drains beautifully, another in the top where it never has. But I'd like to know where the water goes, because in a flood - even in the 2007 disaster floods - the water from all of this valley finished up in just one field, and then it just disappears.

Lydia: In our arable rotation, we have four years of herb ley with around ten different species, including sainfoin and lots of different clovers. When the animals are there, they're pooping and they're eating, and that's the life cycle. They're getting a much more balanced diet, and the soil is benefitting.

This is our first year experimenting with heritage wheat, which is a mixture of different varieties. It doesn't need any sprays or any fertiliser. The heritage wheat roots are really long. Modern varieties aren't - so they don't withstand drought. The heritage wheat might give a much lower yield, but you've spent nothing on it. So the margin is the same or better. There is now a Cotswolds Grain Network joining farmer, millers, bakers and brewers growing and using local, regeneratively grown heritage and ancient grains. Some of our wheat has been stone-ground in a beautiful, fully restored watermill at Stanway House, before being sent to artisan bakeries. It's very exciting.

We also have a new veggie enterprise, and any day now we will be selling veg boxes to the locals! It has been such a lot of work, shovelling tonnes of compost and woodchip and learning how to be a 'grower' but it's been fun and very rewarding.

Clive: My family's been here for around 240 years. I'm the seventh generation. I feel terribly guilty that for much of my arable farming career I did what the agronomist said: for example, if they found a wire worm eating the wheat, you'd spray it with a blanket insecticide, which kills everything. At the time, I did it, without thinking. But I've stopped. What we do here now is regenerative. And in the past, I've seen rivers of soil disappearing down the slopes of our ploughed fields. Now we don't see that at all.

"One of the most useful lessons to take from *Landwise* would be to get land managers and others, not just farmers, but anyone involved with using the land, to understand the variability of soils - what they will and won't do, and how to use them appropriately."

Adrian Hares
Farmer and FACTS adviser

On this farm, our biggest challenge is water: we have heavy soils, and the water travels too slowly. But it's getting better. You want it to percolate into the top soil, through the subsoil, into the drain and then run down to the river. If the soil is compacted the water just sits there, or runs straight off the top.

The thing about soil is that you need to keep looking at it under different conditions, so you're looking at soils with different characteristics, through the cycle of the seasons.

There are lots of permutations. We analyse soil according to different zones. The average zone size is around three to three-and-a-half hectares, so on a farm of 125 hectares we have between 30 and 40 zones. Apart from by the river, which is permanent pasture, the farm is in a 6-year crop rotation, which varies slightly according to soil type. In this part of the farm, we have 5 different soil types: silty clay and a heavy clay loam, with a calcareous and a non-calcareous version of each, and an alluvial soil. The fundamentals of the soil are different, therefore we try to manage each zone differently. In one field, for example, we alter the rotation in different parts of the field according to the soil type. So you create a bit of extra work, but it's worth it.

I think good soil management is working out what you can grow and what you can't grow on your fields. This is something farmers traditionally have always known, but the temptation, of course, is that if you're tooled up to grow a range of crops, then you want to grow them everywhere. But at the end of the day, if you can't grow it on half your field, then you're better off just accepting reality and managing in a different way. It's a question of finding the right balance between doing some mechanical work to remove compaction and then getting a crop established, so the roots will penetrate compacted areas and runoff will reduce.

If the soil is not compacted, worms can travel better and they create vertical channels which helps drainage. It becomes a positive cycle. Lots of things in soil management are actually positive cycles: if you establish a good crop with adequate nutrition and the soil is in half decent condition, the crop will root vigorously, and in the process, it will improve the soil for the next crop - provided of course you don't cultivate it when it's too wet, in which case you're back to square one, or maybe square minus-one!

One of the most useful lessons to take from *Landwise* would be to get land managers and others, not just farmers, but anyone involved with using the land, to understand the variability of soils - what they will and won't do, and how to use them appropriately.

Modelling is fine in theory, but the way that water behaves in a field is potentially very complicated. For example, where freer-draining soil overlays heavier soil, water percolates down, which is great, but then it hits the heavy soil and comes out on the side of the slope - that's how a spring is formed. Those kinds of things you can't actually model unless you go in a field look at the typography. The best thing is for a farmer or a tractor driver to learn what to look for, because it's very difficult to quantify.

Soil is fundamental to a farming business, so it seems important to understand it. There have always been changes we can make, but with climate change, and increasingly heavy rainfall events, the challenge is getting greater, not less.

GROUND TRUTH

Aitch Two Oh

a single drop, on its own, does little
but it is never alone

imagine: 100 drops in a teaspoon,
and how many spoonfuls pass through land
the shape of water (sinking, resting, racing)
depending on soil,
where aggregates,
clods and porosity
matter

for anything fluid finds a way,
yet will always test the limits

and choices flow downstream,
or so it seems
there is always more to know

together, we can gather hydrological data,
discuss pedotransfer properties

how much moisture is there in the soil?
how does it change?

for the bigger picture, bring out the satellites,
distant observation, ask for radar data
from the Sentinel-1 Constellation

up close, check quadrants, analyse
how friable this brown gold is

where can water linger?

then: ask your feet how the ground feels,
how heavy are your boots?

touch the soil, rub it in your hands
let the cold and pungent brown settle in your skin
so hands are mapped like catchments

then: breathe it in
you can lie face down if you choose,
but a handful will do -
does it smell right?

and what do the grasses, the crops and the birds tell us?

how do we listen?
what data do we use to shape and validate the models
to make more sense of things

how do we listen? and how do we talk?

what happens when, like a free river, conversations cascade,
pool and drift, become braided ...

can they enter new ground?

"Cotswold soil is quite hungry soil and it loses fertility really quick. The wildflower seed needed to be on the lowest fertility bits. It's been quite successful - now the whole of these fields are covered in flowers. We have had seed harvesting on these fields for the last three years and it is given to other farmers trying to diversify their grassland."

Robert Jackson
Farmer, Manor Farm, Sevenhampton

We've got quite a few types of soil, even within the same fields. We've got grey clay, brown clay, we've got sand patches, Cotswold brash and some quite nice loamy soils. It's pretty variable terrain. You can dig in some places and get four inches of soil, and in other places you can dig 15 foot and not find any stones. The *Landwise* team came to take some samples and I'll be interested to find out what they discover about infiltration.

It's not the sort of soil that runs off very easily. We do get water running off the field sometimes, but it doesn't usually bring a lot of silt with it. In the big long valley field (Lemonade) though, it did happen a couple of times, when it was ploughed. That's changed now: it's in an environmental scheme and isn't arable any more. When it was a whole field it would have been ploughed downhill. Now there's arable bird food, root crops and mustard planted in four plots across the top where it is flatter: tall vegetation with tufty grass mix that'll stop the water running, and the erosion has stopped. It's great barn owl habitat. There's a variety of different age grasses, and we cut a third of it each year to put in haylage bales for our cattle. The voles like chewing on new grass, so there's always something there for the owls. So that area is permanent grass now and there's a couple of plots that are for arable weeds, cultivated each year. They grow poppies and other common weeds - the rarest we have found is Venus's looking glass - this however is not considered 'rare'. One side of the field is planted with an area of pollen and nectar plants. A food source for many insects.

If you've got four inches of snow on the ground, the bird food crops are the only thing sticking out at the top. We've had clouds and clouds of yellowhammers flying over the top of it, like the murmurations of starlings you see on film sometimes. Skylarks and corn buntings breed here, they've been nesting in the same places for the last four years, and reed buntings have been in the long grass that we leave for two or three years. And we've had short-eared owls and hen harriers, and there are kestrels nesting in the top barn and barn owls in the barn in the farm yard.

We've got ten fields of arable, and we put quite a lot of organic manure on because we've got 100 cattle and 250 sheep. I have just started getting the soil tested and there are quite high indices for carbon and organic matter.

We sometimes graze the wildflower grass fields in the spring, with the sheep, before everything gets flowering. That helps control the ragwort. One field (Whittington Firs) used to have loads of ragwort, and in the last three years, we've only had handfuls. But it's taken us 10 or 12 years of pulling it before it seeds, to get on top of it.

When we made changes to put arable fields to arable reversion with wildflowers, we chose the bank of the field with a really heavy clay, and another one that's mostly stones. Cotswold soil is quite hungry soil and it loses fertility really quick. The wildflower seed needed to be on the lowest fertility bits anyway. But it's been quite successful - now the whole of these fields are covered in flowers. We've recorded over a hundred different species in one area of traditional limestone unfertilised grassland bank. We have had seed harvesting on these fields for the last three years and it is given to other farmers trying to diversify their grassland.

"What is critical is that whatever is done in the upper part of the Pang Valley is going to affect us downstream. This is where the Flood Forum is so effective as we are working with an overall view of flooding in the whole valley as well as in our individual villages."

Kay Lacey
Chair, Pang Valley Flood Forum, since 2013
Flood warden for Pangbourne, since 2006

The Flood Forum was set up by West Berkshire Council, Thames Water and the Environment Agency, and is now run by local flood wardens, parish councils and volunteers. It represents ten parishes that have the River Pang flowing through them and have all been affected by flooding. We have a lot of really experienced, professional people, and there's a really good rapport between everybody. We let each other know what's happening in each village and have a website full of information which residents and others can access. We've got a Technical Sub Group, and have regular meetings.

Pangbourne Flood Group is part of the Flood Forum. We've developed our own Flood Plan which includes a list of houses vulnerable to flooding. The Environment Agency flood map only covers some - our list is based on our experience of what actually happened in 2007, when we had 140 homes flooded, and then the floods of 2010 and 2013/2014.

Whenever we get flooding, it's complicated, because you never quite know how it's going to happen. Three main rivers affect Pangbourne: the River Pang, the Sulham Brook and the River Thames. The rivers react quite differently. The Thames is quite a slow rise, but as it gets higher and higher, it's less controllable. The Pang and Sulham Brook are flashy - they respond very, very quickly, with a rapid rise and fall. And you can't prepare for everything, because it's those unforeseen things that can affect how the flood responds like a fallen tree blocking a section and causing the water to overbank.

What is critical is that whatever is done in the upper part of the Pang Valley is going to affect us downstream. This is where the Flood Forum is so effective as we are working with an overall view of flooding in the whole valley as well as in our individual villages. One of our initiatives was our Natural Flood Management Project. We gained a DEFRA grant to instal leaky dams on two of the tributaries that flow into the Pang, hoping to slow the flow of water downstream. This is using Natural Flood Management methods and working with nature, rather than hard engineering which isn't always possible or appropriate. Over time the results will show what their impact is when we have a severe rainfall event, but they seem to be fairly effective with smaller rainfall events.

I'm on the ground. I've spent what the last 13 years writing articles, delivering letters, giving talks. And I've had to deal with each situation as it arises. I've learnt a huge amount. But there is no guarantee that we've done enough. Yes, we'll have the emergency services but I still get nervous when we get heavy rainfall because I feel personally responsible for what happens.

I think a lot of people are sleepwalking into a problem, and are still quite unaware of how climate change is going to affect us. It's so important to keep photos so we can show people: look at that, that's the height the water got to, on that road and into those houses. But for a lot of residents, it's not until it actually happens that it becomes real. We need a bit of a near miss, a close shave, to get people to take it seriously. And we are talking about when we get the next flood, because it will be *when* rather than *if*.

A MODEL AS A CRYSTAL BALL

the question is: what will water do?
from pond to earth to spring to stream, to river, to field, to town
what happens when the heaviest rains come down?
what will happen with increasing rain
or when the summers change?

we have the wisdom of experience, the forgetfulness of years
we can recall what shocks, but may overlook
the way that all the small things add up

to grasp the whole picture
we need something beyond ourselves:
the gift of modelling - field scale, broad scale,
across a catchment

what happens to the water?
what's the rate of flow?
how much rises to air?
how much flows to rivers?

a model can straddle time
it is an explorer of possibilities:
how long it may take for rainfall accumulation
to become a flood, and where this flood might be

set the phones ringing
put the flood wardens on alert

or what could happen to rivers
when there's transformation
from bare earth to grass,
from rye to herbal leys,
or woodlands and trees

you can ask a model to capture
the complex dynamism of life
the cycle of soil-water-atmosphere-plants

you can ask a model to calculate
decades of change
in less than a day

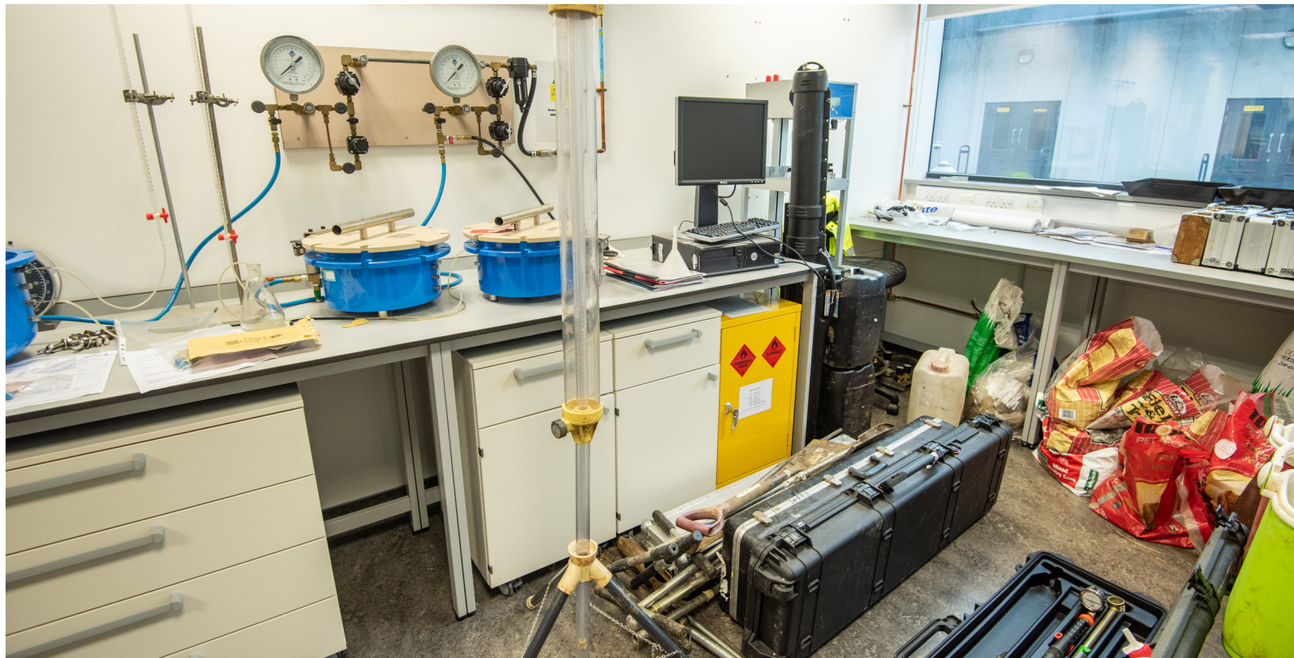
but all you can ask is for it to suggest a way forward
for a model's context is general,
yours is unique

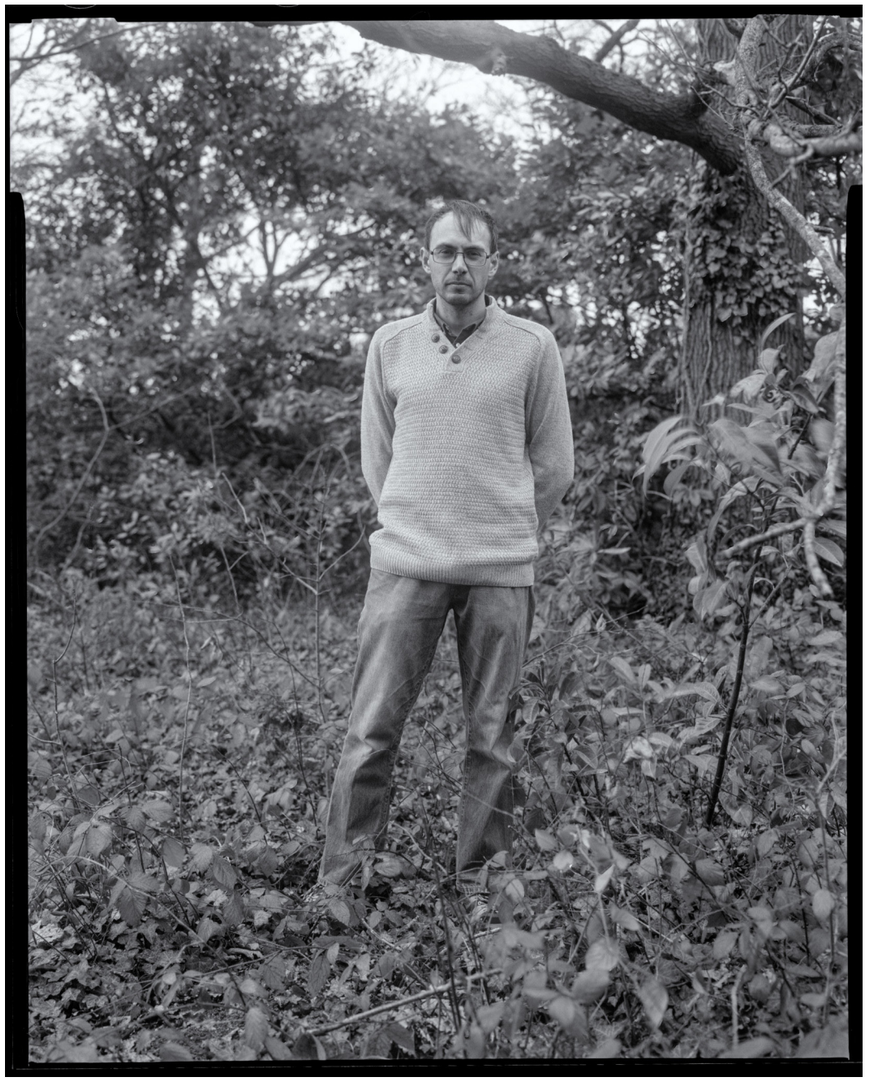
in any one field on any single farm,
geology, topography, aspect
and farmer's work
intersect

and in every choice about action
many elements blend:

model predictions, field level evidence
what you hear from your neighbours
what you feel in your gut

and a readiness to change





"When people talk about Natural Flood Management, they often think of leaky dams. But this project takes a focus on land use and soil-based practices: stopping water *before* it gets into the river. Of course, I can see all the data, which is just a graph. But for some people it's their homes and livelihoods. I'm hoping that the *Landwise* work will have impact to help mitigate that."

Will Maslanka
Postdoctoral Research Assistant in Remote Sensing, University of Reading

I have been focusing on measuring soil moisture from satellite observations, and specifically using the Sentinel-1constellation. It's a European Space Agency constellation of satellites that have been collecting radar data across the globe since 2014. I've downloaded the data and converted it into a soil moisture time series.

The software measures radar data, or 'backscatter': a signal is sent, and the data is a measurement of how much of the signal is echoed back, or returned. The amount of backscatter depends on a number of things, including soil moisture content. There are studies in other institutions looking at something similar, but on a larger 1-kilometre grid spacing: this is too coarse for the information we need, as it would average over multiple fields, multiple land uses and multiple farms. We need finer detail.

For any given pixel in the time series, I can see the highest and lowest values and how these correspond to the wettest and driest the soil has been. I look at all the 20-metre pixels within 100-metre squares, and average across them. This spatial averaging removes a lot of the small scale impacts on backscatter, such as wind, or orientation of crops.

I can also look at rainfall data and see for any given date, in specific places that have a sufficient number of repeating satellite orbits, how long it takes the soil to dry, and which areas retain moisture well. In theory, this data can be compared to data taken on the ground in broad-scale surveys to help us learn more about soil moisture in individual locations.

I access other satellite data if the rest of the team need it. For example, visual data for 2018 showed the impact of the drought. You can watch the fields dry up and go brown; and you can see the onset of early harvests, because the greenery disappears between orbits.

Another thing that we're looking at is anecdotal evidence - which areas people recall as being wet or flooded - and compare this to satellite imagery. The satellite sees the entire catchment, which is something people cannot do. We are able to see how the two sources of evidence can complement each other.

We're looking, as well, at different types of crops in the catchment - which crops typically have wetter soils, and how they're growing through the year. This and the soil moisture data can be used to form a baseline, and can be used to verify models, or to feed into new models, for example to show what could happen if we changed crops, or more trees were growing. It's a circular process, as we collect data and feed back to one another. And if the data suggests some changes in land use could be beneficial, does that work on the ground, is it something a farmer or landowner would agree with?

Whenever people talk about Natural Flood Management, they often think of leaky barriers or leaky dams. But this project takes a focus on land use and soil-based practices: increasing infiltration, increasing soil stormwater storage, and stopping water *before* it gets into the river, holding it to delay the peak. It could give evidence to show that, for instance, growing different types of grasses or altering rotations is likely to have a measurable impact on soil moisture, and on flooding, whether that's an increase or a decrease of flooding downstream.

Of course, I can see all the data, but to me, it's just a return, or a graph. For some people it's their homes and livelihoods. I'm hoping that the *Landwise* work will have impact to help mitigate that, to reduce flooding.

"I don't know what I thought - as if I was going to do a Queen Canute! I saw the water coursing down Mill Lane from Tidmarsh. When the reports came out, the Environment Agency said that the water had come down Sulham hill, but that isn't what happened. It came down Mill Lane, and then rushed into Sulham Brook. It was coming with such a force, I couldn't believe it."

Dorothy Pickering
Resident of a property that flooded, Sulham

I remember that Friday, 20th of July, 2007. My daughter, who was living in Grenada, West Indies, at the time, had heard about the terrible weather here and had been phoning to check I was OK. And I was - until the evening, when she rang and I saw the water rising outside the house, pouring over the grass, and onto the patio. And I knew then, I was going to flood.

I had to do something, so we stopped talking and I went outside. I don't know what I thought - as if I was going to do a King Canute or Queen Canute! I headed down the lane to see what was happening. And I saw the water coursing down Mill Lane from Tidmarsh. When the reports came out about the floods, the Environment Agency said that the water had come down Sulham hill, but that isn't what happened. It came down Mill Lane, and then rushed into Sulham Brook at the little bridge. It was coming with such a force, I couldn't believe it. So I came back in the house. My daughter rang again to see how I was, and said to me, 'Mummy, don't forget the photographs'. I'm so grateful to her - furniture can be replaced but photographs are your life. For anyone else who experiences flooding, that's one thing I'd recommend: save the photos! So I took them upstairs and then came down and began moving the smaller pieces of furniture.

Earlier in the day, when news about flooding in the area was coming in, I had spoken to one of my neighbours who had said I must ask if I needed help. And then there I was, with water sloshing around, so I called him. He came, with other people from the village. They were fantastic, I'm so grateful for all their help. We moved a hell of a lot out of the way but we couldn't move everything. The house ended up with water, all around - like an Indian maharajah's Palace. Inside, the water came about eight inches up the walls.

The other thing which I did, and thank goodness I thought of it, was turn off the electricity at the mains fuse box. I rang my electrician, who said he wasn't able to do anything until the water levels had dropped, but by Sunday they were low enough. He took all the sockets out, so they could begin to dry out, and reconnected the system so that I was able to turn the power on upstairs. And I know not everybody would want to stay in a flood-damaged house, but I did. I managed fine, just living upstairs.

We had to use dehumidifiers for months. Until the brickwork dries out, you can't begin the repairs. After that, you can plaster, fix the electrics. Thank goodness I had insurance. Overall, the cost of making the house liveable again was about £60,000: new carpets, work on the electrics, a new kitchen, and walls painted, as well as the cost of keeping the dehumidifiers going for so many months.

A few days later, Kay Lacey from the Pang Valley Flood Forum turned up with a woman I knew - Lizzie - and they were wonderful. Kay had set up the Flood Group in Pangbourne in 2006. One of the things she does is to help people get prepared in case there's another flood. I now have a whole pile of flood sacks in the garage, ready, just in case. When you put them out and they get wet, they swell up and should keep the water from getting in.

I don't know if or when there might be another flood. But I feel lucky, I live in a small community where we all know one another, and everyone helps each other. And we have a village WhatsApp group. And with the Flood Groups and the research that is happening, I feel reassured that there are things being done to try to reduce flooding - there is certainly a lot of work to do.

PERCOLATION

thirty years ago, heavy rain - these fields flooded

that's how it is, we thought, as we ploughed,
turned the silty clay loam
hoped for profit from monoculture

but the floods continued and the soil felt like concrete
so we thought about what's beneath the surface
and finding another way

how quickly things can change
when we work for the earth
instead of asking the earth to work for us

as a community, plants repair the soil
become magnets for more life

fields shine with Venus's looking glass
poppies, orchids, sweet clover, yarrow
and sing with a chorus of skylarks, goldfinches, corn buntings
and rising from the hedges, clouds of yellowhammers

and see, the barn owls are back

while the land tracks the seasons,
beneath our feet, there are shifts in myccorhizal thinking

a map will show you lines, grids, divisions
but look - everything is connected

one farm affects one stream
one stream affects one river
one river affects one ocean
one ocean affects one planet

and one person affects one other

"We found that innovative management practices improved soil structure. We also found that mature broadleaf woodland soils have the highest organic matter content and porosity relative to grass and arable land. So land use, and land management with practices such as controlled traffic or min/zero tillage or organic additions, can all improve soil structure and increase land based Natural Flood Management potential."

Emily Trill
Hydrologist at UK Centre for Ecology and Hydrology (UKCEH)

We've taken soil samples from across the West Thames catchment, across five different soil types. The point is to compare how land management and farming practices can affect soil properties to increase water storage, and help with natural flood management.

We started by sampling 164 fields. This was the broad scale survey looking at the quality of the near-surface soil. In each field we compared a trafficked area to an in-field area, and the uncultivated margins, over four land use classes: arable with grass in rotation, arable without grass rotation, permanent grassland, and woodland. Then we've done a more detailed survey on seven of these fields over three sites, looking at soil properties over depth and repeated at different times of year. This work goes into finer spatial detail than some older datasets, to give evidence on in-field variability that's lacking elsewhere.

For each sample, we test for bulk density and infer porosity which measures how much water the soil can hold. If it's more dense, it is less porous and there is less capacity to hold water. One of the key findings was the relationship between soil organic matter and porosity: with small additions of organic matter to relatively low organic content soil, there is significant increase in porosity. So the soil structure is improved and can hold more water with good potential for Natural Flood Management.

We also test for slaking and dispersion, which is a measure of how soil behaves when it gets wet, and this changes even within fields. If you have a lot of rain, even if you've got loads of pore space underneath the surface - low bulk density, high porosity - if the surface caps easily, the top level closes like a crust, and the water can't get in. You might see this where there are tram lines: the water's just running off, but if you dig a hole, you see the soil is unsaturated underneath. The soil could hold a lot more water and reduce the impact of flooding if the surface soil is managed differently.

To reduce this problem you can control the traffic, for instance by programming a tractor using GPS to follow the same tracks every time to limit the area of compaction. And there are other practices - like min till or no till. We found that these innovative management practices also improved soil structure, increasing porosity, and Natural Flood Management potential. We also found that mature broadleaf woodland soils have the highest organic matter content and porosity relative to grass and arable land. So land use - such as tree planting - and land management with innovative farming such as controlled traffic or min/zero tillage or organic additions can all improve soil structure and increase land based Natural Flood Management potential.

I think what's useful is getting people in different areas to talk together, and understand it as one big picture. It's a very complex topic. A lot of other projects I work on are research driven - all academics working to answer academic questions. You get great outcomes, but the difference with this project is that it has been co-developed with farmers. So I hope the outcomes will help to answer their questions and actually be useful to them. When we do wider engagement activities, people really want to know: how much of a difference do different land management practices make? And what can I do to make a difference?

"What is powerful is if you have field data and you have a model which broadly approximates what the field data are showing you. Then I think the stakeholders are more willing to trust the model when applied to another land management scenario."

Anne Verhoef
Soil scientist and Earth System modeller
Professor of Soil Physics and Micrometeorology, University of Reading

I look at the hydrology of the soil-plant-atmosphere system and I work on soil hydrological models. I use SWAP - the 'Soil Water Atmosphere Plant' model. With field scale modelling we're looking at processes: the feedbacks and interactions between the soil, the plants, and the atmosphere that matter for flooding on different kinds of land use.

I need data on soil texture - how much sand, silt and clay is in the soil - and I need the hydraulic parameters, which show the way the water flows in the soil. How easy is it for the water to flow? How well is water retained? And how easy is it for plant roots to take water out of the soil?

I also need data on crops and weather. We want to know, for any moment in time during our model runs, how much water is in the soil, because if the soil pores are fully filled with water, surface runoff may occur. We also want to know how much of the 'excess water' will become runoff and how much filters down to deeper soil layers (recharging the groundwater stores), which could potentially cause groundwater flooding or cause river levels to rise.

We're looking at permanent grassland, crop rotations with four-to-five crop types, and pine and spruce forests, and I have run the model for 14 soil types. There are so many variables. For example, grassland might be mowed, or grazed, or both, and if it's grazed, is that 20 cows per hectare, or 40? There are about 100 parameters in the grass growth input file that one could change. Just getting the basics right has been a lot of work!

The model may suggest that it would be better to have a forest, but of course that's not reality - we can't have all forests. I see my work for *Landwise* as a model sensitivity analysis: we can look at the same soil, but change the ease with which water flows through the soil (hydraulic conductivity), for example, by degrees to see what happens - is a 20% change enough, or do we need to change it by 200% before we see significant changes in runoff and recharge?

I know, uncertainty is there. But my modelling can show where, in theory, changes that will help with Natural Flood Management can be made, like a crop rotation that leaves more pore space free for floodwater, to help buffer large rainfall events.

The model outputs will predict the effect of a land use change, such as a different crop rotation, but of course what actually happens depends on where a field sits in the landscape, and what neighbouring farmers are growing. I think any stakeholder practitioner would like to see field level evidence based on measurements, more so than models - but what is powerful is if you have field data and you have a model which broadly approximates what the field data are showing you. Then I think the stakeholders are more willing to trust the model when applied to another land management scenario.

My models work at field level. When we put my output data into a landscape or a catchment scale model, then we can have more definite answers with regards to fluvial or groundwater flooding. In the past, we used to think about crop models, hydrological models, land surface models, climate models; but there needs to be a continuum. Nowadays we call these earth system models, where we try to have all of these processes presented in a fluid and interconnected way.

WATERSHED

who thought that the picturesque was perfect
that a monoculture worked, or a river should run straight
when life is multi-stranded

show me a river at dusk without jackdaws
rooks and blackbirds, preparing for the dark

show me a river that sings its song
without the sound of traffic, trains, or planes

show me a river that lives its life
without connecting to people

show me a river that will behave
just as we want it to

show me a river that will not change
as the world around it changes

show me people who are unafraid of floods

we stand at the confluence of times,
all we have known, flowing to this moment

think again about the braiding of things
how every stream flows into a river

consider: the peril of separating problems
storing them in silos, in files, in labs

it's a risky business, to disconnect water from soil
to separate farming from the countryside,
the countryside from the urban
to isolate data from action

when knowledge connects,
so too do our choices, and our hope

we stand at the confluence of times,
all we have known flowing to this moment

at this watershed
we hold the future in our hands



















Some Background

Landwise is one of three projects investigating Natural Flood Management funded by the National Environment Research Council (NERC). The other two consider land management in the uplands, investigating how best to retain and keep water at the top of a catchment. *Landwise* focuses on land management in lowland catchments for Integrated Flood Risk Reduction. Its research is about ways of using the full depth and storage capacity of the soils in the fertile lowland areas, with a geographical focus on the Thames catchment.

There is a wide variety of brown earth soils across the Thames, and they all have different proportions of clay at different depths in the soil profile. There is a lot of variability, and soil properties may be different even within a single field. Some soils are free draining most of the time, but under some land use conditions, if there is an unfortunate coincidence of cultivation or compaction, followed by rainfall, they can flatten and become sealed, so that rain flows across the surface as sheet flow. Such rapid surface run off can lead to flooding. This temporal vulnerability and spatial variability hasn't been factored in to the hydrological models in the past, because there has not been sufficient evidence for it.

Landwise has been designed to evaluate the effectiveness of realistic and scalable land-based natural flood management measures to reduce the risk from flooding from surface runoff, rivers and groundwater in groundwater-fed lowland catchments. Through measuring soil properties at a number of scales and combining this with data about land use from farmers and land managers, *Landwise* has aimed to bring together a variety of knowledges and expertise, in the context of past flood events and prediction of the efficacy of Natural Flood Management going forwards.

somewhere nowhere is the collaborative practice of artist researchers Harriet Fraser and Rob Fraser. Their work explores the nature and culture of rural spaces, and they work in interdisciplinary teams to investigate and communicate issues connected with the natural environment. Their practice entails walking, often over long distances, and research through conversations and interviews with people who are experts by experience and by training; they bring together the 'feeling' and the 'knowing' of place, and introduce 'data of the heart' into discussions. Photography, poetry, landscape installations and group activities provide public-facing artwork and opportunities for engagement, and feed into research and debates among a variety of stakeholders. Work is shared through exhibitions, books, films, participatory events and presentations.

The Frasers are Visiting Research Fellows at Cumbria University, where they have established the People-Land-Art-Culture-Ecology (PLACE) Collective at the UK Centre for National Parks and Protected Areas. This brings artists into interdisciplinary research within and beyond Protected Landscapes. (https://theplacecollective.org)

The poems and images and excerpts from quoted interviews contained in this book, as well as samples of soil and water from nine locations in the Thames catcment, were shared at the Landwise final event at FarmEd, in Oxfordshire, June 2022.

CHANGE OF COURSE

take the pressure off
let roots grow deep, and work together
in the hidden life of earth

take the pressure off
come away from the critical edge
and listen

what do the rivers tell you
what do the crops reveal
how are the animals

where is the change, in the sequence
from rain to earth to river to sea to rain

watch and question
again and again

because you can change what you do
but you can’t stop the rain

show me a river that will not change
as the world around it changes

somewhere nowhere

www.somewhere-nowhere.com