

Catchment Sensitive Farming

Working with farmers
to improve water and air quality

Philippa Mansfield and Alex Lowe CSF National team



Photos of the Wye Valley thanks to Wayne Davies CSFO



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for farmers**

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How CSF works

Network of CSF Officers, partners and specialist farm advisers

provide advice and grant support via Countryside Stewardship

to farmers in high priority areas for water quality in catchments across England and in partnership with water companies

60% of CSF recommendations are implemented by farmers. Farmers take action voluntarily.

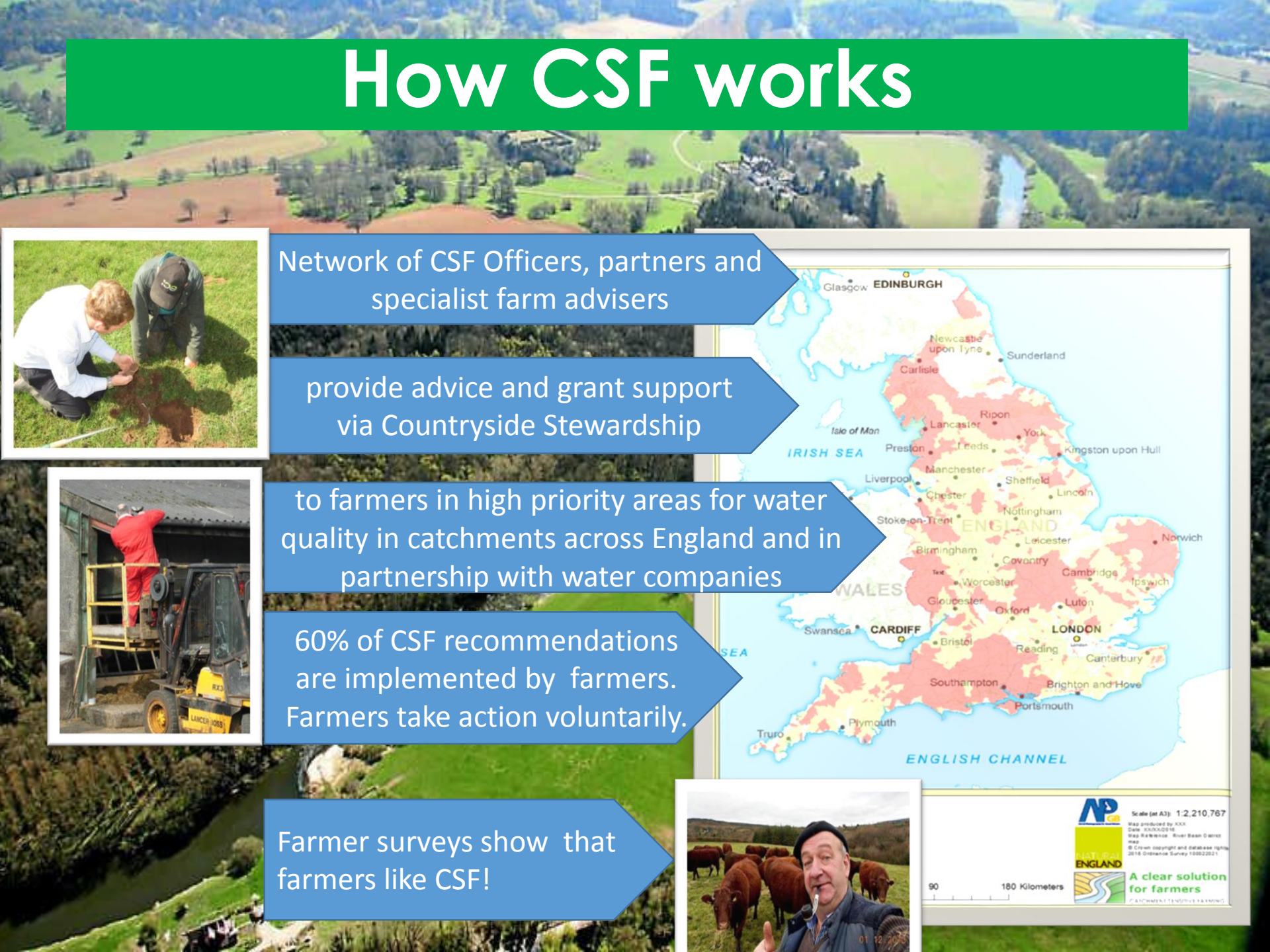
Farmer surveys show that farmers like CSF!



Scale (at A3): 1:2,210,767
Map produced by NPF
Date: 01/04/2016
Map Name: River Basin District map
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2016 Ordnance Survey 100023212

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PARTNERSHIP THROUGH FARMING

90 180 Kilometers



CSF – Working together with



CSF and farmers tackle water pollution

Agricultural pollutants impacting water:

- Sediment
- Phosphate
- Nitrate
- Pesticides
- Faecal Pollution

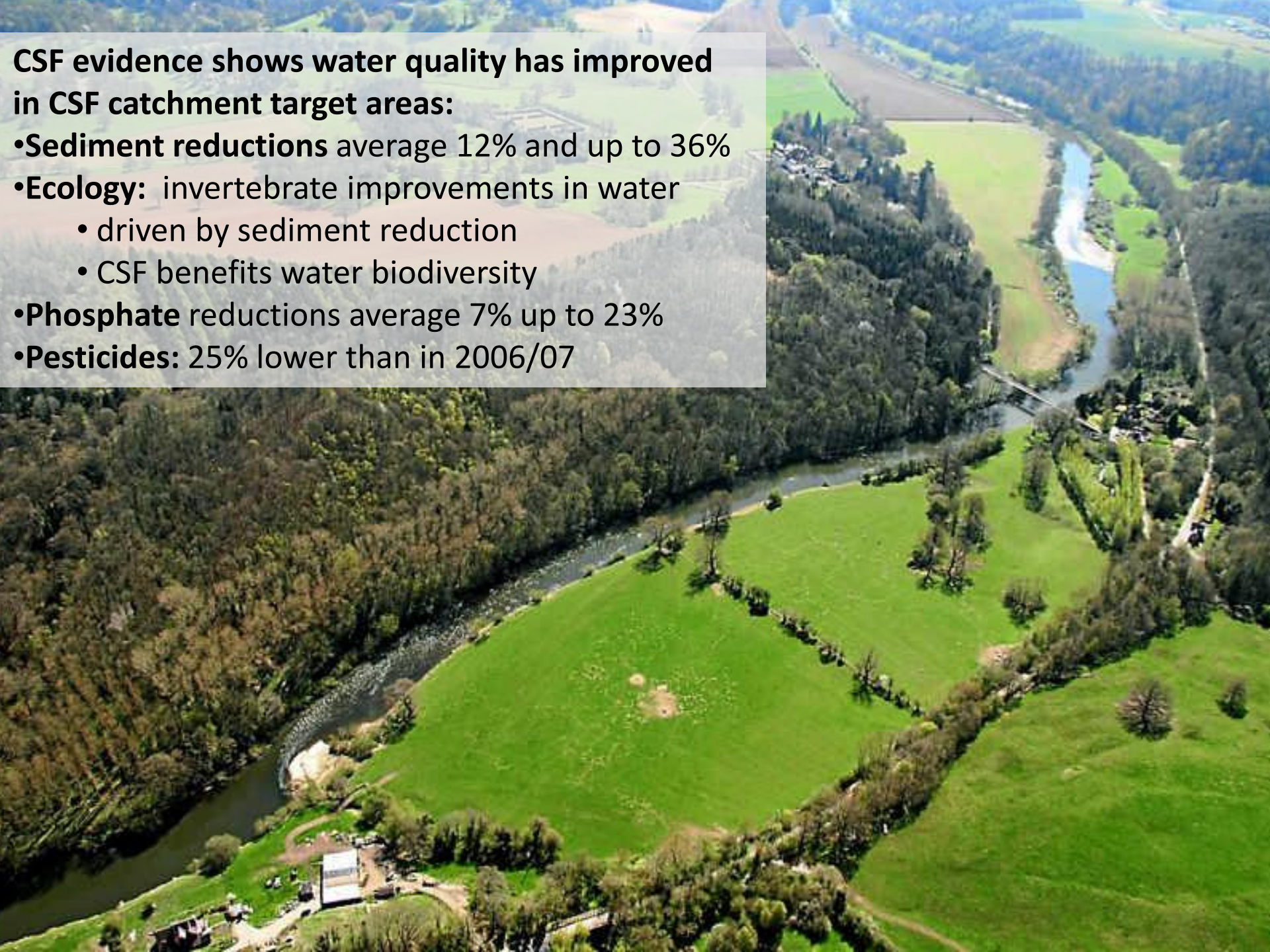


The **priority** of each of these **pollutant pressures** within Countryside Stewardship is shown on [Magic](#) at the farm scale.

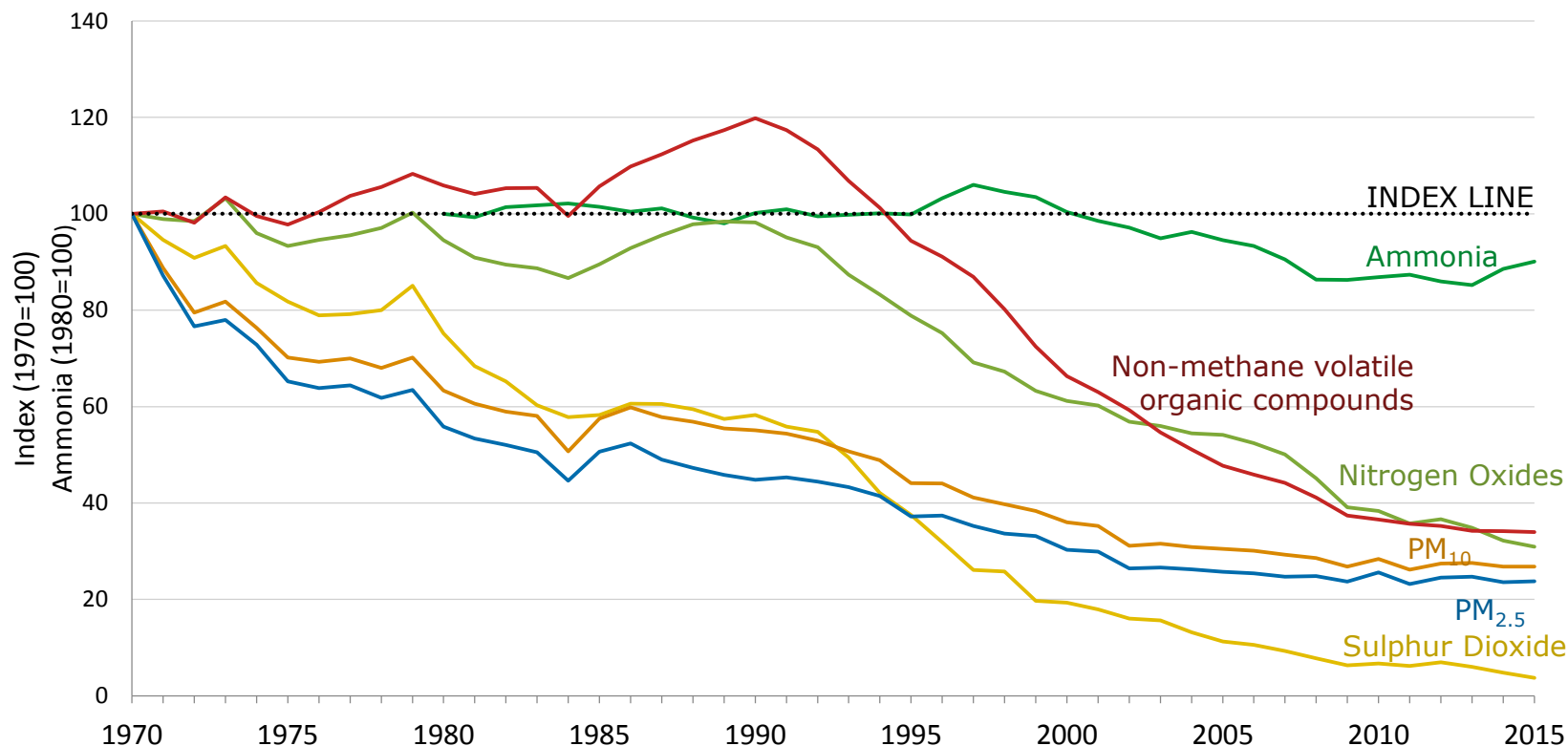
Priorities are described locally in the [Countryside Stewardship Statements of priorities](#)

**CSF evidence shows water quality has improved
in CSF catchment target areas:**

- **Sediment reductions** average 12% and up to 36%
- **Ecology:** invertebrate improvements in water
 - driven by sediment reduction
 - CSF benefits water biodiversity
- **Phosphate** reductions average 7% up to 23%
- **Pesticides:** 25% lower than in 2006/07



New Challenge – improving air quality

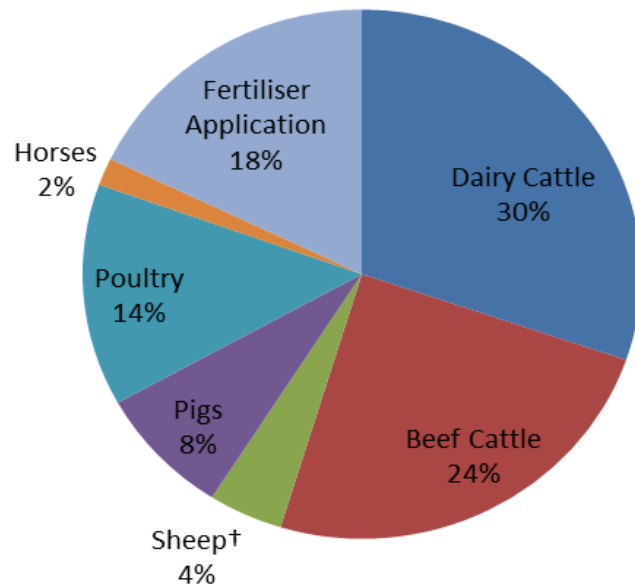


- There has been a long-term decline in air pollution since 1970.
- With the exception of ammonia & PM_{2.5}, emissions of all pollutants continued to decrease in 2015.
- Ammonia reacts in air to form toxic particulates which cause respiratory problems in humans
- 88% ammonia emissions are from agriculture

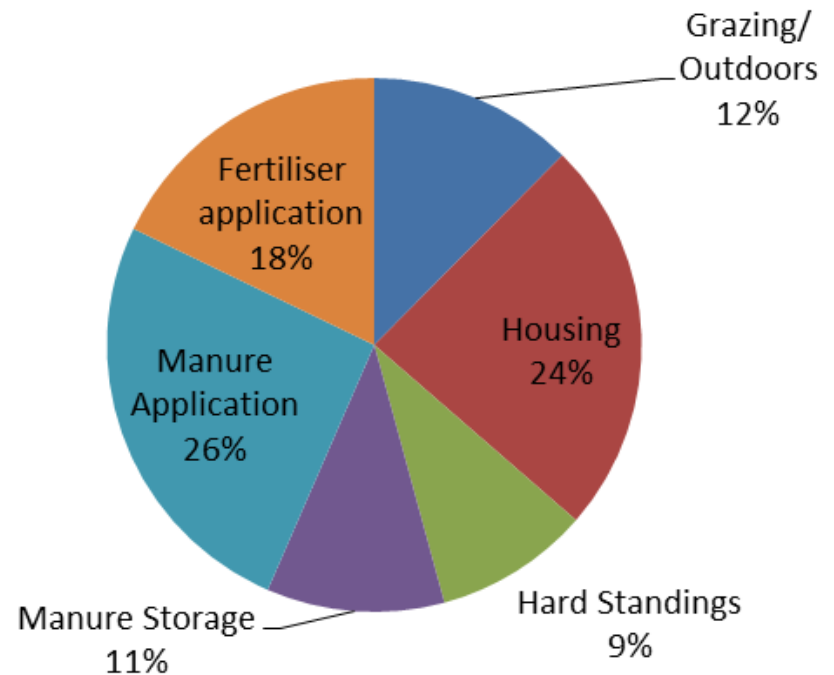
Agricultural Ammonia: sources

YouTube video on Ammonia:

<https://www.youtube.com/watch?v=QBeFdC5aYbY>



Management Category



Misselbrook et al, Defra Contract SCF0102; Inventory of Ammonia Emissions from UK Agriculture 2014; Inventory Submission Report November 2015.

Widespread ecological damage due to Nitrogen deposition

Major pressure on UK biodiversity

- Nutrient enrichment
- Direct toxic effects
- Acidification
- Increased sensitivity to other stresses



Source: CEH



'bleached' lichens

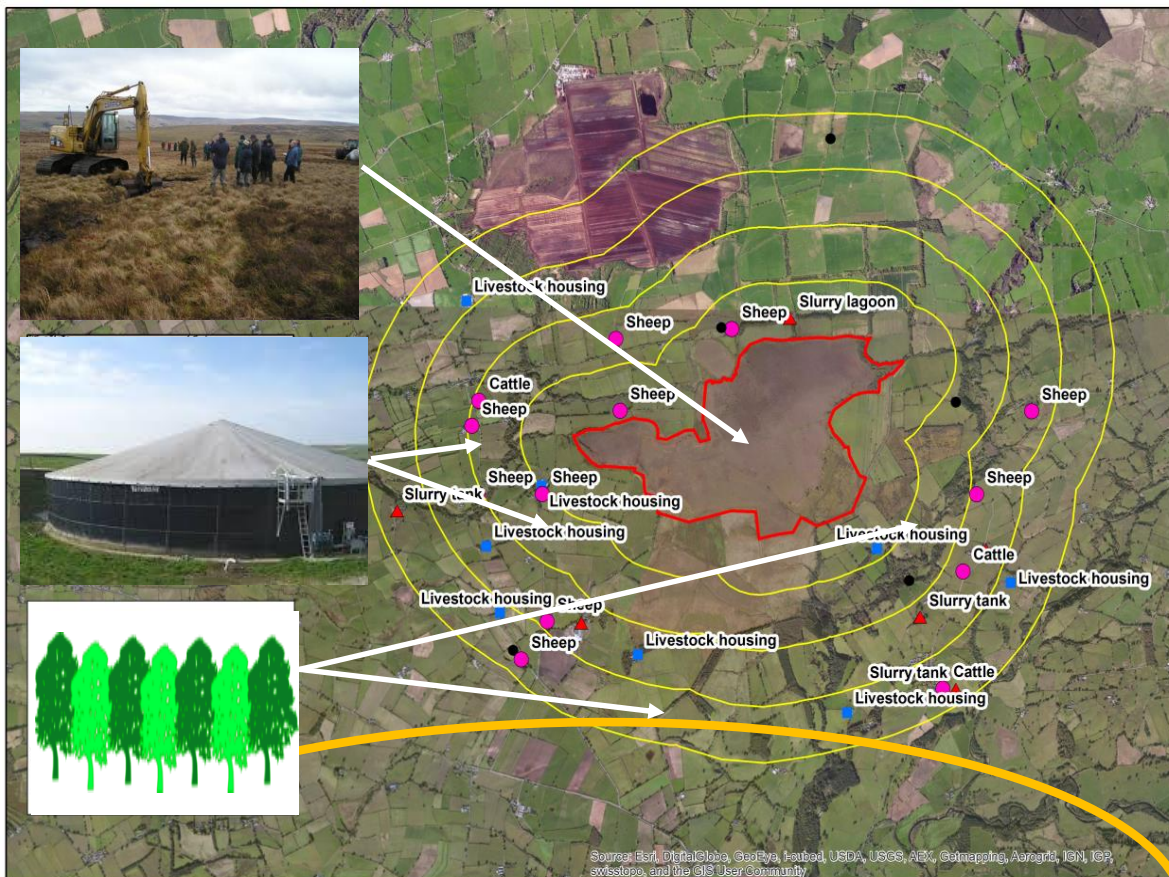


↑ frost damage




Wavy hair-grass replacing heather

Natural England are trialling Shared Nitrogen Action Plans (SNAPs)



- New remedy for protected sites/habitats.
- Co-produced with external stakeholders.
- To identify and secure practical steps that to reduce and mitigate N impacts.
- Pilots in Devon, Greater London, Shropshire, Nottinghamshire.

Farming Ammonia Reduction Grant for slurry lagoon cover with CSF advice



1 week's water savings after
completion
Farmer estimated winter rainfall
pumping costs from this lagoon would
be £6,500.

CSF Measures Deployed – The Big 3

- Reducing the **Source** of Pollution
 - Breaking or slowing the **Pathway** for the Pollutant
 - Protecting/ Buffering the **water body/sensitive site**
- CSF has delivered advice to over 20,000 farm holdings covering >2.6M hectares
- 60% implemented so far
- Evidence based approach



Defra Project WQ0106



Top 10 CSF recommendations taken up by farmers

CSF farm events and
1:1 advice visits
to priority farms



- Separation of clean and dirty water
- Soil analysis
- Adopting a nutrient plan
- Adopting a soil management plan
- Integrated fertiliser and manure management
- Reducing compaction in the soil
- Reducing volume of dirty water
- Fencing off rivers
- Reduction of phosphate fertiliser
- Maintenance of farm tracks



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CSF Soil Husbandry, Water Management Plans and Field Drainage advice visits

Identify soil compaction reducing infiltration of water leading to soil erosion and run off risks, soil loss and restricted crop growth



Map overland flow pathways and drain flow to water courses
CSF advice on field management or CS options to address losses



Photocredit Melissa Hoskings

GREAT Soils: <https://www.soilassociation.org/greatsoils/>

Innovation for Agriculture and CSF - soil health videos and joint events



Soil videos on IfA YouTube:

<https://goo.gl/Vcuuj3>

www.innovationforagriculture.org.uk

Kitchen Science - Matthew Shepherd
NE soil biologist

1. Collecting soil bugs
2. Extracting soil bugs
3. The Soil Slab
4. Sediment and nutrient loss from soils
5. Holding on to soil nutrients
6. Soil structural stability

7. **Soil Health** - Stephen Briggs (IfA)

8. **Conservation agriculture** - farmer case studies

CSF-IfA 30 soil health events this winter

CSF advice visits on nutrient and manure management, machinery review & calibration

Reduce ammonia losses by slurry injection and band spreading

Improve efficiency, save costs and reduce nutrient losses by planning, calibration and making the most of nutrients in manures.

Reduce pollution risk with organic manure spreading risk map



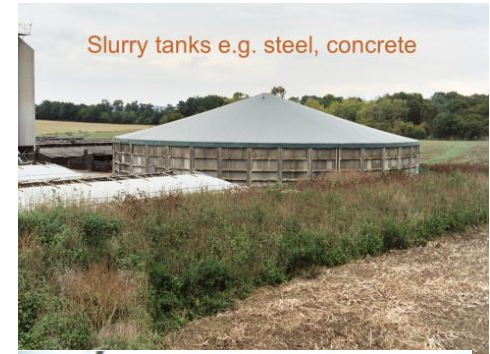
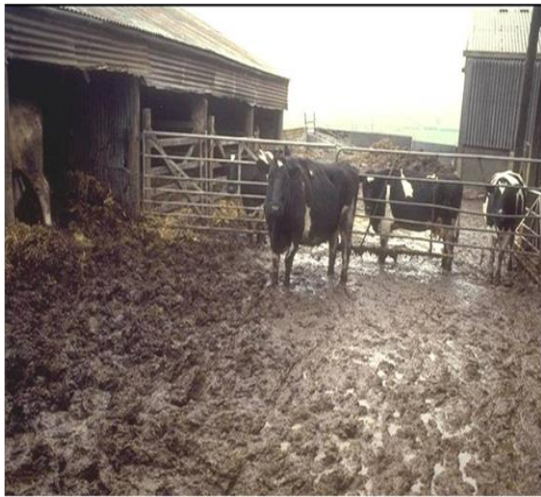
On line/printed nutrient management guidance:

Tried & Tested: Think Manures etc www.nutrientmanagement.org

New Nutrient Management Guide (RB209): Principles & Organic Materials sections
www.ahdb.org.uk/rb209

CSF Farm Infrastructure Audits and Slurry and manure handling and storage advice visits

Save costs in slurry handling and storage and reduce water and ammonia pollution by roofing over farmyards, covering slurry stores, fixing gutters and drains to separate clean and dirty water



Slurry tanks e.g. steel, concrete



Earth-banked slurry lagoon

Advice online: www.riverstrust.org.uk/pinpoint

www.ahdb.org.uk

Countryside Stewardship water capital grants available

CSF sector-specific advice visits and design of water holding features/constructed wetlands

Specific advice for sectors with high risk of soil run off from bare and damaged soil causing water pollution e.g. maize (over-sowing), potatoes, outdoor pigs
Design sediment/silt traps and constructed wetlands – CS grants available



Photo credits Robert Camps and Des Kay, CSFOs

Advice online: www.ahdb.org.uk; www.wwt.org.uk/farmwetlands

Countryside Stewardship environmental priorities

Wildlife and nature:

restoring habitats, providing food and nesting places, creating areas for rare flowering plants and managing hedges.



Pollinators:

ensuring the right resources for wild pollinators where they are needed most.



Water/flooding:

making water cleaner and reduce risk of flooding by encouraging changes to farming practice & improving farm infrastructure.



Woodland:

funding the creation of new woodland and supporting the management of existing woodland.



Other priorities: historic environment, landscape character, genetic conservation, educational access and climate change adaptation and mitigation.

Countryside Stewardship Mid Tier

- Capital items & land management options for soil and water
- Wide range of mid-tier options for Soil and Water:



2 year legume fallow



Winter cover crops



Wide buffers and riparian strips



Water holding features: Seepage barriers, earth banks, swales, check dams...

Countryside Stewardship Higher Tier

- Targeted for priority sites with complex management
- Mid tier options and capital items also available
- CSF works with other Natural England advisers to include options and items for water quality where relevant
- Some items and options only available in higher tier including:

High Tier only



Tramline disruption



Grip blocking of drainage channels

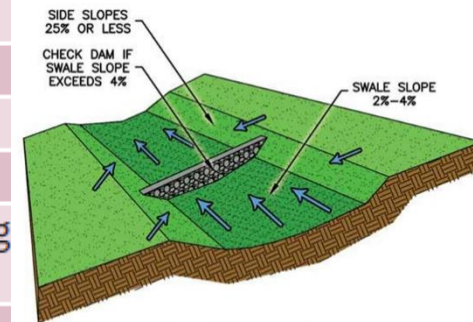


Constructed wetlands
- need CSF advice

Higher Tier Land Management Option:
Creation of grassland for target features

Options & Capital Items requiring CSFO Approval in Mid Tier

Code	Option
SW7	Arable reversion to grassland with low fertiliser input
SW8	Management of intensive grassland adjacent to a watercourse
RP13	Yard - underground drainage pipework
RP14	Yard Inspection pit
RP15	Concrete yard renewal
RP17	Water storage tanks underground
RP18	Above ground water storage tanks
RP19	First flush rainwater diverters or downpipe filters
RP20	Relocation of sheep dips & pens
RP21	Relocation of sheep pens only
RP22	Sheep dip drainage aprons & sumps
RP23	Installation of livestock drinking troughs (in draining pens for freshly dipped sheep)
RP4	Livestock and machinery tracks
RP24	Lined bio bed + loading & wash down area
RP25	Lined bio bed with existing wash down area
RP27	Sprayer or applicator load & wash down area
RP28	Roofing for sprayer wash down areas, manure storage, livestock gathering areas, slurry and silage stores
RP29	Self-supporting covers for slurry stores



VEGETATED (grassed) SWALE
FIGURE 2A

Countryside Stewardship and Organic Farming

The Organic options provide support to organic farmers, in recognition of the environmental benefits that organic farming can achieve

6 Organic Management options

5 Organic Conversion options

5 agri-environment options specific to organic land

Examples

OT1: Organic land management - improved permanent grassland £40/ha

OR3 Organic Conversion – rotational land £175/ha for up to 2 years

OP5: Under-sown cereal £86/ha with grass/flower-rich legume ley

https://www.gov.uk/countryside-stewardship-grants?keywords=&land_use%5B%5D=organic-land

Access to the Organic Management and Conversion options is not competitive: any farmer can apply, provided they are eligible.



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Any questions or comments so far?



Catchment Sensitive Farming

<https://www.gov.uk/catchment-sensitive-farming-reduce-agricultural-water-pollution>


River Basin Strategies and case studies published on Natural England publications catalogue:

[Anglian RBD](#) (CSF002); [Humber RBD](#) (CSF003); [North West RBD](#) (CSF004); [Northumbria RBD](#) (CSF005); [Severn RBD](#) (CSF006); [South East RBD](#) (CSF007); [South West RBD](#) (CSF008)

Countryside Stewardship

<https://www.gov.uk/guidance/countryside-stewardship-manual>



A man wearing a blue jacket and a dark beanie is holding a large clump of soil with some grass roots. He is looking down at the soil and pointing at it with his right hand. A group of people, including a woman in a pink jacket and a man in a dark jacket, are gathered around him, looking at the soil. The background shows a field with a fence and some trees.

What can CSF do for organic farmers?

Environmental benefits of Organic Farming

- **Reduced nutrient use and losses to air and water**
 - 35-65% less nitrogen leached from arable fields
- **No persistent pesticides impacting water on organic farms**
- **Healthier soils**
 - 4% higher humic acid storing soil carbon,
 - abundance of soil microbes and
 - resilience against flooding and drought
 - Organic
- **Wildlife - a third more species on average with 50% more pollinator species and 75% more plant species**
- **Whole farm approach with limited external inputs means that organic farming must be sustainable and balanced**
 - essential to retain and build fertility and soil resources
 - organic farming systems are resilient if managed properly



Pollution risks on farms including organic

= loss of valuable resources

- **Slurry and manure storage, handling, farm yards and spreading**
 - **Nutrient losses to air and water**
- **Out-wintering of cattle and outdoor pigs - poaching**
 - **sward and soil damage and run off**
- **Livestock access to water courses**
 - **faecal indicator organisms contaminating Bathing Waters**
- **Crops with large areas of bare soils e.g. outdoor vegetables/potatoes**
 - **soil erosion and run off, carrying phosphate**
- **Ploughing up clover leys when no suitable following crop to take up N released by cultivation**
 - **Loss of nitrates**

Case Studies from Organic farms in Devon



**Water quality and ecology in River Otter impacted by sediment
Bathing Water quality at Budleigh Salterton impacted by
Faecal Indicator Organisms from farms up-river**

Photos and examples from organic farms thanks to Matt Heaton CSFO East Devon

**Soil wash run off
from fields**

**sandy soils prone
to erosion**

**culvert inundated
muddy run off
across road down
slope into river**



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Clinton Devon Estates

- 17,000 acres (2,800 acres Home Farm)
- 3 organic dairy herds, breeding mule ewes, pedigree texels and arable crops
- Slurry lagoon on top of hill – considering cover
- East of sensitive heathland habitats
- ***“In East Devon, a storage lagoon, built in 2011, allows dirty water to be pumped directly from Otter Dairy all year round for distribution on the land when it is most needed. This practice has resulted in a significant decrease in nitrates in the local water courses and provided free, natural fertilizer on the land.”***
- Higher Level Stewardship agreement
- Woodlands – benefits water and air quality
- **Improvements made for water quality with CSF help**
 - covered yards, covered silage clamps,
 - **Arable riparian land on Home farm reverted to grassland,**
 - **watercourse fencing (protects Budleigh Salterton)**

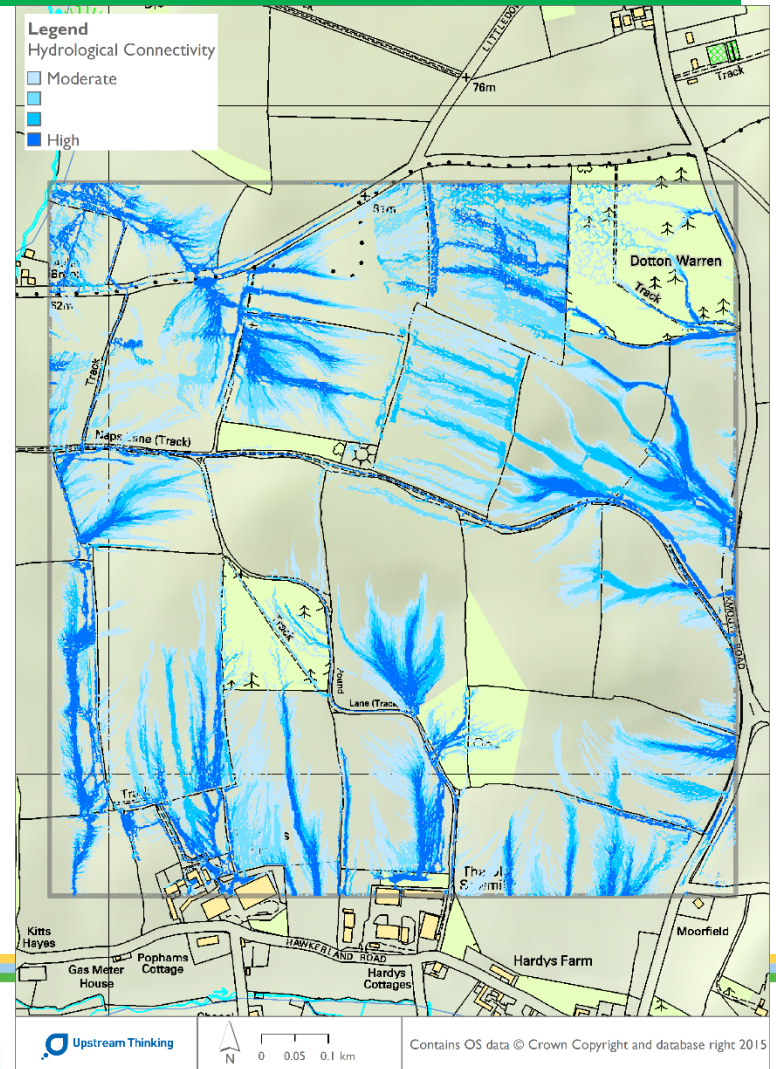


Late-sown slow growing crop of winter oats

Sandy soil prone to erosion



Risk of soil run off down field and lane into stream
– CSFOs install sediment fence (filter fence)



Overworked headland cultivation line 12 m in – 200m runnel down field



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After 1 month... 10 tonnes sediment intercepted by sediment fence



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Winter oats after sediment fence removed

Sediment/filter fence as last resort
– avoidance better

Fence removed to allow weeding
and re-used in another field.

Field now in long term grass ley

Solutions?

Crop choice for field and soil,
timely planting in good conditions,
avoid over-working soil,
build up soil organic matter,
cultivate across the slope,
cover crops



South Devon Organic Growers - Outdoor vegetables winter harvest



South Devon Organic Growers selling to Riverford Organics

Split field
beetroot/cauliflower

Chisel plough after beetroot harvest before spring planting cauliflower



Bare fields mid-winter managed to reduce soil erosion and run off and increase water infiltration (too late for cover crops). Put big bales on tracks and in gateways to stop soil loss. 5 year grass ley to be planted after field vegetables – lower risk of soil loss

Case study - nitrate losses

- Field in red clover ley ploughed up
- Farm borehole water tested
 - 150kg/ha Nitrogen equivalent
 - Impact on Drinking Water quality
 - Loss of valuable nutrient and soil fertility



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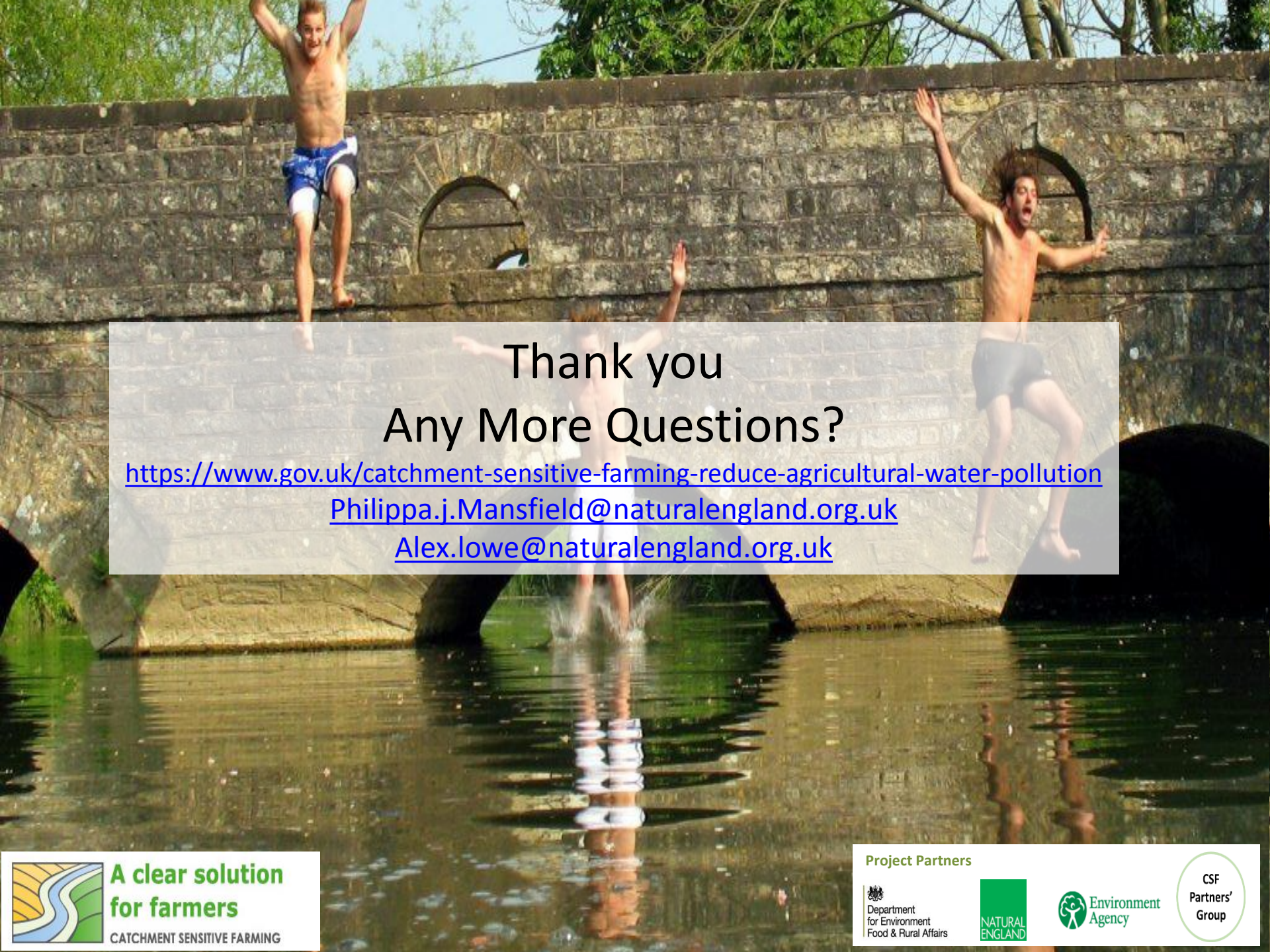


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Workshop questions

- **What works well on organic farms**
 - organic techniques that could be shared?
- **What can we do better on organic farms?**
 - What can we do to reduce the risk of air and water pollution from organic farms?
 - What crops/operations/fields or farmyards on your farm pose a risk of water/air pollution?
- **What do organic farms need from CSF?**

A photograph of three people jumping over a stone bridge into a river. The bridge is made of large, grey stone blocks and has several arched openings. The water is dark and reflects the bridge and the people. The background shows green trees and a clear sky.

Thank you Any More Questions?

<https://www.gov.uk/catchment-sensitive-farming-reduce-agricultural-water-pollution>

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