

The Water Framework Directive
& Hydro-morphology. Challenges and Implications.



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Rural land-use, land management & environmental stewardship

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Environment Agency

creating a better place

Overview

- Natural Resources
- All's well with soil condition?
- Best Farming Practice - Richard Smith
- FD2114 Research Summary
- Implications of FD2114 results for FRM etc
- Recognition of rural issues in Making Space for Water

Natural Resources

- Land, water & air
- Primary purpose of rivers & floodplains
- Natural process at land/water interface
- Ecological use
- Social & economic use

Natural Resources

- **Control** of natural process for social & economic land-use
- **Working with** natural processes for social, economic & ecological land-use
- River channel & floodplain spaces - are they **natural geomorphological resources** ?

All's well with soil condition?



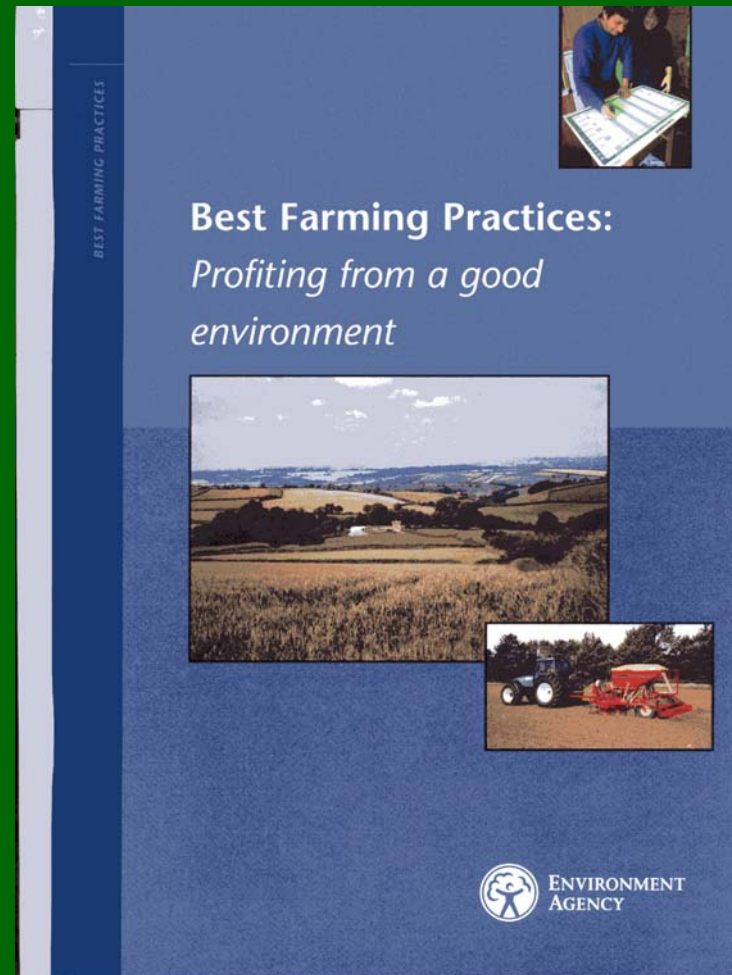
c1950's to 80's



c1990's onwards

Best Farming Practice

- Richard Smith's work
- Raised awareness



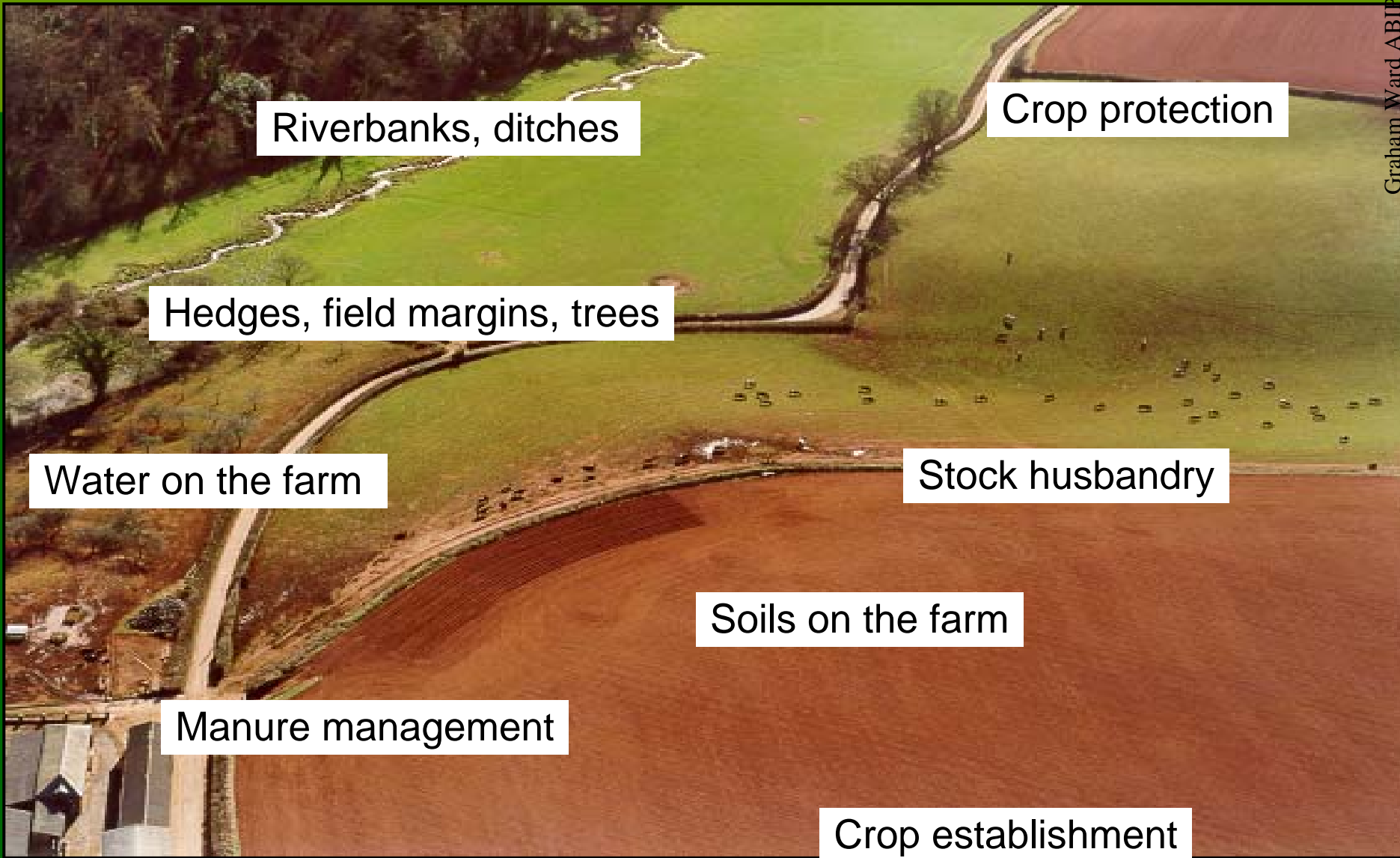
Best Farming Practice

what's the concern

- water pollution
- flooding
- fisheries
- biodiversity
- water resources
- soil quality



Best Farming Practice opportunities for change



Riverbanks, ditches

Crop protection

Hedges, field margins, trees

Water on the farm

Stock husbandry

Soils on the farm

Manure management

Crop establishment

Best Farming Practice - soil

Soil wash



Surface cap



Compaction



Well structured soil



Best Farming Practice measuring run-off at IGER



Undersown

53 litres

Chisel plough

1litre

Stubble

228 litres

Cover crop

179 litres

Best Farming Practice some consequences

Soil erosion



Mud in streams



Mud on roads



Increased flood risk



Research Project FD2114

Review of the impact of rural land use and management on flood generation

Defra/Environment Agency
Flood and Coastal Defence R&D Programme



Project FD2114: Review of Impacts of Rural Land
Use and Management on Flood Generation

Part A: Impact Study Report

R&D Technical Report – FD2114 TR

FD2114

Acknowledgements



- Joint Defra & EA project
- Defra project officer Edward Evans
- Research leader Professor Enda O'Connell
- Research Consortium:
 - University of Newcastle, Lancaster University, NERC, IGER, ADAS, NSRI, NERC.

Defra/Environment Agency
Flood and Coastal Defence R&D Programme



Project FD2114: Review of Impacts of Rural Land
Use and Management on Flood Generation

Part A: Impact Study Report

R&D Technical Report – FD2114 TR

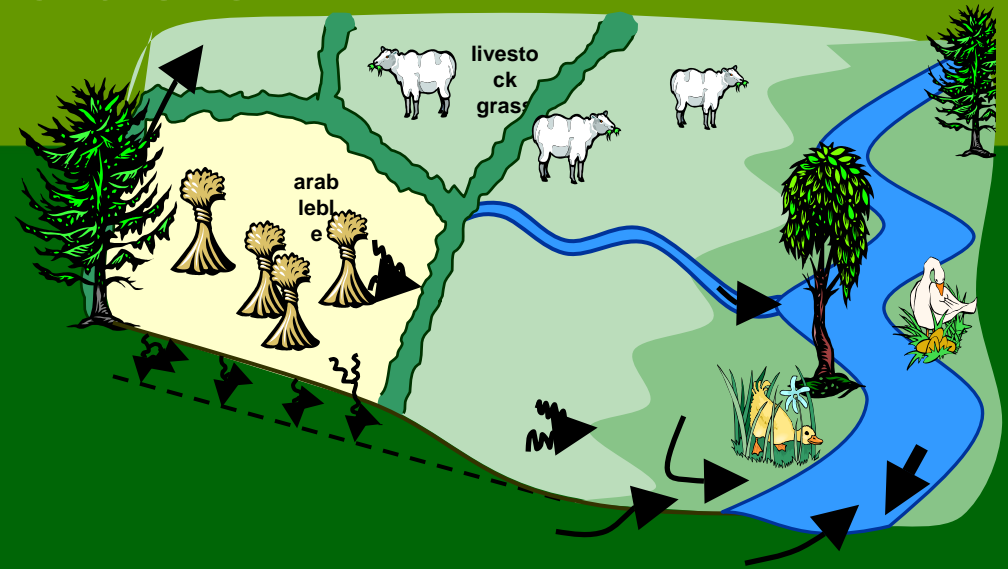


FD2114 objectives

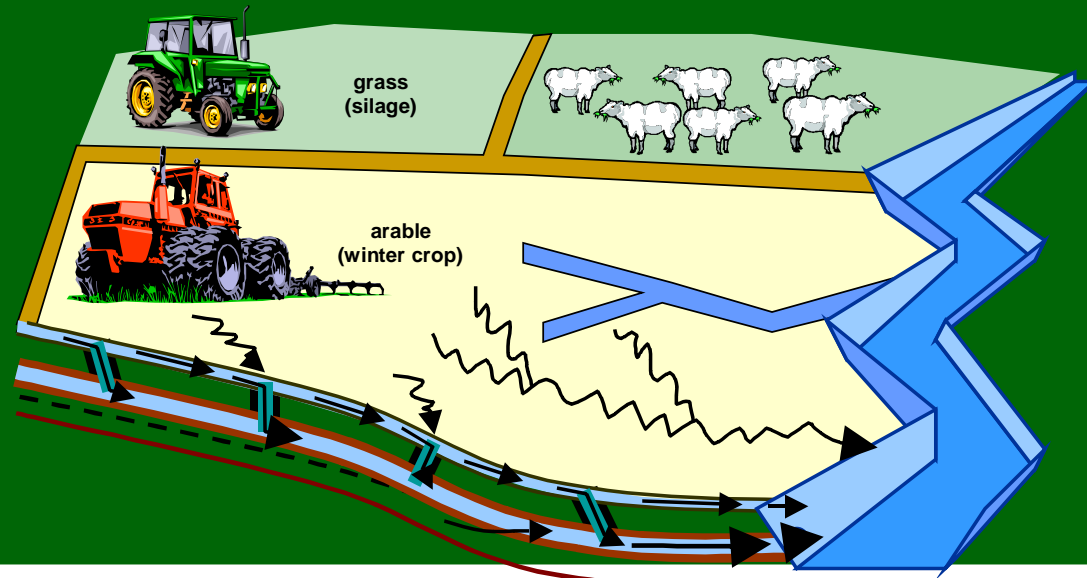
- Review the impact of rural land management on flood generation
- Short term improvements in modelling
- Future research plan

FD 2114 Changes in Land Use and Management - *conclusion i*

Intensive farming
Changes in land use
Mechanisation
Field drainage
Increased stocking rates
Removal of field infrastructure



Over last 50 years,
significant changes in
land use and
management practices;
driven by EC and UK
agricultural policy



FD 2114

Local Scale Impacts - *conclusion ii*

- Have there been impacts on local scale flooding in the past?
- **YES**
 - Substantial evidence on local scale changes to runoff generation and impacts, but effects are complex



Large Scale Flooding

■ Local, small-scale



- increase in “muddy” floods, from sediment-laden runoff

■ Downstream, larger-scale



- is there a link?
- flooding on floodplains



Large Scale Impacts

- *conclusion iii*

- Have there been impacts on large scale flooding in the past? – **POSSIBLY**
 - Only very limited evidence that local changes in runoff are transferred to the surface water network and propagate downstream

Analysis of Peak Runoff Records

- *conclusion iv*

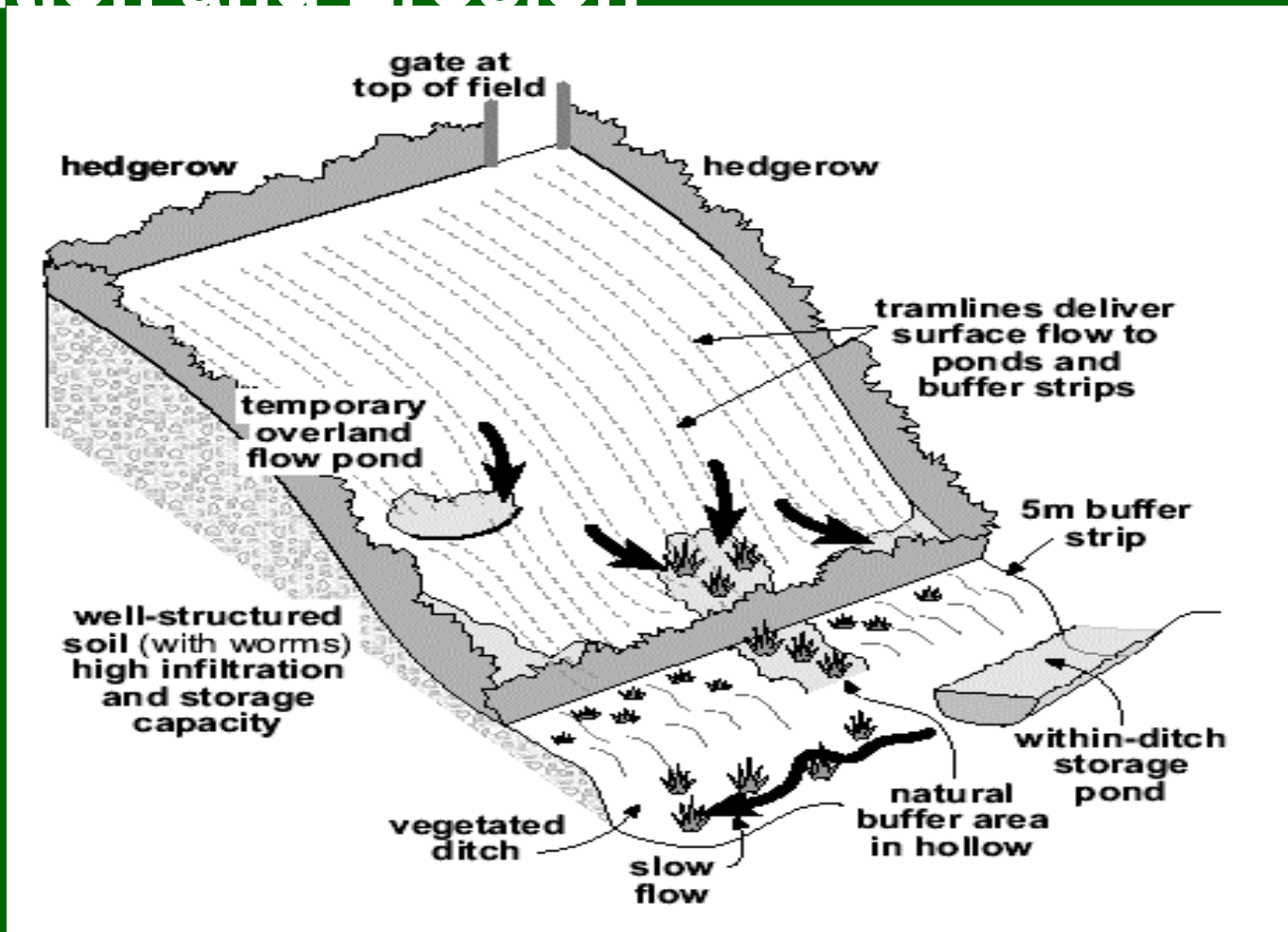
- Is there evidence of impacts in peak runoff records?
No (based on FEH)
 - Climate is dominant source of variability;
possibly masks second order impacts
 - eg Arterial agricultural flood alleviation &
land drainage schemes.

Mitigation Measures :Local Scale

- *conclusion v*

- Can measures be engineered for local scale flood alleviation/avoidance, reducing risk?
- **YES**
 - Various measures available to mitigate local flooding by delaying runoff
 - Integrated approach needed so that maximum benefit generated for flood, pollution and erosion mitigation

Potential for Integrated Runoff Control to Reduce Flood Risk, Pollution and Erosion



Social and Economic Dimensions and Policy Aspects - *conclusion vi*

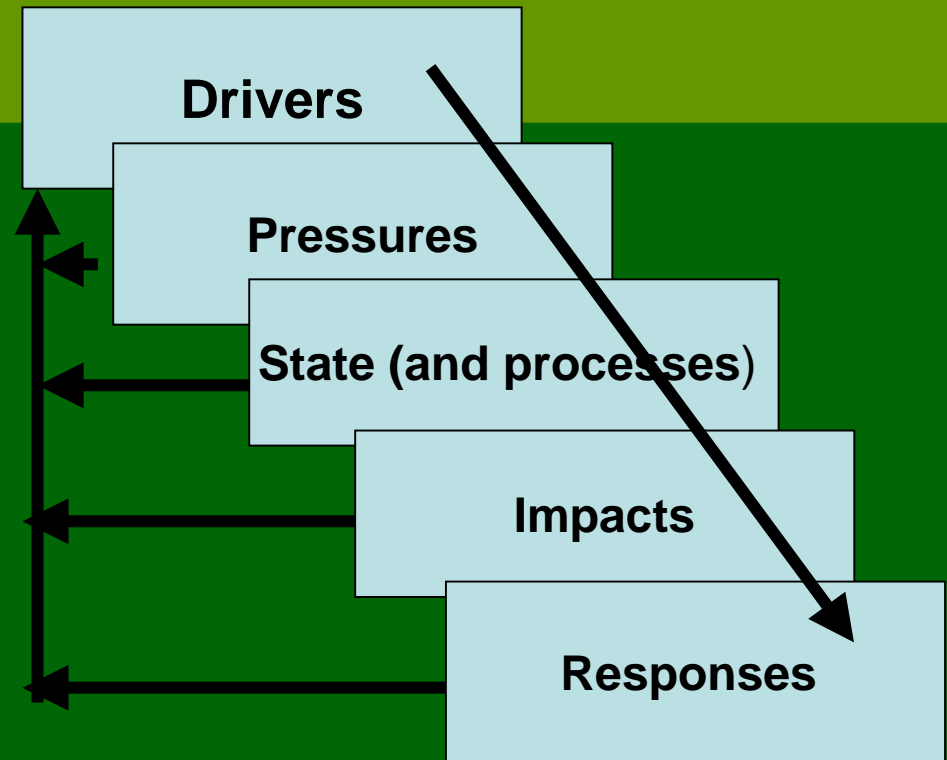
- How effectively will land managers respond to promotions and policies related to flood prevention/mitigation measures?
- **Uncertain**
 - Use compliance as a condition of support to farm incomes

Social and Economic Dimensions and Policy Aspects

- *conclusion vi*

Would changes in land use/management help to reduce flood risk?

How might such changes be promoted amongst land managers?



Possible Futures?
Policy Interventions,

Research Plan: Key Questions

- Can impacts be detected in historical rainfall-runoff data?
- Can indices be created for the relative vulnerability to impacts, so vulnerable regions/landscapes can be identified?
- What is best approach to rainfall-runoff modelling for predicting impacts?
- Which data are of most value in predicting impacts?
- What effect will flood avoidance/alleviation measures have over the longer term (e.g. 30 years)?
- How can uncertainty be handled?

**Implications of FD2114
research results for
Flood Risk Management &
Water Framework Directive**

FD 2114 implications

- 1. Verification of impact at small scales (field, hill slope and small catchment)
 - means... interventions at these scales could be used to for FRM and WFD purposes etc

FD2114 implications

- 2a. Uncertainty of impact at larger scales
 - means...if we want to use rural interventions for FRM & WFD purposes at these scales then we need to know more...
 - What is the relationship?
 - How could we intervene?
 - Would the public accept rural measures to alleviate flooding instead of conventional measures?

FD2114 implications

- 2b. Uncertainty of impact at larger scales
 - implication is...agricultural response to other drivers such as climate change, market forces, new technology, incentives etc., could skew soil & catchment characteristics in the wrong direction and inadvertently increase run-off, soil erosion etc
 - Do we need to know more, so we can avoid this?

Flood Risk Management in Environmental Stewardship's HLS



acknowledgement - Alan Bullivant



- FRM is a secondary objective of ES
- ES does not offer specific FRM options, however HLS habitat creation options may contribute to FRM
 - managed & unmanaged realignment
 - 'new' flood storage areas
 - inundated grassland

HLS & FRM

The floodplain zone is targeted within HLS both:

- nationally by BAP habitats
- locally by the targeting statements

CFMP's & SMP's can help with local targeting

Making Space for Water

- 1st Government Response.



Recognised Rural Issues...

- Make greater use of rural land-use solutions.
 - creation of wetlands & washlands
 - managed realignment of coasts & rivers
- Priority research into the role rural land management techniques (such as cultivation practice & woodland creation) might play in managing flood risk at catchment scales.

Conclusion



- Land & water bodies are **resources**.
- The **space** water bodies occupy (the river channel & floodplain system) is a finite geomorphological resource, often with conflicting demands.
- Good ecological status or potential is dependent on how the water bodies and catchment drainage system, from the soil to the sea, is **physically managed**.
- The physical management of this system has **shaped the landscape**. Can it do so again?
- How will this physical management be planned & managed for both people & wildlife?