

**Integrating Water and Soil Strategies
Translating Research into Action**

Erosion and Siltation:

Defining the problem and control strategies

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Outline of the presentation

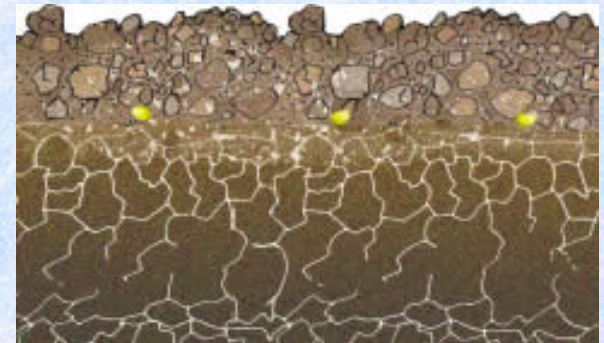
- Background
 - Current significance of soil erosion in the EU
- Impacts of soil erosion
- The need for soil erosion control
- Mitigation strategies
 - 2 projects
 - “The strategic placement and design of buffering features for sediment and P in the landscape” (BUFFERS)
 - “Soil and water protection in Northern and Central Europe” (SOWAP)



**Both demonstrate “Translating research into action” and
“Integrating water and soil strategies”**

Current significance of soil erosion

- Soil erosion is moving up the environmental agenda.
- Soil erosion identified as a “major threat to European soil resources” (Towards a Thematic Strategy for Soil Protection, 2002)
 - EU 6th Environmental Action Programme
 - Water and Soil Framework Directives
 - DEFRA’s Soil Action Plan
 - DEFRA Agri-Environment and Environmental Stewardship Schemes.



Current significance of soil erosion

- **Soil erosion is associated with both land AND water management strategies.**
- **On-site consequences of erosion (relate to land management)**
 - **Loss of the soil resource**
- **Off-site consequences of erosion (relate to water management)**
 - **Declines in water quality**
 - **Siltation and sedimentation**



On-site impacts of soil erosion

Soil erosion causes loss of soil functions -



- **Production**
 - Rooting media to support food, fibre and bio-fuels, agricultural and industrial raw materials
- **Storage**
 - water (flooding risk?), nutrients, air, organic matter, carbon sequestration, trace elements
- **Biodiversity**
 - habitat for micro- and macro-organisms, gene reservoir
- **Filtration**
 - water, solar energy absorption
- **Transformations**
 - organic wastes, chemicals, neutralisation of toxins
- **Cultural features**
 - Construction foundation and raw materials, recreation, protection of archaeology, landscape, aesthetics.

Off-site impacts of soil erosion

- Turbidity (sediment concentrations in flow)
- Sediment as a carrier of potential pollutants
- Sedimentation / deposition / siltation



Environmental impacts of soil erosion

Estimated annual costs of soil erosion to UK economy in £million (2000 prices)

	£ million	% contribution from agriculture
Soil organic loss, leading to carbon dioxide loss	74	95%
On-farm costs (additional fertilisers, etc.)	8	100%
Accidents/stream channels (i.e. off-site costs mainly related to clean-up operations)	8.2	95%
Effects on flooding	115	14%
TOTAL ANNUAL COST (£ million)	205	

Source: Environment Agency 2002. *Agriculture and natural resources: benefits, costs and potential solutions*. Bristol.

Control Strategies

“It costs less to keep soil on the land than dredge it from waterbodies, hence the philosophy of ‘*control at source*’ for water pollution by sediment.”

Glymph, 1951.

“No matter how well-designed your soil conservation scheme, it will fail unless the right social and economic and political conditions prevail.”

M.A. Stocking, University of East Anglia



Control Strategies – examples of integrating land and water management, and translating research into action

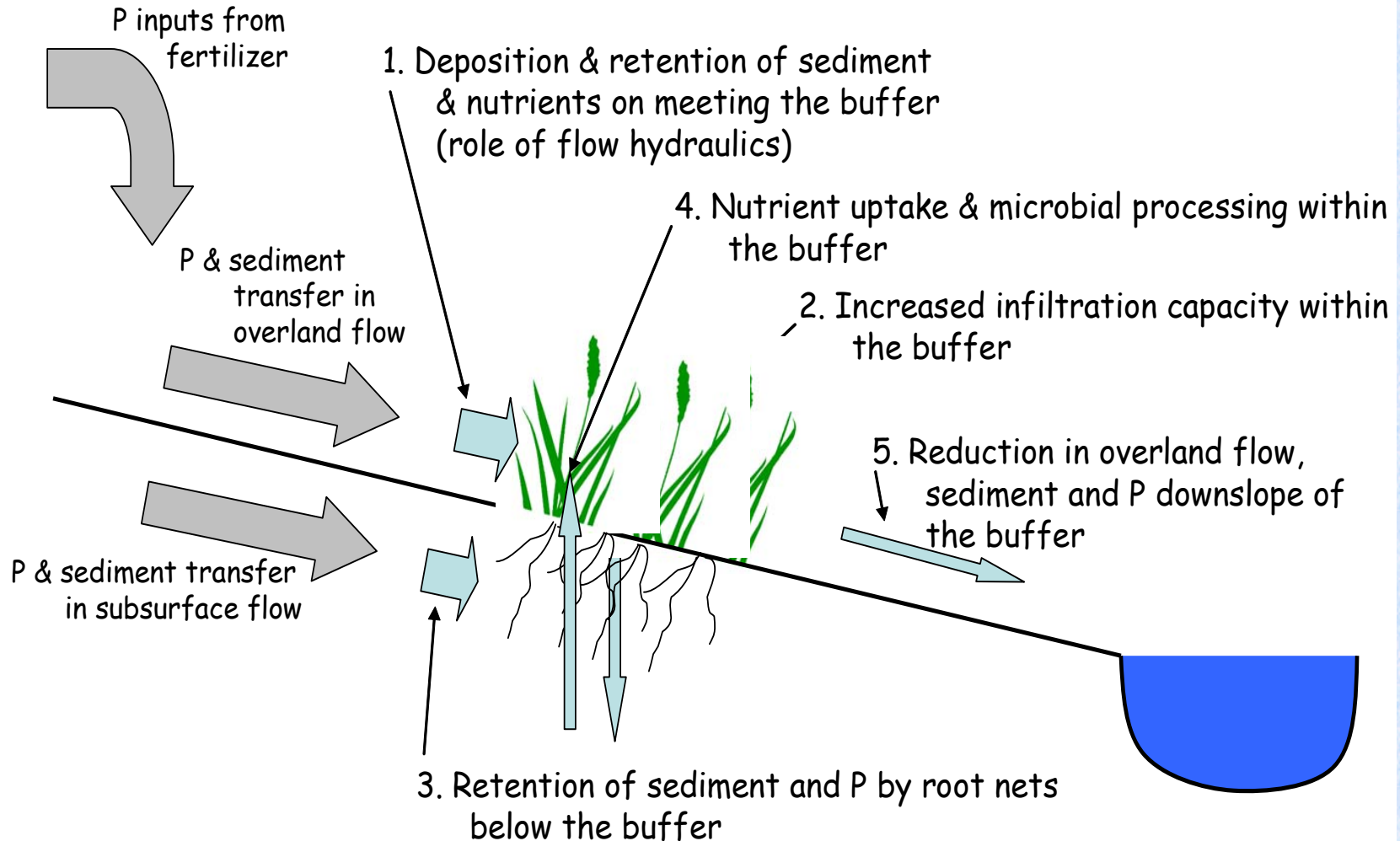
1. The strategic placement and design of buffering features for sediment and P in the landscape (BUFFERS Project PE0205) - DEFRA



2. Soil and Water Protection in Northern and Central Europe (SOWAP) – E U LIFE Environment / Syngenta



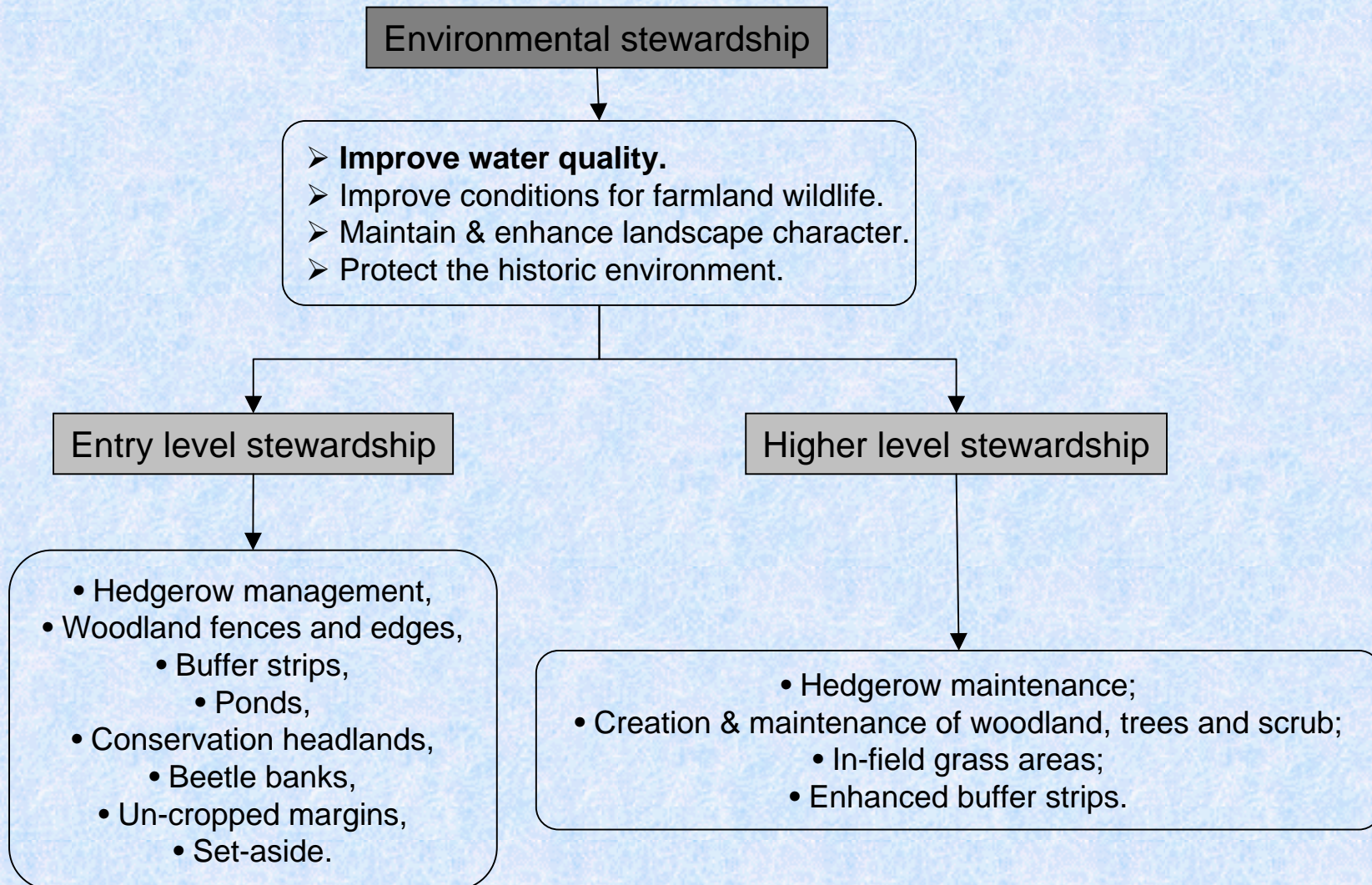
Theoretical buffer functions



BUFFERS PE0205

1. To determine the **effectiveness** of landscape buffer features (specifically those within DEFRA's Agri-Environment Scheme) in trapping sediment and phosphorus

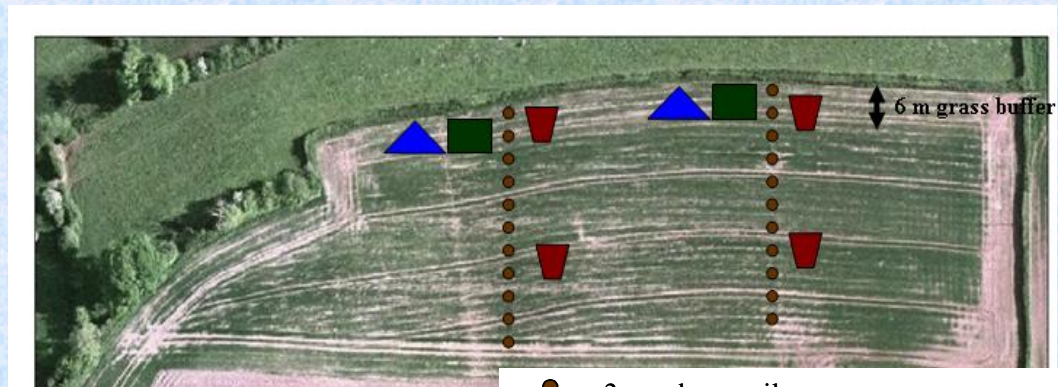
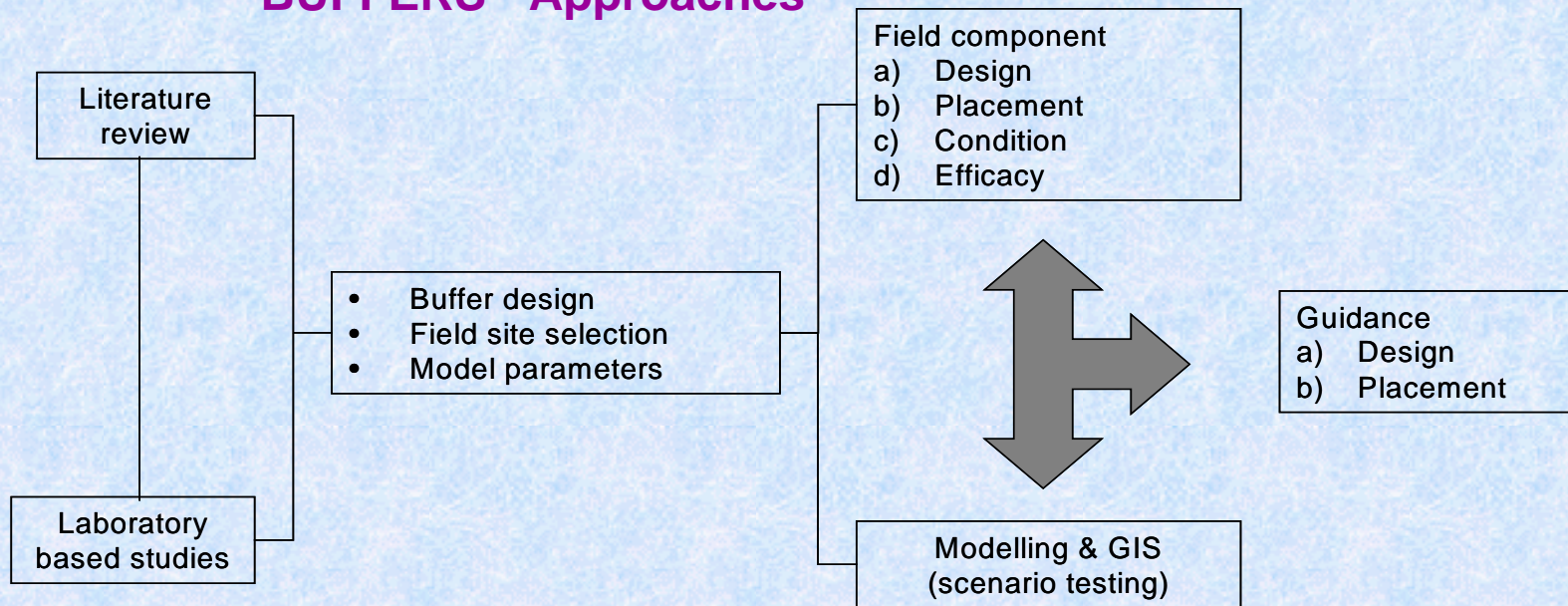
DEFRA Agri-environment schemes



BUFFERS PE0205

1. To determine the **effectiveness** of landscape buffer features (specifically those within the UK's Agri-Environment Scheme) in trapping sediment and phosphorus
2. To determine the optimal **design** of buffers in the landscape
3. To determine the optimal **position** of the buffer in the landscape
4. To develop **protocols** to support advisors, consultants and land managers in optimising buffer design and location
5. To calculate the **cost effectiveness** of the recommended options, in terms of stewardship payments and financial impacts on farmers

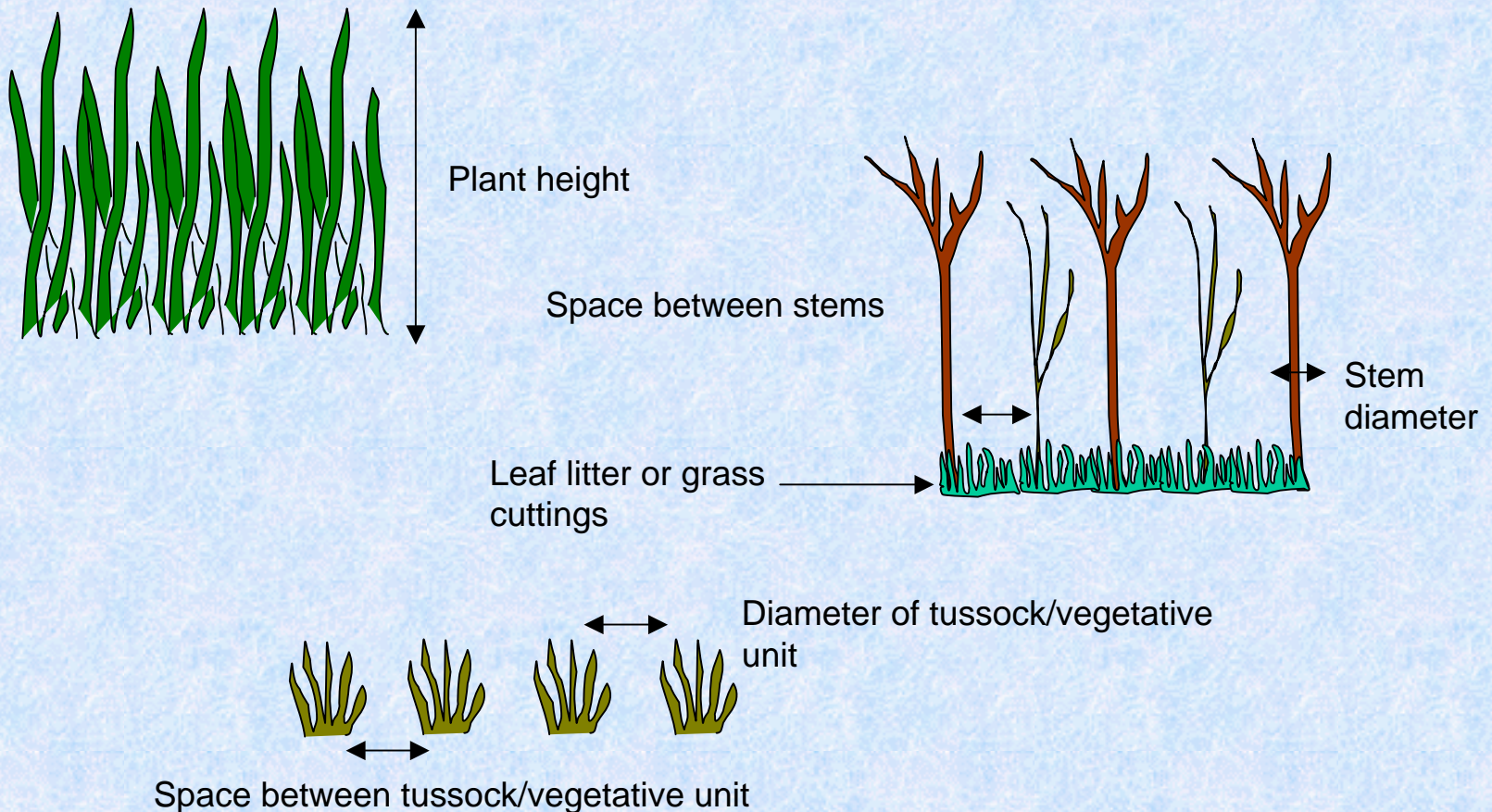
BUFFERS - Approaches



- 2 cm deep soil core
- ▼ 20 cm deep depth profile
- Astroturf mats (front, middle and back of buffer)
- ▲ Surface water traps (front and back)

BUFFERS - Project Objectives

1. To determine the effect of plant biophysical parameters on the dynamics of sediment trapping



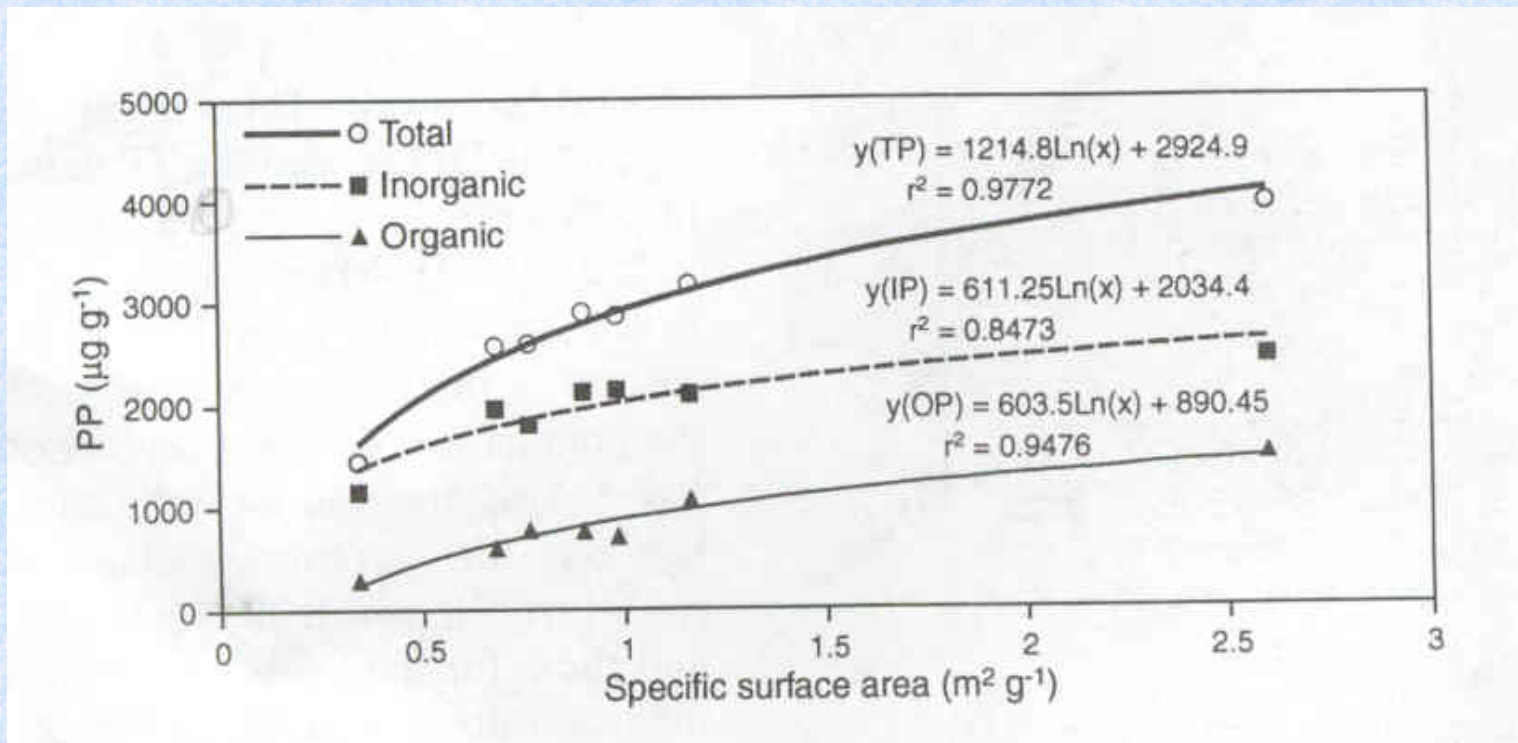
BUFFERS - Project Objectives

2. To determine the rates and mechanisms for sediment trapping by established buffer features in UK agricultural land



BUFFERS - Project Objectives

3. To determine the relationship between sediment size and P content trapped by established buffer zones



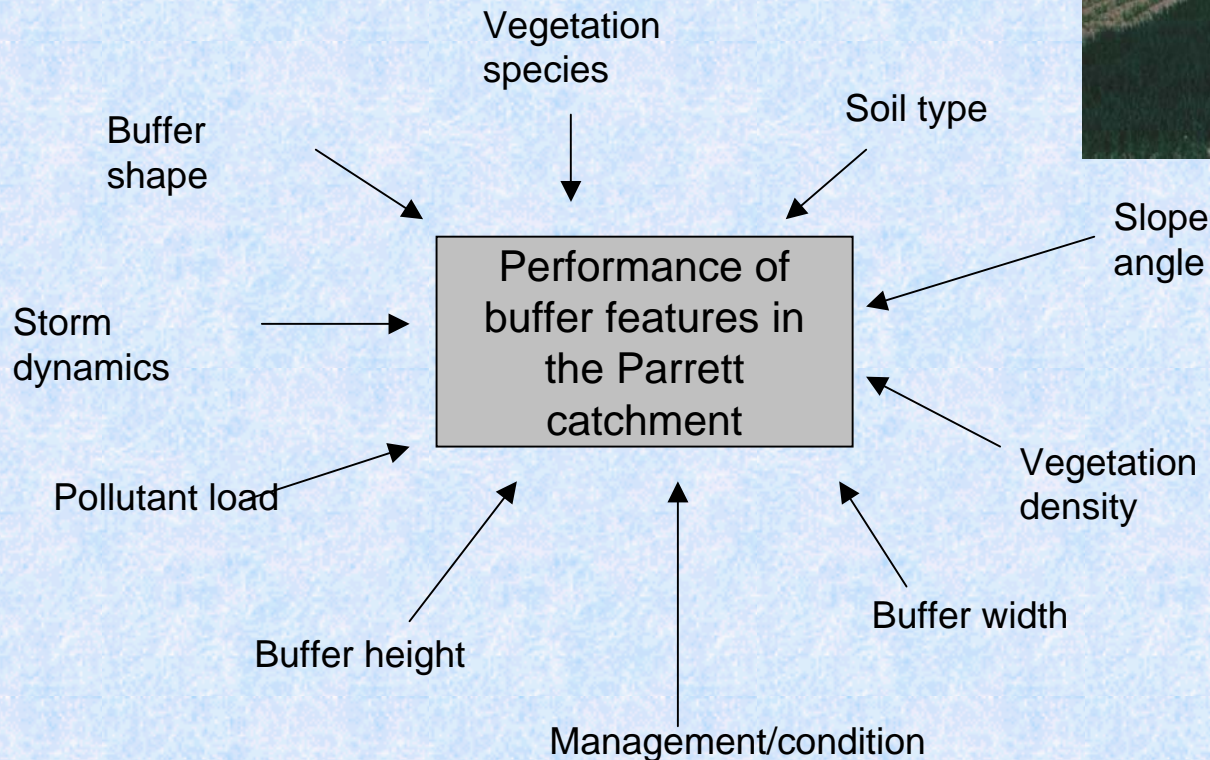
Relationships between TP, IP and OP and specific surface area for an individual suspended sediment sample (Owens and Walling, 2002)

BUFFERS - Project Objectives

- To evaluate the design and placement factors that influence buffer performance.



Examples of factors:



BUFFERS - Project Objectives

5. To evaluate seasonal differences in buffering potential for trapping sediment

6 m grass riparian buffer in the Parrett catchment

Site 27



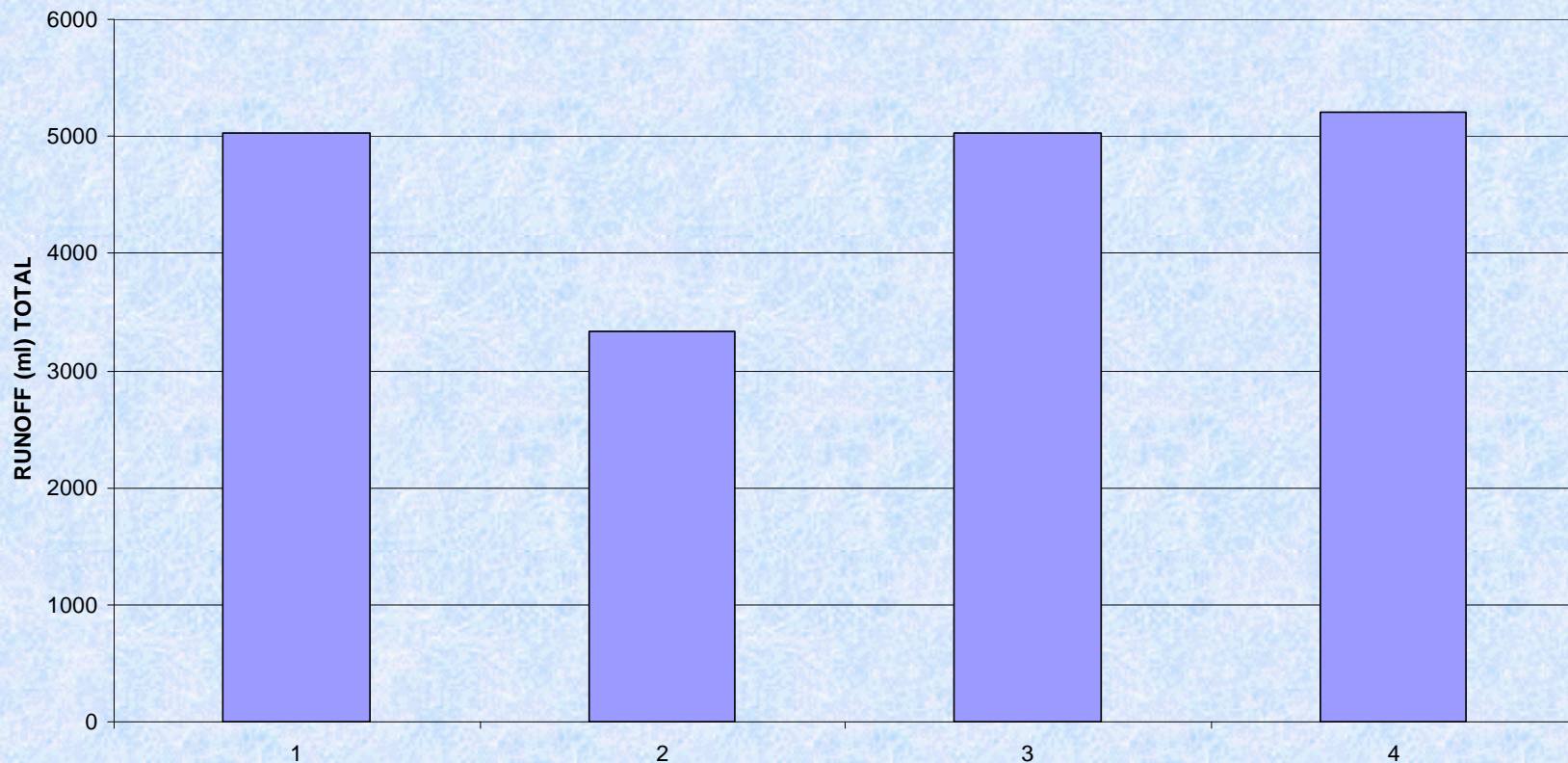
FEBRUARY



JULY

Preliminary Laboratory Findings

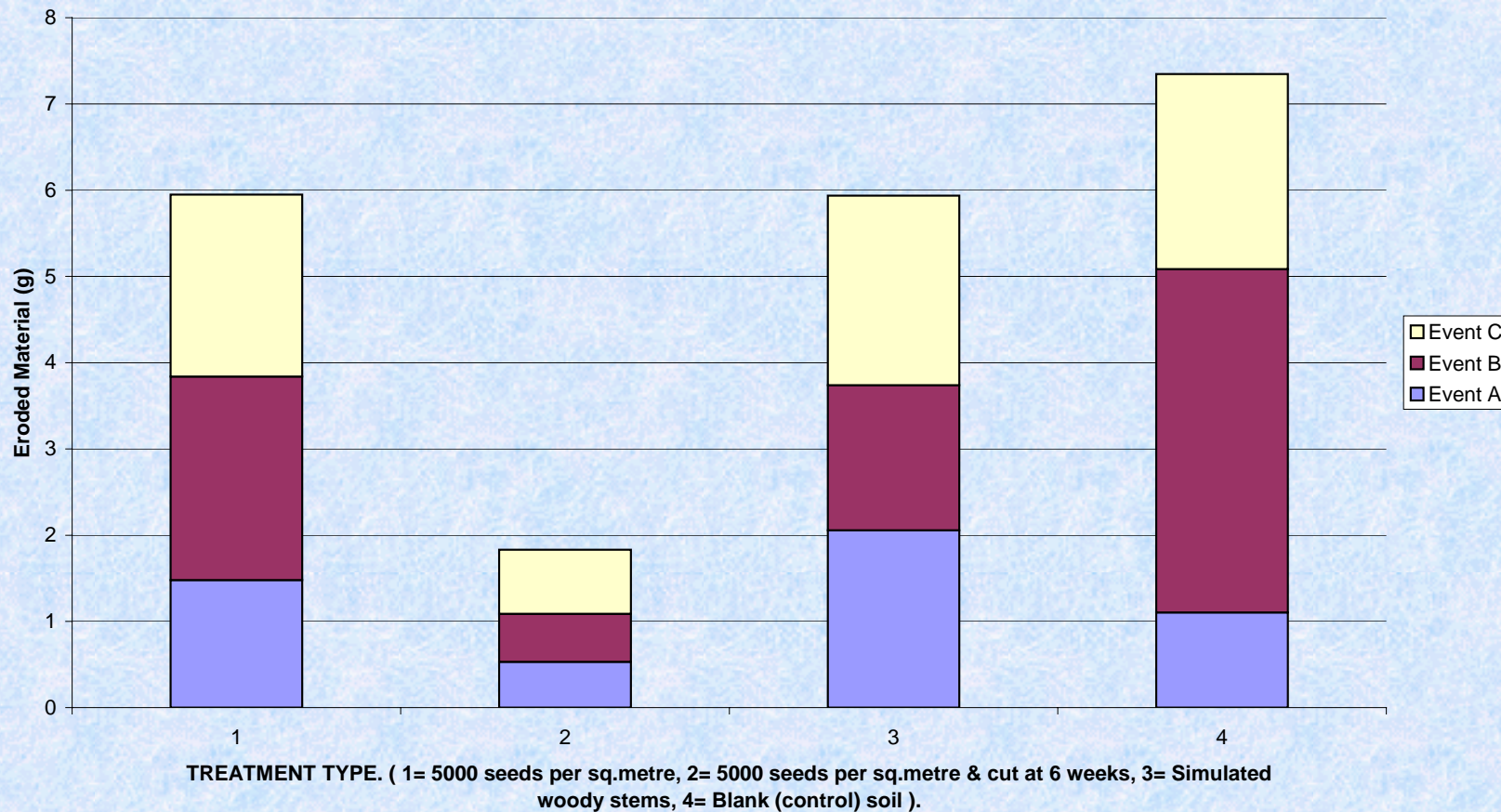
RUNOFF TOTALS CHART



TREATMENT TYPE (1=5000 SEEDS PER SQ. M, 2=5000 SEEDS PER SQ. M & CUT AT 6 WEEKS, 3=SIMULATED WOODY STEMS, 4=BLANK SOIL (CONTROL) TRAYS)

Preliminary Laboratory Findings

Eroded sediment in Runoff.



Field component – preliminary findings

- Simple field experimentation and observations provide useful data
- Seasonal variation exists in buffer vegetation composition, height and density, but effects on buffer function unknown at present
- Boundary between buffer edge and field edge affects flow paths
- Low points and gaps in buffer vegetation may accelerate flow velocity and cause the buffer to fail



SOWAP Project

- Another example of translating research into action
- Integrates land and water management
- Considers the current drivers and policy environment
- Aims to demonstrate practical application of land management practices to reduce soil, water and nutrient losses