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Critical Source Areas of Phosphorus Loss in an Extensively Farmed Grassland Catchment

Donnacha Doody & Bob Foy

Presentation Overview

- Uncertainty in science and policy
- Appreciative systems
- Case study – Lough Melvin catchment
- Water Framework Directive

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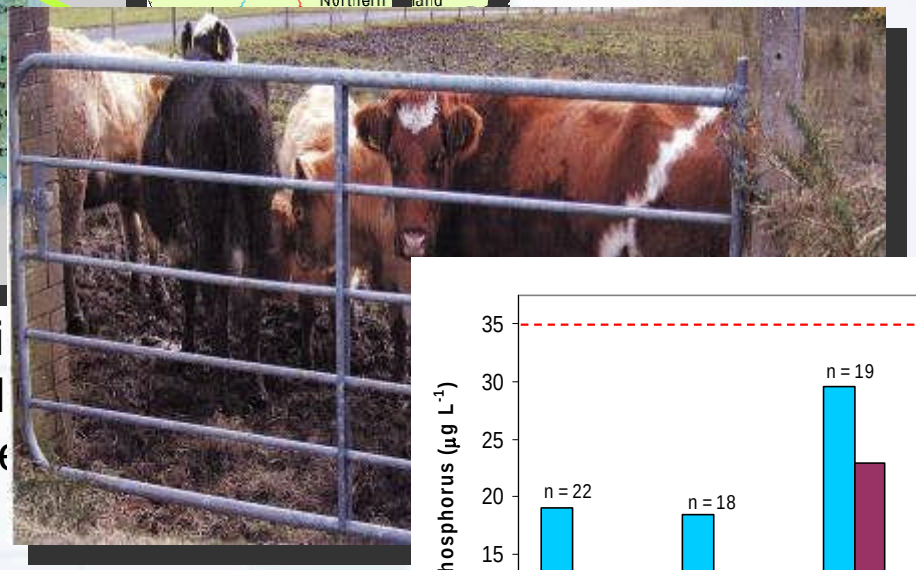
Introduction

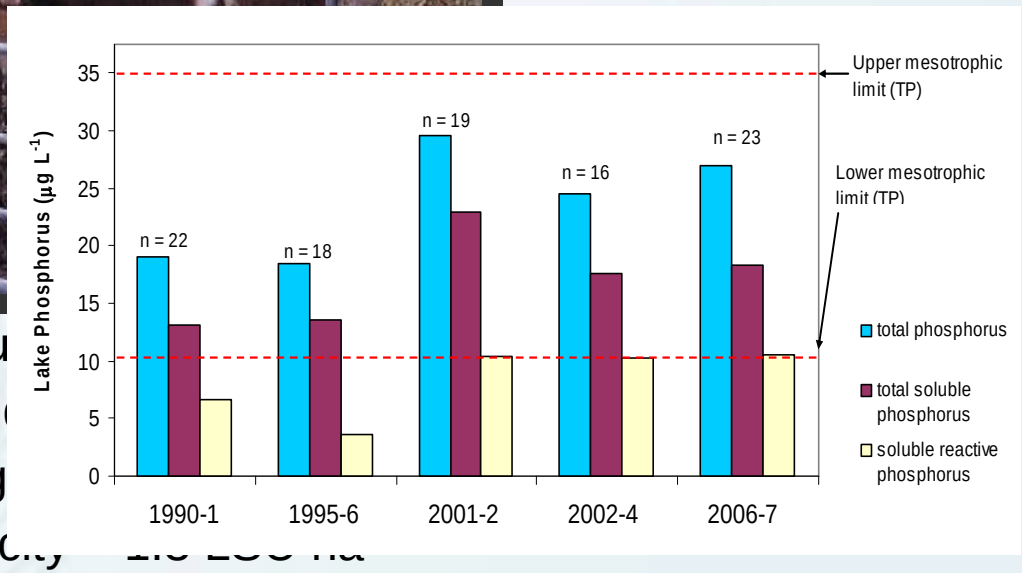


Lough Melvi

- Western Upl
- Poorly draine
- High rainfall

Extensive Agricu

- Suckler cows, an
- Average stocking
- Production capacity [illegible] ha
- Agriculture contributing 62% of P load to the lake



Data Sources

- Survey of 50 Farms
- Phosphorus Risk Index
- Interviews with Farmers
- Review of REPS Plans

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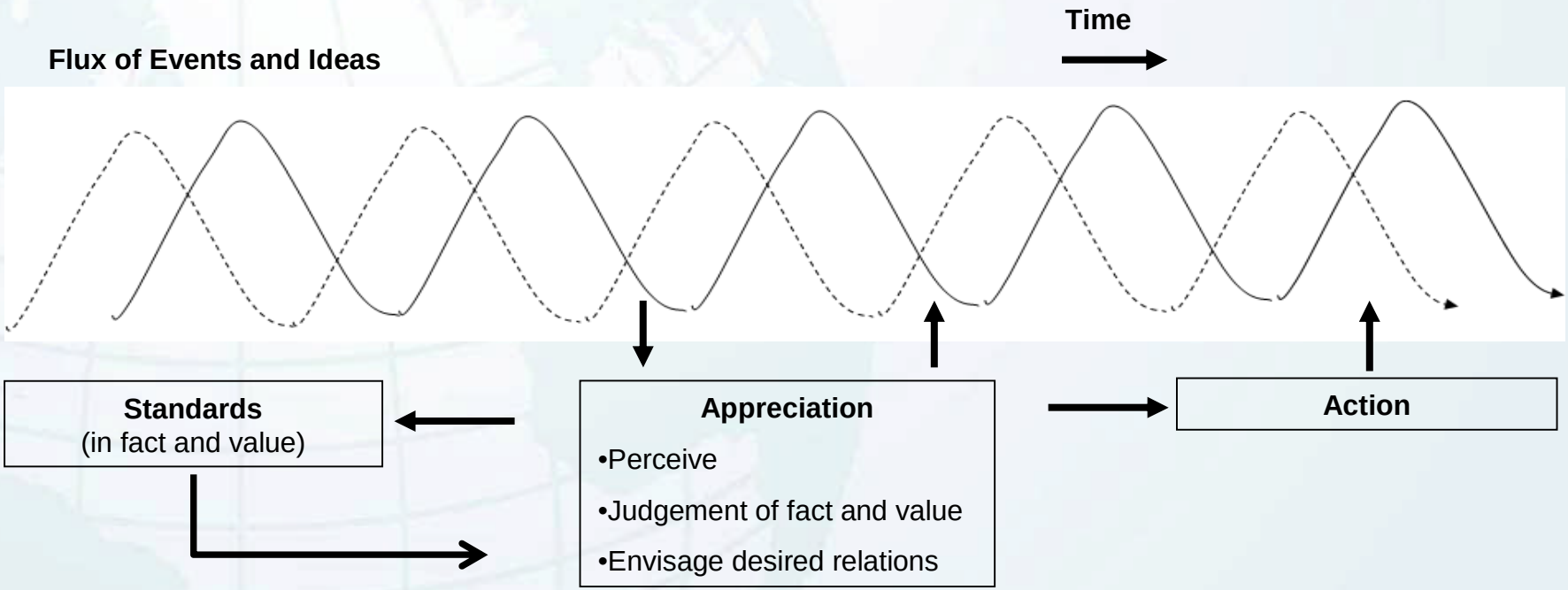
Appreciative Systems

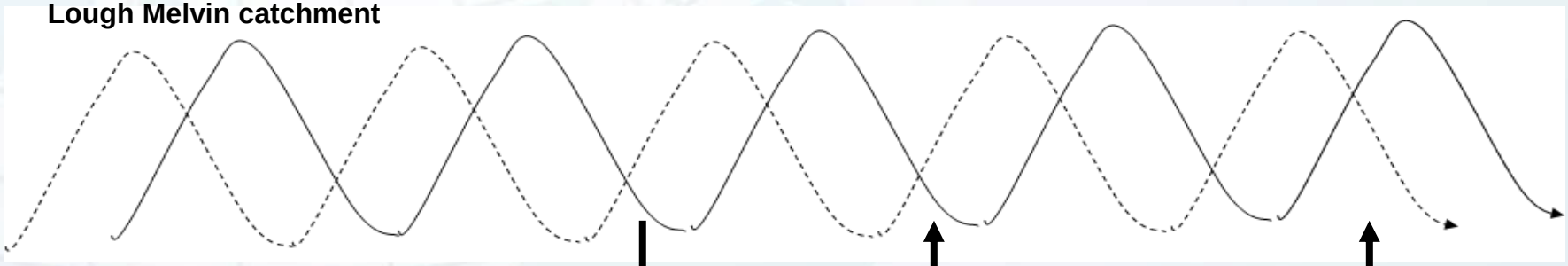


(Blackmore 2005. *Sys.Res & Behav Sci.* 22:4 , 329-341)

Lough Melvin: Case Study of Uncertainty

1990-2007

Flux in phosphorus export and water quality in the Lough Melvin catchment



Standards

- •EU Directive
- •Pollution Regulations
- •Voluntary Schemes
- •Code of Good Practice

Appreciative Processes

- •Scientific Research
- •Knowledge Transfer
- •Science - Policy Interface
- •Monitoring and Evaluation
- •Stakeholder Engagement
- •Policy Development

Action

- •Increase P efficiency
- •Decrease fertiliser use
- •Technology uptake
- •Implement measures
- •Timing of applications

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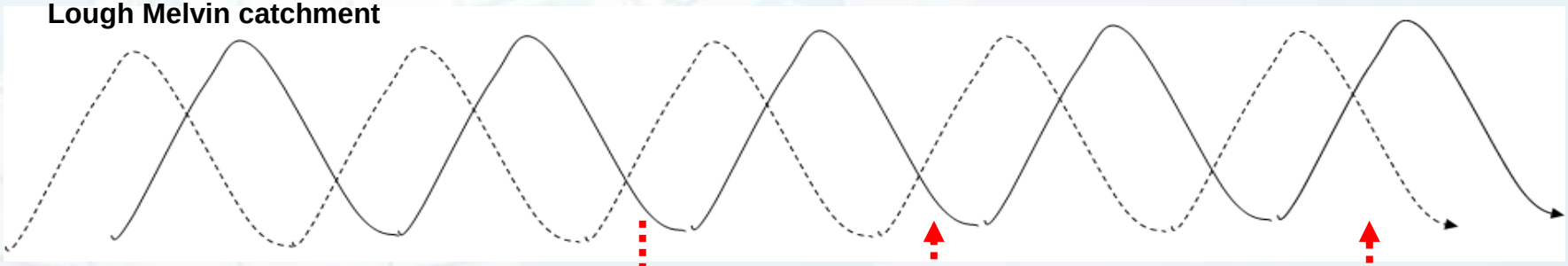

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Causes of Uncertainty

- Uncertainty in Implementation (Actions)
  1. Interaction between farming systems and prevailing natural conditions
- Uncertainty in Understanding (Appreciation)
  2. Understanding of catchment hydrology
  3. Monitoring and evaluation
- Uncertainty in Policy (Standards)
  4. Converting policy into action

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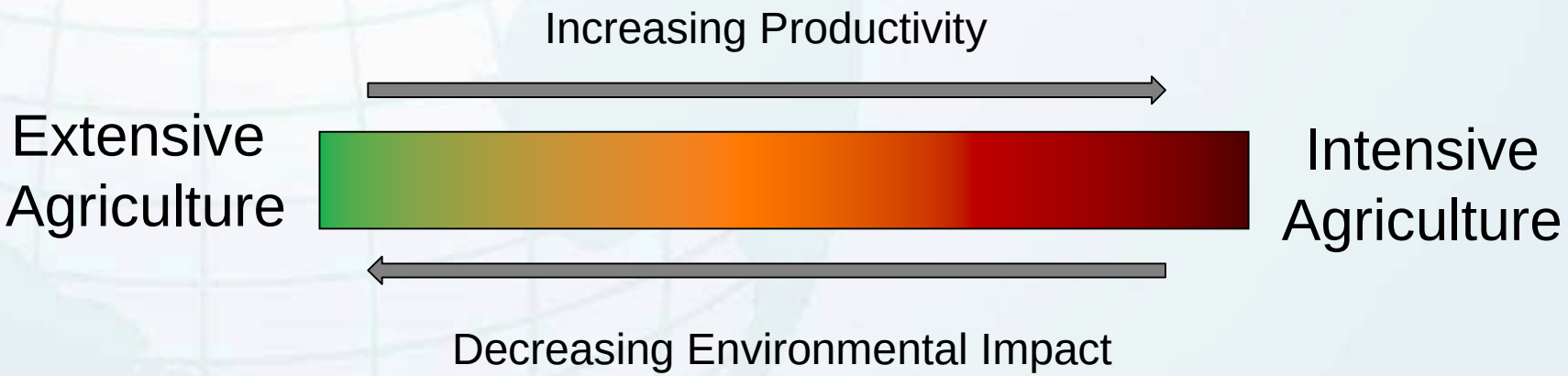
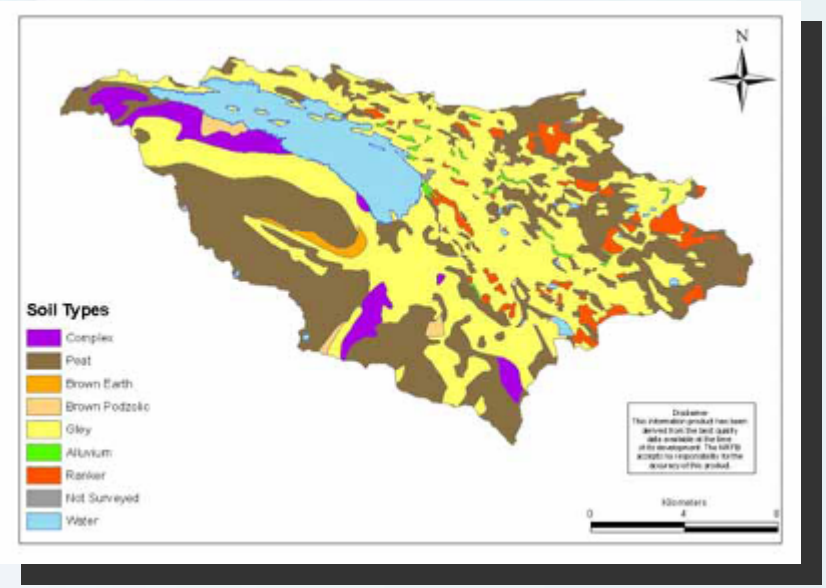
Role of Duality in Uncertainty

- Duality: extensive vs. intensive agriculture



1. Farming System and Prevailing Conditions

- Slurry - 37% of farms
- Spatial limitations on slurry application
- Reliance on contractors – 73%
- Poor silage quality



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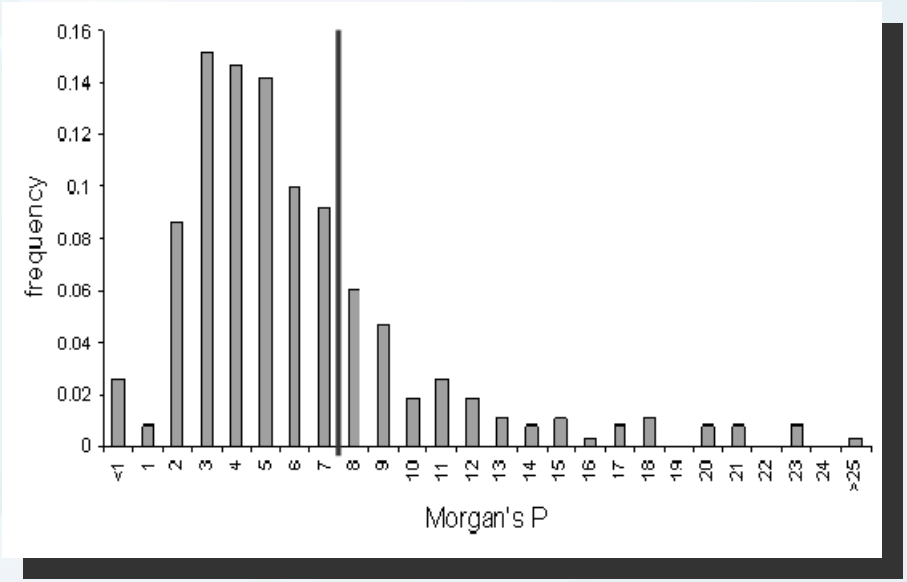
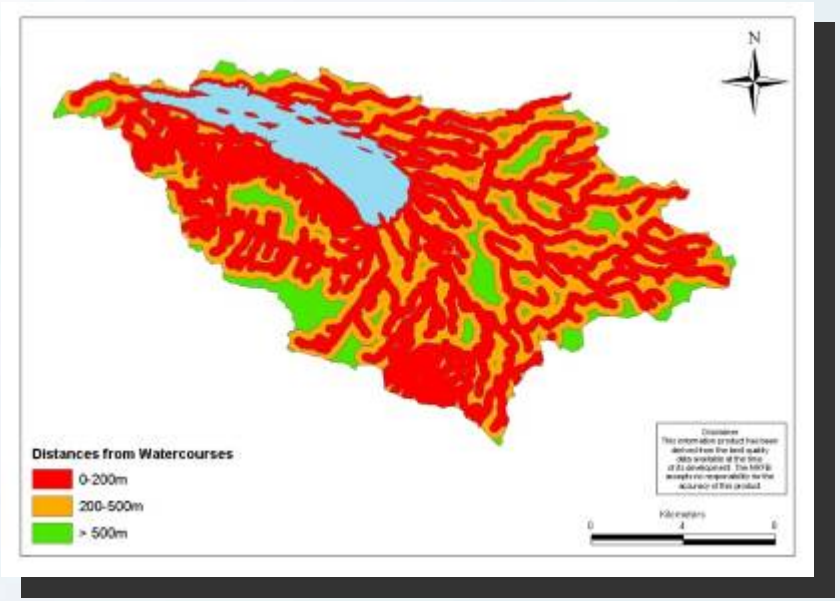
1. Farming System and Prevailing Conditions

- 22% of fields surveyed > 8 mg l^{-1} Morgan's P
- 37% of Index 4 soils received > 10 kg P ha^{-1}
- 42% of all fields received > 10 kg P ha^{-1}



2. Catchment Hydrology

- High connectivity
- 60% of fields are within 200 m of a watercourse
- 57% of surveyed fields had surface field drains
- Extensive subsurface drainage



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Impact of Uncertainty

- 1
- 2

31% of fields high risk for phosphorus loss

- 3
- 4

Limited response to decreasing water quality

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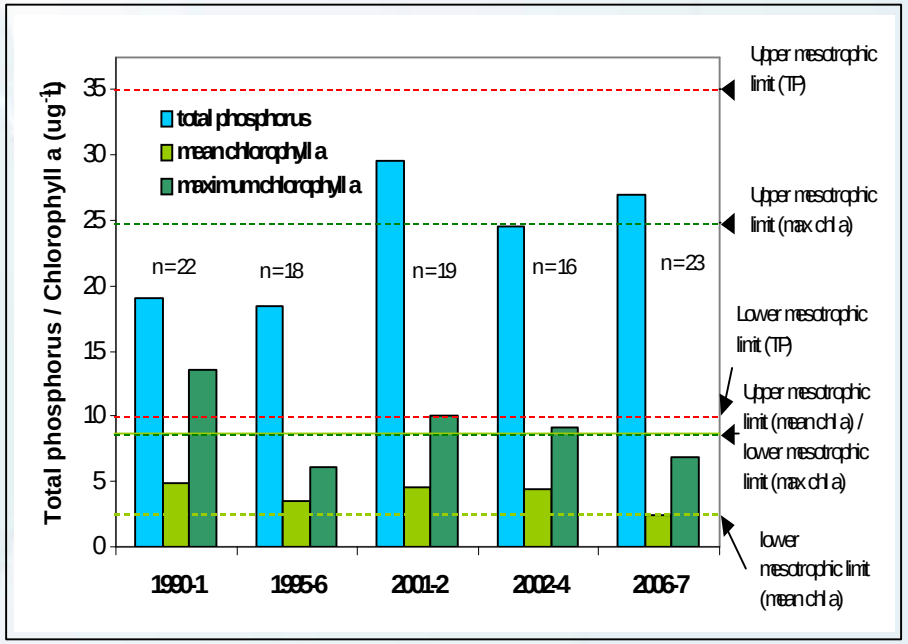
3. Monitoring & Evaluation

- Monitoring based on Chlorophyll *a*
  - No increase from 1990 – 2007
- Increasing DOC & peat stain
- Limiting photosynthesis
- DOC altering internal balance
- Littoral ↓ vs pelagic ↑
- Autotrophy ↓ vs heterotrophy ↑



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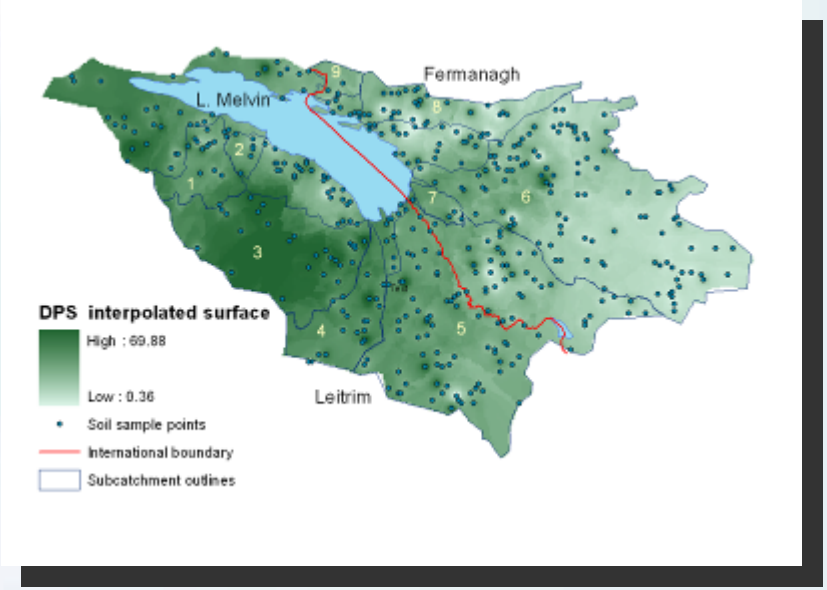
3. Monitoring & Evaluation

- 400 soils stratified by Corine land cover types
- Degree of P Saturation (DPS) using oxalate Al, Fe and P.
- Concluded - No clear correlation between Soil P and P loss.
- Uncertainty in results



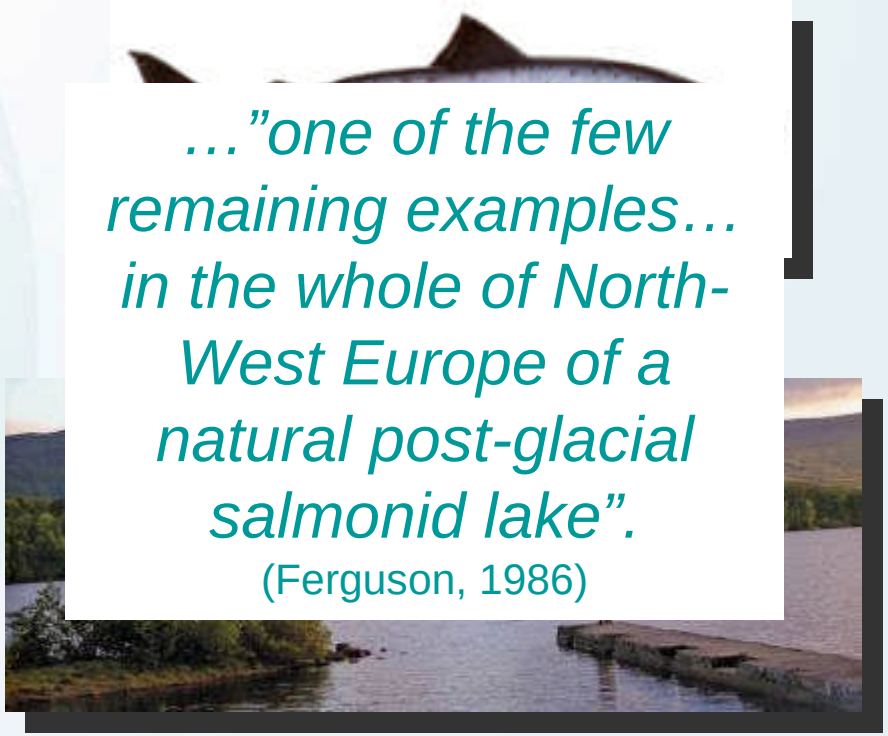
4. Converting Policy into Action

EU FW Fisheries Directive (1978)

- Salmon, 3 distinct sub-species of brown trout + Arctic char
- Not designated as salmonid waters in ROI

EU Habitats Directive (1992)

- Candidate SAC
- No conservation plan yet developed.



…"one of the few remaining examples… in the whole of North-West Europe of a natural post-glacial salmonid lake".

(Ferguson, 1986)

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4. Converting Policy into Action

Water Pollution Act 1977

- No bye-laws restricting slurry application were introduced

REPS – Participation

  - 37% Lough Melvin
  - 60% Leitrim

- Decreases kg organic P ha^{-1} by up to 20%

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Converting Policy into Action

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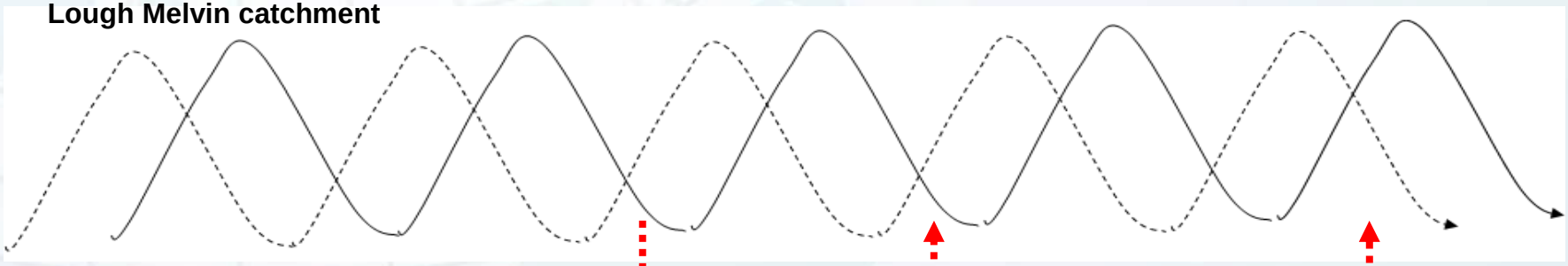

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Water Framework Directive

- Catchment specific approach
  - Not realistic in all catchments
  - High status water bodies
- Evaluation of appreciative processes
  - Not just flux in water quality & actions of stakeholders
- Engaging with stakeholder
  - Advisory services
  - Participatory research
- Systems approach

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Thank You

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