Priority Best Practices for Nutrient Pollution Control

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The analysis and synthesis process

- Task was to evaluate all 28 GEF projects in CEE related to agriculture
- Conducted site visits of selected projects
- Reviewed reports, web sites, presentations, etc from projects
- Compiled list of common practices among projects
- Conducted literature search of primary practices
- Developed report and recommendations on moving forward with *systematic* approach focused on priority practices identified

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Using a systems approach to nutrient pollution control

- Develop whole farm or catchment water quality protection program to achieve target
- Use a systems approach that identifies BMPs and matches them to key "intervention" points
- Implement BMPs over time based on impact, cost and farmer interest
- *Make operation and maintenance a critical element in pollution control plan*

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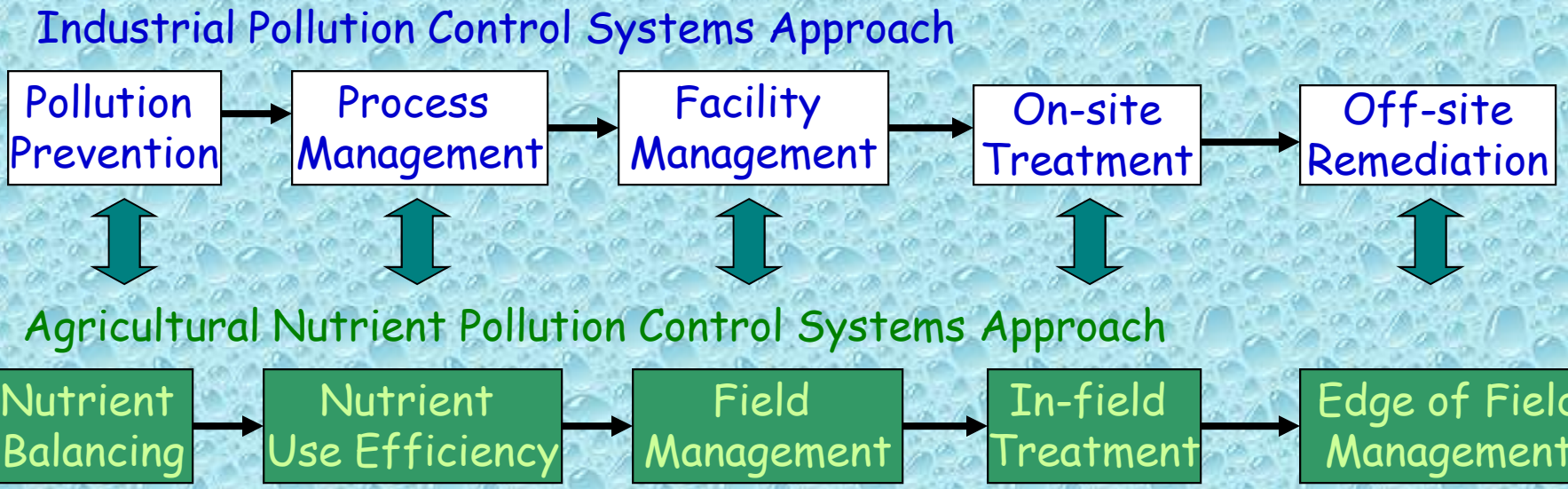
Applying a Traditional Industrial Pollution Control Approach to Agricultural Nutrient Pollution Control



Examples of Agricultural Nutrient Pollution Control System Practices

- Ecological Agriculture
- Nutrient rate reduction
- Nutrient And Manure Management
- Conservation Tillage and Erosion Control
- Cover Crops
- Grazing Management
- Riparian Buffers
- Wetland Treatment

T Simpson, 1-2008

Eight Priority Best Practices

- Nutrient management
- Manure management
- Wetland restoration/creation
- Riparian buffers
- Conservation tillage/erosion control
- Cover crops
- Grazing management
- Ecological/organic production systems.

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Pollution Prevention = Nutrient Balancing

- Ecological Agriculture
  - Not really a Best Practice but an ecological production system
  - Decision to enter production system should require commitment to minimizing water quality impacts
- Crediting all nutrients from all sources
- Rotations that balance nutrients, which usually means more perennial crops in rotation

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Process Management = Nutrient Use Efficiency

- Nutrient Management
  - Proper timing, rate and method of nutrient application
  - Credit all nutrient sources, including manures
  - *Match nutrient use to overall crop management*
  - Slow release fertilizer/compost to match crop need
- Manure management
  - Proper storage and handling
  - Uniform application at rates to match crop needs
  - Timing and method of application to minimize loss

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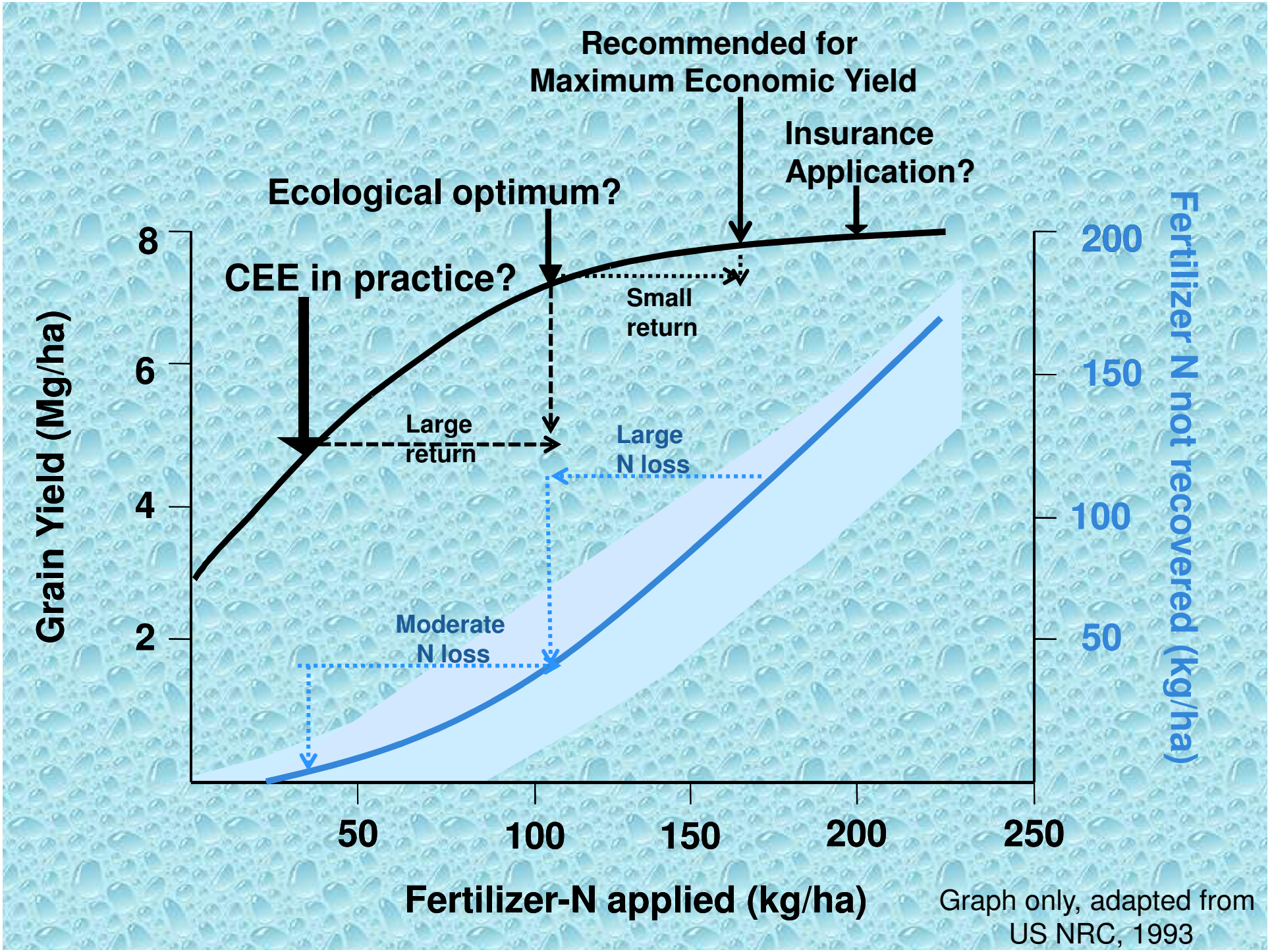
Recommended for
Maximum Economic Yield
Insurance
Application?
Ecological optimum?
CEE in practice?
Small
return
Large
return
Large
N loss
Moderate
N loss
Grain Yield (Mg/ha)
8
6
4
2
200
150
100
50
Fertilizer N not recovered (kg/ha)
50
100
150
200
250
Fertilizer-N applied (kg/ha)
Graph only, adapted from
US NRC, 1993

"Facility" Management

=

Field/Soil Management

- Control erosion
  - Conservation tillage
  - Maintaining plant residue cover
  - Contour tillage, terraces, etc, if tillage necessary
- Maintain or improve soil quality
  - Residue management and minimize soil disturbance
  - Include perennials in rotation
  - Legume and small grain cover crops

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On-site Treatment = In-field Treatment

- Grow "cover crops" following summer annuals
  - Unfertilized cereal grains (rye ,barley, wheat)to trap fall nitrogen and control; preferable not to harvest residue
  - Legumes to "grow" N for next year and erosion control

- Grazing management
  - Maintain healthy grass cover
  - Proper stocking density
  - Rotational grazing where possible
  - Stream exclusion and remote watering

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Off-site Remediation = Edge of Field Management

- Streamside buffers (10-30 M wide)
  - Grass or forest(preferred)
  - 5M Mini-buffers provide some nutrient reduction
  - Wider (30M+) provides better nutrient removal but may not be practical/acceptable in many cases
- Wetland treatment systems
  - Restored wetland is "plugging" drainage of existing drained wetland
    - Restores natural wetland function, including nutrient removal
    - Should be planned/sized to treat runoff from catchment
  - Constructed treatment wetland
    - May or may not have been natural wetland
    - Designed to provide desired water retention (~3-7d)
    - May manage flow at constant rate or have flow(treatment will vary)
    - Wetland system do not provide adequate disinfection for wastewater

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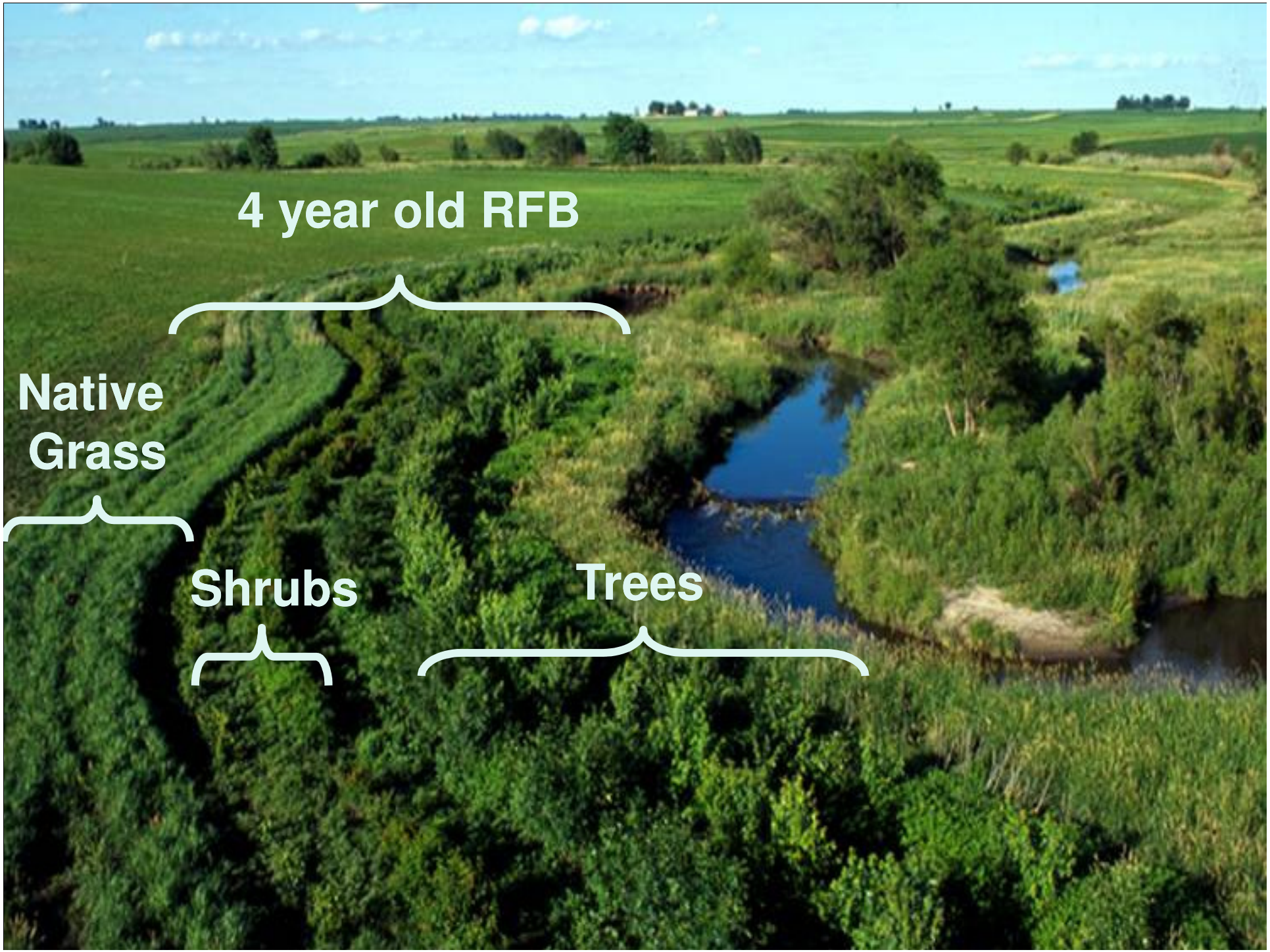
4 year old RFB
Native Grass
Shrubs
Trees

Agro-forestry: Coupling water quality with biomass production in riparian buffers

- Traditional Coppicing – sustainable understory tree "sprouts" regularly harvested – renewed interest in UK
- Recent work with riparian tree plantations - rapid rotation
- Plant selection and management is key

Coppicing Ash Wood
Herefordshire, UK

Closing Observations

- Integrated, systematic approach is critical
- Assuring implementation, operation and maintenance of practices essential to real impact
- There is no single "magical" Best Practice
- Systems must match farm conditions and farmer willingness and capability
- Discussed 8 "priority practices" but many others exist or are "new" that may be priorities on certain farms and regions
- Use all the available tools in your tool box

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