

Perspectives on Drainage Water Management Practices



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Drainage is essential for crop production in much of Indiana

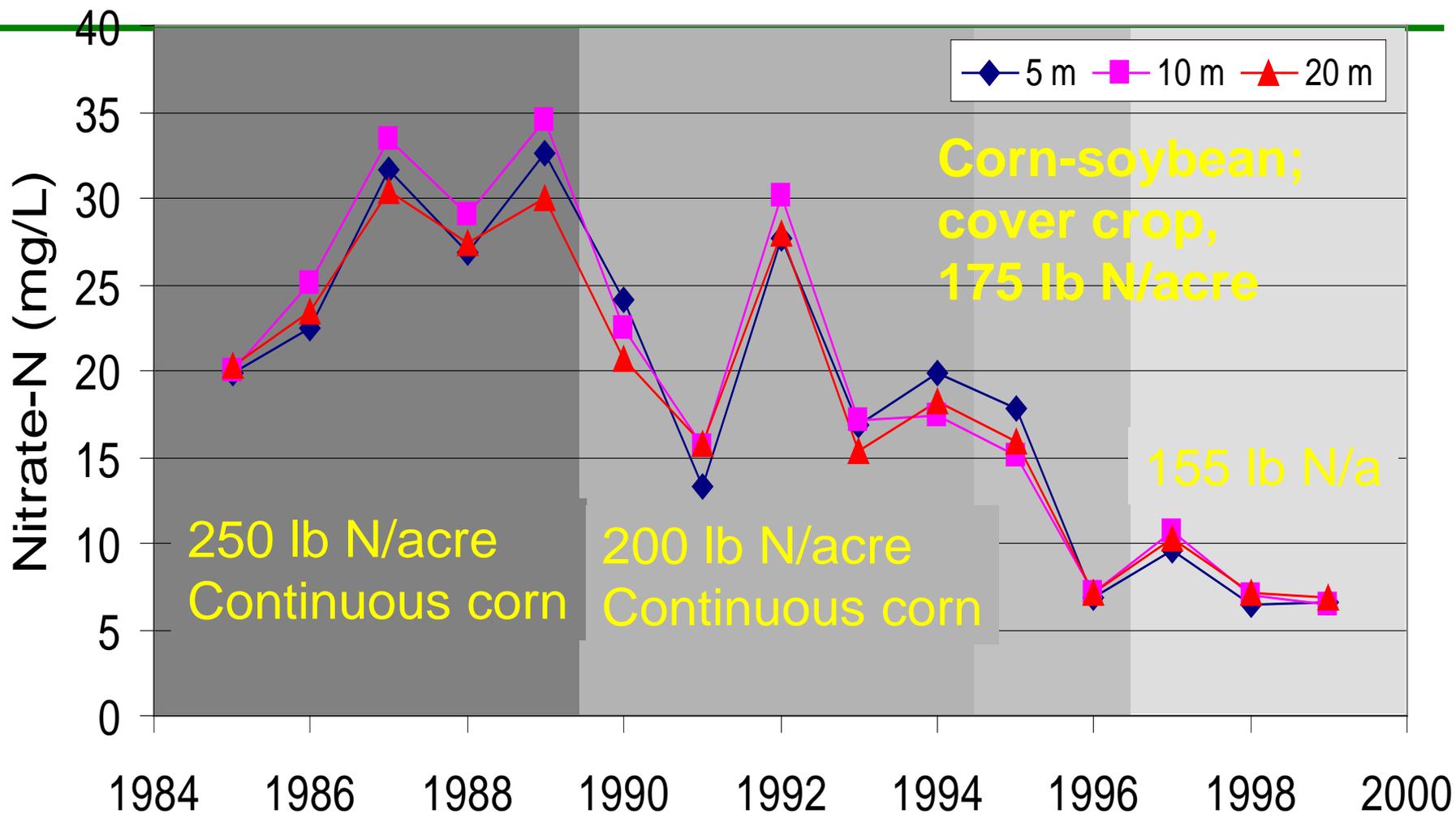
- High crop prices makes additional drainage pay
- Recent flooding has increased desire for more intense drainage



What we apply to the crop does not necessarily stay on the crop



Nitrate-N Concentration (Southeast Purdue Ag Center)



What can producers do to reduce nitrate export?

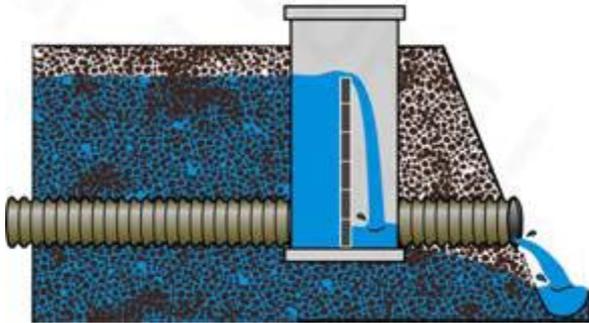
- In-field (agronomic)
- Edge-of-field (drainage water management, bioreactors)
- Downstream (wetlands, 2-stage ditches)

Different approaches may be most appropriate in different sites



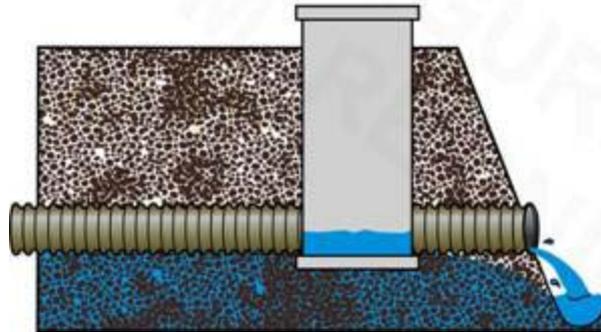
Drainage water management

After harvest



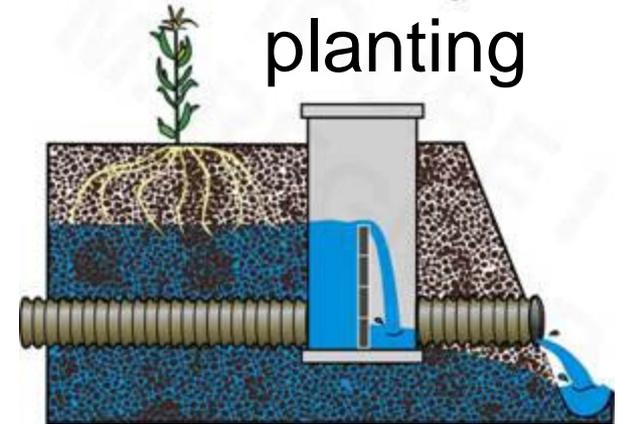
The outlet is raised after harvest to reduce nitrate delivery.

Before planting or harvest



The outlet is lowered a few weeks before planting and harvest to allow the field to drain more fully.

After planting



The outlet is raised after planting to potentially store water for crops.

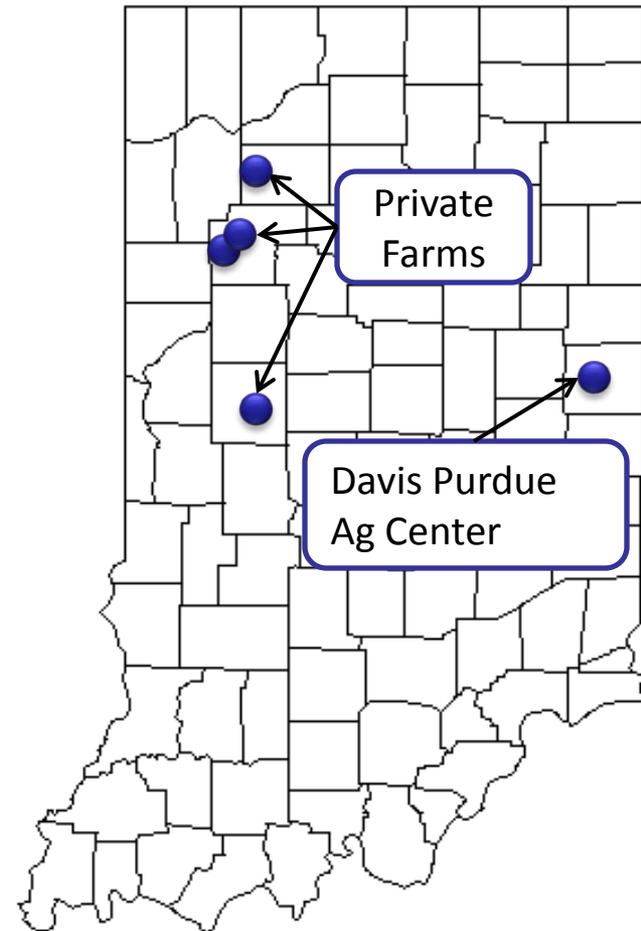
Outlet controlled
by lifting the
boards.
Automated gate
structures are
also being
developed



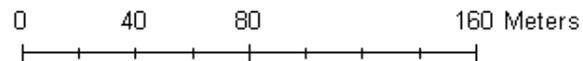
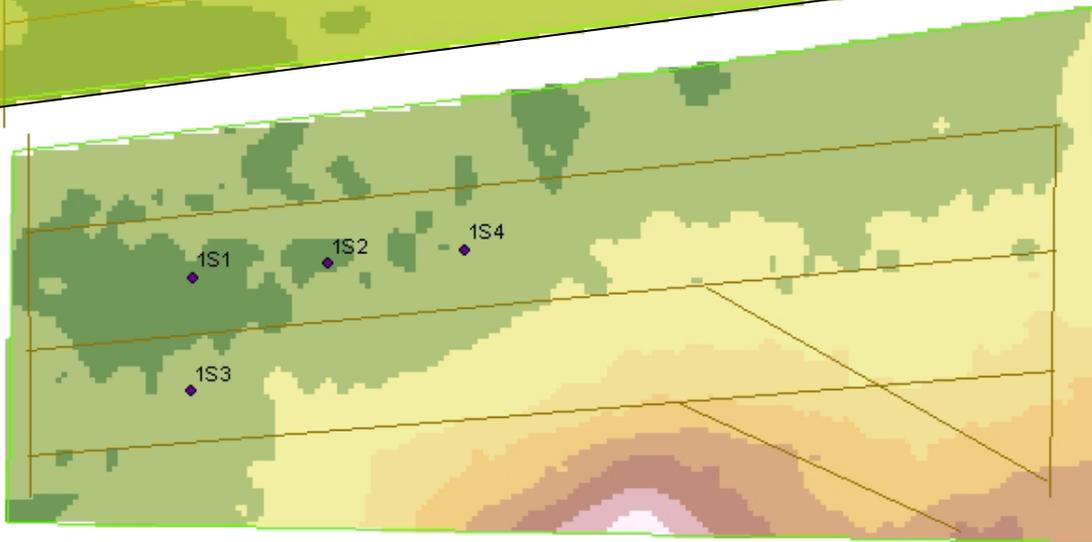
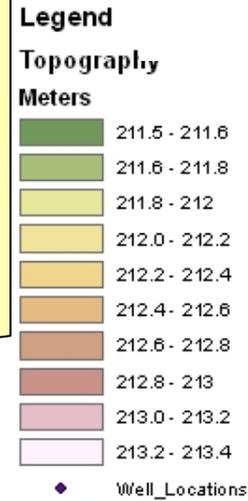
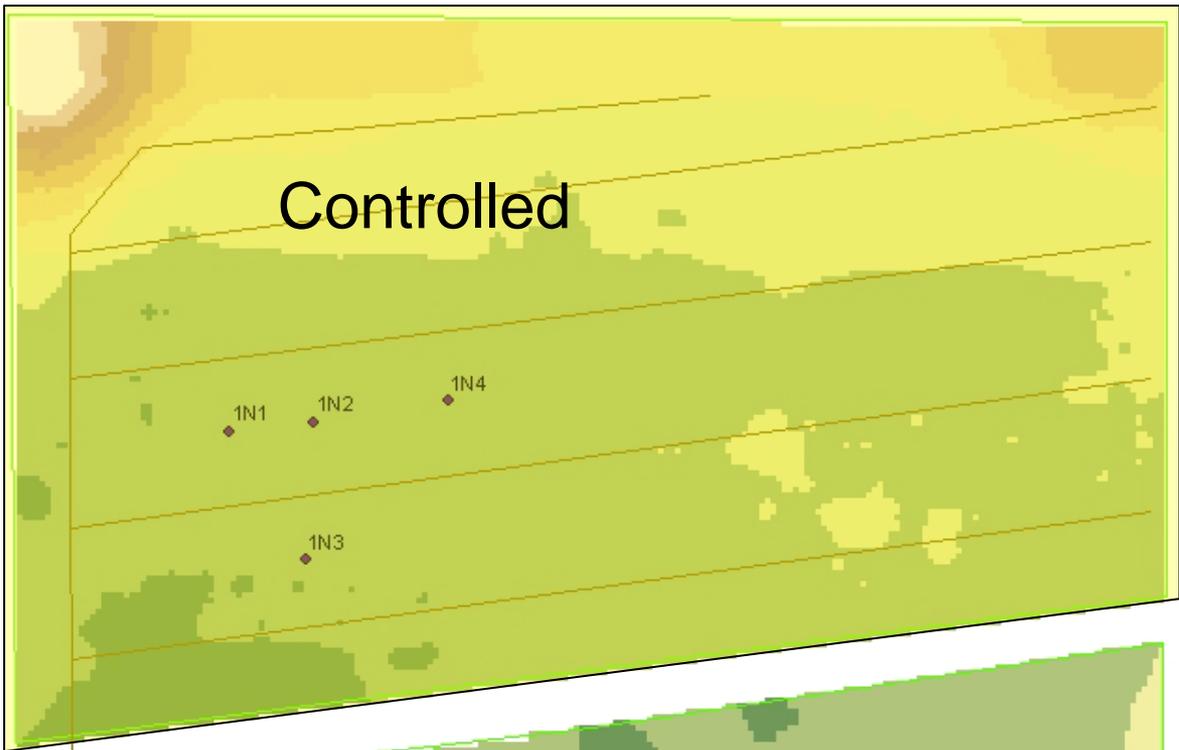
Photos: ARS

Indiana: 5 sites for research and demonstration

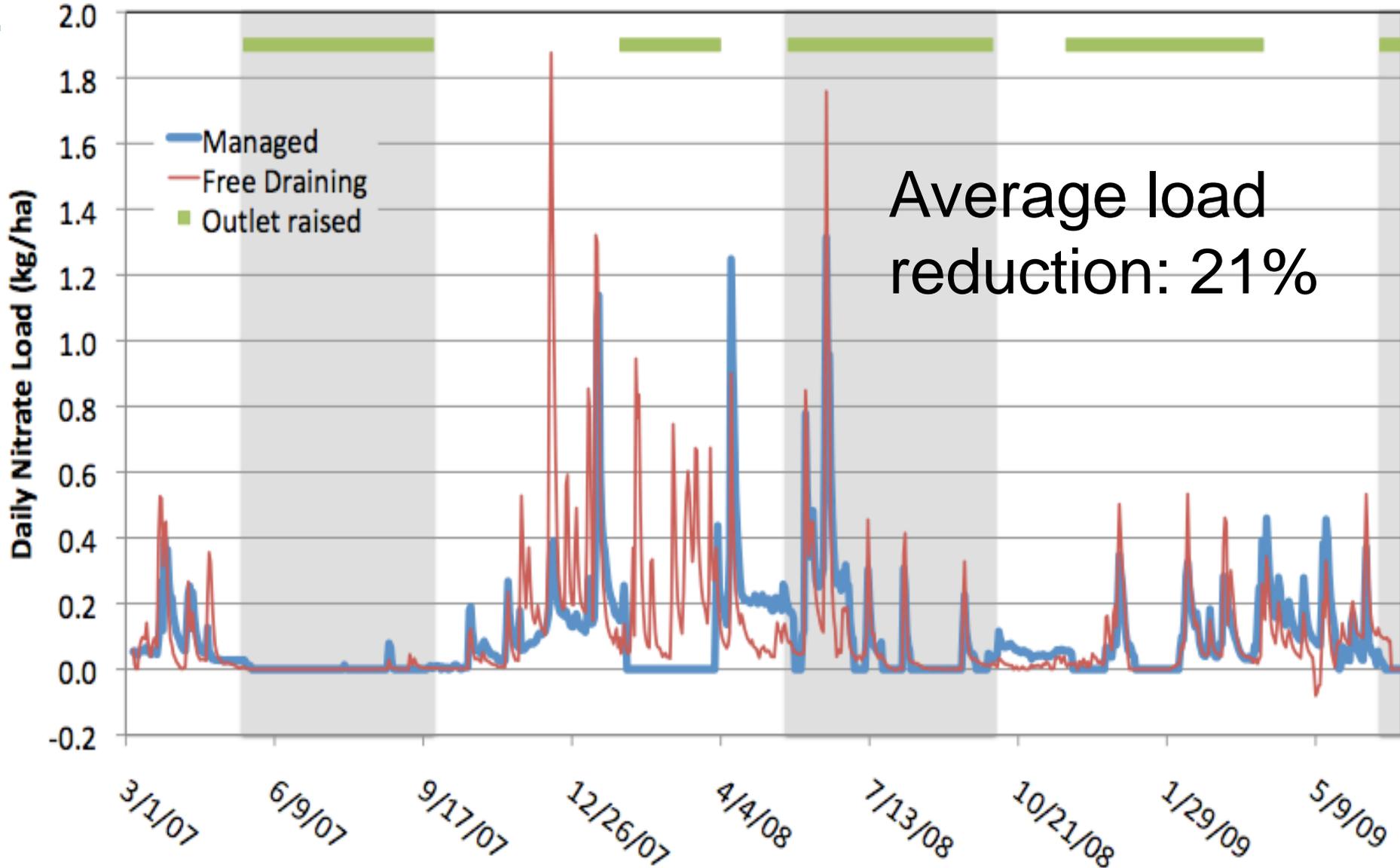
- Paired fields or split fields
 - similar soils,
 - drainage systems,
 - management histories and yields,
 - planted with the same corn hybrid or soybean variety,
 - with the same pesticides and fertilizer rates.



Example paired field: Site 1



Example nitrate load



Limits

...to drainage water management practices



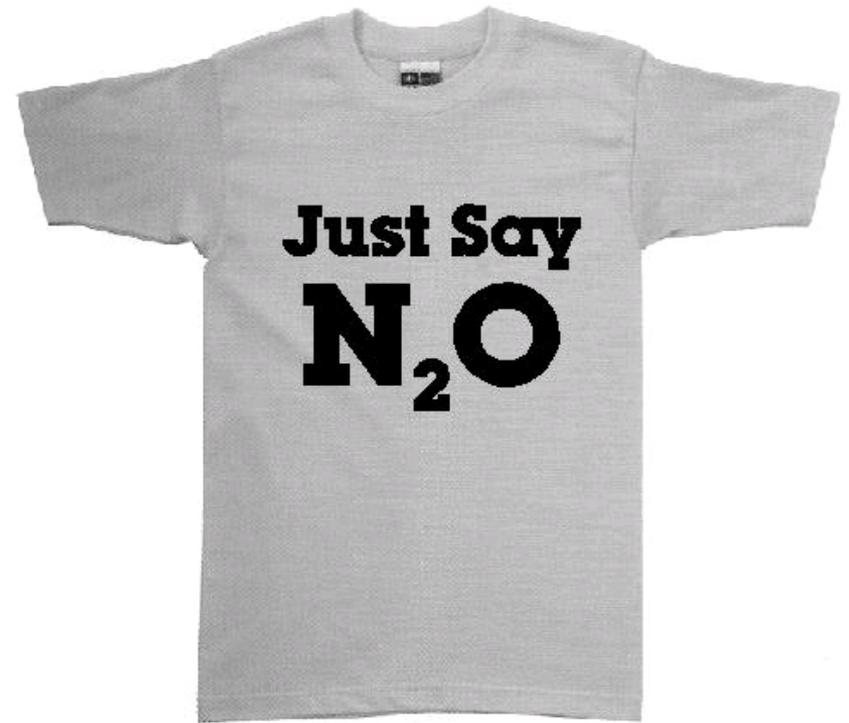
1. Unanswered Questions

- What happens to water and nitrate that does not come out in subsurface drains?
 - Surface runoff?
 - More ET?
 - Deep seepage? (and... is it denitrified?)
 - Lateral seepage? (and is it denitrified?)
- Researchable question, but funding not yet identified....



Greenhouse gas question

- Does some nitrate become N_2O ?
Under what conditions?



From www.keystone-graphics.com/webstore/

2. Only some sites are suitable

- For example, most suitable in reasonably level topography and/or level drains.

For retrofits:

- Focus on flat land (we have plenty!)

For new (expanded, intensified) system:

- Encourage tile installation on contour (“drainage water management ready”)

3. Drainage management can increase surface runoff and associated pollutants

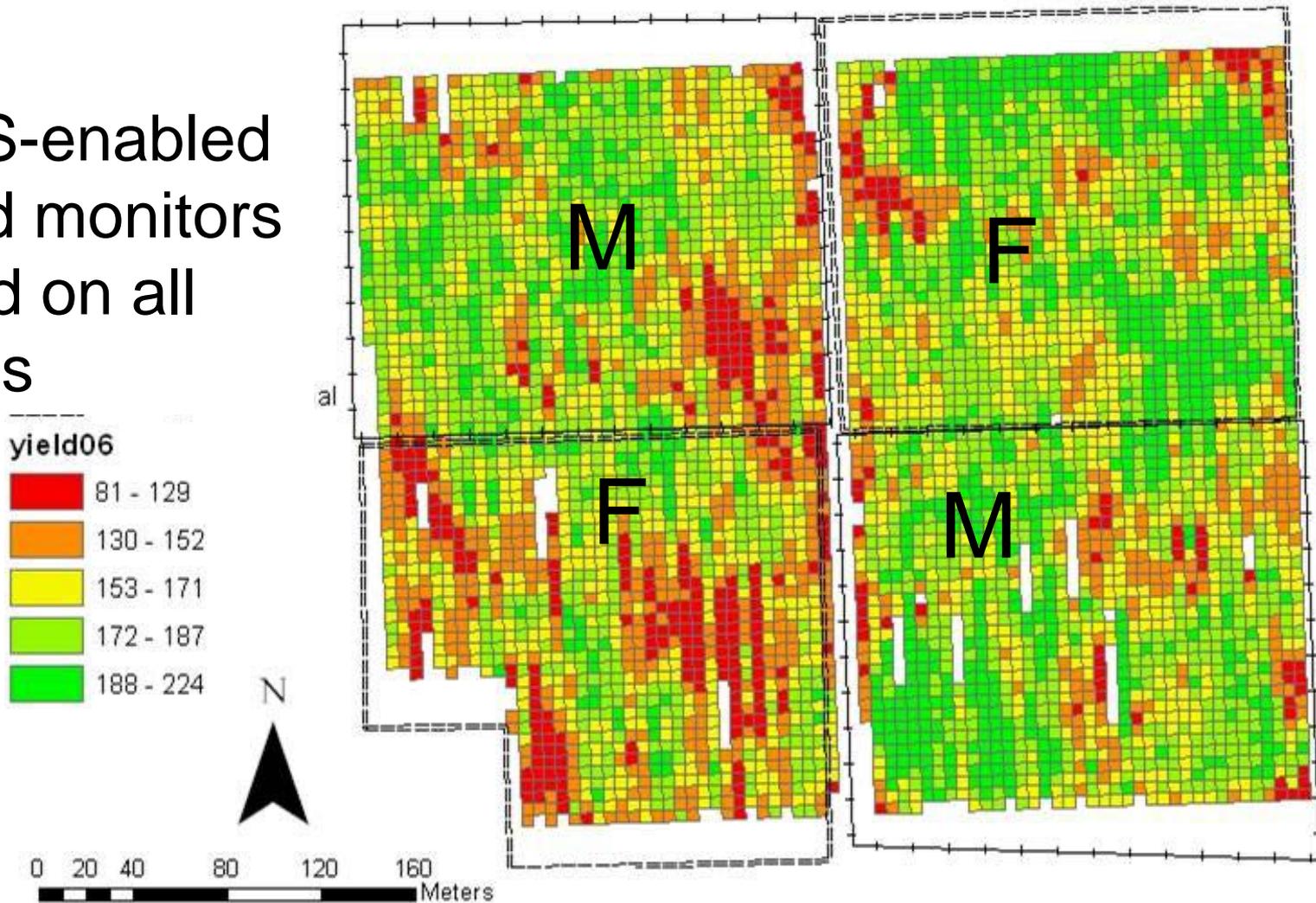


4. Unclear Benefits to Producers, and Resulting Reluctance to Adopt

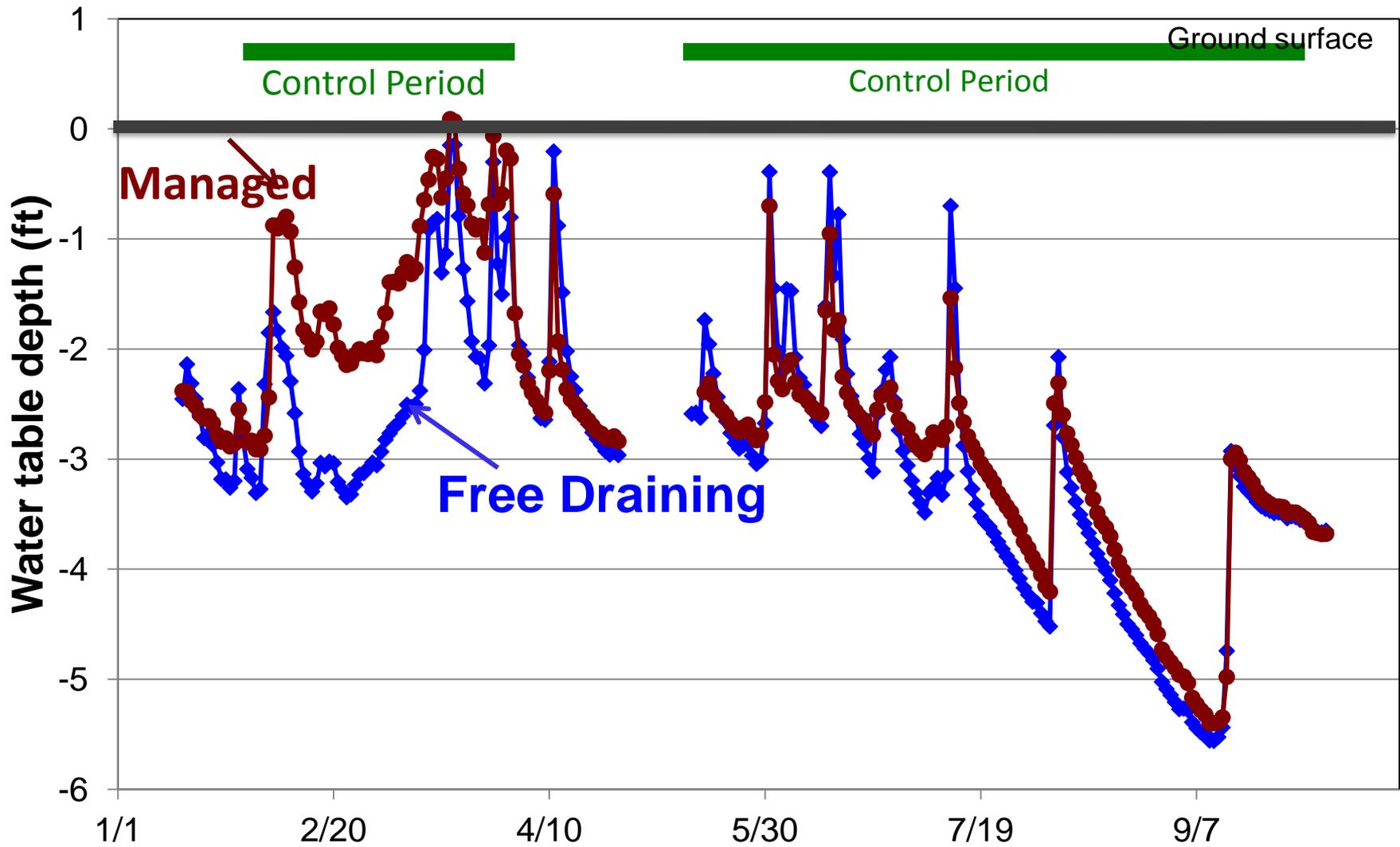


Yield impacts generally positive but small; sometimes negative

GPS-enabled yield monitors used on all fields



May be because managed drainage only raises water table in some conditions



Characteristics of practices that influence adoption

- **Relative advantage:** the degree to which an innovation is perceived as being better than the idea it supersedes
- **Compatibility:** the degree to which an innovation is consistent with existing values, past experiences, and needs of potential adopters.
- **Trialability:** the degree to which an innovation may be experimented with on a limited basis
- **Risk**
- **Observability:** the degree to which the results of an innovation are visible to others

Drainage water management is hard to observe

- Does this hinder adoption?

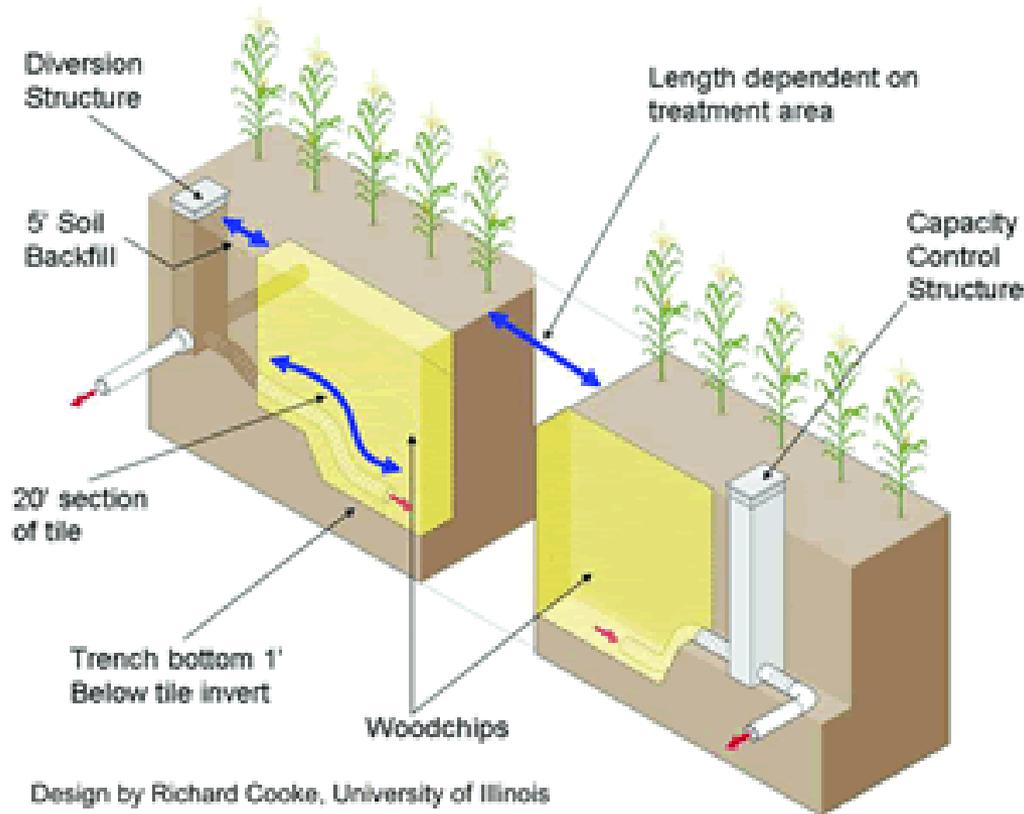


We may often need additional practices to “trap” nitrogen that is lost from the field



Denitrifying Bioreactors

- Trenches filled with woodchips, that provide carbon to encourage denitrification



Restoration of wetlands downstream of drainage outlets

- Wetlands provide extensive areas for denitrification and biological uptake to occur



Ditch design to improve water quality

**Ditches like this
can encourage
denitrification
and biological
assimilation of
nitrogen**



Photo from A. Ward, Ohio State



Two-Stage Ditches

Photo: The Nature Conservancy

Summary:

As drainage is intensified, more nitrate will usually be lost to the environment.

More intensive drainage calls for

- Even better management of nitrogen.
- Drainage water management practices

