

# What is a Phosphorus Index?

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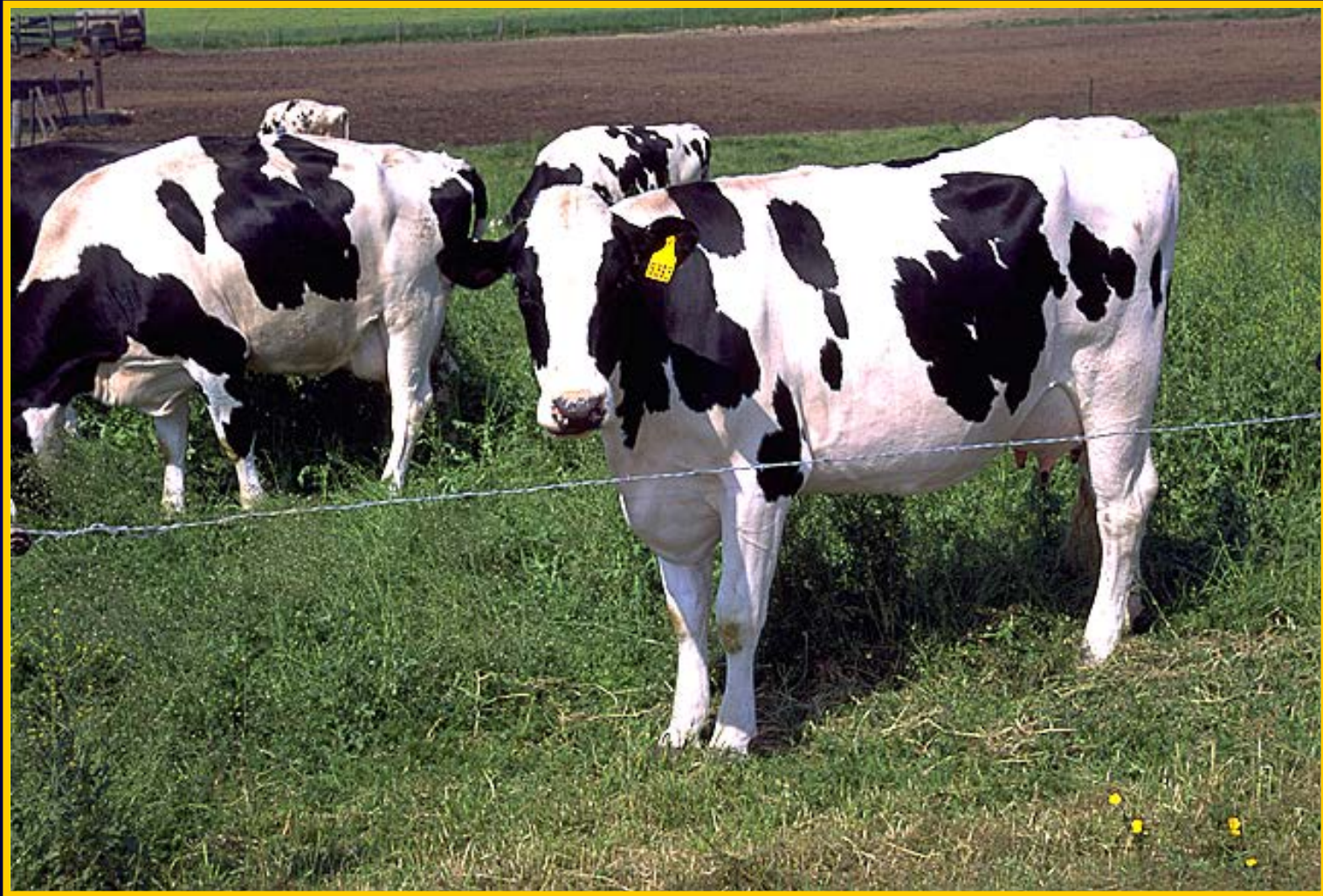
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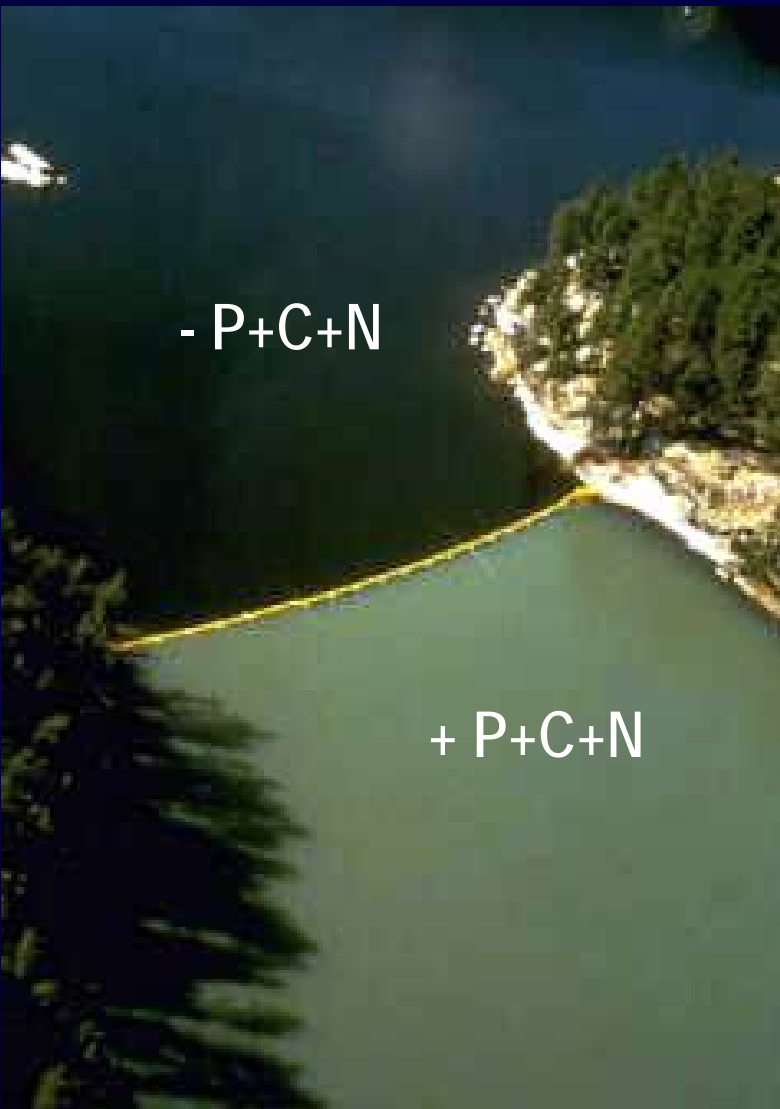
**(540) 231-0472**

# *Phosphorus: Essential for Animal Health and Productivity*



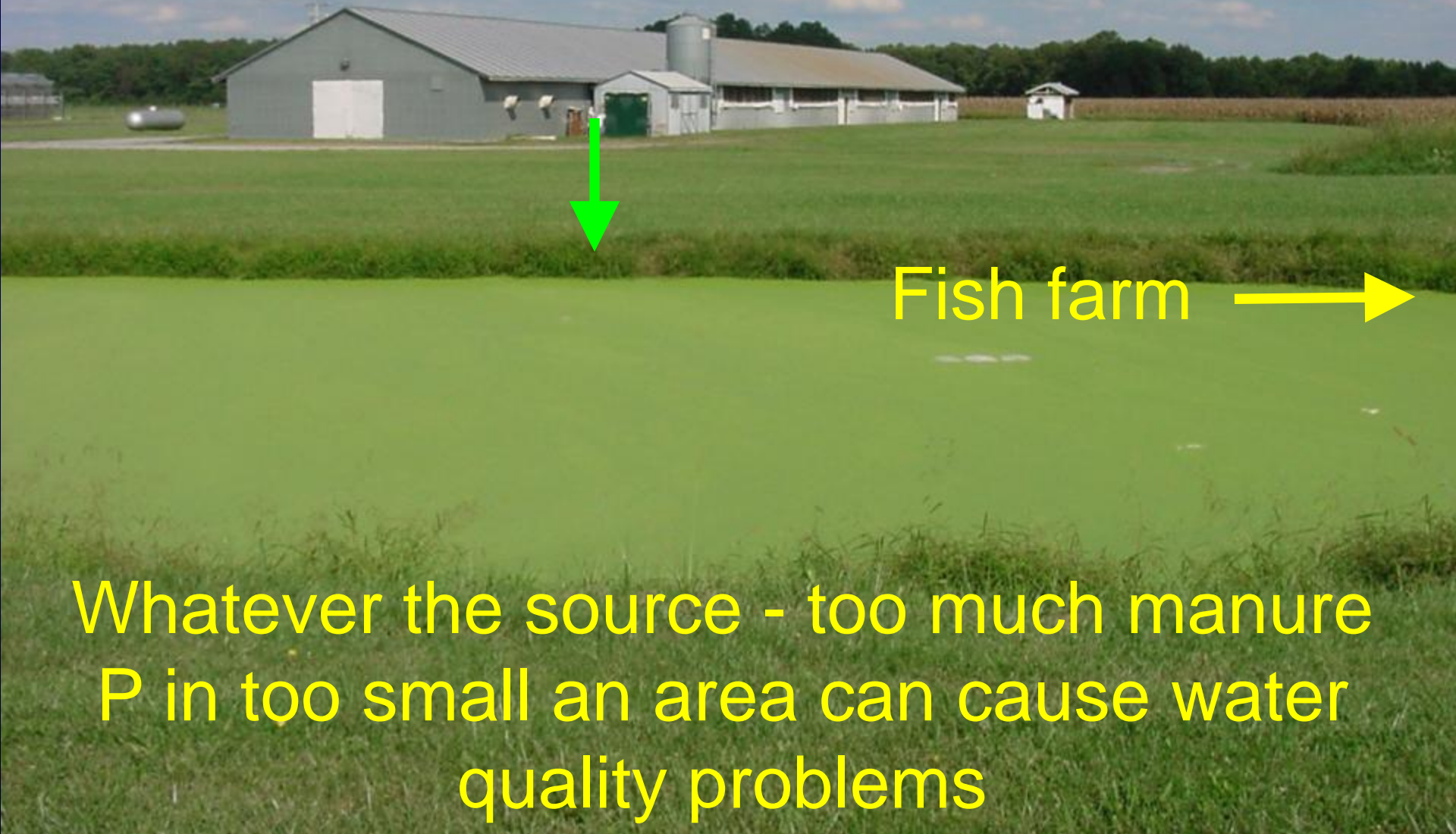
# Phosphorus Generally Limiting in Freshwater Systems

University of Manitoba Experimental Lakes Area Research Project



# Non-Point Source Pollution Hard to Trace

Poultry Pollution?



Fish farm →

Whatever the source - too much manure  
P in too small an area can cause water  
quality problems

# Nitrogen vs Phosphorus Based Nutrient Management Plans

- **N-based:** Apply manure to meet crop Nitrogen needs, **over applies Phosphorus and Potassium compared to crop removal**
- **P-based:** **Crop removal for high P soils.** Apply manure to meet crop Phosphorus needs, **under applies Nitrogen.** Therefore, inorganic N fertilizer needed to meet crop N requirements

# Phosphorus Saturated Soils

No P applications (*i.e. no manure*) allowed if soils >65% saturated with P, *period*.

Region	Mehlich1P (ppm)
Eastern Shore and Lower Coastal Plain	>458
Middle and Upper Coastal Plain and Piedmont	>375
Ridge and Valley	>525

# If Soils not >65% P Saturated

Inorganic P additions shall be based on soil test (M1P) - easy

Organic P additions - same as NRCS 590

1. Agronomic soil test - most restrictive
2. Environmental soil test - less restrictive
3. Phosphorus Index - most flexible

# Environmental Soil Test Threshold

**M1P (ppm)**

**Max Permitted P Application**

**<55**

**Nitrogen based**

**55-136**

**(162 R&V)**

**Phosphorus based (crop removal)**

**>136**

**(>162 R&V)**

**No Phosphorus**



# If $M1P >$ Environmental Soil Test Threshold

Can run the Virginia P-Index

## ➤ Advantages

- More flexible
- Field specific, therefore more accurate
- May still be able to apply manure to meet crop N needs

## ➤ Disadvantage

- Time consuming

# If a P Index is Time Consuming and Hence more Expensive, Why Run a P Index?

Run the Virginia P-Index if:

- Your soils are above the soil test P Threshold, and:
- You have manure you want/need to use

# Decision Example for Ridge and Valley

## P MANAGEMENT FOR ALL ORGANIC NUTRIENT SOURCES

### N-BASED ZONE

20% saturation line

110 lb/A or 55 ppm

DCR ENVIRONMENTAL THRESHOLD 1X P REMOVAL ZONE

35% saturation line

324 lb/A or 165 ppm

### P-INDEX (VARIABLE) ZONE

P Index Score is calculated based on field-specific factors including soil test P, erosion estimate, distance to stream, etc.

Score	P Loss Risk	Management Strategy
0 to 30	Low	N-based
31 to 60	Medium	P-based: 1.5x crop removal
61 to 100	High	P-based: 1x crop removal
Over 100	Very High	Zero P

65% saturation line

All crops/tillage

1050 lb/A or 525 ppm

### ZERO P ZONE

P is 0 to 55 ppm,  
we can manage for N

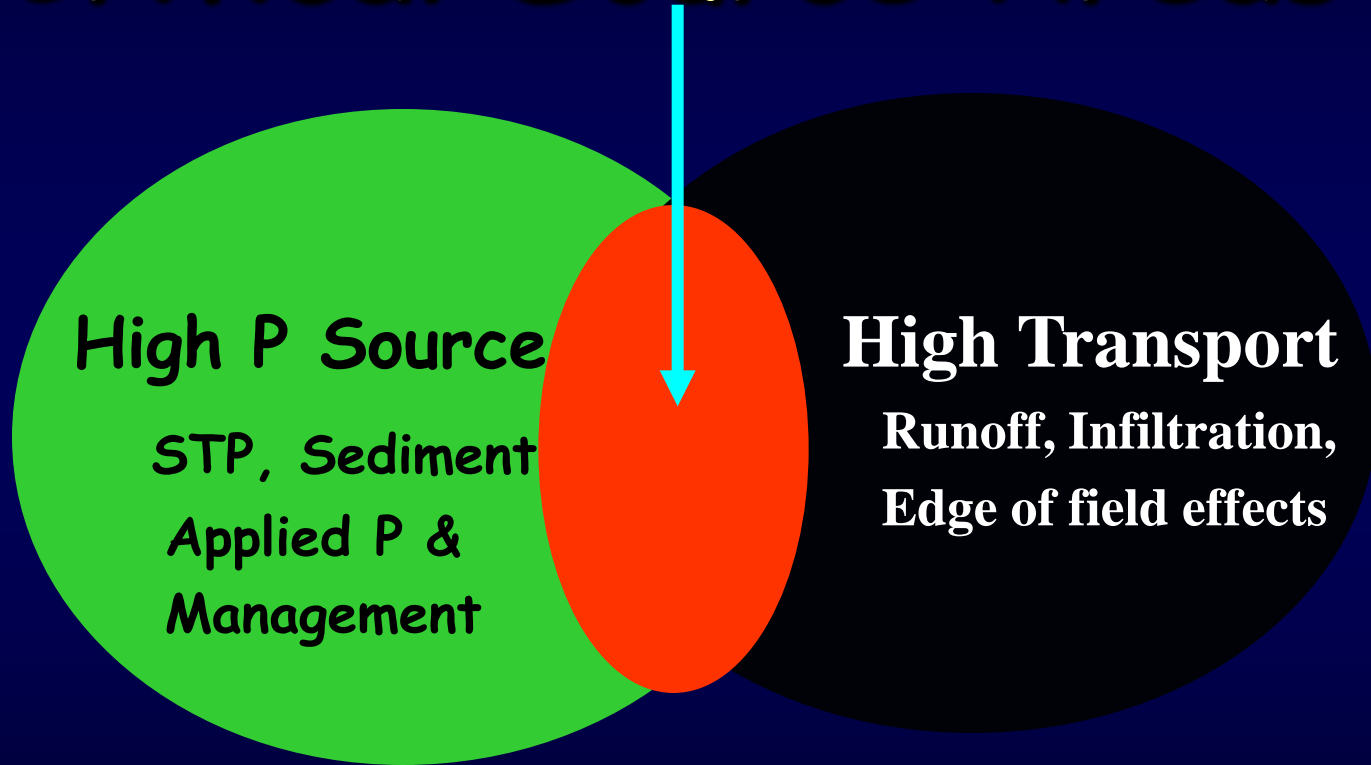
P is 55 to 162 ppm,  
we can apply as much P  
as the crop will remove

P is 162 to 525 ppm,  
we use the P-Index

P is above 525 ppm,  
we cannot apply any P

# Phosphorus Index:

## Critical Source Areas



$$P \text{ Index} = \text{Source (management)} \times \text{Transport}$$

# VA P-Index: P-Loss Mechanisms

- Sediment bound P through soil erosion (mass)
  - Erosion Risk Factor (ERF)
- Dissolved P in runoff (soil & fertilizer)
  - Runoff Risk Factor (RRF)
- Dissolved P through subsurface transport or leaching
  - Subsurface Risk Factor (SRF)

$$\text{P-Index Value} = (\text{ERF} + \text{RRF} + \text{SRF}) \times 8.5$$

# VA P-Index: Inputs

## Information from the producer

- Soil test P (Mehlich 1)
- Manure/biosolids analysis for total P
- Rate, method, timing of application
- Crop rotation and management

## Information from a field visit

- Riparian buffer width
- Distance from field to stream
- Data to calculate erosion (RUSLE2)

# VA P-Index: Inputs

## Information from soil survey

- County
- Predominate soil-mapping unit in field
- Soil drainage class
- Soil textural class
- Hydrologic soil group

# Phosphorus Index Recommendations

P Index	Max Permitted P Application
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Low	Nitrogen based
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Medium	P crop removal x 1.5
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High	Phosphorus crop removal
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Very High	No Phosphorus
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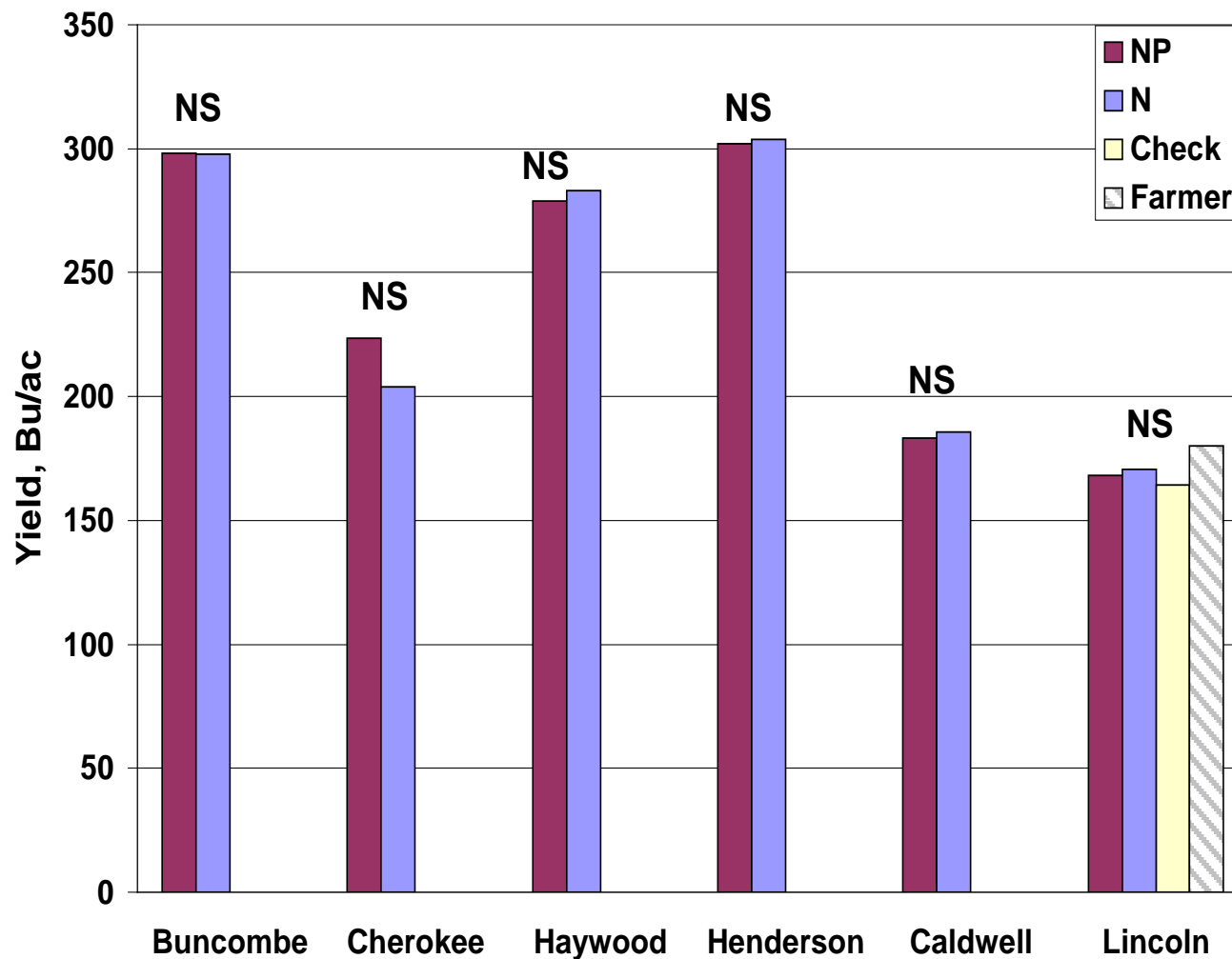
# What are management Options that Help Meet P Based Nutrient Management Plans?

# Reducing Soil P Buildup on Dairy Farms - Management Options

- By adding reduced amounts of manure (requires more crop acreage)
- On soils below threshold, do N-based applications ~1 year in three - track STP and keep below threshold
- By adding manures low in P: Reducing P inputs from dietary P by feeding to requirement
- Reduce inorganic fertilization - no starter P

# Corn Yield on High P Mountain and Piedmont Soils (NC)

Osmond et al. (2006)





Method of  
application  
impacts P  
losses

# What BMPs will Help manure management in P-Index?

- 1) Reduced P feeds - very cost effective
- 2) Buffers
- 3) Manure injection
- 4) Conservation tillage
- 5) Crops such as corn silage that remove a lot of P - helps reduce STP or can apply more manure according to a P-based plan