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# Phosphorus Management in Comprehensive Nutrient Management Plans (CNMP's)

August 2003



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## Standard 633 – Water Quality Criteria

- Agricultural wastes are not to be land-applied on soils that are frequently flooded (*defined by the National Cooperative Soil Survey or in the Flooding Frequency Soil List posted in Section II eFOTG*) during the period when flooding is expected unless incorporated immediately

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## Standard 633 – Water Quality Criteria

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### Liquid Manure ...

- Limit application to AWC in upper 8" AND Monitor tile outlets during application (see table1)
- Application rate is to be adjusted to the most limiting factor to:
  - avoid ponding,
  - avoid surface runoff,
  - avoid subsurface drainage (tile) discharge,
  - meet nutrient needs of the field,
  - or within the nitrogen or phosphorus risk assessment for the field

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## Standard 590 – Water Quality Criteria

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- No manufactured  $P_2O_5$  applied above 40 ppm Bray P1 or equivalent test, unless recommended by appropriate industry standards or the land grant universities for specialty crops, vegetable crops, etc.

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## Purpose of “P” Risk Assessment

To Assess the Risk of Phosphorus Movement from Field(s)

Two Assessment Methods:

1. Phosphorus Soil Test Risk Assessment
2. Phosphorus Index Risk Assessment

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## Phosphorus Soil Test Risk Assessment

- Based on Soil Test Result for Each Field (soil test to represent 25 acres)
- Current, 3 to 5 years
- Bray-Kurtz P1 or adjusted Mehlich 3

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## Soil Test Assessment Method P Transport Risk for Manure Application

- Low Risk Potential < 40 ppm Bray P1
- Mod. Risk Potential 40 - 100 ppm Bray P1
- High Risk Potential 100-150 ppm Bray P1
- Very High Risk Potential >150 ppm Bray P1

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## Low Risk Potential

< 40 ppm or 80 Lbs/ac

- Recommended N for succeeding crop
- OR  $P_2O_5$  recommended/removal for annual or multiple year manure ( $P_2O_5$ ) applications.

Note: May need to calculate Bray P1 Soil Buildup

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## Moderate Risk Potential

40-100 ppm or 80 to 200 lb/ac

- Recommended N for succeeding crop or  $P_2O_5$  removal whichever is less
- > 30% ground cover or manure incorporated within one week
- No commercial  $P_2O_5$  recommended

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## High Risk Potential

100-150 ppm or 200-300 lb/a

- Recommended N for succeeding crop or  $P_2O_5$  removal whichever is less.
- Plus distance criteria:
  - 100 Ft. from drainageways, water sources, or other sensitive areas if NOT Incorporated and NO Filter Strip.
  - 33 Ft. Filter Strip
  - “0” setback if manure is incorporated within 24 hours
- > 50% ground cover, or manure incorporated within 7 days

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## Very High Risk Potential

> 150 ppm or > 300 lb/a

- No manure or organic by-products
- No additional  $P_2O_5$
- Use  $P_2O_5$  draw-down strategies
  - change rotation
  - cover crops
  - double crop
  - removal of crop residue
  - change feed ration

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## Other Criteria for Summer, Fall, and Winter Application

Nitrogen application from manure for spring planted crops is to be based on:

Total Ammonium N + 1/3 of Organic N  
Calculated @ time of application

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## Other Criteria - Spring Manure Application

Nitrogen application from manure for spring planted crops:

May be adjusted to apply the recommended N

(Increase manure application rate to offset N losses)

Within the  $P_2O_5$  and  $K_2O$  limitations

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## Other Manure Application Criteria

**Do not exceed in one year's application:**

- 250 lb/ac of  $P_2O_5$   
or
- 500 lb/ac of  $P_2O_5$  for High Nutrient Concentrated Manure (Fields < 100 ppm Bray P1)
  - > 60 Lbs of  $P_2O_5$  per 1000 gallons, or
  - > 80 Lbs of  $P_2O_5$  per ton
- 500 lb/ac of  $K_2O$

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## Commercial

- Phosphorus is not to be applied above the amount recommended per the Tri-State Fertility Guide or by OSU guidance
- Erosion rate managed to “T” or less

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## Phosphorous Index

**Purpose**  
**Factors**  
**How to Use**

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## Purpose of P - Index

- Tool for field personnel to identify fields, areas, and practices that have the greatest risk of “P” transport.
- The tool is based on “widely accepted” factors (not just one factor) contributing to “P” transport.
- It is not an absolute measure - it is planning tool.

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## P - Index vs. Soil Test Method

- Soil Test Method is the most “sustainable”.
- P - Index generally permits higher “P” application rates - could be short-term.
- P - Index buys time until new technology comes along.



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## P - Index Factors



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- Erosion
- Connectivity to Water
- Runoff Potential
- Bray P1 Soil Tests
- Amt. Fert. Applied
- Method of Fert. Appl.
- Amt. Manure Applied
- Method of Manure Appl.
- Filter Strip Management



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## P Index - Erosion



- Addresses P attached to soil
- Indirectly dissolved P in runoff
- Measure using RUSLE and WEQ/WEPS

The lower the erosion rate the lower the risk of "P" runoff.

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## P Index - Connectivity to Water



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- Measure of the risk of P transported in water runoff to a perennial stream or water body.
- The closer the connection the higher the risk.



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## Connectivity to Water



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## Runoff Class

- Looks at the sites potential to produce runoff.
- Combines Soil Hydrologic Group with Slope
- Use Soil Survey and Measured Field Slope (Generally the same slope used for RUSLE)

### Runoff Class Matrix - Phosphorous Index Values

Slope Range	Hydrologic Soil Groups			
	A	B	C	D
<1 %	0	1	3	6
1-3%	1	2	4	7
4-6%	2	3	5	8
7-10%	3	5	7	10
11-15%	4	6	9	12
>15%	6	8	11	15

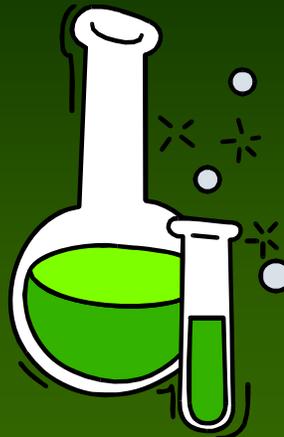
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## P Index - Bray P1 STP

- The higher the P level in the soil the more P subject to transport via soil and water.
- Measured as Bray P1 in PPM



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## P Index Amount Fertilizer & Manure Applied



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- The more P added at any one time the higher the risk of P transport.
- Fertilizer weighted more than Manure. (fertilizer is more soluble)
- Measure lbs/ac P2O5



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## P Index Method of Fertilizer & Manure Application

- Incorporated & High Residue Reduces Risk.
- Quicker Incorporation Reduces Risk
- Fertilizer Weighted Higher than Manure



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## P Index - Filter Strips

- Well managed filter strips reduce sediment and P transport to water.
- Reduce risk by 2 points for a well managed filter strip (minimum 33 feet wide)



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## P Index - How to Use

- **Field by Field or Cons. Treatment Unit.**
- **Subfields (High risk vs. Lower Risk Areas)**
- **Management Based on Risk**
  - Low (<15) N based
  - Medium (15-30) N based - However, P removal rate is recommended.
  - High (31-45) P based (removal rate)
  - Very High (>45) - No additional P

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# P Index Summary



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- Planning Tool
- P Risk Assessment Tool  
(combines effects of multiple factors)
- Best if used when soil test method is at limit.
- Not a long term solution - need to get to a P balance.
- Seek Alternative Utilization Options



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