Phosphorus Management in Comprehensive Nutrient Management Plans (CNMP’s)

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.
Standard 633 – Water Quality Criteria

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

Standard 590 – Water Quality Criteria

- No manufactured P$_2$O$_5$ 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.
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

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
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

Low Risk Potential

< 40 ppm or 80 Lbs/ac
- Recommended N for succeeding crop
- OR P<sub>2</sub>O<sub>5</sub> recommended/removal for annual or multiple year manure (P<sub>2</sub>O<sub>5</sub>) applications.

Note: May need to calculate Bray P1 Soil Buildup
Moderate Risk Potential

40-100 ppm or 80 to 200 lb/ac
- Recommended N for succeeding crop or P₂O₅ removal whichever is less
- > 30% ground cover or manure incorporated within one week
- No commercial P₂O₅ recommended

High Risk Potential

100-150 ppm or 200-300 lb/a
- Recommended N for succeeding crop or P₂O₅ 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
### Very High Risk Potential

- > 150 ppm or > 300 lb/a
  - No manure or organic by-products
  - No additional P$_2$O$_5$
  - Use P$_2$O$_5$ draw-down strategies
    - change rotation
    - cover crops
    - double crop
    - removal of crop residue
    - change feed ration

### 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
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$_2$O$_5$ and K$_2$O limitations

Other Manure Application Criteria

Do not exceed in one year’s application:

- 250 lb/ac of P$_2$O$_5$
  
  or

- 500 lb/ac of P$_2$O$_5$ for High Nutrient Concentrated Manure (Fields < 100 ppm Bray P1)
  
  - > 60 Lbs of P$_2$O$_5$ per 1000 gallons, or
  
  - > 80 Lbs of P$_2$O$_5$ per ton

- 500 lb/ac of K20
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

Phosphorous Index

Purpose
Factors
How to Use
**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.

**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.
**P - Index Factors**

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

**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.
P Index - Connectivity to Water

- 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.
Runoff Class

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

<table>
<thead>
<tr>
<th>Runoff Class Matrix - Phosphorous Index Values</th>
<th>Hydrologic Soil Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope Range</td>
<td>Hydrologic Soil Groups</td>
</tr>
<tr>
<td>&lt;1%</td>
<td>A</td>
</tr>
<tr>
<td>1-3%</td>
<td>0</td>
</tr>
<tr>
<td>4-6%</td>
<td>1</td>
</tr>
<tr>
<td>7-10%</td>
<td>2</td>
</tr>
<tr>
<td>11-15%</td>
<td>3</td>
</tr>
<tr>
<td>&gt;15%</td>
<td>4</td>
</tr>
</tbody>
</table>

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
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

Incorporated & High Residue Reduces Risk.

Quicker Incorporation Reduces Risk

Fertilizer Weighted Higher than Manure
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)

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
**P Index Summary**

- 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