

Iowa Phosphorus Index



Why do we care?

Phosphorus deficiency in corn



- Stunted, lower corn leaves turn purple





What is the difference between Nitrogen or Phosphorus?



Nitrogen moves primarily as nitrate with water



Phosphorus moves primarily with eroded soil

Phosphorus Concerns

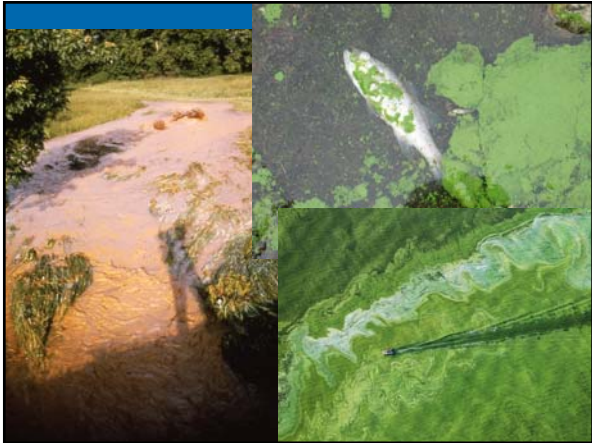


- Excess P moves off of agricultural fields with
 - soil erosion
 - water runoff
 - subsurface flow
- produces excess algae growth in streams and lakes

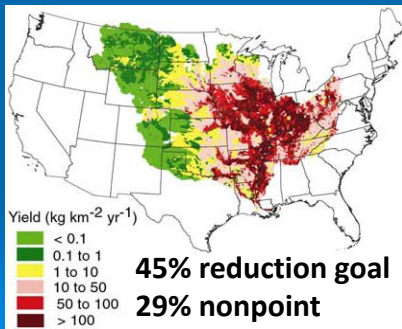
➤ Prompted the development of a P risk assessment tool – Iowa Phosphorus Index

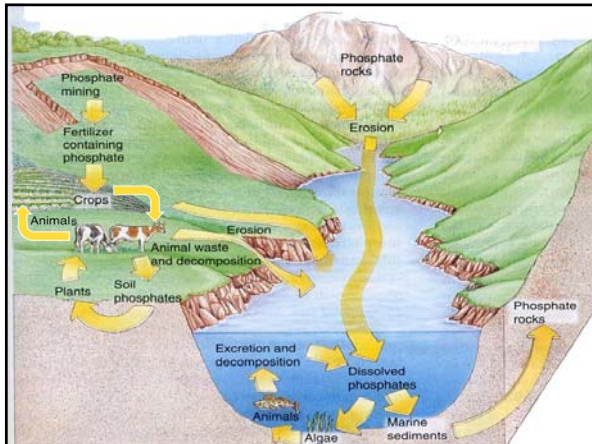
Resource Concerns

- SOIL EROSION:
 - Sheet, Rill & Wind
 - Concentrated Flow-Gully
- SOIL QUALITY: ???
- WATER QUALITY DEGRADATION
 - Excess nutrients in surface & ground water
 - Excessive sediment in surface waters (indirectly)



Iowa's Phosphorus Reduction Goals to the Gulf of Mexico





Why do farmers add phosphorus?

To grow a bigger crop

Agronomic P Application Rates
Start with a Soil Test

- Measures soil nutrient levels.
- Identifies fields that need or do not need additional nutrients.
- Tracks fertility and production trends over time.

Soil Test Categories

VH	Very High	<1%
H	High	5%
O	Optimum	25%
L	Low	65%
VL	Very Low	80% of time expect to get a yield response

Soil Test Categories

VH	Very High	< 1%	31+
H	High	5%	
O	Optimum	25%	For corn/soybeans Optimum is: Bray-1, Mehlich-3: 16 - 20 ppm Olsen: 11 - 14 ppm
L	Low	65%	Mehlich-3 ICP: 26 - 35
VL	Very Low	80% of time expect to get a yield response	

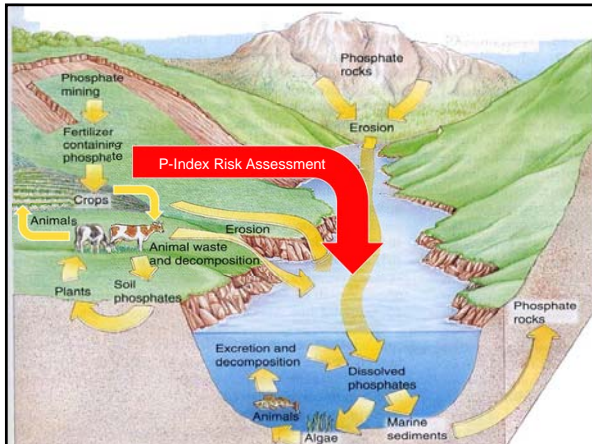
Contrast P Recommendations vs Phosphorus Index

- P Recommendations are for production



- P-Index is for water quality





What Impacts the Delivery of Phosphorus to Surface Water?

- Field Characteristics?
- Management?
- Conservation Practices?

Iowa Phosphorus Index

Erosion Component

Runoff Component

Subsurface Drainage

•Erosion Component

- **Gross Erosion**
 - Sheet & Rill (RUSLE2)
 - Ephemeral Gully
 - Gully
- **Sediment Trap**
 - Terrace
 - Sediment control basin
- **Sediment Delivery**
 - Landform
 - Distance to stream

•Erosion Component – cont'd

- **Filter Factor**
 - Filter strip
- **Enrichment Factor**
- **Soil Test Phosphorus**

•Runoff Component

- **Runoff Curve Number Factor**
 - By Landform
 - Cover factor
 - Soil
- **Precipitation Factor**
 - By County
- **Soil Test Phosphorus**
- **Phosphorus Rate and Application Method Factor**

Subsurface Drainage Component

- ❑ **Flow Factor**
 - Tile
 - Water flow through soil profile
 - Cropping system
- ❑ **Soil Test Phosphorus**
- ❑ **Precipitation**

Phosphorus Index Categories

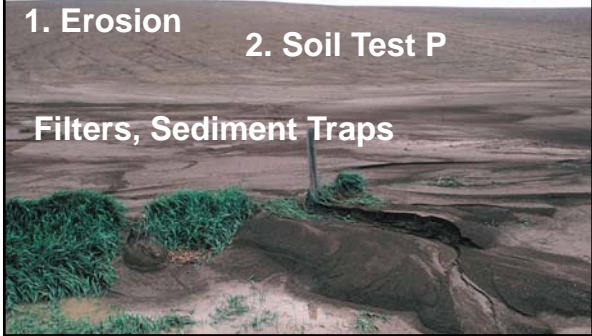
P.I.	Category	Risk to Water Quality
> 15	VH	Very High Risk
5 – 15	H	High Risk
2 – 5	M	Medium Risk
1 – 2	L	Low Risk
0 – 1	VL	Very Low Risk

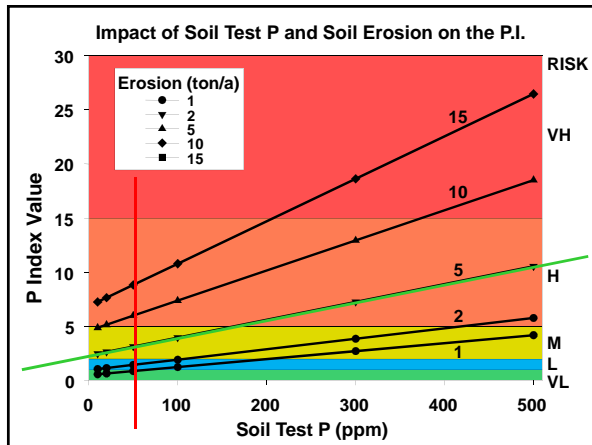
Planning Implications of Risk Categories

- **High or Very High risk**
 - implement practices to reduce that risk to Medium or below. **Do not apply P until the risk is reduced.**
- **Medium risk**
 - avoid accumulating P to level which raises the risk
- **Low, Very Low, and Medium risk**
 - Can apply manure, municipal and industrial biosolids, or organic by-products based on the nitrogen application rates

What are the most critical drivers of the P-Index?

1. Erosion 2. Soil Test P
Filters, Sediment Traps





•When to use the P-Index?

- P application rate exceeds ISU recommendations, or
- Manure, municipal and industrial biosolids, and/or organic by-products are applied, or
- Soil loss exceeds the tolerable level, or
- Average soil test phosphorus for the field is in the very high range
- (Source: 590 Nutrient Management Standard (Oct. 2013))

Issue of Tile Line Inlets



Phosphorus moves primarily with eroded soil



Where to Get More Information

Data Collection Worksheet for RUSLE2 and Iowa Phosphorus Index (ISU PM 2021)
Iowa Technical Note No. 25: Iowa Phosphorus Index



• Phosphorus Index
Source Factors

- ❑ Soil test P
- ❑ Rate, method and timing of P applications
- ❑ Erosion

• Phosphorus Index
Transport Factors

- Sediment delivery
- How close the field is to water
- Soil conservation practices
- Precipitation
- Runoff potential

- Tile flow/subsurface drainage
