University of Maryland – Phosphorus Management Tool (The Revised Maryland PSI)

Joshua McGrath
Frank Coale

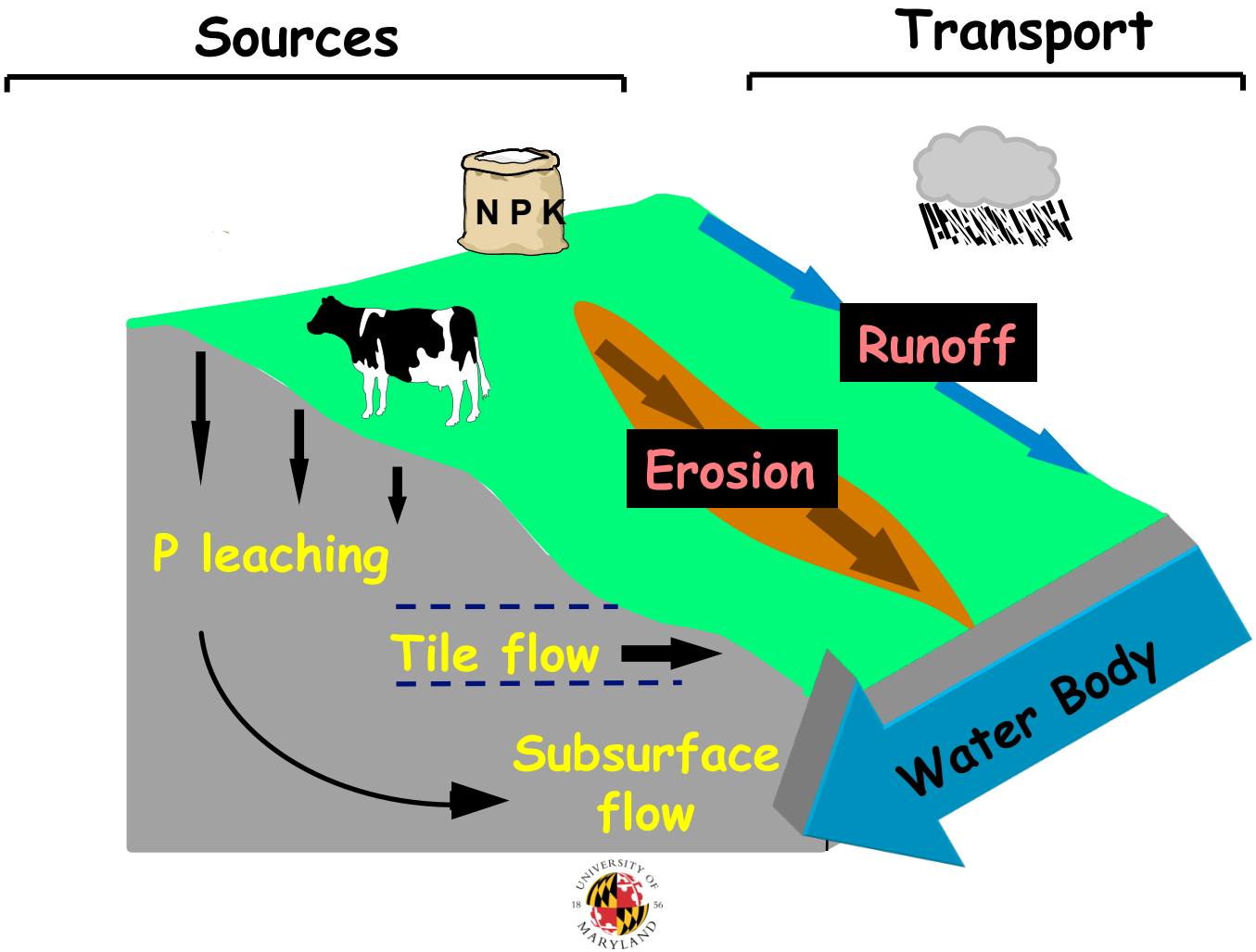
Laboratory for Agriculture and Environmental Studies
DEPARTMENT OF ENVIRONMENTAL SCIENCE & TECHNOLOGY

UNIVERSITY OF MARYLAND EXTENSION
Solutions in your community

Objectives

- Accurately assess relative risk of P transport across diverse landscapes
- Include new science, specifically regarding P transport on the Coastal Plain
- Increased emphasis on the impact of farm management decisions

Phosphorus Losses: Source and Transport



Factors evaluated in PSI assessments

	Old PSI	New PSI
Soil erosion loss estimation	✓	✓
Surface runoff potential of site	✓	✓
Subsurface drainage potential of site	✓	✓
P leaching potential of site	✓	✗
Distance from edge of field to surface water	✓	✓
Buffer type and width	✓	✓
Receiving water body priority status	✓	✗
Agronomic soil test P level	✓	✓
Soil P saturation ratio	✗	✓
P fertilizer application rate	✓	✓
P fertilizer application method, placement, tillage & timing	✓	✓
Manure P application rate and P solubility	✓	✓
Manure P application method, placement, tillage & timing	✓	✓

Major Changes Found in Current Draft

- New Name: University of Maryland – Phosphorus Management Tool (UM-PMT)
- Three interpretative categories (eliminating “Very High”)
- All recommendations now based on P management
- Three major transport pathways separated arithmetically

Interpretative categories in the revised PSI	
Score	**Generalized Interpretation of P Loss Rating**
0-50	·**LOW** potential for P movement from this site given current management practices and site characteristics. ·Soil P levels and P loss potential may increase in the future due to continued nitrogen-based nutrient management. ·Total phosphorus applications should be limited to no more than a three-year crop removal rate applied over a three year period.
51-100	·**MEDIUM** potential for P movement from this site given current management practices and site characteristics. Practices should be implemented to reduce P losses by surface runoff, subsurface flow, and erosion. ·Phosphorus-based nutrient management planning should be used for this site. Phosphorus applications should be limited to the amount expected to be removed from the field by crop harvest or soil-test based P application recommendations.
> 100	· **HIGH** potential for P movement from this site given current management practices and site characteristics. ·No phosphorus should be applied to this site. ·Active remediation techniques should be implemented in an effort to reduce the P loss potential from this site.

Interpretive categories in the existing PSI	
Score	**Generalized Interpretation of P Loss Rating**
0-50	·**LOW** potential for P movement from this site given current management practices and site characteristics. There is a low probability of an adverse impact to surface waters from P losses from this site. ·Nitrogen-based nutrient management planning is satisfactory for this site. ·Soil P levels and P loss potential may increase in the future due to continued nitrogen-based nutrient management.
51-75	·**MEDIUM** potential for P movement from this site given current management practices and site characteristics. Practices should be implemented to reduce P losses by surface runoff, subsurface flow, and erosion. ·Nitrogen-based nutrient management should be implemented no more than one year out of three. ·Phosphorus-based nutrient management planning should be implemented two years out of three during which time P applications should be limited to the amount expected to be removed from the field by crop harvest or soil-test based P application recommendations, whichever is greater.
76-100	·**HIGH** potential for P movement from this site given current management practices and site characteristics. ·Phosphorus-based nutrient management planning should be used for this site. Phosphorus applications should be limited to the amount expected to be removed from the field by crop harvest or soil-test based P application recommendations. ·All practical management practices for reducing P losses by surface runoff, subsurface flow, or erosion should be implemented.
> 100	·**VERY HIGH** potential for P movement from this site given current management practices and site characteristics. ·No phosphorus should be applied to this site. ·Active remediation techniques should be implemented in an effort to reduce the P loss potential from this site.

How will this impact farmers?

Score	Old	New
0-50	N Based Planning	3-year P removal
51-75	P based 1 out of 3 years	P based planning
76 – 100	P based planning	
>100	No P application	No P application

- **Assume continuous corn with yield goal of 150 bu/acre.**
- **Poultry litter testing 60-60-40 (lbs/ton) to be applied to corn.**

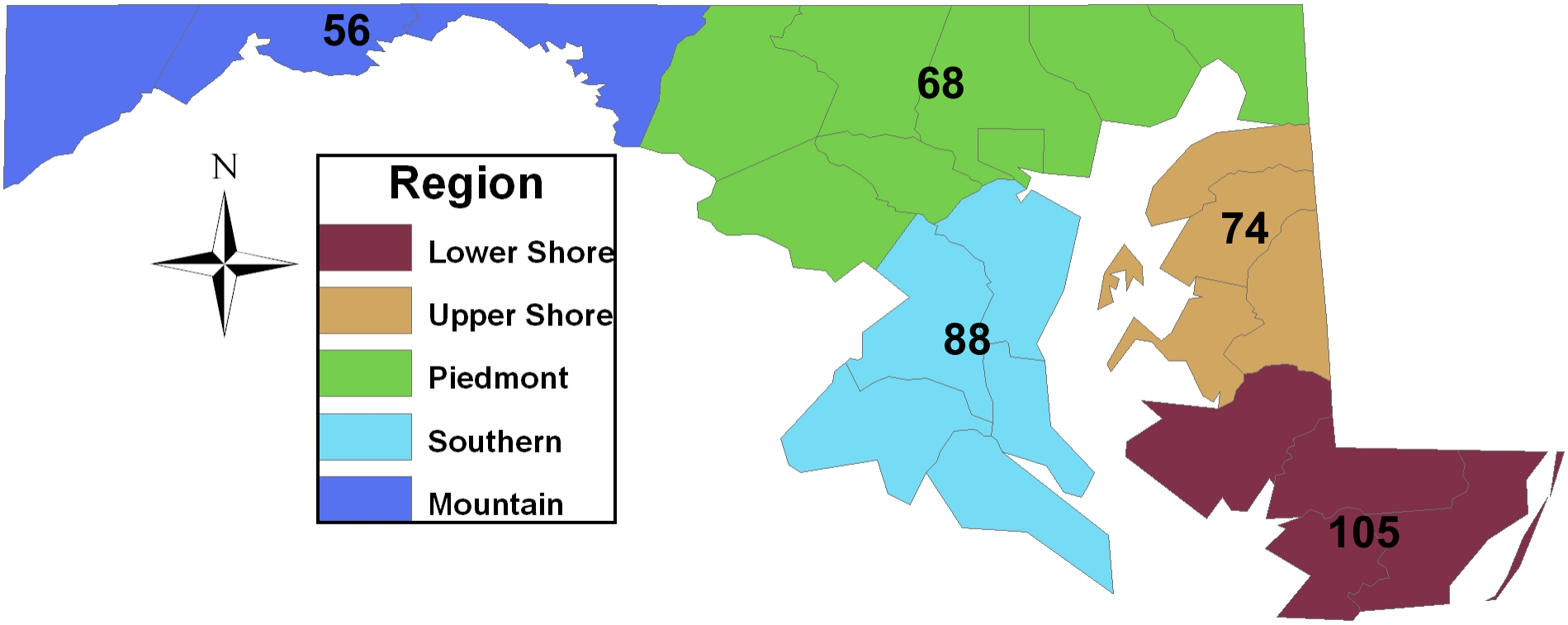
Score	Old Rate (tons/acre)	New Rate (tons/acre)
0-50	5	3.5
51-75	5 + 1.5+1.5	1.5
76 – 100	1.5	
>100	0	0

Possible Scenarios

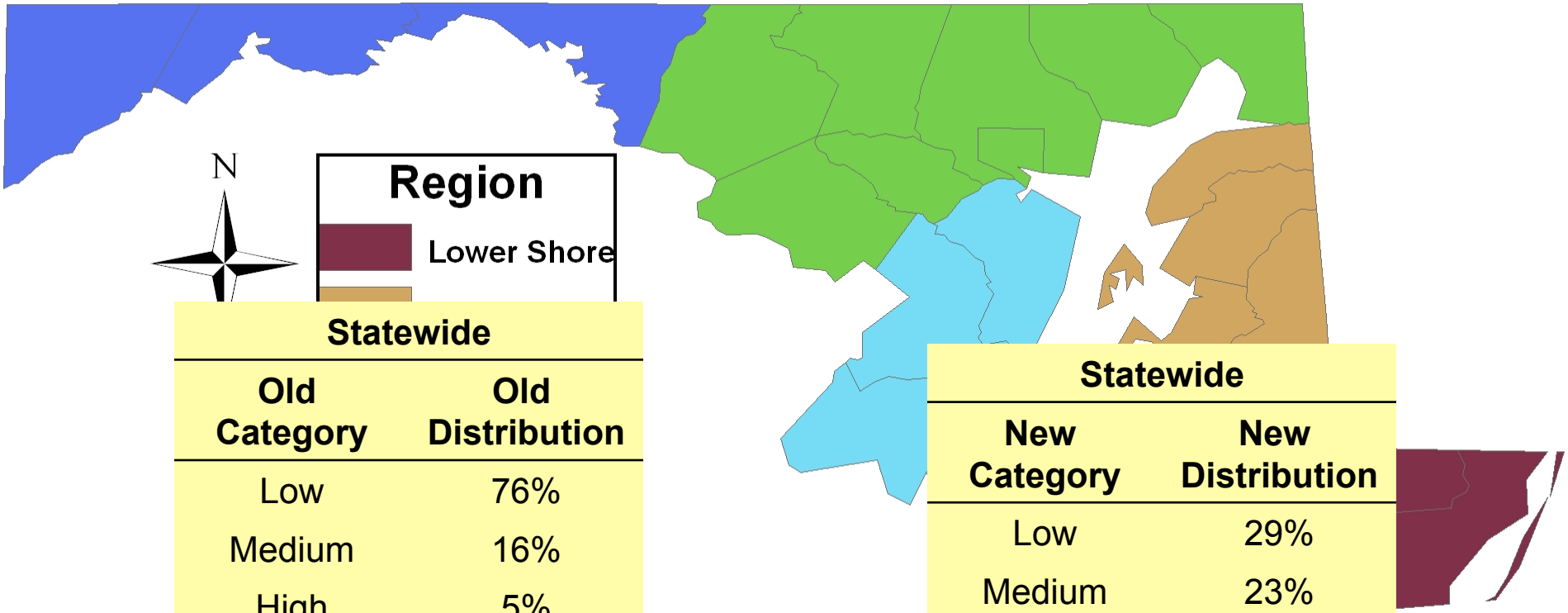
- We cannot predict statewide trends in UM-PMT scores – only time will tell
- We are working on a web based tool so that nutrient management planners can do trial runs for individual fields and see how their old and new scores compare
- The following slides present data from 391 fields across the state
  - Soil P concentrations and P application rates were increased on some fields so this data does not reflect real-world conditions, only one possible scenario

Number of Fields Sampled in Each Region

Statewide total = 391



Statewide Distribution of Final Scores



Statewide	
Old Category	**Old Distribution**
Low	76%
Medium	16%
High	5%
Very High	3%
n	**391**

Statewide	
New Category	**New Distribution**
Low	29%
Medium	23%
High	48%
n	**391**

How are fields redistributed between categories?

Old Category	n	Percent Distribution to New Category
Low	107	36% Low
	75	25% Medium
	115	39% High

How are fields redistributed between categories?

Old Category	n	Percent Distribution to New Category
Medium	5	8% Low
	8	13% Medium
	49	79% High

How are fields redistributed between categories?

Old Category	n	Percent Distribution to New Category
High	3	16% Low
	4	21% Medium
	12	63% High

How are fields redistributed between categories?

Old Category	n	Percent Distribution to New Category
Very High	3	23% Medium
	10	77% High