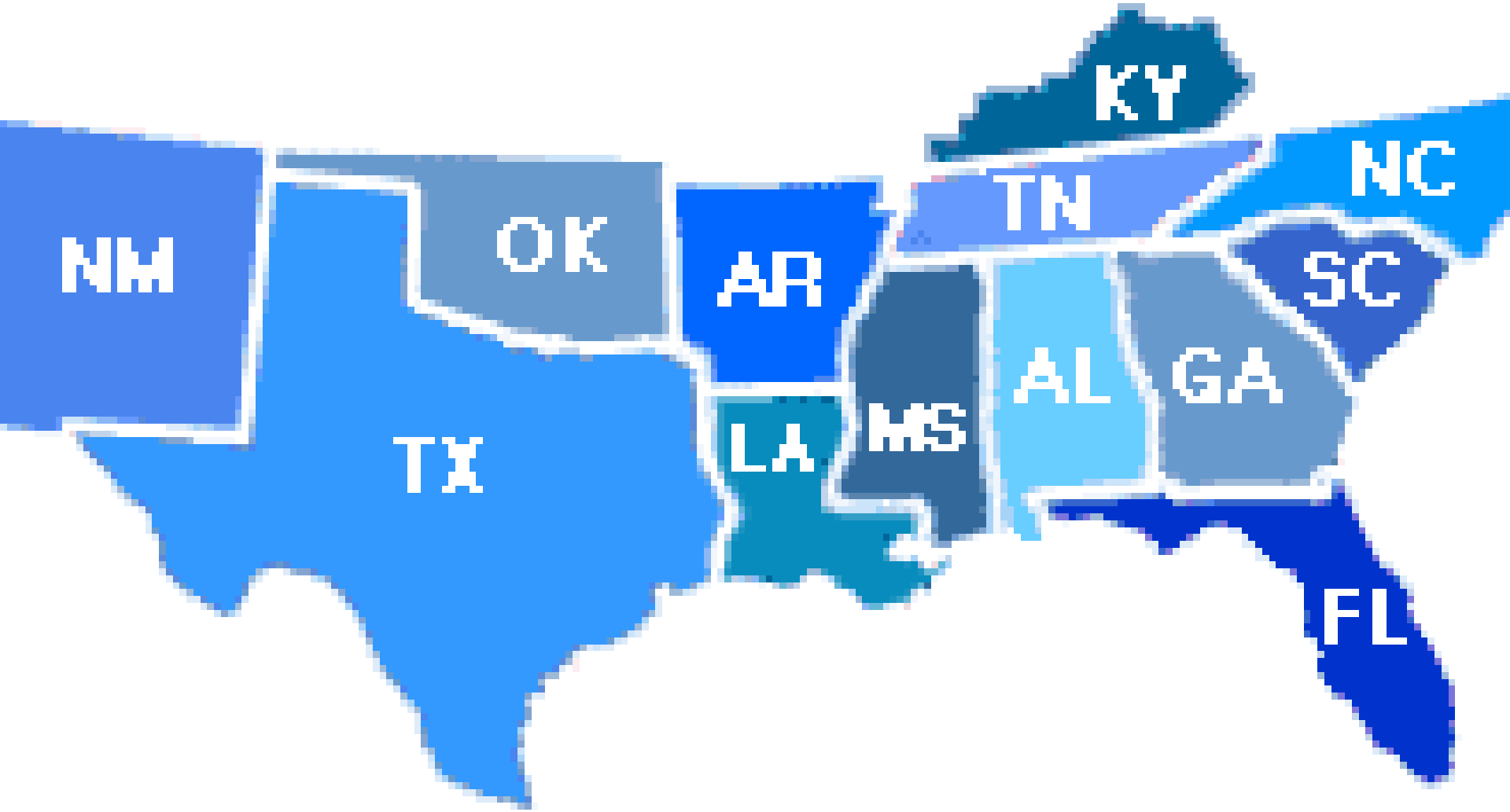
Phosphorus Loss (Risk) Indexes in the Southern Region



General Information for P Loss Indexes in the US

- Sharply, et al. 2003. Development of phosphorus indices for nutrient management planning strategies in the United States. J. Soil Water Cons.
- Daniel et al. 2002. The Phosphorus Index: Background and Status. White Paper for National Center for Manure and Animal Waste Management (http://www.cals.ncsu.edu/waste_mgt/natlcenter/papers.htm)

General Information for P Loss Indexes – National P Project

- http://pswmru.arsup.psu.edu/phosphorus/nprp.htm
- Jennifer L. Weld: Summary of Phosphorus Indices: Management Category Ranges
- Links to state P Index documents

State P Loss Index Links in SR

- http://www.aces.edu/department/aawm/PINDEXFinal2001.pdf (AL)
- http://pswmru.arsup.psu.edu/phosphorus/ArkansasPI.pdf (AR)
- http://www.engr.uga.edu/service/extension/agp2/aware/nut_manage.html (GA)
- http://nutrients.ifas.ufl.edu (FL)
- http://www.ca.uky.edu/enri (KY)
- http://www.soil.ncsu.edu/nmp/ncnmwq/ (NC)

State P Loss Index Links in SR

- http://www.nm.nrcs.usda.gov/technical/tech-notes/agro/ag59.xls (NM)
- http://www.animalwaste.okstate.edu/OK_P_Index_Worksheet.xlt (OK)
- http://www.esri.sc.edu/Projects/usda/CNMPLiterature/NRCS_SC_Suppl/SC_Ag_Waste_Sup2.pdf (SC)
- http://bioengr.ag.utk.edu/extension/ExtProg/WasteMgmt/P%20Index.pdf (TN)

USDA-NRCS P Management Strategies

- Soil test P for agronomic use: P requirements of the crop
- P threshold approach: establish critical soil test P levels
- P risk index approach: integrates P source and transport characteristics of a field

What is a P Risk Index?

- The Phosphorus Risk Index is a field based planning tool that integrates soil properties, hydrology and agricultural management practices to assess the risk of P movement from soil to water

Factors in P Risk Index

Transport

- Rainfall data
- Surface runoff class
- Erosion potential
- Proximity to stream channel
- Soil texture and permeability

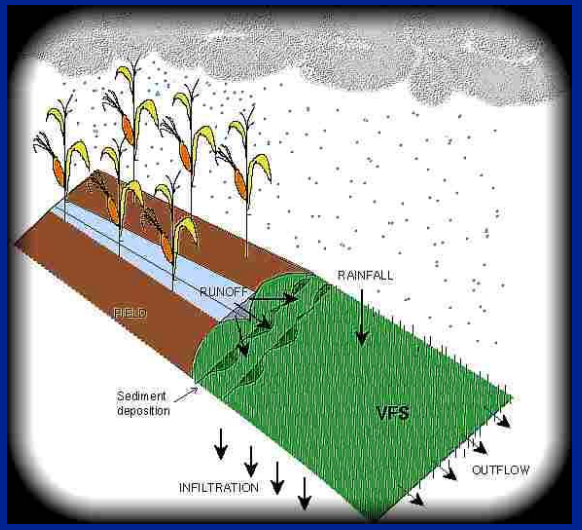
Factors in P Risk Index

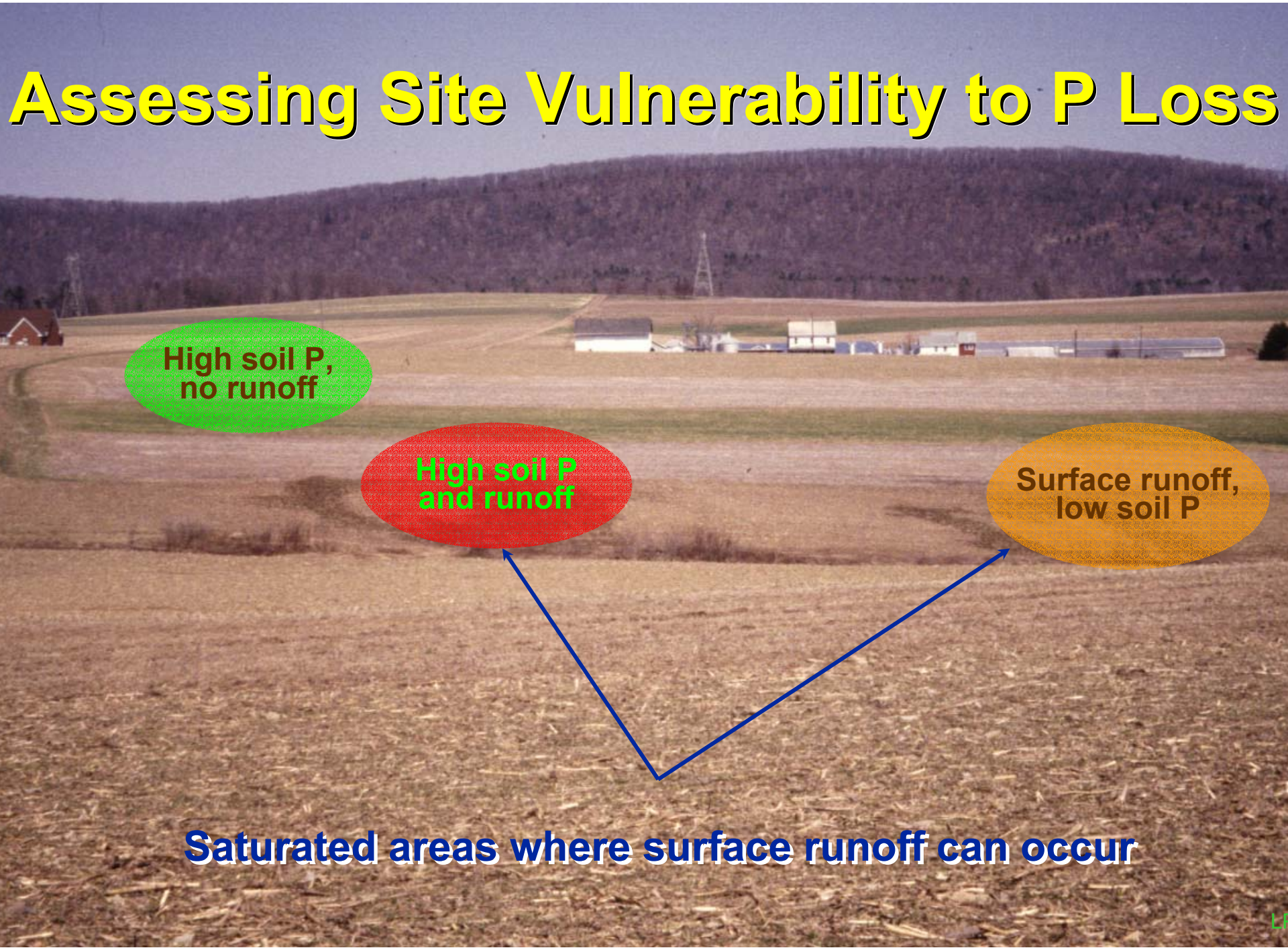
Source

- Soil P content
- Fertilizer P rate
- Manure P rate

Site Management

- Application method
- Application timing
- BMPs




Assessing Site Vulnerability to P Loss
High soil P, no runoff
High soil P and runoff
Surface runoff, low soil P
Saturated areas where surface runoff can occur

riginal P Index (Lemunyon and Gilbert, 199
Source Factors

	None (0)	Low (1)	Med. (2)	High (4)	V. High (8)
STP (1.0)	N/A	Low	Medium	Optimum	Excessive
Inorg. P Rate (0.75)	None	<15	16-40	41-65	>65
Inorg. P Method (0.5)	None	>2 inches	Incorp.	Incorp >3 Mo.	Surface
Org. P Rate (1.0)	None	<15	16-40	41-64	>65
Org. P method (0.5)	None	>2 inches	Incorp	Incorp >3 mo.	Surface

riginal P Index (Lemunyon and Gilbert, 199
Transport Factors

	None (0)	Low (1)	Medium (2)	High (4)	V. Hig (8)
oil Erosion 1.5)	N/A	<5 t/a	5-10 t/a	10-15 t/a	>15 t/a
rigation rosion (1.5)	N/A	Infreq. Well drain	Mod. Irri. Slope<5%	Freq. Irri. 2-5% slope	>Freq. Irri. >5% slope
unoff lass (0.5)	N/A	V. Low or Low	Medium	High	Excessiv
ist. To ater (1.0)	>1000 ft	1000-500	500-200	200-30	<30

Interpretation of the P Risk Index

P Risk Index	General Vulnerability to P Loss
<8	Low potential for P loss
8 - 14	Medium potential for P loss
15 – 32	High potential for P loss
>32	Very High potential and adverse impact on waters

Summary of P Loss Indexes in SR

- Additive vs. multiplicative
- Surface drainage vs. leaching
- All farm fields vs. pasture
- Water body P sensitivity
- Credits for BMPs
- Screening tool, e.g., soil test P
- Weight of each factors
- Different index values

Summary of P Loss Index in SR

State	Index Started	Index Value	STP Limit	Validation
Alabama	2001	0-96	No	No
Arkansas	2002	0-1.8/0-100	No	Yes
Florida	2000	0-225	No	Underway
Georgia	2002	0-100	No	No
Kentucky	2001	0-112	400/PI	Yes
Louisiana		0-1800		

Summary of P Loss Index in SR

State	Index Started	Index Value	STP Limit	Validation
MS		0-22	?	
NM	2001	0-47	No	No
NC	2003	0-100	No	Some
OK	1998	Qualitative	300/400	No
SC	2002	0-25	No	No
TN	2003	0-301	No	No
TX	2000	0-32E/0-35W	?	Yes

Summary of P Loss Index in SR

- Majority like initial version
- Arkansas – empirical relationships based on field studies
- NC – quantitative using hydrologic models

Use of P Loss Indexes

Rating	Management
Low	N based management
Medium	N based management with BMPs
High	P applications to crop removal
Very High	No P fertilizer or manure application, remediation required

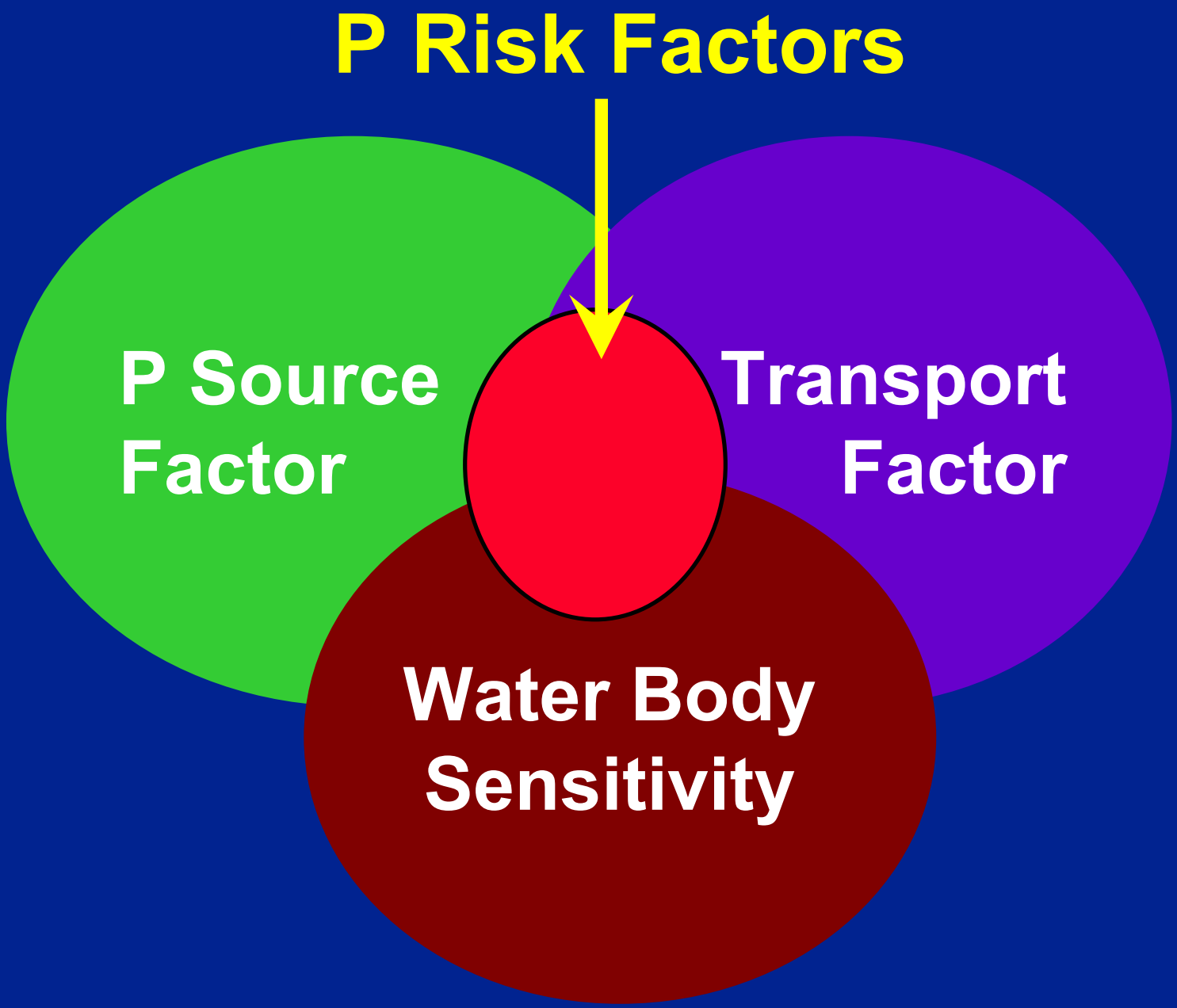
Revised AR P Index for Pasture

PI Value = (P Source) x (P Transport) x (BMPs)

P Source = (0.4 * lb/ac soluble manure P) + (0.0007 * lb/ac soil test P) + Particulate P (RUSLE2)

P Transport = Erosion + runoff class + flooding frequ. + appl. method + appl. timing + grazing manage.

P Index with BMPS = P Index * 0.9 for each BMP


P Risk Factors
P Source Factor
Transport Factor
Water Body Sensitivity

Discussion

- Should the values be standardized?
- Should the index be linked to waterbody sensitivity?
- Should the index be validated?
- How to evaluate the effectiveness of P Index approach?
- Should the index be quantitative?