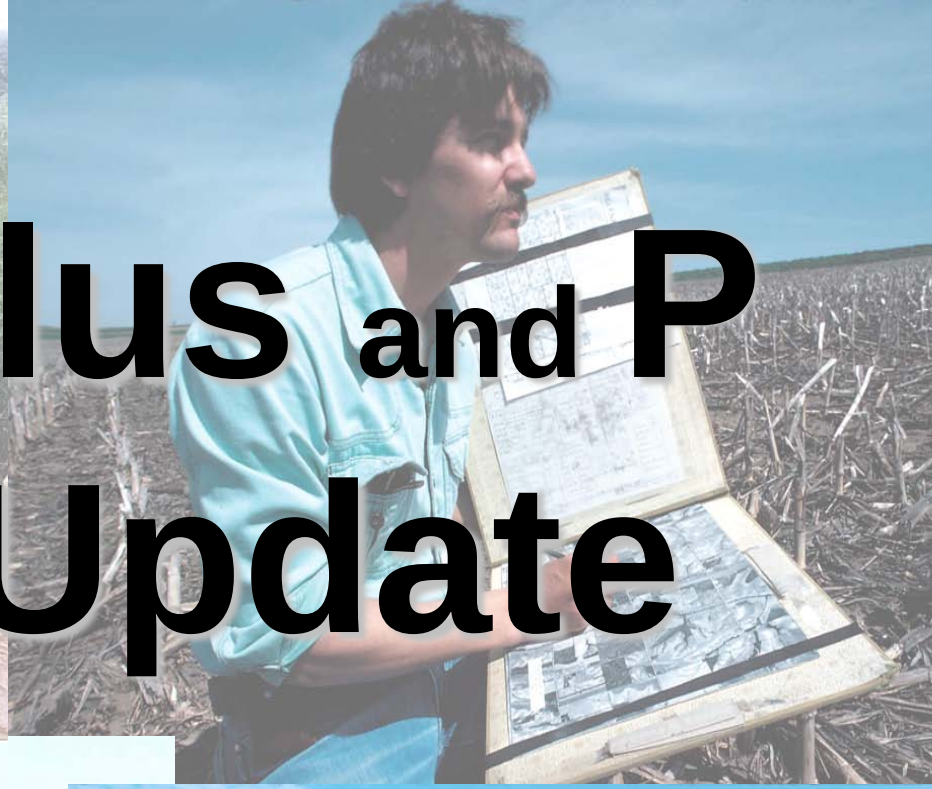
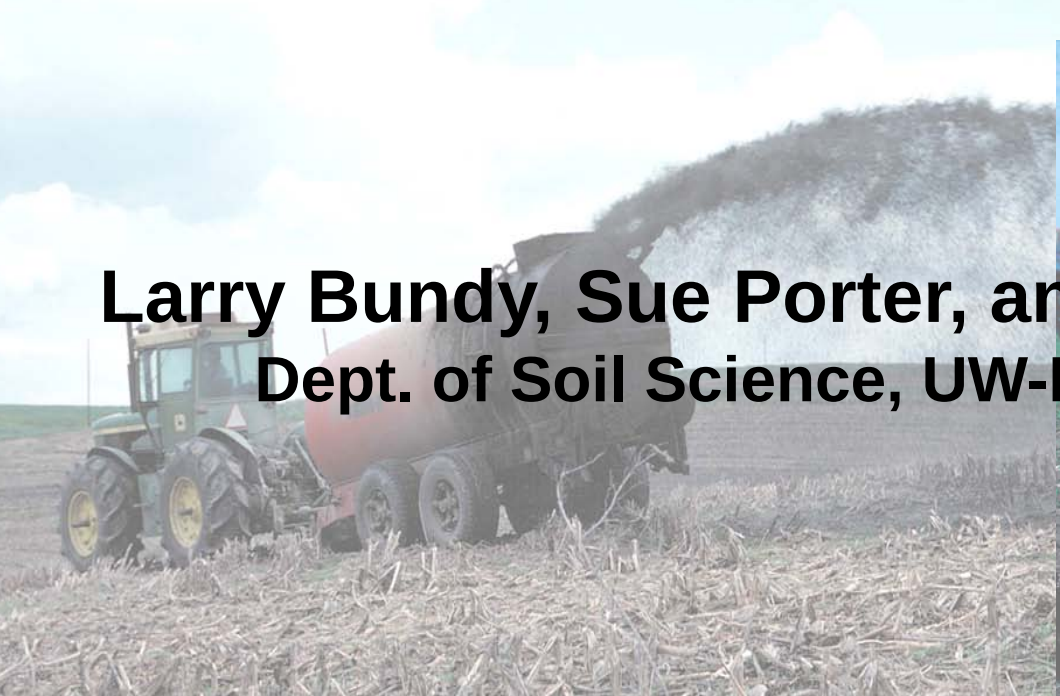
Snap Plus and P Index Update





Larry Bundy, Sue Porter, and Laura Ward Good
Dept. of Soil Science, UW-Madison & WDATCP

SNAP-Plus

- Nutrient management planning software program

Phosphorus Index

- Nutrient management planning tool that assesses the risk of phosphorus delivery to surface water from agricultural fields

SNAP-Plus software uses "routine" information:

- Soil test
- Crop and tillage
- Slope and slope length

SNAP-Plus

Provides field-by-field:

- Multi-year nutrient management plan
- Rotational soil loss assessment
- P Index calculation
- P balance calculation
- Record-keeping

Nutrient Management Standard 590:

All fields that receive crop nutrients must be farmed to T (according to farm conservation plan).

SNAP-Plus currently provides a RUSLE2 rotational soil loss assessment (may be 10-20% higher than if done with full RUSLE2).

Nutrient Management Standard 590:

Available nitrogen applications can not exceed crop N requirements or N removal for legumes

SNAP-Plus calculates N recommendations and N credits

Nitrogen Uptake for First Year Legumes and Companion Crops

Crop	**Yields**	**N Uptake**
	per acre	*lb/acre*
Legume hay	2-3 T	220
Legume hay with oatlage	1st cut: 1-2 T 2nd cut: 1-2 T	240
Soybean	50 bu	180

Nutrient Management Standard 590:

Phosphorus applications must be planned using soil test P thresholds or the P Index.

Soil test P thresholds –

> 50 ppm – limit P applications to crop removal

> 100 ppm – eliminate P applications if possible; cumulative P applications must be 25% less than crop removal (over 4 years)

P Index –

Must be less than 6 averaged across the rotation.

SNAP-Plus calculates both the P balance and P Index for each field.

SNAP-Plus Test Version

Test version for 590 Standard is available on web:

www.soils.wisc.edu/Snap-Plus/590Test.html

Snap-Plus

File Edit Tools Reports Options Help

Farm Name: Livestock ordinance

Internet available
Rusle2 connected

Farm | Field | Soil Tests | Nutrient Sources | Cropping | Summaries

Field Name: ne poultry

County	Acres	Slope	Soil Name	Soil Symbol	Subsoil Fert
WI-Outagamie	329	8	BOYER	BrC2	A

Calculate all years

Soil Test Date: 10/7/2004

pH	OM %	P (ppm)	K (ppm)
7	3	105	100

First | Prev | Next | Last

	2005	2006	2007	2008	
Crop:	Corn grain	Corn grain	Soybeans wide row	Corn grain	
Yield Goal:	130-150	130-150	45-55	130-150	
Tillage:	Fall Chisel	Fall Chisel	Fall Chisel	Fall Chisel	
Soil Test Date:	10/7/2004	10/7/2004	10/7/2004	10/7/2004	
	☐ Crop Irrigated	☐ Crop Irrigated	☐ Crop Irrigated	☐ Crop Irrigated	☑ Crop Irrigated
	N P2O5 K2O	N P2O5 K2O	N P2O5 K2O	N P2O5 K2O	N P2O5 K2O
Recommendation:	**120 0 40**	**120 0 40**	**0 0 50**	**120 0 40**	
Prior years legume credit:	0	0	0	40	
Prior years manure credit:	0 0 0	0 0 0	0 0 0	0 0 0	
Plan manure applications:	120 150 120	0 0 0	0 0 0	0 0 0	
Plan fertilizer applications:	0 0 0	115 0 60	0 0 0	92 0 0	
Total credits:	**120 150 120**	**115 0 60**	**0 0 0**	**132 0 0**	
Adjusted recommendation:	**0 -150 -80**	**5 0 -20**	**0 0 50**	**-12 0 40**	
Annual Total P Index:	**2.0**	**2.0**	**5.3**	**2.0**	
☐ Details					

Summary results for
4 year crop rotation starting in 2005

Rotation: 2005 - 2008

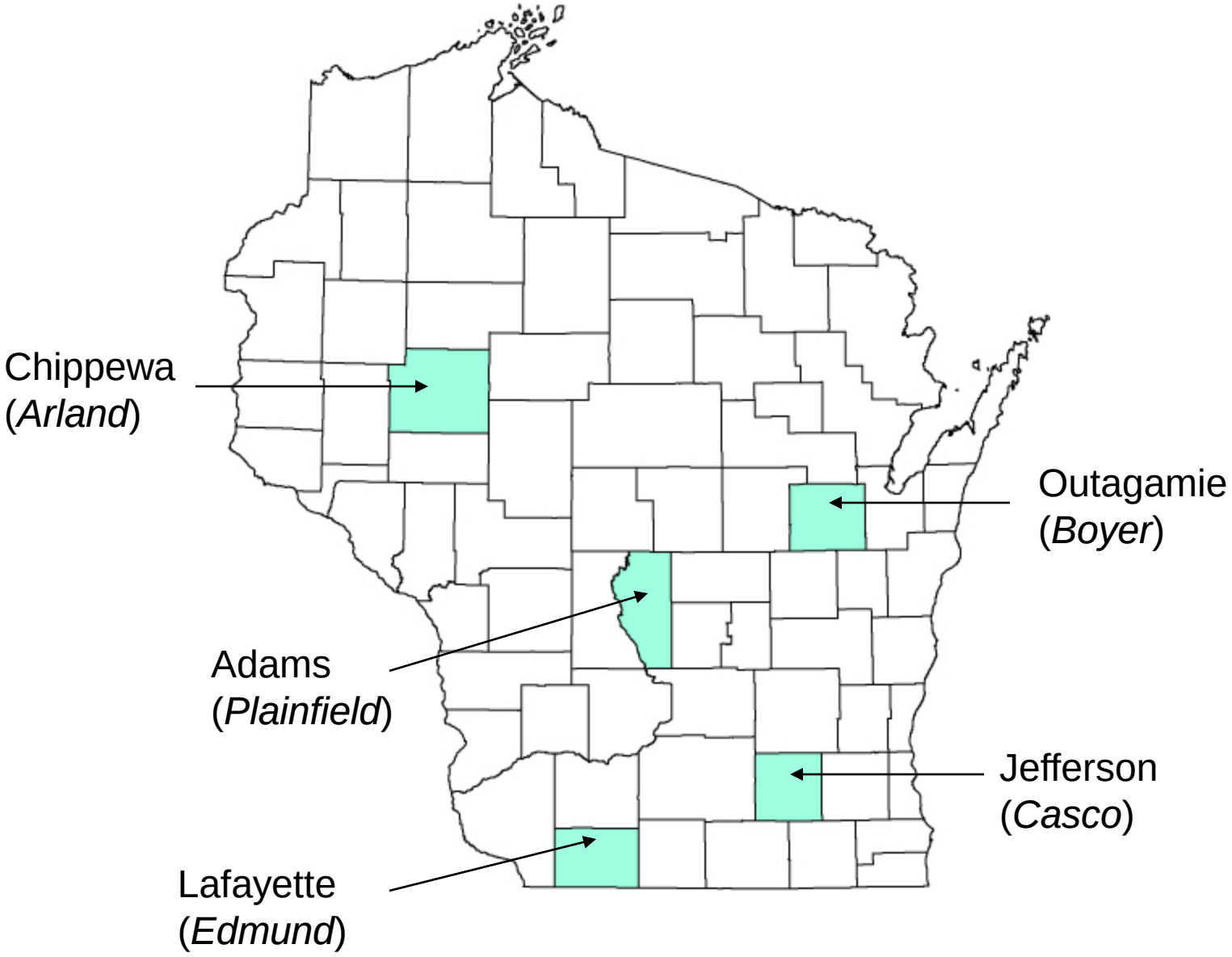
Ave soil loss	1.6	t/acre
Field "T"	4	t/acre
Ave P Index	2.8	

Summary results for
4 year nutrient balance starting in 2005

Balance: 2005 - 2008

P2O5	-60	lb/acre

start | Doc... | Eud... | Pio... | Micr... | Micr... | Sna... | 12:10 PM



Counties and Soils Selected for Snap-plus Planning Exercise

Assumptions of planning exercise using proposed standard:

- Soil test P = 105 ppm
- Slope is 8%, slope length is 150 feet
- Medium yield potential soils (except for Plainfield)

For planning exercise:

All operations must:

- Meet T
- Avoid over-applying N
- Maintain P Index less than 6 across rotation
- Apply 25% less P_2O_5 than crop removal

Cash Grain Operations

No Change!

Commercial fertilizers still applied according to UW recommended rates.

Dairy Operations

- CCAAA rotation
- With N credit for fair stand of alfalfa, no N needed for first year corn except for irrigated sands (NC farm).
- Liquid dairy manure applied to second year corn and seeding year alfalfa to maximum allowable N rate
- Manure = 9.3-5-16/1000 gal.
- Nitrogen limits manure applications

Dairy operations

			Rotational			
	Soil	T	Soil loss	Crop P_2O_5 uptake	P_2O_5 balance	P Index
		T/a/year		*lb/acre/yr*		
NW	Boyer	3	2.8	265	-115	4.2
NC	Plainfield	5	0.2	305	-105	0.3
NE	Arland	4	0.7	265	-115	1.7
SE	Casco	3	2.8	285	-125	4.4
SW	Edmund	2	1.8	285	-125	4.7

Poultry Operations

- CCCS Rotation
- Nitrogen needed for all corn years
- N requirement for one year of corn adds about 75% of the crop P_2O_5 removal for the 4-year rotation
- Manure = 24-30-24/ton

Poultry operations

			Rotational			
	Soil	T	Soil loss	Crop P_2O_5 uptake	P_2O_5 balance	P Index
		T/a/year		*lb/acre/yr*		
NW	Boyer	3	1.6	210	- 60	2.8
NC	Plainfield	5	0.3	260	- 65	0.4
NE	Arland	4	2.6	210	- 60	4.0
SE	Casco	3	2.4	225	- 60	3.9
SW	Edmund	2	0.6	225	- 60	2.7

Poultry operations

- Can use P Index strategy if need to apply more manure

  At 105 ppm soil test P, all PI values less than 6.

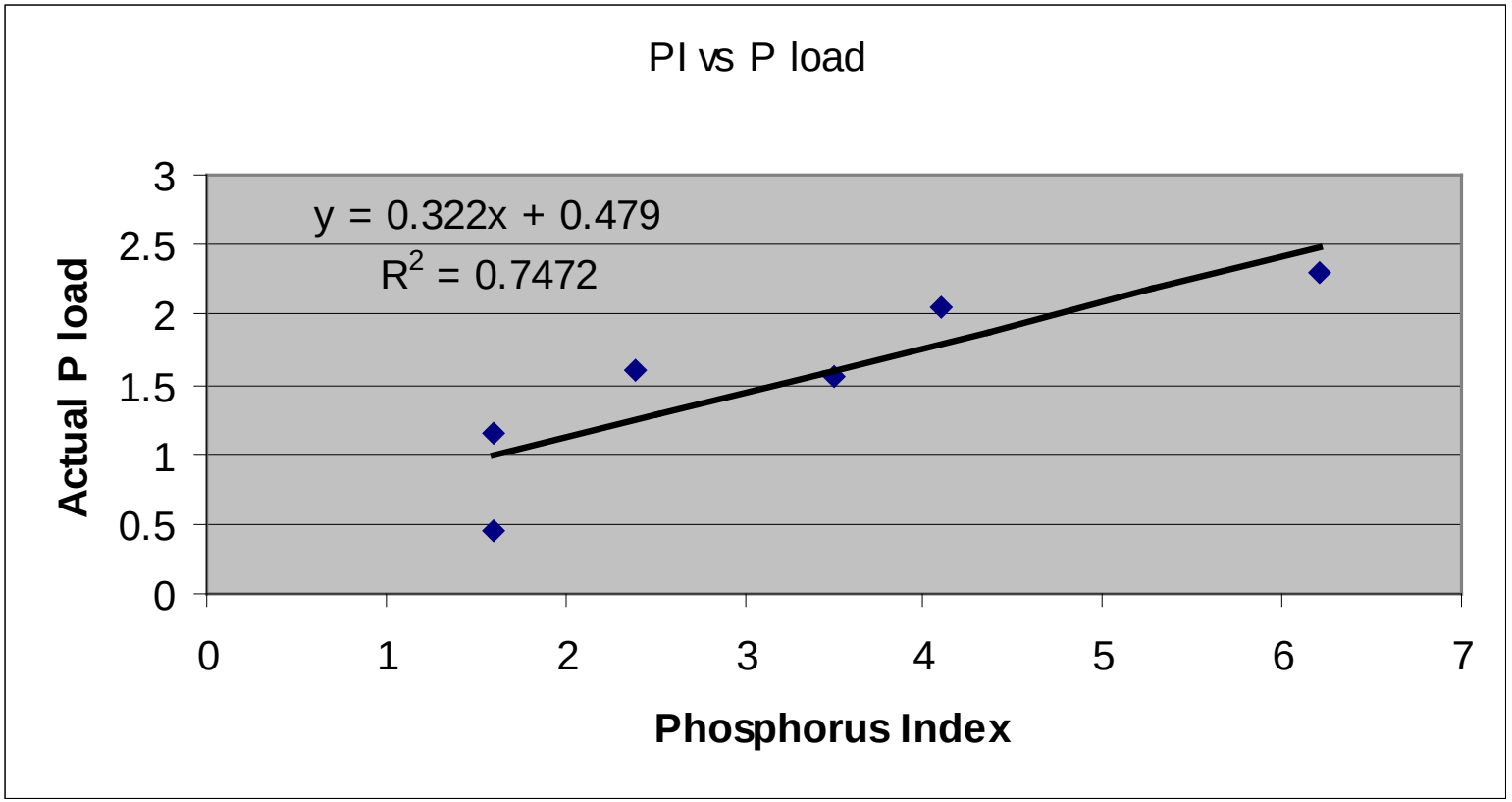
- But this is only temporary solution, because if continue to raise soil test P, P Index value will go above 6.

  At 300 ppm soil test P, only sites with very low erosion (NC, Plainfield and NE, Boyer) are less than 6.

Summary

- P index buys time to achieve P balance
- For dairy with CCAAA rotation, N determines manure rates
- High P in poultry manure requires large acreage or off-farm distribution

PI values vs. measured total P runoff losses from several sub-watersheds, Pioneer Farm, UW-Platteville



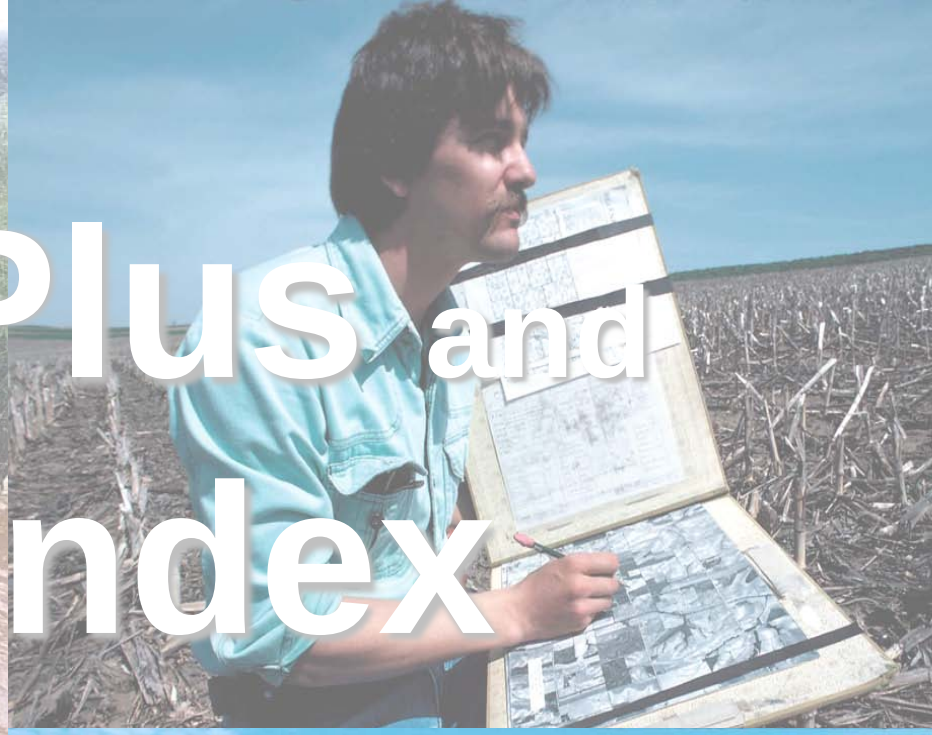
*** Provisional data and Site 2 – 2004 removed

More Research Base for P Index

- Year-round runoff monitoring in field-scale watersheds with different soils and management (23 sites)
- 2005: Simulated rainfall runoff experiments in North Central Wisconsin (Marshfield).

Research Base for P Index

- Analysis of soils from throughout Wisconsin for relationships between soil test P, water-soluble P, soil total P, soil properties, and soil P stratification (106 profiles).
- Simulated rainfall runoff trials with different managements and soils (335 plot events).
- Small plot replicated long-term natural runoff collectors with different managements and soils (72 plots)



Snap Plus and the P Index

Update and Impact