Update from the Ag Land Use Loading Rate Steering Committee

Draft Agriculture Relative Load Ratio Estimates (07/15/15)

Land Use	Manure	Relative N Loadings (leach. + runoff)	Notes & Updates	Relative P Loadings (sediment-attached P)	Relative P Loadings (dissolved P)	Relative Sediment Loadings (runoff)
Corn grain	No	1.00		1.00	1.00	1.00
Corn silage	No	1.09	in review			
Corn grain	Yes	1.27	likely increase			
Corn silage	Yes	1.59	in review			
Soybean, full seas.	No	0.88	likely decrease	Variability between landuses will be captured as a function of LRseg-based RUSLE2 erosion estimates, so no further relative ratios are proposed.	Variability between landuses will be captured as a function of LRseg-based APLE dissolved P estimates, so no further relative ratios are proposed.	Variability between landuses will be captured as a function of LRseg-based RUSLE2 erosion estimates, so no further relative ratios are proposed.
Small grain & Soybean	No	0.82				
Small grain & Forage	Yes	0.95				
Other Agronomic	Yes	0.55				
Legume or mixed Hay	Yes	0.16				
Grass or other Hay	Yes	0.14				
Pasture	Yes	0.11	in review			
Ag Open Space	No	0.04				
Special Crops, high	Yes	1.41				
Special Crops, low	Yes	0.32				

The Steering Committee has reservations about the old RUSLE rates for pasture and hay relative to cropland (too high) and would like to review the new RUSLE2 rates to ensure better relative representation of these land uses in P6.

Pasture/Hay Literature Review

J. Cropper

Parameter	Units	Average Loading Rates				Ratios to Pasture
		Pasture		Other Hayland		
		Range	(Mean)	Range	(Mean)	
Dissolved P	(lbs/ac)	0.10 - 1.3	(0.70)	0.30 - 0.83	(0.64)	0.91
Total P	(lbs/ac)	0.10 - 1.8	(0.95)	0.32 - 0.91	(0.70)	0.74
Sediment	(lbs/ac)	50 - 200				
Total N	(lbs/ac)	1.3 - 3.84			0.52	0.20

References:

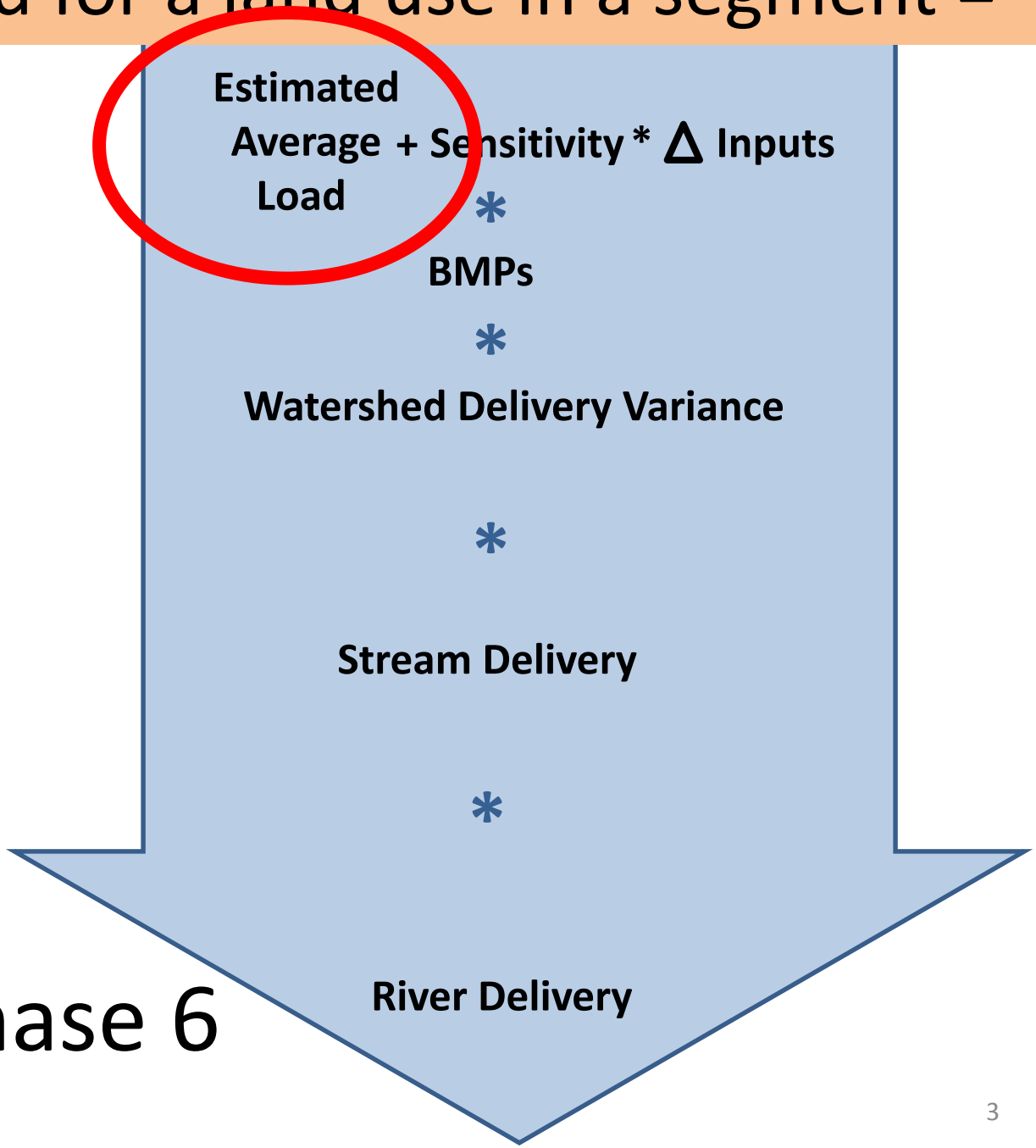
Kilmer, V. J., J. W. Gilliam, J. F. Lutz, R. T. Joyce, and C. D. Eklund. 1974. Nutrient Losses from Fertilized Grassed Watersheds in Western North Carolina. J. Environ. Quality, 3:214-219.

McMullen, R.L. and K.R. Brye. 2012. Leachate Water Quality from Pasture Soil after Long-term Broiler Litter Applications. Wayne E. Sabbe Arkansas Soil Fertility Studies. AAES Research Series 608. pp. 28.

Owens, L. B. and M. J. Shipitalo. 2006. Surface and Subsurface Phosphorus Losses from Fertilized Pasture Systems in Ohio. J. Environ. Qual. 35:1101 -1109.

Vadas, P. A., D. L. Busch, J. M. Powell, and G. E. Brink. 2014. Monitoring runoff from cattle-grazed pastures for a phosphorus loss quantification tool. Agriculture, Ecosystems and Environment 199 (2015) 124-131.

Load for a land use in a segment =



Phase 6

TN Target Development

Decision Point #1

Global Model:
e.g. Sparrow

Crop
25 Lbs/A/Yr

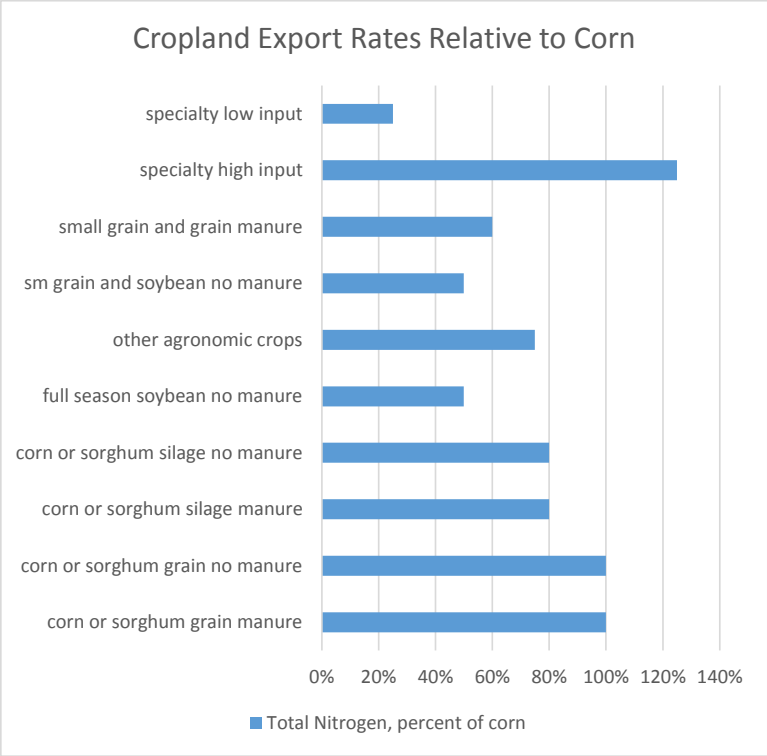
Pasture
20 Lbs/A/Yr

Urban
10 Lbs/A/Yr

Natural
2 Lbs/A/Yr

Decision Point #2

Land use specific information:
Literature and models



Decision Point #3

Map the land uses

Crop

Hay

Pasture

Level 3
2.1.1.1 Grain - fallow
2.1.1.2 Grain - fall sm grain
2.1.1.3 Silage - fallow
2.1.1.4 Silage - fall sm grain
2.1.2.1 Fall fallow
2.1.2.2 Fall sm grain
2.1.3.1 Sm grain - Dbl Crop Beans
2.1.3.2 Forage
2.1.3.3 Sm grain - fallow
2.1.4.1 Grain - fallow
2.1.4.2 Grain - fall sm grain
2.1.4.3 Silage - fallow
2.1.4.4 Silage - fall sm grain
2.1.2.1 Fall fallow
2.1.2.2 Fall sm grain
2.1.5.1 Sm grain - Dbl Crop Beans
2.1.5.2 Forage
2.1.5.3 Sm grain - fallow
2.2.1.1 Alfalfa and Other Legumes with manure
2.2.1.2 Alfalfa and Other Legumes without manure
2.2.2.1 Non-Legume Forage with manure
2.2.2.2 Non-legume Forage without manure
2.2.3 Pasture and pastured cropland
2.3.1.1 High nutrient input
2.3.1.2 Medium and low nutrient input
2.3.2.1 High nutrient input
2.3.2.2 Medium and low nutrient input
2.3.3.1 High nutrient input
2.3.3.2 Medium and low nutrient input
2.4.1.1 CAFO (regulated)
2.4.1.2 AFO (unregulated)
2.5.1 Impervious
2.5.2 Pervious

Annual P Loss Estimator (APLE) tool

Developed by Vadas, et al. (USDA-ARS)

Annual time step

Excel-based model

Edge-of-field estimation

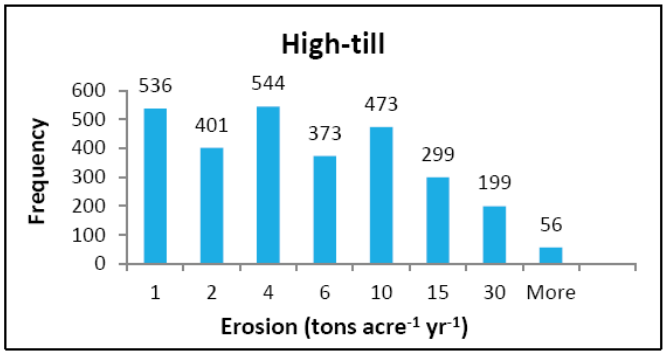
Simulates sediment and dissolved P surface losses from soil, manure, and fertilizer sources

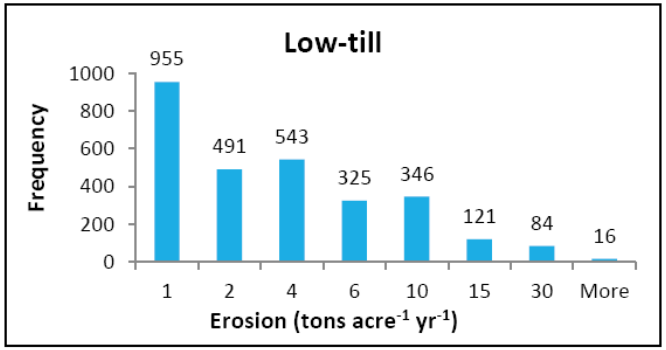
- Sediment P + Dissolved P = Total P loss

Minimal subsurface loss or leaching to groundwater simulated

APLE input assumptions (v.5.3.2)

Land Use	Summary Statistic	Annual Runoff (inches)	Annual Erosion (tons acre^{-1})
HWM	Mean	3.46	6.19
	Median	2.74	3.78
	Range	1.15 x 10^{-2} – 20.3	1.18 x 10^{-3} – 73.0
LWM	Mean	2.31	3.70
	Median	1.67	1.99
	Range	0.01 – 17.21	1.15 x 10^{-4} – 47.8
PAS	Mean	2.22	1.64
	Median	1.54	0.525
	Range	0.98 x 10^{-2} – 17.0	1.0 x 10^{-6} – 60.





Excerpt from Section 9 of the Watershed Model Documentation (2010) on the use of the NRI RUSLE.

State	Conventional Tillage Crop (tons/ac)	Conservation Tillage Crop (tons/ac)	Pasture (tons/ac)	Hay (tons/ac)	Forest (tons/ac)
Average	5.92	3.55	1.53	1.52	0.26
Standard Deviation	4.19	2.51	2.12	1.07	0.1
Maximum	24.47	14.68	11.5	6.27	0.6
Minimum	0.09	0.06	0.02	0.02	0.13
Median	4.96	2.97	0.76	1.27	0.26
Ratio Relative to Conventional Till	1.00	0.60	0.26	0.26	0.04
Ratio Relative to Cropland	1.00		0.32	0.32	0.05