Tillage Panel

Recommendations for High Residue Minimum Soil Disturbance (HRMSD)

November 6, 2014

Phosphorus

APEL Runs

	Coastal Plain		Piedmont		Ridge and Valley		Plateau	
STP	H	VH	H	VH	H	VH	H	VH
% change CT to NT	**-48%**	**108%**	**-56%**	**-16%**	**-57%**	**-16%**	**-60%**	**-31%**

- Major impact of STP and of soil loss / slope

Phosphorus Literature

Citation	Location	Particulate P	Dissolved P	Subsurface P	Total P
		% change Conservation-T to NT			
Benham, 2007	Ridge and Valley				-23%
Verbree, 2010	Ridge and Valley	-73%	333%		-5%
Kleinman 2002	PA				147%
Andraski, 1985	Wisconsin (silt loam)		57%		-15%
Bundy, 2001	*no manure*		-60%		-35%
Wisconsin (silt loam soils (2))	*with manure*		0%		-80%
Kimmelll et al.,	Woodson sl, Ottawa KS 1.5% slope				-56%
Kleinman, 2009	PA Plateau	5%	80%	71%	10%
Quincke 2007	Nebraska, 2 and 3% slope	14%	0%		9%
Sharpley 1991	OK, TX				-32%
Staver, 2004	Coastal Plain	-65%	421%		238%
Ross, et al , 2001	Coastal Plain				-87%
			Median, all sites		-19%

Phosphorus

Recommendation:
Coastal Plain: 5.0% of TP - No Manure fraction
Uplands : 10.0% of TP - No Manure fraction

- No P reduction credited on land receiving manures
- Conservative reductions on the remainder due to uncertainty
- Application of reduction efficiencies will be based on the fraction of manured acres in each county (USDA Census of Agriculture)

Nitrogen

	% change Conserv-Till to HRMSD (NT)				
Literature Citation	Nitrate	Ammonium	Organic	TN	Location
Menelik, G., R. Reneau, D. Martens, T. Simpson, G. Hawkins. 1990. Effects of tillage and nitrogen fertilization on nitrogen losses from soil used for corn. VPT-VWRRC-Bul 167. Virginia Tech, Blacksburg, VA.				**-19%**	Virginia, Ridge and Valley and Coastal Plain
Shipitalo et al. 2013. Effect of No-Till and Extended Rotation on Nutrient Losses in Surface Runoff. Soil Sci. Soc. Am. J. 77:1329–1337	-20%			**0%**	Ohio, silt loam soils
McDowell, L. L.; McGregor, K. C. Nitrogen and phosphorus losses in runoff from no-till soybeans. Transactions of the ASAE 1980 Vol. 23 No. 3 pp. 643-648				-90%	Loess soils in MS
Eghball and Gilley. 1999. Phosphorus and nitrogen in runoff following beef cattle manur or compost application. JEQ 28:1201-1210				-24%	Nebraska, Sharpsburg silty clay loam
Tolbert et al. 1995. Management effects on nitrogen and phosphorus losses on expansive clay soils				-74%	Texas

Nitrogen

Recommendation:
Coastal Plain: 2.25% of TN
Uplands : 5.25% of TN

- Represents a conservative overall reduction of 15%
- Not applicable to the proportion of N moving via subsurface pathways, HGMR ground water partitioning coefficients applied to N reductions applied to the estimated 15% decrease in surface losses. Efficiency adjusted based on HGMR ground water partitioning -15% * 0.15 for Coastal Plain and 15% * 0.35 for Uplands
- Application of reduction efficiencies will be based on the fraction of manured acres in each county (USDA Census of Agriculture)

Panel Proposed HRMSD BMP	
Total N Uplands High-Residue Minimum Soil-Disturbance Low-Till → HRMSD (Stackable) Load Reduction Efficiency above CT **5.25% No Manure Fraction*** **0.00% Manure Fraction**	Total N Coastal Plain High-Residue Minimum Soil-Disturbance Low-Till → HRMSD (Stackable) Load Reduction Efficiency above CT **2.25% No Manure Fraction*** **0.00% Manure Fraction**
Total P Uplands High-Residue Minimum Soil-Disturbance Low-Till → HRMSD (Stackable) Load Reduction Efficiency above CT **10.0% No Manure Fraction** **0.00% Manure Fraction**	Total P Coastal Plain High-Residue Minimum Soil-Disturbance Low-Till → HRMSD (Stackable) Load Reduction Efficiency above CT **5.0% No Manure Fraction** **0.00% Manure Fraction**
TSS Uplands High-Residue Minimum Soil-Disturbance Low-Till → HRMSD (Stackable) Load Reduction Efficiency above CT **64.0% No Manure and Manure Fraction**	TSS Coastal Plain High-Residue Minimum Soil-Disturbance Low-Till → HRMSD (Stackable) Load Reduction Efficiency above CT **64.0% No Manure and Manure Fraction**

* panelist comment

Panelist Comment

A panelist suggested application of HGMR ground water coefficient to modeled nitrate fraction of TN instead of applying it to overall TN

Apply the USGS-based coefficient for surface and subsurface water flow partitioning to only the nitrate portion (model assumes that 53.05% of TN is nitrate) and credit the full 15% reduction to the remainder of the TN (46.95%)

As an example, here is how this would be calculated for upland areas:(15% X 0.5305) = 7.96% then (7.96% X 0.35) = 2.785% reduction for nitrate. Plus (15% X.4695) = 7.04% reduction for organic and ammonia fractions for a total of 9.83%

The recommendation would be for reductions from TN of **8.23%** in the Coastal Plain and **9.83%** in the other HGMR's on non-manured acres.