Panelist	Academic	Program	Modeling
Andy Clark, SARE	X	X	
Barbara Elliott, W Va Agr.		X	
Charlie White, PA St.	X		X
Chris Lawrence, NRCS VA	X	X	
Dean Hively, USGS	X	X	
Patricia Brown, NRCS WVa	X	X	
Jack Meisinger (Chair), USDA-ARS	X		
Jamie Ulrich, PA Agr.		X	
Ken Staver, Univ MD Wye	X		X
Mark Goodson, NRCS PA			
Paul Salon, NRCS NY	X		
Quirine Ketterings, Cornell	X		
Ray Weil, Univ MD CP	X		
Robert Baldwin , DE DNRC		X	
Ron Hoover, PA St.	X	X	
Sjoerd Duiker, PA St.	X		
Royden Powell, MDA			
Tim Sexton, VA DNR		X	X
Wade Thomason, VA Tech	X		

Current Cover Crop N Reduction Efficiencies

Total Nitrogen Estimates

Coastal Plain/Piedmont Crystalline/Karst Settings

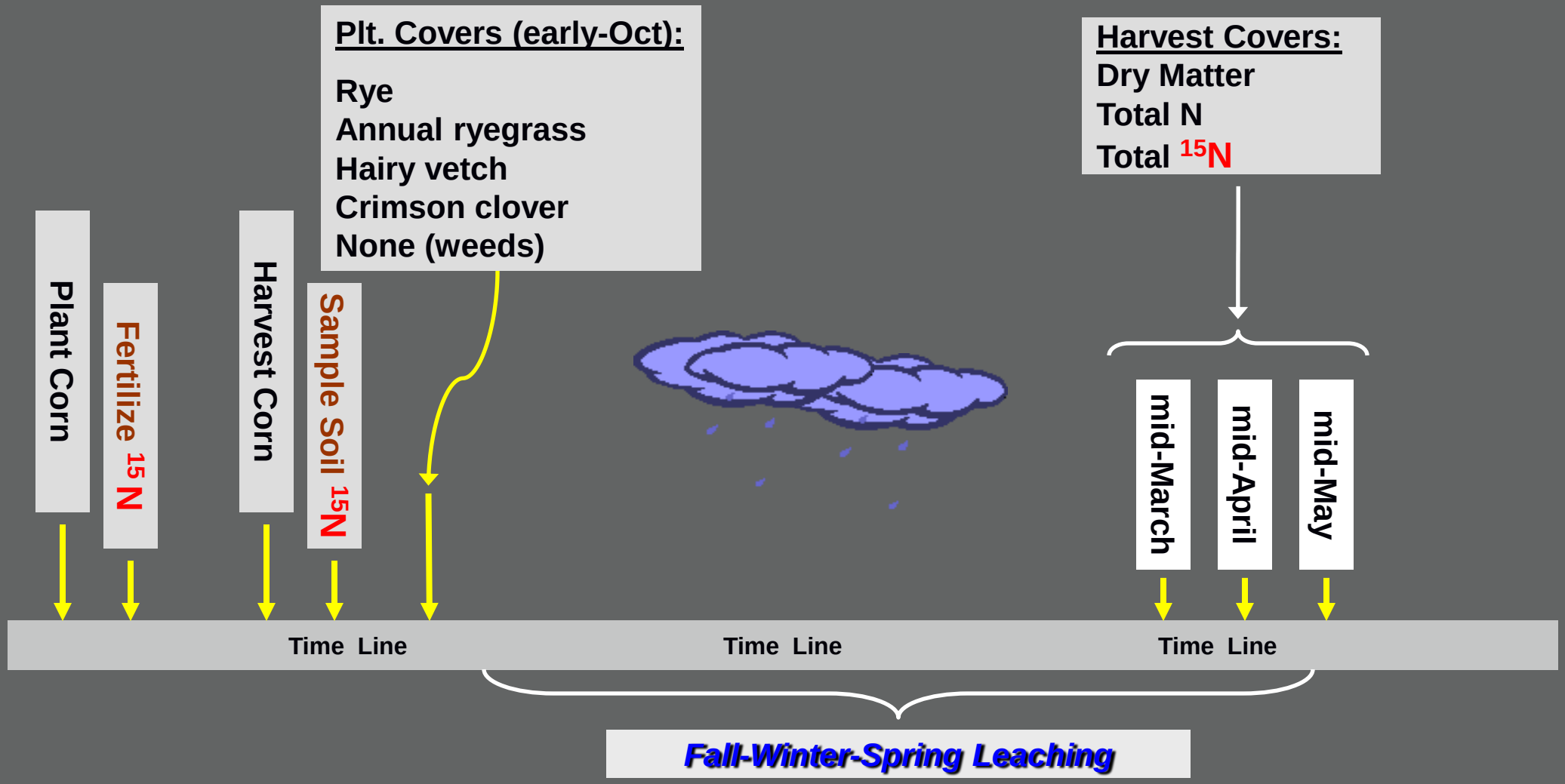
Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn		Drilled		Other		Aerial/soy		Aerial/corn		Drilled		Other		Aerial/soy		Aerial/corn	
Species:	**Rye**		**Rye**		**Rye**		**Rye**		**Wheat**		**Wheat**		**Wheat**		**Wheat**		**Barley**		**Barley**		**Barley**		**Barley**	
Till:	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
Early planting	**0.45**	**0.45**	0.38	0.38	0.31	0.31	0.18	0.18	0.31	0.31	0.27	0.27	0.22	0.22	0.12	0.12	0.38	0.38	0.32	0.32	0.27	0.27	0.15	0.15
Normal planting	**0.41**	**0.41**	0.35	0.35	NA	NA	NA	NA	0.29	0.29	0.24	0.24	NA	NA	NA	NA	0.29	0.29	0.24	0.24	NA	NA	NA	NA
Late planting	0.19	0.19	0.16	0.16	NA	NA	NA	NA	0.13	0.13	0.11	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Mesozoic Lowlands/Valley and Ridge Siliciclastic

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn		Drilled		Other		Aerial/soy		Aerial/corn		Drilled		Other		Aerial/soy		Aerial/corn	
Species:	**Rye**		**Rye**		**Rye**		**Rye**		**Wheat**		**Wheat**		**Wheat**		**Wheat**		**Barley**		**Barley**		**Barley**		**Barley**	
Till:	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
Early planting	**0.34**	**0.34**	0.29	0.29	0.24	0.24	0.14	0.14	0.24	0.24	0.2	0.2	0.17	0.17	0.1	0.1	0.29	0.29	0.25	0.25	0.2	0.2	0.12	0.12
Normal planting	**0.31**	**0.31**	0.27	0.27	NA	NA	NA	NA	0.22	0.22	0.19	0.19	NA	NA	NA	NA	0.22	0.22	0.19	0.19	NA	NA	NA	NA
Late planting	0.15	0.15	0.12	0.12	NA	NA	NA	NA	0.1	0.1	0.09	0.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Which Cover Crops Conserve Residual N after Corn?

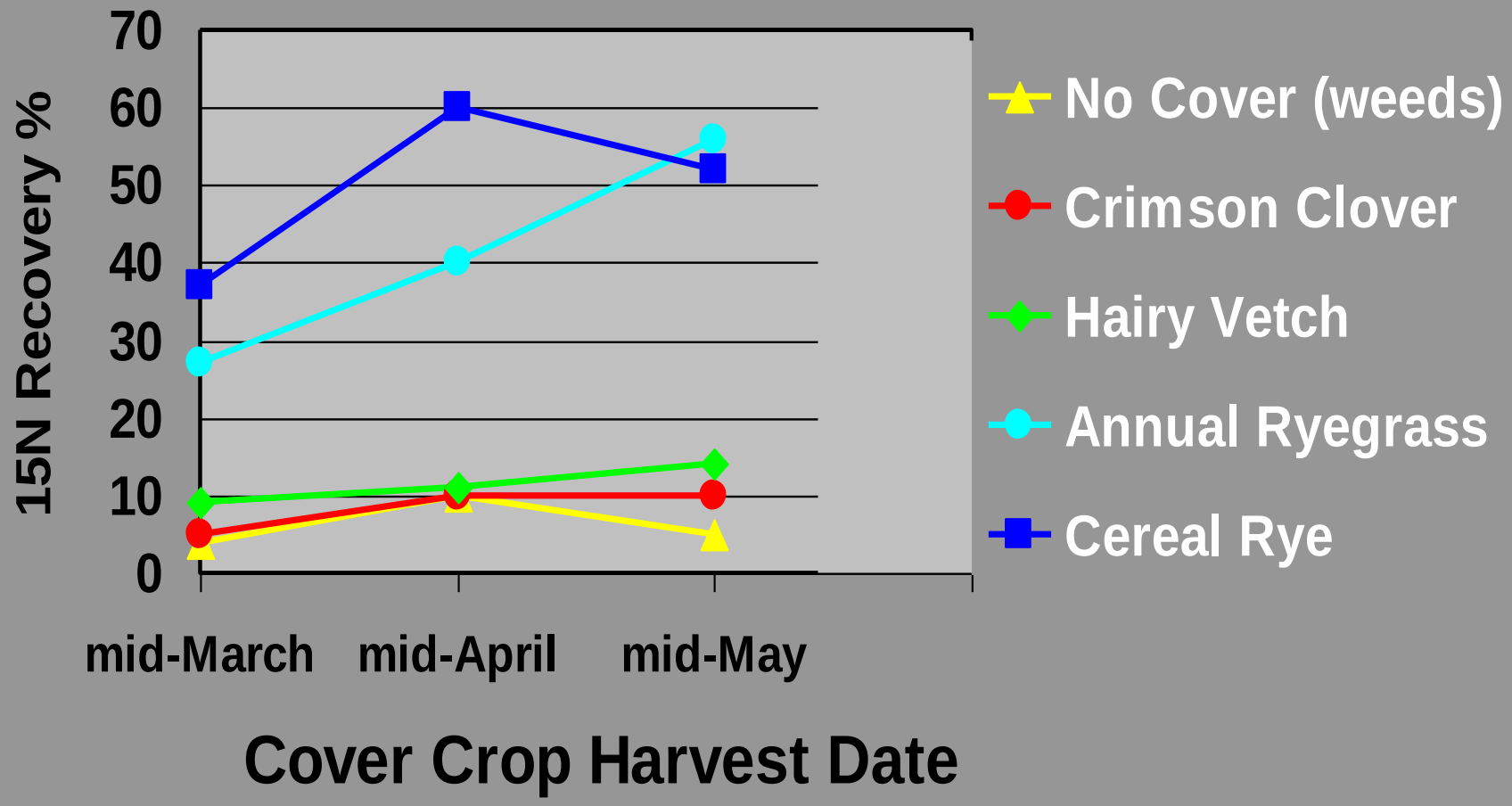
(Shipley, Meisinger, Decker - 1992)



N Conservation = Corn Fertilizer N (^{15}N) Recovered by Covers

Which Cover Crops Conserve Residual N after Corn?

(Shipley, Meisinger, Decker - 1992)



Example of Data Summary for Legumes

Summary of CC N Reduction Efficiency Literature for Legumes and Legume-Grass Mixtures			
Literature Citation	**Notes**	**Plt. Date**	**Har. Date**
	Poplar Hill, MD; Lower Eastern Shore		
Shipley, P.R., J.J.Meisinger, and A.M. Decker. 1992. Conserving residual corn fertilizer nitrogen with winter cover crops. Agron. J. 84(5): 869-876.	**Mattapex silt loam**, mod. well-drained; shallow water table, 336 kg N/ha 15N fert corn, stalks disked 2X then NT plt, No fall fert N, four covers and a control, Abruzzi rye, Marshall ryegrass, Dixie Crimson Clover, Hairy Vetch, and a weed control (chickweed). Used Above-grd 15N in covers as % of fall soil 15N, data from **Table 3, Harvest II, 336 kg N/ha, 1987 & 1988 divided by (% of TN in shoots) fr. p.875)**	Sept. 22, 1986 Oct. 5, 1987	April 20, 1987 April 14, 1988 Avg.
Ranells, N.N. and M.G. Wagger. 1997. Nitrogen-15 recovery and release by rye and crimson clover cover crops. Soil Sci. Soc. Am. J. 61:943-948.	Kinston NC: Coastal Plain, **Norfolk loamy sand**, very well drained, sandy clay loam subsoil, no water table mentioned, Prev. corn crop fert. @ 150 kg N/ha, field micro-plots 2mX3m fert with 50 kg $^{15}NO_3$-N /ha from KNO_3 approx. 1 wk after planting. Species were (varieties not given) rye, crimson clover, and rye + crimson clover mix. All covers sampled in mid-April (samples in Dec & March not used due to v. small harvest area). **Used above-grd 15N in covers as % recovery of fall applied 15N from Table 2, for 1992-93 and 1993-94 seasons.**	Oct. 8, 1992 Oct. 1, 1993	~ April 15, 1993 ~ April 15, 1994

Example of Data Summary for Legumes

Blue font = literature useful for general views, but not suitable for numeric data	
Literature Citation	**Notes**
Gabreil, J.L. and M. Quemada. 2011. Replacing bare fallow with cover crops in a maize cropping system: Yield, N uptake and fertiliser fate. European J. Agronomy 34: 133-143.	Irrigated corn for grain with ~210 kg 15N/ha from enriched NH4NO3 followed by unfertilized covers of vetch or barley. Mediterannean climate, calcarious silt loam soil. Used micro plot, measured soil 15N after corn and before cover planting and 15N uptake of covers in spring, including roots. The 3-yr avg cover crop recovery of the fall 15N to 1.2m deep in the soil was vetch only 1.2% and barley 10.6%. **Therefore, these data support the fact that legumes are quite poor recyclers of fall N, even in a much different climate and soil than MD.**
Feaga, J.B., J.S. Selker, P.D. Richard, and D.D. Hepmhill. 2010. Long-term nitrate leaching under vegetable production with cover crops in the Pacific Northwest. Soil Sci. Soc. Am. J. 74:186-195.	An 11-year study of deploying a cover crop vs. fallow after vegtables in OR. Vegetables were sweet corn, brocoli, or snap beans in any year with only one vegetable grown each year. Had 3 N rates: none, a normal Ext. Recc. Rate, and one rate inbeteween. Only had one cover crop treatement each year that was compared to fallow each year. Cover crops were either rye, triticale, or a vetch-triticale mix. The cover crops were thus confounded with years and provide only a crude comparison of the effect of cover crops. Leaching was well monitored w/ large (0.31m X 0.85m) passive capillary wick lysimeterplates at a depth of 1.2m. **The only useful ~comparison was that the NO3-N conc. in the drainage below the grass covers (rye or triticale) 9-yr avg. was 34% less than w/out a cover, while the mix (vetch-triticale) averaged 19% less than w/out a cover. So the mixture performed approx. half as well as the pure grasses.**

Example of Data Summary for Legumes

Summary of CC N Reduction Efficiency Literature for Legumes and Legume-Grass Mixtures			
Literature Citation	**Notes**	**Plt. Date**	**Har. Date**
	Poplar Hill, MD; Lower Eastern Shore		
Shipley, P.R., J.J.Meisinger, and A.M. Decker. 1992. Conserving residual corn fertilizer nitrogen with winter cover crops. Agron. J. 84(5): 869-876.	**Mattapex silt loam**, mod. well-drained; shallow water table, 336 kg N/ha 15N fert corn, stalks disked 2X then NT plt, No fall fert N, four covers and a control, Abruzzi rye, Marshall ryegrass, Dixie Crimson Clover, Hairy Vetch, and a weed control (chickweed). Used Above-grd 15N in covers as % of fall soil 15N, data from **Table 3, Harvest II, 336 kg N/ha, 1987 & 1988 divided by (% of TN in shoots) fr. p.875)**	Sept. 22, 1986 Oct. 5, 1987	April 20, 1987 April 14, 1988 Avg.
Ranells, N.N. and M.G. Wagger. 1997. Nitrogen-15 recovery and release by rye and crimson clover cover crops. Soil Sci. Soc. Am. J. 61:943-948.	Kinston NC: Coastal Plain, **Norfolk loamy sand**, very well drained, sandy clay loam subsoil, no water table mentioned, Prev. corn crop fert. @ 150 kg N/ha, field micro-plots 2mX3m fert with 50 kg $^{15}NO_3$-N /ha from KNO_3 approx. 1 wk after planting. Species were (varieties not given) rye, crimson clover, and rye + crimson clover mix. All covers sampled in mid-April (samples in Dec & March not used due to v. small harvest area). **Used above-grd 15N in covers as % recovery of fall applied 15N from Table 2, for 1992-93 and 1993-94 seasons.**	Oct. 8, 1992 Oct. 1, 1993	~ April 15, 1993 ~ April 15, 1994

Example of Data Summary for Legumes

Percent Recovery of 15N in above-ground DM						Percent Recovery relative to Rye				
Rye	Ann. Ryegr.	Hairy Vetch	Crimson Cl.	Weeds	Other	Rye	Ann. Ryegr.	Hairy Vetch	Crimson Cl.	Other
51%	An. Ryegr. Tab	18%	11%	4%	NA	1.000	An. Ryegr. Tab	0.351	0.222	
69%	An. Ryegr. Tab	6%	8%	14%	NA	1.000	An. Ryegr. Tab	0.080	0.108	
60%		**12%**	**9%**	9%		**1.000**		**0.216**	**0.165**	

Rye			Crimson Cl.	Rye-Crimson Clover Mix	Rye			Crimson Cl.	Rye-Crimson Clover Mix
35%			4%	13%	1.000			0.114	0.371
42%			3%	24%	1.000			0.071	0.571
39%			**4%**	**19%**	**1.000**			**0.093**	**0.471**

Average (all Pure Legumes) % Recovery Relative to Rye: 0.158

Example of Data Summary for Legumes

Total Nitrogen Estimates

Coastal Plain/Piedmont Crystalline/Karst Settings

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn		High Soil contact, drilled etc.		Low Soil contact, aerial etc.		High Soil contact, drilled etc.		Low Soil contact, aerial etc.	
Species:	**Rye**		**Rye**		**Rye**		**Rye**		**Legumes (all)**	**Legumes (all)**	Legumes (all)	Legumes (all)	**Legume plus grass mixture**	**Legume plus grass mixture**	Legume plus grass mixture	Legume plus grass mixture
Till:	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
Early planting	**0.45**	**0.45**	0.38	0.38	0.31	0.31	0.18	0.18	**0.07**	**0.07**	NA ?	NA ?	**0.26**	**0.26**	NA ?	NA ?
Normal planting	**0.41**	**0.41**	0.35	0.35	NA	NA	NA	NA	**0.06**	**0.06**	NA	NA	**0.24**	**0.24**	NA	NA
Late planting	0.19	0.19	0.16	0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
									value = 0.158*0.45=0.07				**Avg (0.07 & 0.45) = 0.26**			
													(Check w/ NC Rye & Crim Cl. Mix: 0.21)			

Mesozoic Lowlands/Valley and Ridge Siliciclastic

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn		High Soil contact, drilled etc.		Low Soil contact, aerial etc.		High Soil contact, drilled etc.		Low Soil contact, aerial etc.	
Species:	**Rye**		**Rye**		**Rye**		**Rye**		**Legumes (all)**	**Legumes (all)**	Legumes (all)	Legumes (all)	**Legume plus grass mixture**	**Legume plus grass mixture**	Legume plus grass mixture	Legume plus grass mixture
Till:	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
Early planting	**0.34**	**0.34**	0.29	0.29	0.24	0.24	0.14	0.14	**0.05**	**0.05**	NA ?	NA ?	**0.20**	**0.20**	NA ?	NA ?
Normal planting	**0.31**	**0.31**	0.27	0.27	NA	NA	NA	NA	**0.05**	**0.05**	NA	NA	**0.18**	**0.18**	NA	NA
Late planting	0.15	0.15	0.12	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
									value = 0.158*0.34=0.05				**Avg (0.05 & 0.34) = 0.20**			

Example of Data Summary for Triticale & Oats

Small Grain Forage Variety Test, 1994-2010, Northern Piedmont AREC, Orange, Va. Source: email of 8-12-2013, from Wade Thomason.

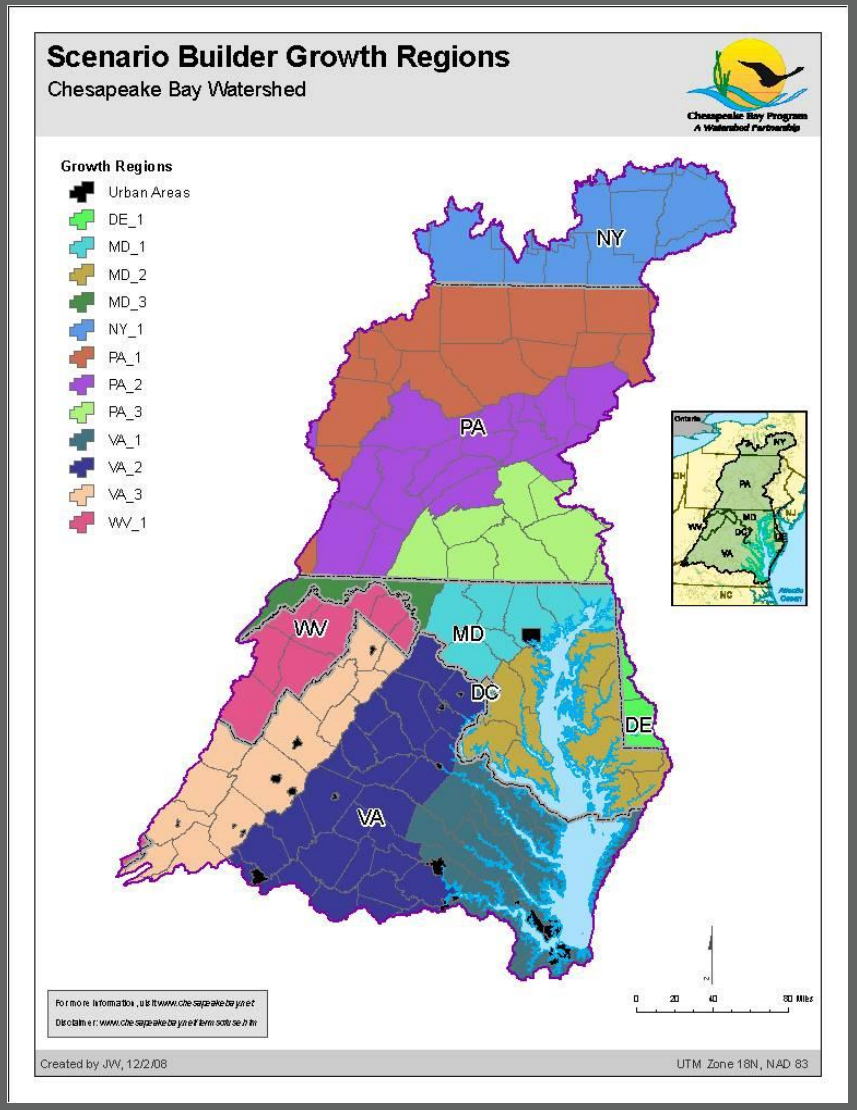
Species	Cultivar	Harvest Date	No. Years	Dry Matter tons/ac	TN Uptake lbs N/ ac	Dry Matter Rel. to Rye	TN Uptake Rel. to Rye
Rye	Wheeler	mid-late April	11	4.05	183.86	1.00	**1.00**
Triticale	Trical 102	mid-late April	6	3.88	160.67	0.96	**0.87**
Wheat	Sisson	mid-late April	8	3.19	164.43	0.79	0.89
Barley	Nomini	mid-late April	9	3.07	131.27	0.76	0.71
Oats	SS 76-30	mid-late April	11	2.40	101.79	0.59	**0.55**

Cover Crop Panel Status, 8-12-2013

Species	Current Status	Remaining Action
Legumes (all)	Almost complete	Panel Approval & Write-up
Legume + Grass Mix	Almost complete	Panel Approval & Write-up
Triticale	Almost complete	Panel Approval & Write-up
Annual Ryegrass	Almost complete	Panel Approval & Write-up
Oats	In Progress	Complete & Approval & Write-up
Forage Radish	In Progress	Complete & Approval & Write-up
Forage Radish + Grass Mix	In Progress	Complete & Approval & Write-up
Unspecified Grasses	Almost complete	Panel Approval & Write-up

Thoughts on Phase 6 “Wish List”

Greater spatial resolution:



- Update P and Sediment Efficiencies
- Add Soil Properties, texture, slope
- Estimate residual N at end of season
- Allow accumulation of nutrients in soil