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		

Q4: Did the panel alter the way existing cover crop species receive credit?

A4: No. The expert panel recommended that the current cover crop species be simulated in the same way they have historically been simulated using the Phase 5.3.2 Watershed Mod

Q5: What does a jurisdiction need to report in order to receive credit for cover crop species?

A5: Jurisdictions should report the following information:

- **Cover Crop Type: Species of cover crop**
- **Planting Method: Aerial, Drilled, Other**
- **Planting Time Period: Early, Standard, Late**
- **Crop preceding Cover Crop: Corn, Soybean**
- **Acres: Number of acres with reported species within geographic reporting unit**
- **Location: Approved NEIEN geographies: County; County (CBWS Only); Hydrologic Unit Code (HUC12, HUC10, HUC8, HUC6, HUC4), State (CBWS Only)**
- **Date of Implementation: Year cover crop was planted**

Current Cover Crop N Reduction Efficiencies

Total Nitrogen Estimates

Coastal Plain/Piedmont Crystalline/Karst Settings

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	Rye		Rye		Rye		Rye	
Till:	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
Normal planting	0.41	0.41	0.35	0.35	NA	NA	NA	NA
Late planting	0.19	0.19	0.16	0.16	NA	NA	NA	NA

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	Wheat		Wheat		Wheat		Wheat	
Till:	High	Low	High	Low	High	Low	High	Low
Early planting	0.31	0.31	0.27	0.27	0.22	0.22	0.12	0.12
Normal planting	0.29	0.29	0.24	0.24	NA	NA	NA	NA
Late planting	0.13	0.13	0.11	0.11	NA	NA	NA	NA

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	Barley		Barley		Barley		Barley	
Till:	High	Low	High	Low	High	Low	High	Low
Early planting	0.38	0.38	0.32	0.32	0.27	0.27	0.15	0.15
Normal planting	0.29	0.29	0.24	0.24	NA	NA	NA	NA
Late planting	NA	NA	NA	NA	NA	NA	NA	NA

Mesozoic Lowlands/Valley and Ridge Siliciclastic

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	Rye		Rye		Rye		Rye	
Till:	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
Normal planting	0.31	0.31	0.27	0.27	NA	NA	NA	NA
Late planting	0.15	0.15	0.12	0.12	NA	NA	NA	NA

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	Wheat		Wheat		Wheat		Wheat	
Till:	High	Low	High	Low	High	Low	High	Low
Early planting	0.24	0.24	0.2	0.2	0.17	0.17	0.1	0.1
Normal planting	0.22	0.22	0.19	0.19	NA	NA	NA	NA
Late planting	0.1	0.1	0.09	0.09	NA	NA	NA	NA

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	Barley		Barley		Barley		Barley	
Till:	High	Low	High	Low	High	Low	High	Low
Early planting	0.29	0.29	0.25	0.25	0.2	0.2	0.12	0.12
Normal planting	0.22	0.22	0.19	0.19	NA	NA	NA	NA
Late planting	NA	NA	NA	NA	NA	NA	NA	NA

Practice Definition

The new cover crop species will be added within the existing Traditional Cover Crop definition, no modifications of the existing definition are being recommended at this time.

This practice is recommended for revision because the existing species of rye, wheat, and barley do not adequately capture the diversity and extent of current cover crop practices being deployed in the Watershed.

The purpose of this revision is to allow the Bay Model to better represent current cover crop cultural practices and acreages, which have significantly expanded since 2007 when the Cover Crop BMP was last revised.

The purpose of the cover crop practice is to reduce nutrient losses to ground and surface water by sequestering them in a short-term crop grown after the main cropping season. The sub-categories are the cover crop species, the planting time, and the seeding method.

This practice meets the criteria standards under the USDA-NRCS National Handbook of Conservation Practices (NHCP)

Cover Crop Expert Panel Draft Recommendations for Phase 5.3.2

Addition of New Cover Crop Species with Nitrogen Reduction Efficiencies

New Cover Crop Species Proposed:

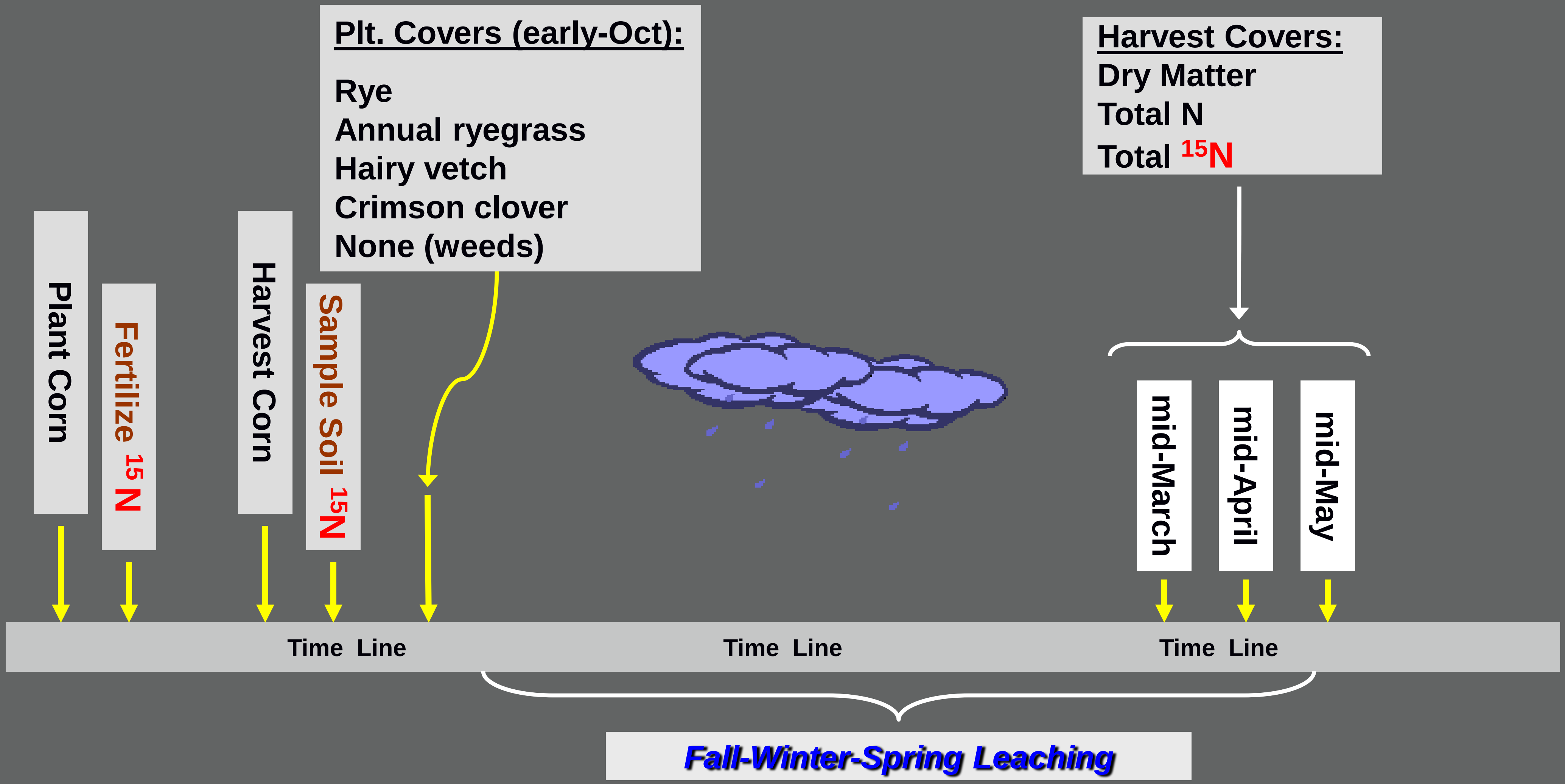
- **Annual Ryegrass**
- **Annual Legumes**
- **Annual Legume plus Grass Mixtures**
- **Brassica (winter hardy)**
- **Forage Radish**
- **Forage Radish plus Grass Mixtures**
- **Triticale**
- **Oats (winter hardy)**
- **Oats (winter killed)**

Q2: Why is there no credit given for phosphorus or sediment for the new cover crops species?

A2: As of publication of this document, the panel is recommending that consideration of phosphorus and sediment reductions for the new species will take place at a later time, due to the lack of data on the effect of cover crops on phosphorus and sediment losses. The panel's final Phase 5.3.2 report will therefore address nitrogen, and will consider phosphorus and sediment reductions for all species at a later time, most likely when the expanded modeling expertise with the NRCS APEX model is available.

Which Cover Crops Conserve Residual N after Corn?

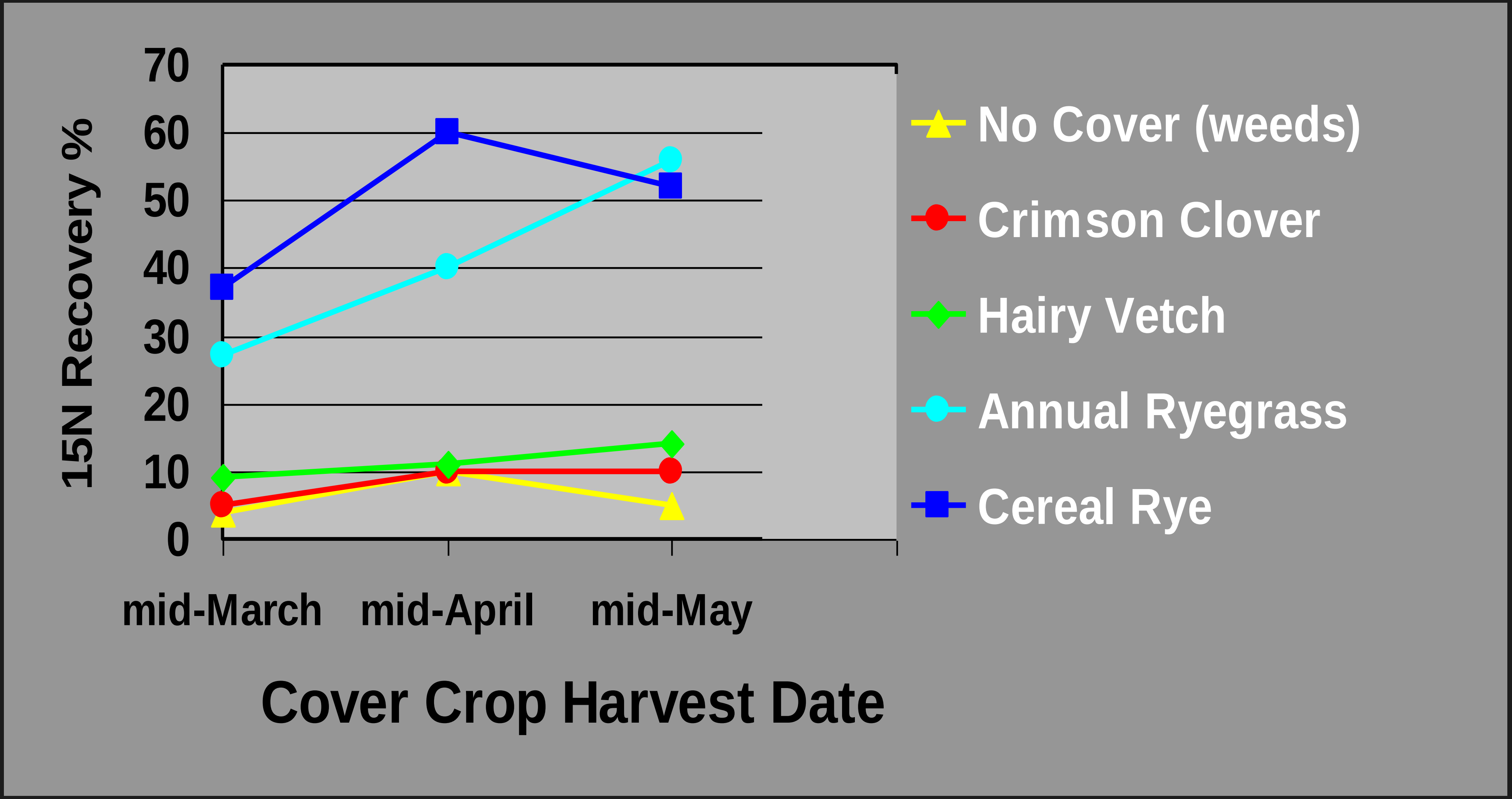
(Shipley, Meisinger, Decker - 1992)



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
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.	Poplar Hill, MD; Lower Eastern Shore **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

Rye	Ann. Ryegr.	Hairy Vetch	Crimson Cl.	Weeds	Other
51%	An. Ryegr. Tab	18%	11%	4%	NA
69%	An. Ryegr. Tab	6%	8%	14%	NA
60%		**12%**	**9%**	9%	

Percent Recovery relative to Rye

Rye	Ann. Ryegr.	Hairy Vetch	Crimson Cl.	Other
1.000	An. Ryegr. Tab	0.351	0.222	
1.000	An. Ryegr. Tab	0.080	0.108	
1.000		**0.216**	**0.165**	

Rye	Crimson Cl.	Rye-Crimson Clover Mix
35%	4%	13%
42%	3%	24%
39%	**4%**	**19%**

Rye	Crimson Cl.	Rye-Crimson Clover Mix
1.000	0.114	0.371
1.000	0.071	0.571
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**

Proposed New Species or Species Mixtures	Relative Nitrogen Reduction Efficiency (relative to rye)	Number of Individual Studies	Recommended Planting Time [1]
Annual Ryegrass	0.66	5	Early and Normal
Annual Legume	0.16	4	Early and Normal
Annual Legume + Grass	Avg. (0.16 + Grass)	NA	Early and Normal
Brassica (winter hardy)	0.70	13	Early only
Forage Radish	0.58	12	Early only
Forage Radish + Grass	0.90	24	Early and Normal
Triticale	0.86	10	Early, Normal, & Late
Oats (winter hardy)	0.55	11	Early and Normal
Oats (winter killed)	0.40	4	Early only

Triticale

Triticale is a cool season annual cereal that is a cross between wheat and rye, giving it characteristics from each parent. It serves the dual purpose roles of being a N scavenger and an erosion fighter. It grows almost as well as rye in cold months, but is easier to manage in the spring because it is less subject to the rapid spring growth, that can difficult to manage with rye.

The Panel utilized individual studies from MD, NY, PA, and VA that provided ten site-years of data for estimating the Relative N Reduction Efficiency for triticale. All studies were planted in the early- or normal-planting period and all harvests were in mid-April to early-May or in mid-May (NY), which is consistent with crop development in the spring. These studies did not include a late planting, but in the Panel's professional judgment it recommends including a late-planted category, this is the same procedure used by the last 2007 Cover Crop Panel for the late-planting category of rye and wheat (MAWQP, Cover Crop Report, 2007).

The ten site-years of triticale and rye data were summarized using a weighted average based on the number of site-years in each mean as before, which produced a final Relative N Reduction Efficiency of 0.86 for triticale that is listed in Tables 1 and 2.

Summaries of the triticale data are:

a) The MD cover crop studies with triticale were the peer-reviewed paper of Coale et al. (2001) and unpublished 2004 data from Dr. Ken Staver. Each study contributed one site-year with the Staver study reporting a Relative N Reduction Efficiency of 0.84 and the Coale et al. reporting 1.15, which indicates that triticale took up about 15% more N than rye – a fact that should be occasionally expected since rye was one of the parents of triticale.

b) The NY data are from the same unpublished 2010 NRCS cover crop planting date study that is described in the Annual Ryegrass section. The NY data were averaged across the three planting dates which produced a Relative DM Production Efficiency of 0.64 for triticale.

c) The PA data from the "Short-lived cool-season forage trial" planted in 2012 (Houser et al., 2012 & 2013) are the basis for the Estimated N Reduction Efficiency. A summarized description of this study is given in the Annual Ryegrass section. The triticale total N uptake contributed a single site-year of data having an average Relative N Reduction Efficiency of 0.70.

d) The largest triticale data set came from the Virginia small grain forage variety testing report: long-term summary (1994-2004) reported by Smith et al. (2009). The VA study received 25-30 lbs starter-N/ac in the fall and 60 lbs N/ac in the spring for all entries, including the rye reference entry. The VA data consisted of the average total N uptake for a single triticale variety and a single rye variety that were both present in 6 years of the long-term study, thus providing six site-years of data having an average Relative N Reduction Efficiency of 0.88.

Current Cover Crop N Reduction Efficiencies

Total Nitrogen Estimates

Coastal Plain/Piedmont Crystalline/Karst Settings

Seeding method:	**Drilled**		Other		Aerial/soy		Aerial/corn	
Species:	**Rye**		**Rye**		**Rye**		**Rye**	
Till:	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
Normal planting	**0.41**	**0.41**	0.35	0.35	NA	NA	NA	NA
Late planting	0.19	0.19	0.16	0.16	NA	NA	NA	NA

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	**Wheat**		**Wheat**		**Wheat**		**Wheat**	
Till:	High	Low	High	Low	High	Low	High	Low
Early planting	0.31	0.31	0.27	0.27	0.22	0.22	0.12	0.12
Normal planting	0.29	0.29	0.24	0.24	NA	NA	NA	NA
Late planting	0.13	0.13	0.11	0.11	NA	NA	NA	NA

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	**Barley**		**Barley**		**Barley**		**Barley**	
Till:	High	Low	High	Low	High	Low	High	Low
Early planting	0.38	0.38	0.32	0.32	0.27	0.27	0.15	0.15
Normal planting	0.29	0.29	0.24	0.24	NA	NA	NA	NA
Late planting	NA	NA	NA	NA	NA	NA	NA	NA

Mesozoic Lowlands/Valley and Ridge Siliciclastic

Seeding method:	**Drilled**		Other		Aerial/soy		Aerial/corn	
Species:	**Rye**		**Rye**		**Rye**		**Rye**	
Till:	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
Normal planting	**0.31**	**0.31**	0.27	0.27	NA	NA	NA	NA
Late planting	0.15	0.15	0.12	0.12	NA	NA	NA	NA

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	**Wheat**		**Wheat**		**Wheat**		**Wheat**	
Till:	High	Low	High	Low	High	Low	High	Low
Early planting	0.24	0.24	0.2	0.2	0.17	0.17	0.1	0.1
Normal planting	0.22	0.22	0.19	0.19	NA	NA	NA	NA
Late planting	0.1	0.1	0.09	0.09	NA	NA	NA	NA

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	**Barley**		**Barley**		**Barley**		**Barley**	
Till:	High	Low	High	Low	High	Low	High	Low
Early planting	0.29	0.29	0.25	0.25	0.2	0.2	0.12	0.12
Normal planting	0.22	0.22	0.19	0.19	NA	NA	NA	NA
Late planting	NA	NA	NA	NA	NA	NA	NA	NA

Proposed New Species, or Ref. Species (i.e. Rye)	Relative Nitrogen Reduction Efficiency (relative to rye)	Final Nitrogen Effectiveness for Phase 5.3.2
----------- Early planting by Drill seeding (high soil contact) -----------		
Annual Ryegrass (ARG)	0.66	0.30
Annual Legume	0.16	0.07
Annual Legume + Grass	Avg. (0.16 + Grass)	0.19 (Leg.+ ARG)
Brassica (winter hardy)	0.70	0.32
Forage Radish	0.58	0.26
Forage Radish + Grass	0.90	0.40
Triticale	0.86	0.39
Oats (winter hardy)	0.55	0.25
Oats (winter killed)	0.40	0.18
Rye (Ref. Species)	1.00	0.45

Current Cover Crop N Reduction Efficiencies

Total Nitrogen Estimates

Coastal Plain/Piedmont Crystalline/Karst Settings

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	Rye		Rye		Rye		Rye	
Till:	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
Normal planting	0.41	0.41	0.35	0.35	NA	NA	NA	NA
Late planting	0.19	0.19	0.16	0.16	NA	NA	NA	NA

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	Wheat		Wheat		Wheat		Wheat	
Till:	High	Low	High	Low	High	Low	High	Low
Early planting	0.31	0.31	0.27	0.27	0.22	0.22	0.12	0.12
Normal planting	0.29	0.29	0.24	0.24	NA	NA	NA	NA
Late planting	0.13	0.13	0.11	0.11	NA	NA	NA	NA

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	Barley		Barley		Barley		Barley	
Till:	High	Low	High	Low	High	Low	High	Low
Early planting	0.38	0.38	0.32	0.32	0.27	0.27	0.15	0.15
Normal planting	0.29	0.29	0.24	0.24	NA	NA	NA	NA
Late planting	NA	NA	NA	NA	NA	NA	NA	NA

Mesozoic Lowlands/Valley and Ridge Siliciclastic

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	Rye		Rye		Rye		Rye	
Till:	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
Normal planting	0.31	0.31	0.27	0.27	NA	NA	NA	NA
Late planting	0.15	0.15	0.12	0.12	NA	NA	NA	NA

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	Wheat		Wheat		Wheat		Wheat	
Till:	High	Low	High	Low	High	Low	High	Low
Early planting	0.24	0.24	0.2	0.2	0.17	0.17	0.1	0.1
Normal planting	0.22	0.22	0.19	0.19	NA	NA	NA	NA
Late planting	0.1	0.1	0.09	0.09	NA	NA	NA	NA

Seeding method:	Drilled		Other		Aerial/soy		Aerial/corn	
Species:	Barley		Barley		Barley		Barley	
Till:	High	Low	High	Low	High	Low	High	Low
Early planting	0.29	0.29	0.25	0.25	0.2	0.2	0.12	0.12
Normal planting	0.22	0.22	0.19	0.19	NA	NA	NA	NA
Late planting	NA	NA	NA	NA	NA	NA	NA	NA

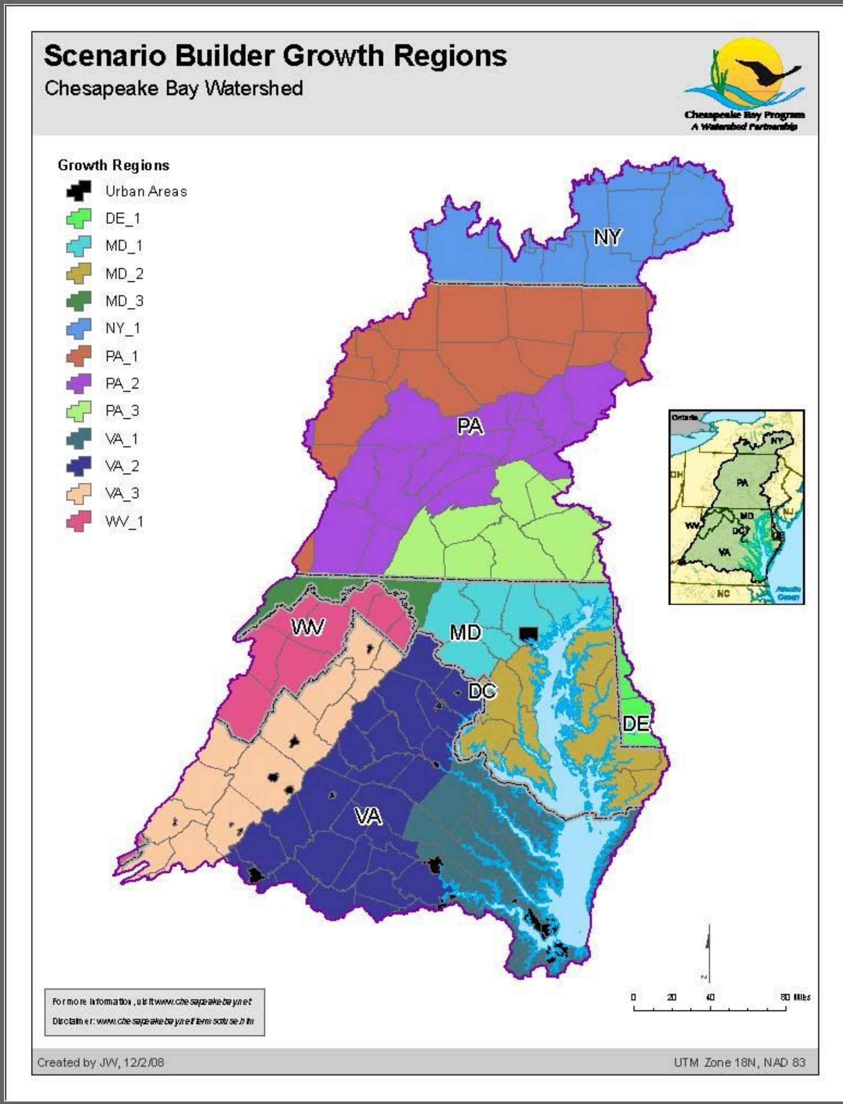
Proposed New Species, or Reference Species (i.e. Rye)	Relative Nitrogen Reduction Efficiency (relative to rye)	Final Nitrogen Effectiveness for Phase 5.3.2
----------- Early planting by Drill seeding (high soil contact) -----------		
Annual Ryegrass (ARG)	0.66	0.30
Annual Legume	0.16	0.07
Annual Legume + Grass	Avg. (0.16 + Grass)	0.19 (Leg.+ ARG)
Brassica (winter hardy)	0.70	0.32
Forage Radish	0.58	0.26
Forage Radish + Grass	0.90	0.40
Triticale	0.86	0.39
Oats (winter hardy)	0.55	0.25
Oats (winter killed)	0.40	0.18
Rye (Ref. Species)	1.00	0.45
------ Early planting, Aerial seeding in Soybeans (low soil contact) ------		
Annual Ryegrass (ARG)	0.66	0.20
Annual Legume	0.16	0.05
Annual Legume + Grass	Avg. (0.16 + Grass)	0.13 (Leg.+ ARG)
Brassica (winter hardy)	0.70	0.22
Forage Radish	0.58	0.18
Forage Radish + Grass	0.90	0.28
Triticale	0.86	0.27
Oats (winter hardy)	0.55	0.17
Oats (winter killed)	0.40	0.12
Rye (Ref. Value)	1.00	0.31

Q6: Can a jurisdiction still receive credit if it cannot report the planting method, planting time, or preceding crop?

A6: Yes. Jurisdictions should always report the most specific information available to them for each cover crop acre. However, if information is not reported, Scenario Builder will credit the jurisdiction with the closest available cover crop type, planting method and planting time period. For example, if a jurisdiction can define cover crop type and planting method, but cannot define planting time period, then Scenario Builder will assume the planting time period was late. In this way, jurisdictions will need to specify more information in order to take advantage of the higher efficiencies related to earlier planting time periods or more effective planting methods.

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**

Q3: How is the reduction actually calculated in Scenario Builder and the Watershed Model?

A3: The total load reduction is determined by the Watershed Model as the product of the efficiency reduction listed in Table 2, the acres of agricultural land within the model segment with cover crops reported, and the total nitrogen load simulated for the model segment for those agricultural acres.

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
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.	Poplar Hill, MD; Lower Eastern Shore **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