

# Mid-Atlantic 4R Nutrient Stewardship Association

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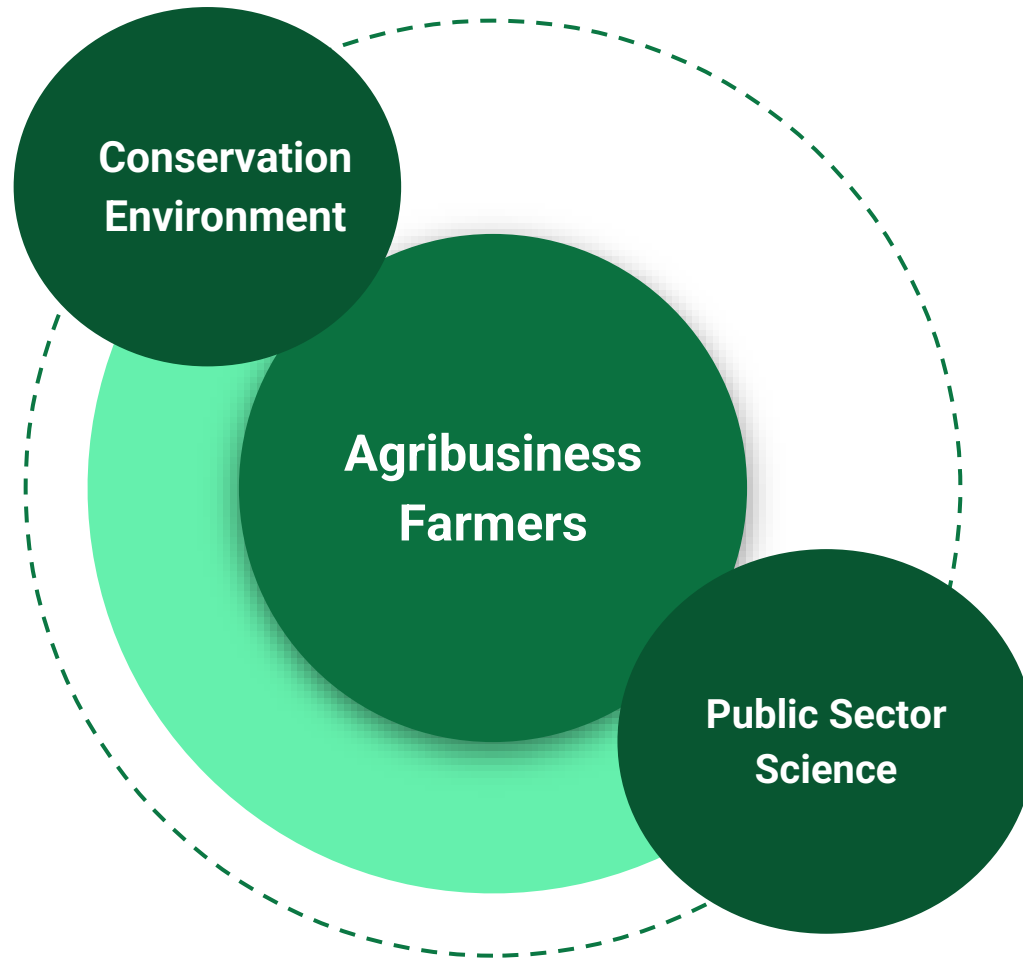
Eric Rosenbaum, RTC

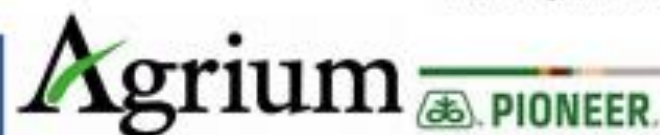
Lindsay Thompson, DMAA



nutrient  
stewardship

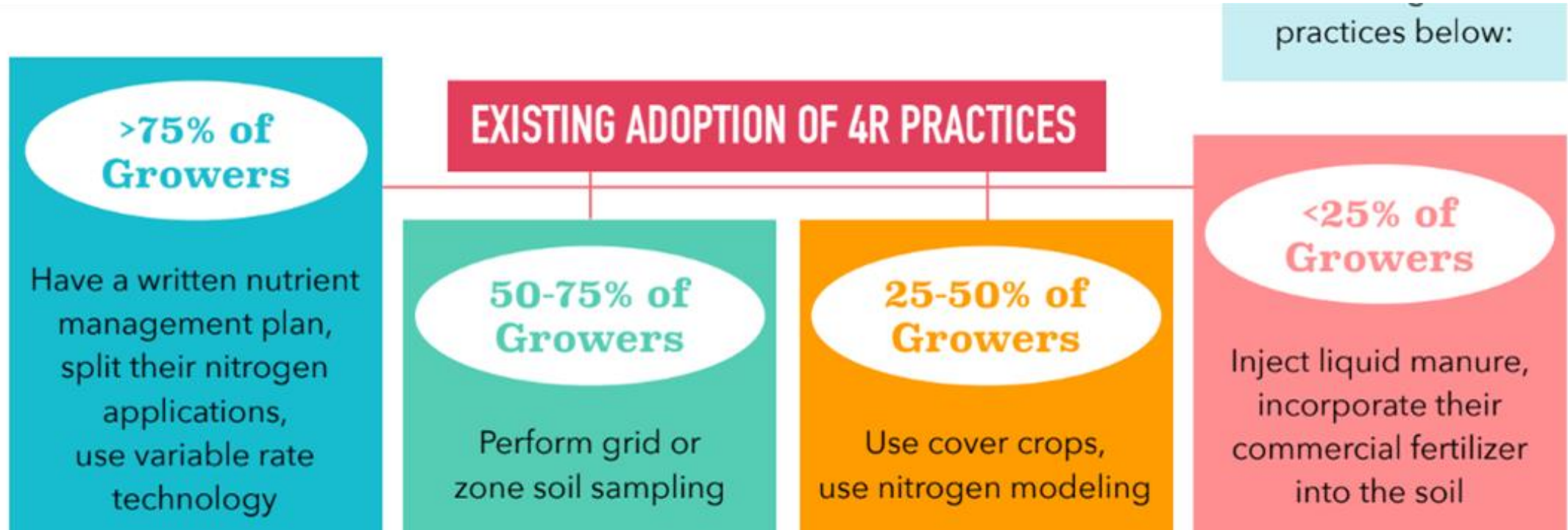
# Innovative Partnerships



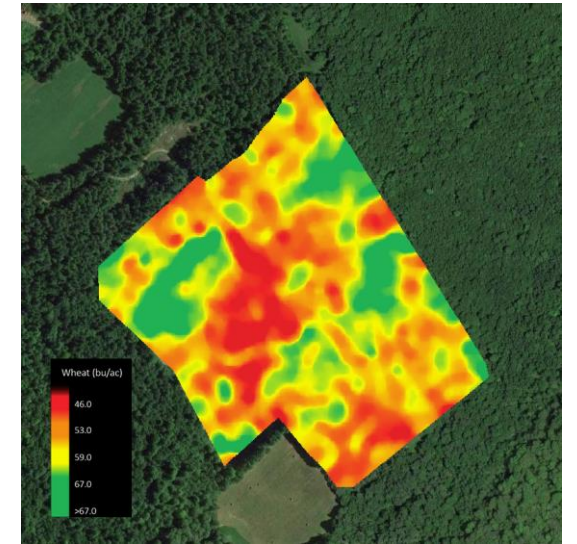
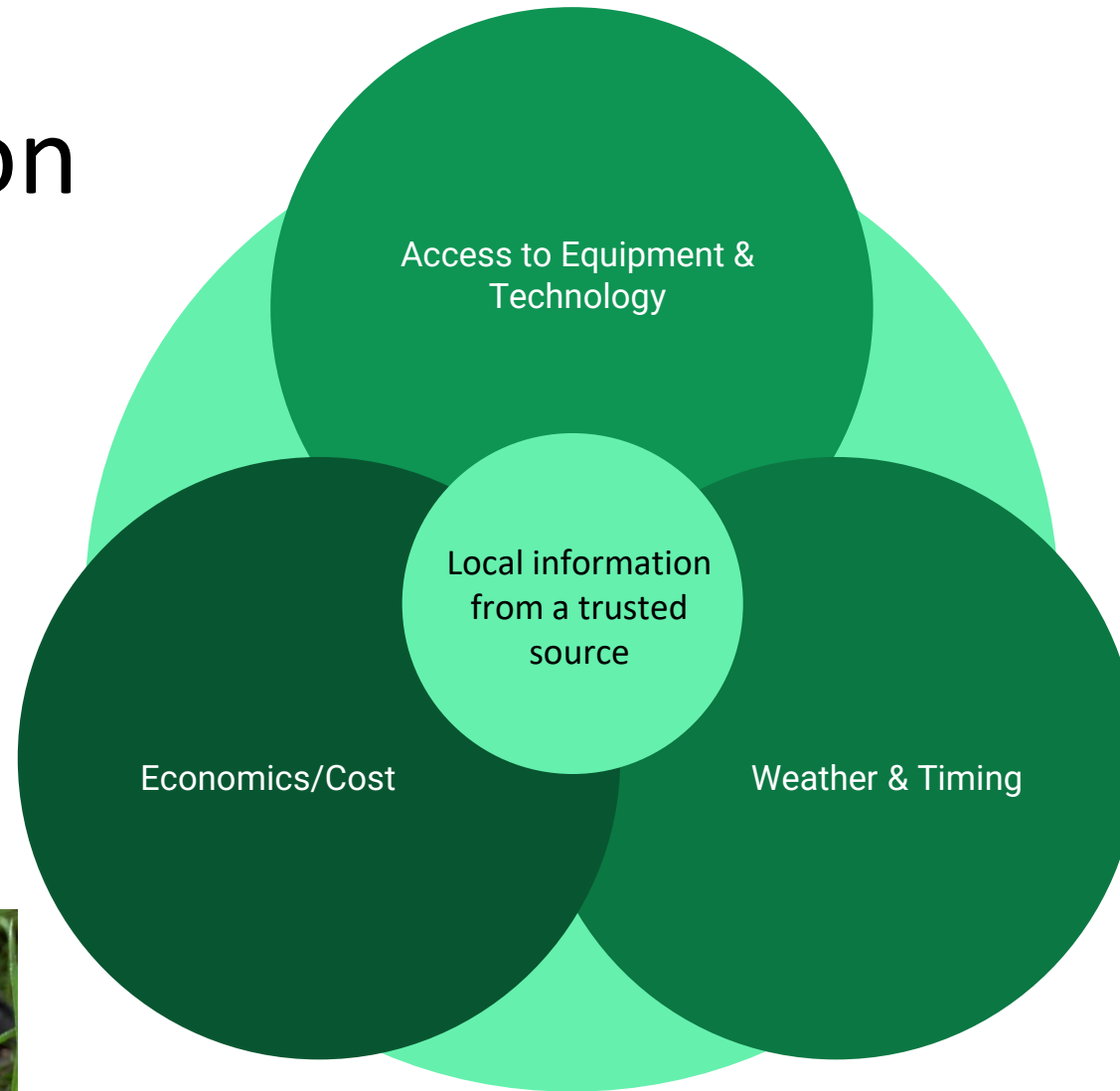




# Addressing Barriers



# Barriers to 4R Implementation





# Getting Conservation on the Ground

		Acres	Reach	
2015	USDA NRCS RCPP Delmarva	13,700	1,700	<ul style="list-style-type: none"><li>• Enhanced Nutrient Management through EQIP and CSP</li></ul>
2017	NFWF INSR	46,103	49,000	<ul style="list-style-type: none"><li>• 4R Acres Implemented</li><li>• Farmer and Advisor Trainings</li><li>• Resource Development</li></ul>
2020	NFWF INSR	22,037	5,327	<ul style="list-style-type: none"><li>• Split Nitrogen implementation</li><li>• Assessing barriers</li><li>• Developing Communication strategy</li></ul>

# Additional Grants and Projects

- Conservation Innovation Grant - PA (N-Modeling)
- SARE Grant - Developing training modules
- Chesapeake Bay Trust Fund - MD (4R planning vouchers)
- DE Nutrient Management Commission - 4R inventory



# Nitrogen Use Efficiency (N-NUE)

$$\text{NUE} = \frac{\text{Yield}}{\text{Total Nitrogen Applied}}$$



High NUE

Lower Risk of  
Nutrient Loss

Optimized per bu.  
Fertilizer Budget

Higher  
Profitability

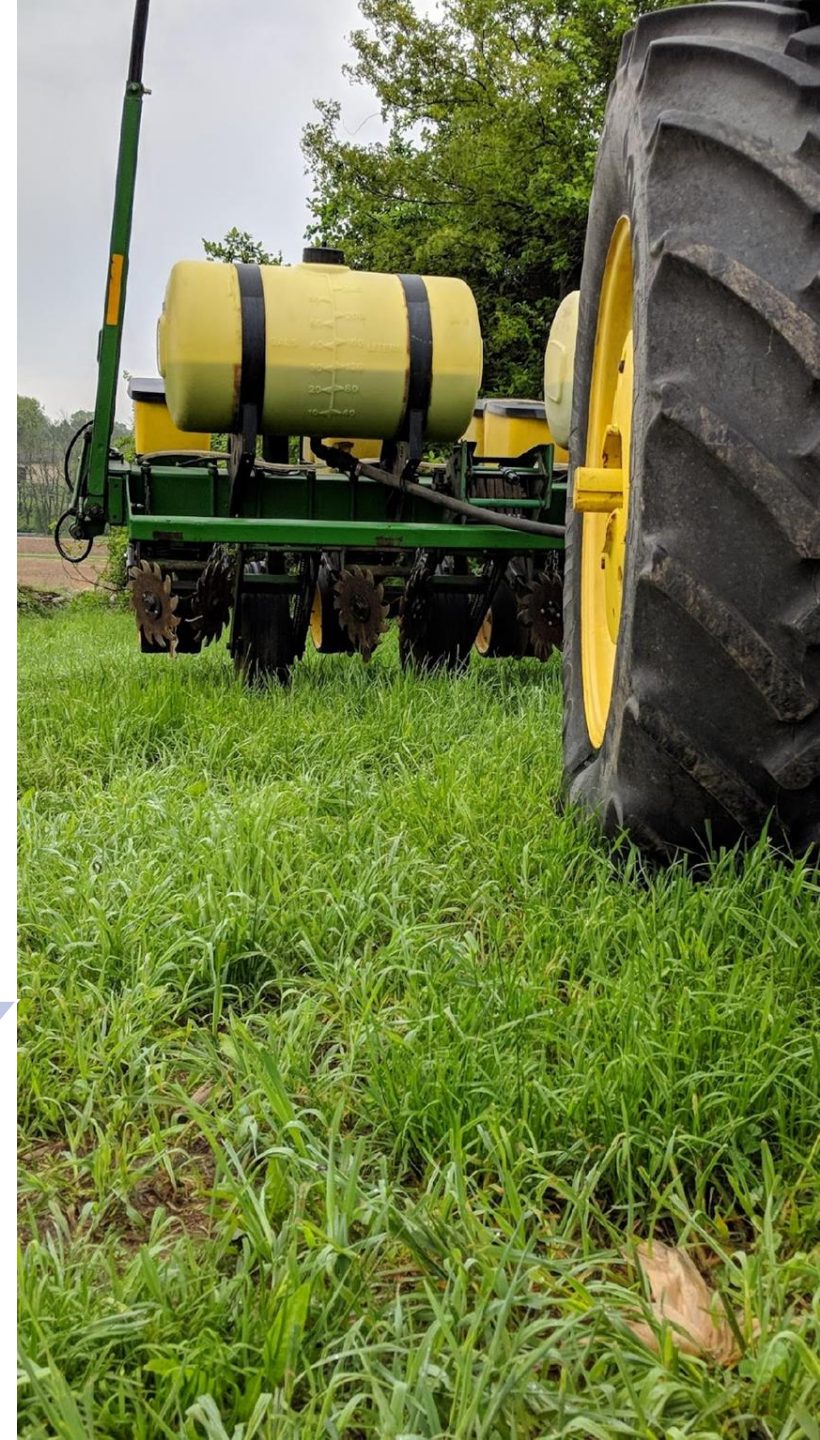
Increased Risk of  
Nutrient Loss

Wasted Fertilizer  
Dollars

Lower  
Profitability

Low NUE

Remember – Higher NUE's have  
lower numbers! 0.75 is better  
than 0.95



# Increasing NUE is *not* Accidental

## 4R NUTRIENT STEWARDSHIP



RIGHT SOURCE



RIGHT TIME



RIGHT RATE



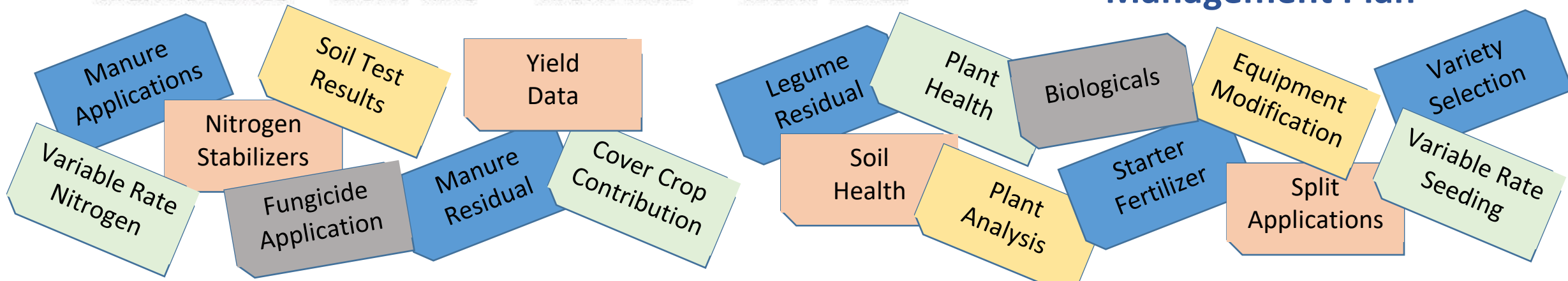
RIGHT PLACE

Every field has the potential for increased NUE!

Assess soil characteristics & active site specific N loss pathways

Assess farm capabilities

**Implement a Nutrient Management Plan**





# SPLIT NITROGEN PROJECT

## 2021 PILOT PROJECT

Made Possible with Funding from:



## 11 FARMS | 2,436 ACRES

Co-operators reimbursed \$15 / A  
for implementing additional split N application

### Participant Criteria:

- **Corn Acres**
  - Minimum Enrollment – 40 Acres
  - Maximum Enrollment – 400 Acres
- **Willingness to:**
  - Optimize Split Applications of Nitrogen based on site-specific conditions and yield goals
  - Split apply nitrogen on enrolled corn acres to meet supplemental nutrient management criteria for nitrogen
  - Provide a comparison check strip where all N is applied up front
  - Share production information & yield data
- **Current regulatory compliance** on enrolled acres



# ADAMS COUNTY SPLIT N

## 2021 PILOT PROJECT

Made Possible with Funding from:



Chesapeake Bay Stewardship Fund



Science. Restoration. Partnership.

## N APPLICATIONS

	Control	+ Split
pop-up fertilizer	3	3
2x2 starter	0	0
legume history	0	0
manure history	20	20
planned manure	35	35
pre-emerge	120	60
sidedress	0	65
<b>Total</b>	<b>178</b>	<b>183</b>
<b>Yield</b>	<b>157</b>	<b>188</b>
<b>Nitrogen Use Efficiency (NUE)</b>	<b>1.13</b>	<b>0.97</b>
<b>Increase in NUE</b>		<b>13%</b>



# ADAMS COUNTY SPLIT N

## 2021 PILOT PROJECT

### ECONOMICS

	Control	+ Split
<b>Total Revenue</b>	<b>\$954.56</b>	<b>\$1088.32</b>
Nitrogen Fertilizer Cost / A	\$74.00	\$86.02
Nitrogen Fertilizer Cost / bu	\$0.47	\$0.44
Increase in Revenue		12%
Decrease / bu in Fertilizer Costs		3%

#### Economic Assumptions:

- \$370 – UAN Pricing June 2021
- \$6.08 – Corn Price November 1, 2021



**\$600 – UAN Pricing January 2022**

### N APPLICATIONS

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# Adaptive Management for Nutrient Stewardship In a Dynamic Environment

WQGIT December 2022

Dean Collamer, Sr. Field Sales Agronomist

GROWMARK FS





**GROWMARK FS**

# Who is GROWMARK FS?

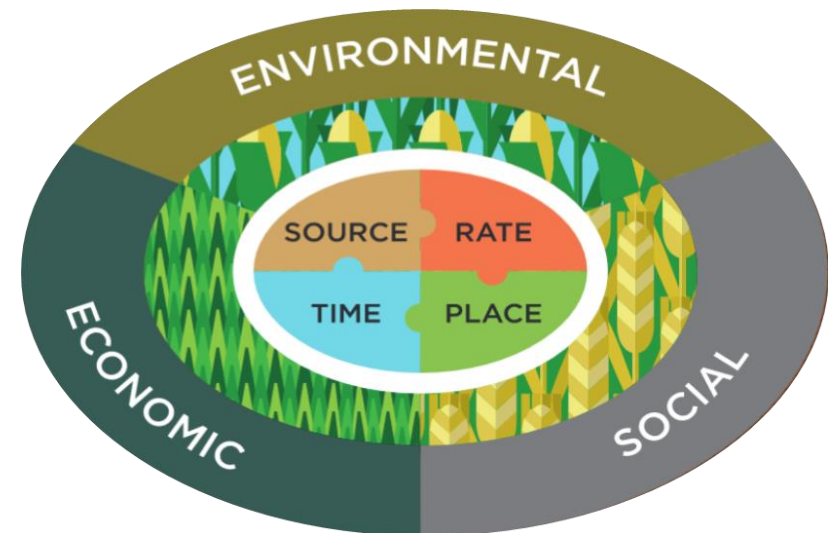


- Operates 46 full service ag retail locations in 6 states
- Wholly owned subsidiary of GROWMARK, Inc. (Midwest coop)
- Support to a wide variety of crops including seed, plant nutrients, lime, crop protection products, custom application, precision ag and propane
- John Richman, General Mgr.
- ± 500 Employees
- > 22,000 Active Customers



# Commitment to 4R Nutrient Stewardship

- GROWMARK FS is committed to delivering to farm customers – a Nutrient Management System.
  - Focused on 4Rs Nutrient Stewardship principles & implementation.
  - 4Rs provides a framework to achieve cropping system goals – increased production, increased farmer profitability, enhanced environmental protection, and improved sustainability.



# Nutrient Management System Goals

- Maximize utilization of available organic nutrient sources
- Balance nutrient applications with realistic crop yield goals
- Optimize nutrient use efficiency through crop system decisions
- Conserve soil nutrients for plant production and soil health
- Mitigate loss of nutrients to air, surface waters, and ground water
- Evaluate decisions for continual system adaptation



# GROWMARK FS partners with Farm Customers to:

- Review/Improve their Crop Management System
- Develop a Nutrient Budget
- Maintain Recordkeeping Where Feasible
- Evaluate and Adapt Crop Decisions

# Advisers for Nutrient Management & Conservation Needs



GROWMARK FS, LLC-Caledonia 2936 Telephone Road (Rte. 20) Caledonia, NY 14423 Grower Summary							
Area	Plan	Acres	Crop	Product	Amnt/ Acre	Total Amount	Cost/ Unit
2017 2017: Crop Plans							
2017 Pre Emerge Com // Cinch ATZ Lite & Instigate							
A		621.00		CINCH ATZ LITE BULK	1.50 QT	232.875 GL	38.0000/GL
				INSTIGATE (2 X 210 OZ)	6.00 OZ	3726.000 OZ	2.5000/Oz
				CUSTOM SPRAY	1.00 AC	621.000 AC	8.0000/Ac
Plan Totals for */A							37.25
2017 Wheat Herbicide							
B		306.00		HARMONY EXTRA SG	90 OZ	275.400 OZ	12.0000/Oz
				W/TOTALSOL (12 X 15 OZ)			
				(36)			
				PROWL H2O HERBICIDE	2.00 Pts	76.500 GL	42.0000/GL
				2/2.5 GL (36)			
				CUSTOM SPRAY	1.00 AC	306.000 AC	8.0000/Ac
Plan Totals for */B							29.30
2017 Wheat Nitrogen Dry Broadcast							
C		306.00		37-0-0 9.1S	100.50 LB	15.377 TN	409.4394/Tn
				CUSTOM SPREAD	1.00 AC	306.000 AC	9.0000/Ac
Plan Totals for */C							29.58
2017 Wheat Nitrogen / Liquid 2nd Pass							
D		306.00	Wheat	28-0-0-2 LQ	16.25 GL	26.978 TN	260.0000/Tn
				GFS DCD 25KG (55.1 LB)	1.00 LB	306.000 LB	5.5000/Lb
				BAG (40)			
				CUSTOM SPRAY	1.00 AC	306.000 AC	8.0000/Ac
Plan Totals for */D							8.00
2017 Wheat Fungicide Pass							





# Qualified/Certified/Experienced Crop Specialists

- Periodic GFS agronomy tech training
  - 4R nutrient stewardship
    - Classroom, in-field, virtual
- Product training - ongoing updates by vendors for seed, nutrients, crop protection products, biologicals, precision ag
- Certified Crop Advisers (CCA) qualification ~ 40%
- Typical Field Experience: 15+ yrs.





# Natural Uncontrollables/Unknowns





# Adaptive In-Season Tools for 4R Implementation

## Source, Rate, Time and Place

- Chlorophyll Meter
- PSNT
- Aerial Imagery
- N Modeling
- Tissue Testing
- Variable Rate Application
- N Stabilizers – Limit Losses to Environment



# Reporting and Verification Challenge

- Self Reporting Opportunity for Nutrient Mgt. BMPs but....  
Interpretation of exact terminology is a problem, e.g. split N timing
- 100% Verification Requirement is a Huge Manpower Demand and Expense
- 4R BMP field record-keeping is near impossible task on a broad scale
  - Especially Challenging for Manure
  - Manageable for Some Farm Operations

# Core Nutrient Management BMP for Nitrogen

- N rate according to LGU, recs at field management unit level
- Manure analysis and volume
- Spreader/applicator calibration
- Yield estimates and cropping plan at field management unit level
- Cropping and manure history at field management unit level

- Acres not meeting the Core NM BMP for N are assumed to be applying rates higher than LGU recommendations
- Acres meeting the Core NM BMP for N are assumed to be applying current rates as recommended by the LGU

Table 12. Core N Nutrient Management Application Rate Multiplier Values

Land Use	Nutrient Management BMP	
	Nitrogen Core Non-Nutrient Management BMP Application Rate Multiplier	Nitrogen Core Nutrient Management BMP Application Rate Multiplier
Full Season Soybeans	1.20	1.00
Grain w/ Manure	1.30	1.00
Grain w/o Manure	1.20	1.00
Legume Hay	1.20	1.00
Silage w/ Manure	1.40	1.00
Silage w/o Manure	1.20	1.00
Small Grains and Grains	1.20	1.00
Small Grains and Soybeans	1.20	1.00
Specialty Crop High	1.30	1.00
Specialty Crop Low	1.20	1.00
Other Agronomic Crops	1.10	1.00
Other Hay	1.00	1.00
Pasture	1.00	1.00



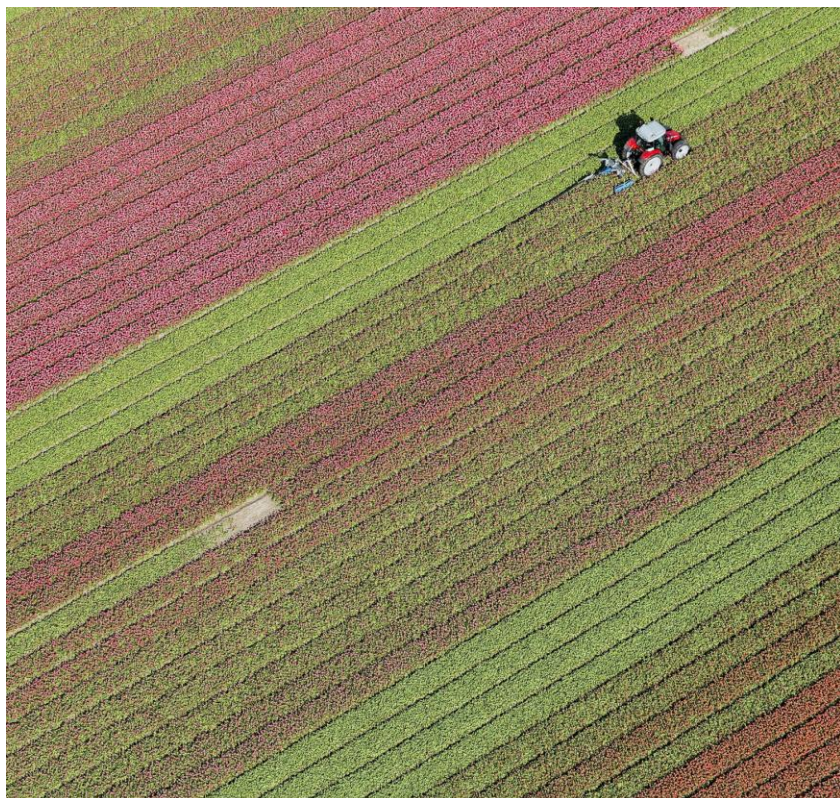
# How 4R Practices are Recognized

*Use advanced N site assessments and N management tools to guide implementation of 4Rs:*

- *PSNT*
- *Manure analysis  $\leq 1$  year old*
- *On-farm replicated research*
- *Corn stalk nitrate test*
- *N-loss risk assessments and models*
- *Yield mapping*
- *Illinois soil nitrogen test (ISNT)*
- *On-farm strip trials*
- *Fall soil nitrate loss*
- *Whole farm balances*
- *In-season remote sensing*
- *Geo-spatial mapping*

N <u>Rate</u> Adjustment Practice	N <u>Placement</u> Adjustment Practice	N <u>Timing</u> Adjustment Practice
N rate less than LGU recommendations	Subsurface injection or incorporation of applied inorganic N	Split N applications
Split N applications for reduced total rate	N application setbacks from water	PSNT
Variable rate N at the sub-field management unit level		

# Supplemental N Nutrient Management Practices



Land Use	Nutrient Management BMP		
	N Rate <i>Supplemental</i> BMP Loss Reduction Multiplier	N Placement <i>Supplemental</i> BMP Loss Reduction Multiplier	N Timing <i>Supplemental</i> BMP Loss Reduction Multiplier
Full Season Soybeans	1.00	1.00	1.00
Grain w/ Manure	0.85	0.95	0.90
Grain w/o Manure	0.95	0.97	0.95
Legume Hay	1.00	1.00	1.00
Silage w/ Manure	0.85	0.95	0.90
Silage w/o Manure	0.95	0.97	0.95
Small Grains and Grains	0.95	0.97	0.90
Small Grains and Soybeans	0.95	0.97	0.90
Specialty Crop High	0.85	0.95	0.95
Specialty Crop Low	0.95	0.97	0.95
Other Agronomic Crops	0.95	0.97	0.95
Other Hay	1.00	0.97	0.95

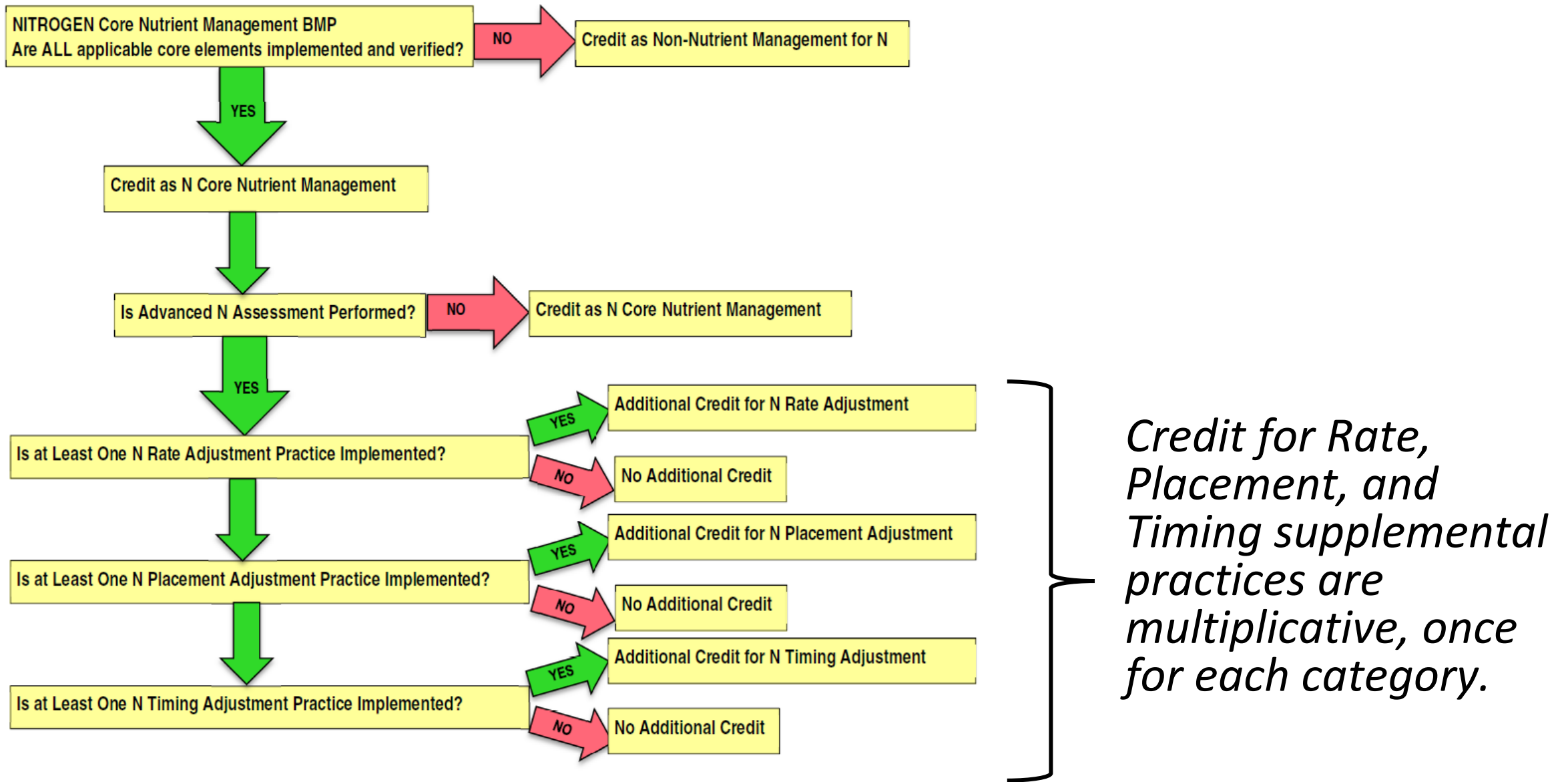


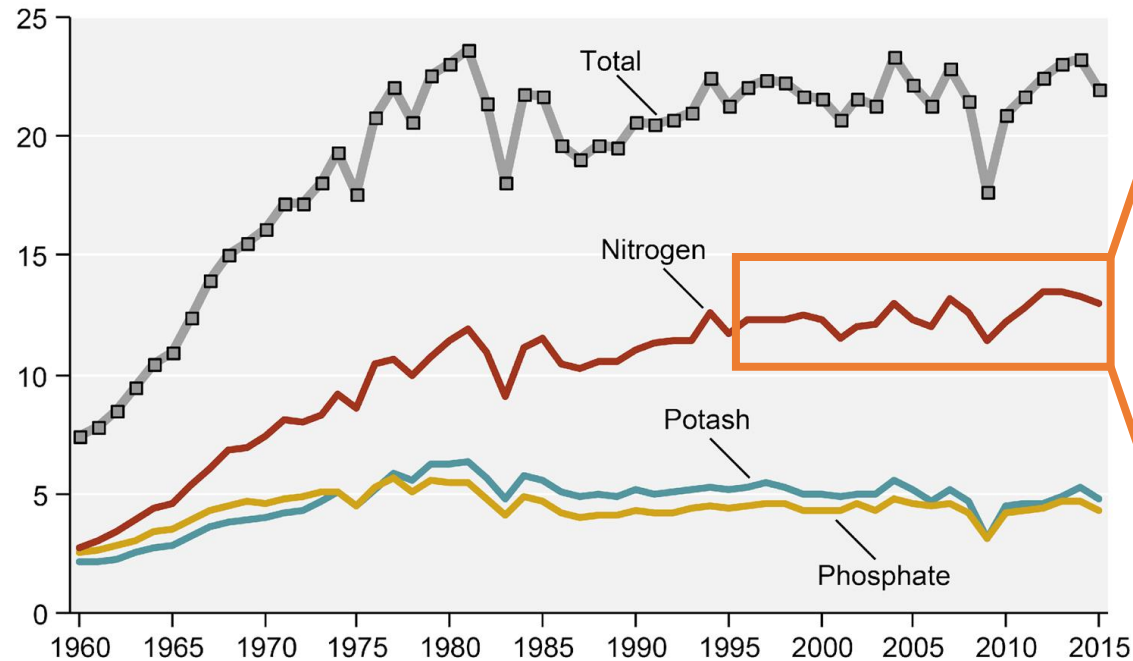
Figure 1. Linkage of Core and Supplemental N Nutrient Management Practices



# U.S. Fertilizer Use and Corn Yield Over Time

Commercial fertilizer use in U.S. agriculture, by primary nutrient, 1960-2015

Short tons (million)



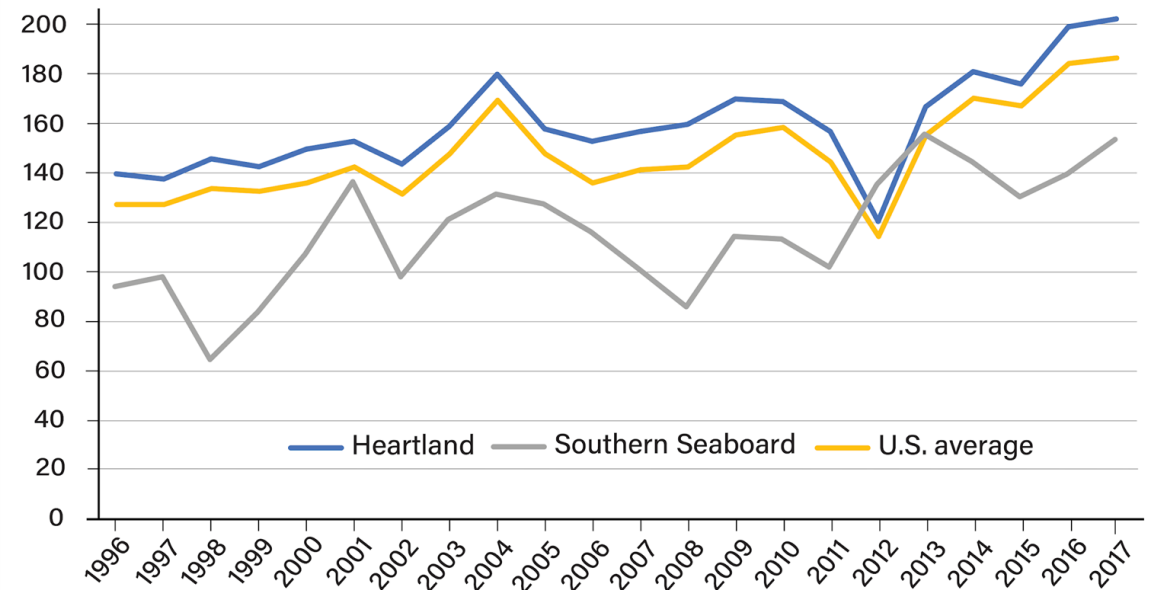
Note: 1 short ton equals 2,000 pounds.

Source: USDA, Economic Research Service, using data from Tennessee Valley Authority, Association of American Plant Food Control Officials, and The Fertilizer Institute.

U.S. corn yields by select region, 1996-2017

USDA Economic Research Service  
U.S. DEPARTMENT OF AGRICULTURE

Bushels per acre



Notes: Heartland includes parts of Illinois, Iowa, Kentucky, Minnesota, Missouri, Nebraska, Ohio, and South Dakota. Southern Seaboard includes parts of Alabama, Arkansas, Delaware, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Texas, and Virginia.

Sources: USDA, Economic Research Service, Costs and Returns.

# NM Practices Reported to Bay Model - 2021

	Acres in Farms (NASS 2021)	Core NM for Nitrogen (acres) (% of total farmland)	N Placement (acres) (% of Core NM ac)	N Rate (acres) (% of Core NM ac)	N Timing (acres) (% of Core NM ac)
DE	530,000	134,958 (25%)	0	0	0
MD	2,000,000	1,028,035 (51%)	108,982 (11%)	372,732 (36%)	80,136 (8%)
PA	7,300,000	533,893 (7%)	202 (0.03%)	241 (0.05%)	4,607 (0.9%)

# Summarizing Key Points

- The 4R Alliances are working as change agents to promote the science and adoption of 4R nutrient stewardship in the Bay watershed.
- Farmer decision making related to crop and fertilizer plans are complex and change in response to in-season factors.
- Good nutrient management practices are economically and environmentally sustainable, especially when fertilizer prices are high.
- More advanced 4R practices (e.g., variable rate application, split N) are being applied than are being reported, verified, and credited because reporting is difficult and expensive.
- It is important to find a better, more cost-effective, credible, and defensible way to measure what farmers are doing; especially related to fertilizer input data.

