

Maryland Agriculture's Role and Progress toward the Chesapeake Bay Restoration

Ag Leadership Roundtable
Jason Keppler

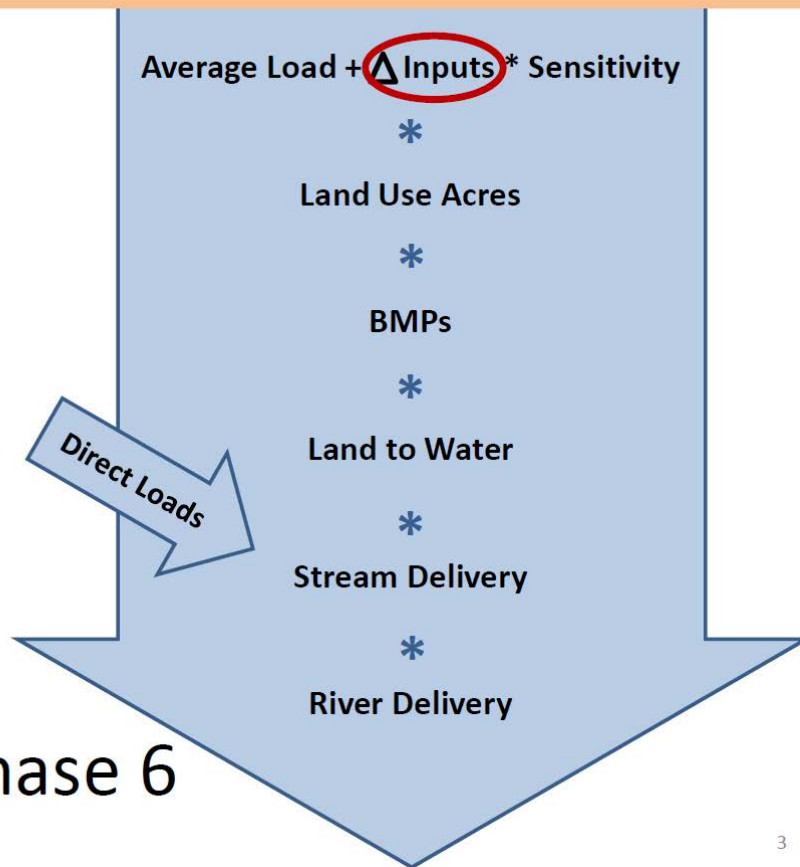




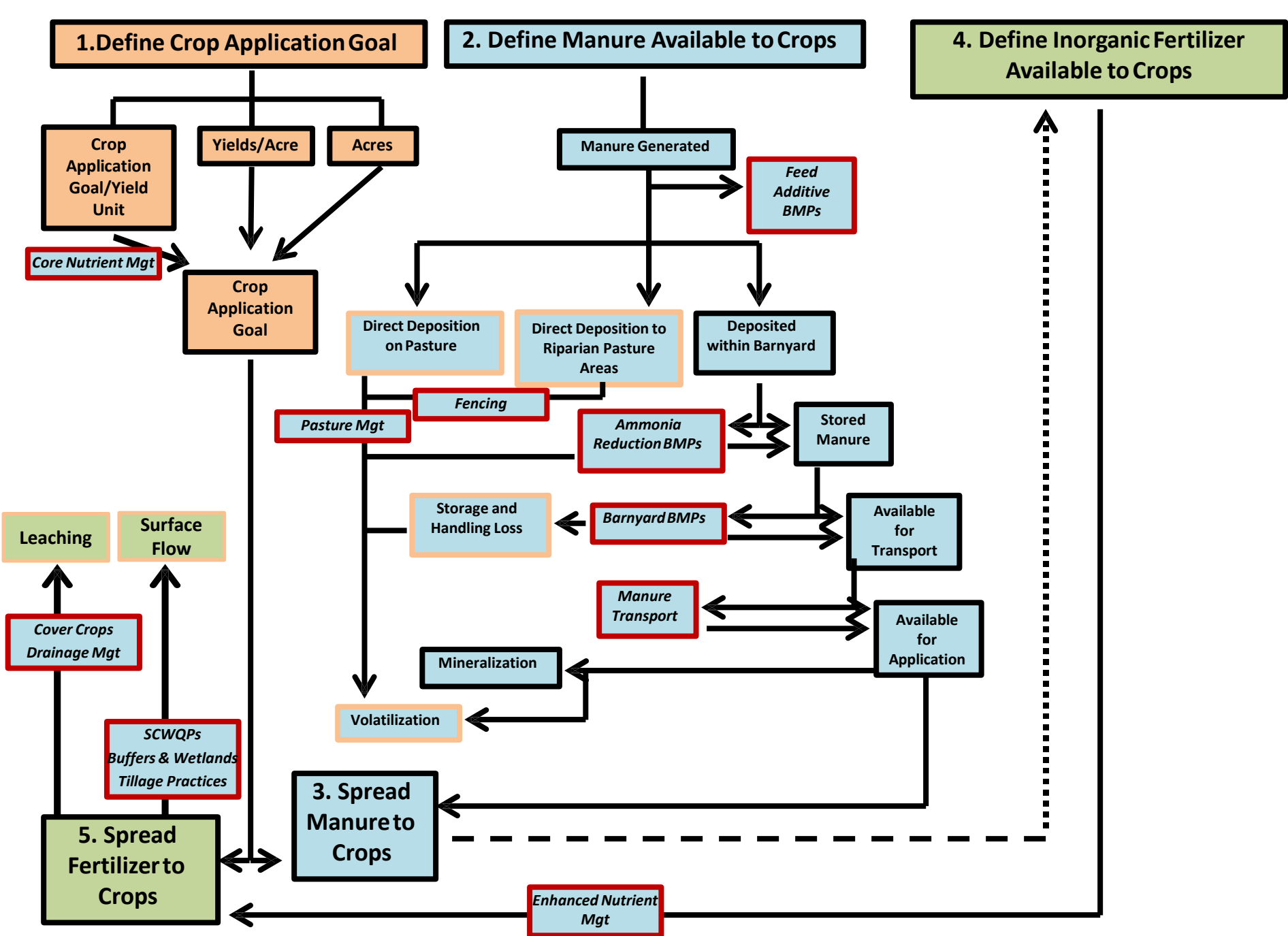
Chesapeake Bay Model 101

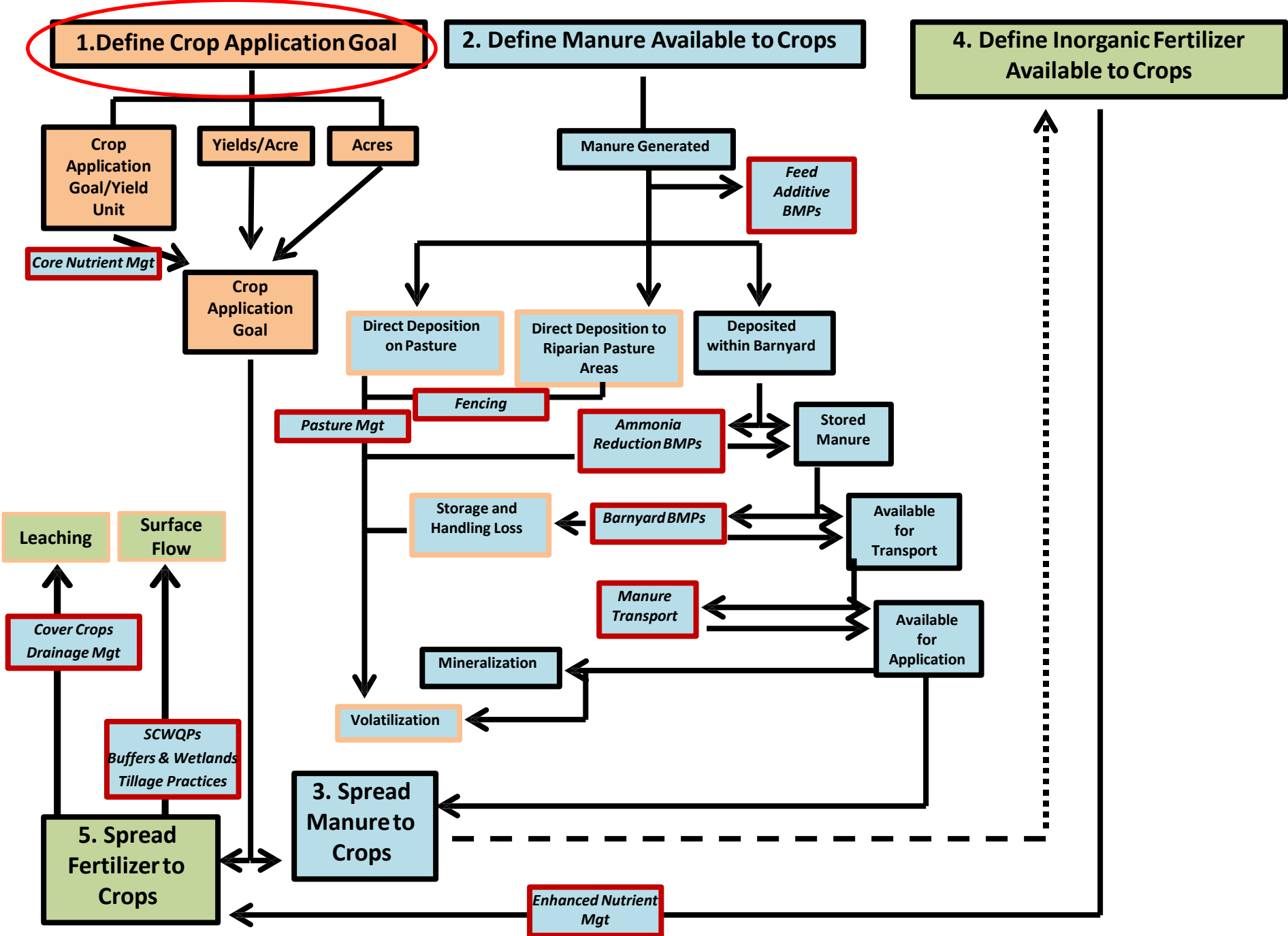


Phase 6 Model Structure



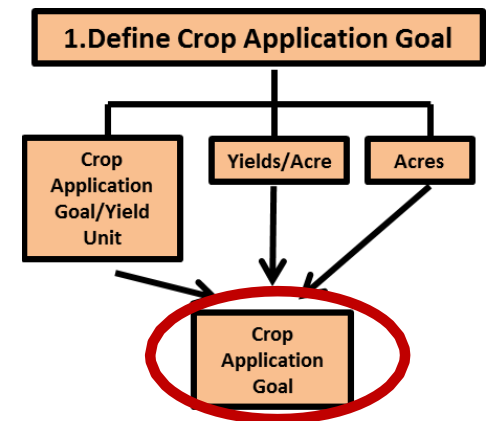
Phase 6

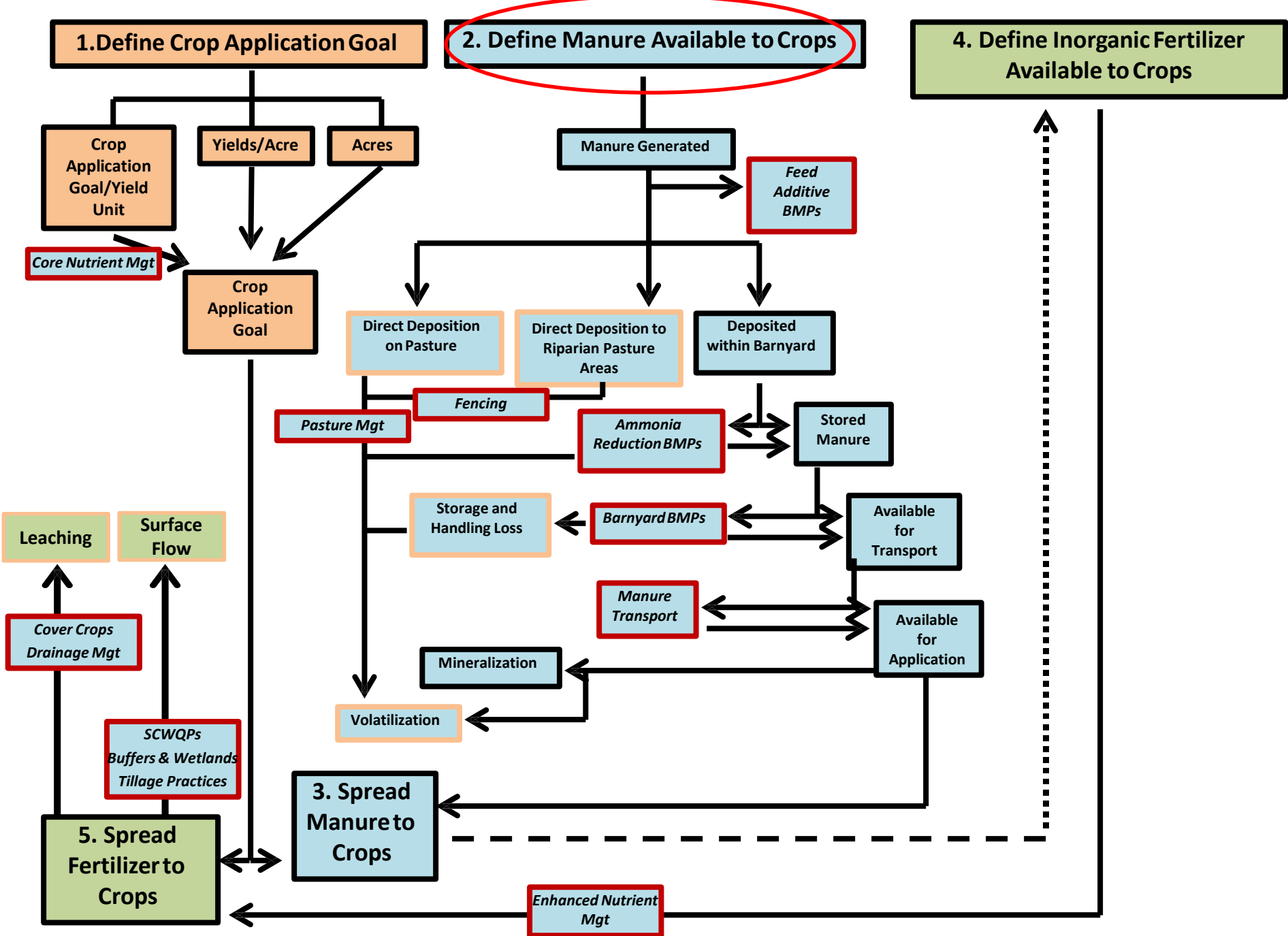




Example of County Corn Application Goal

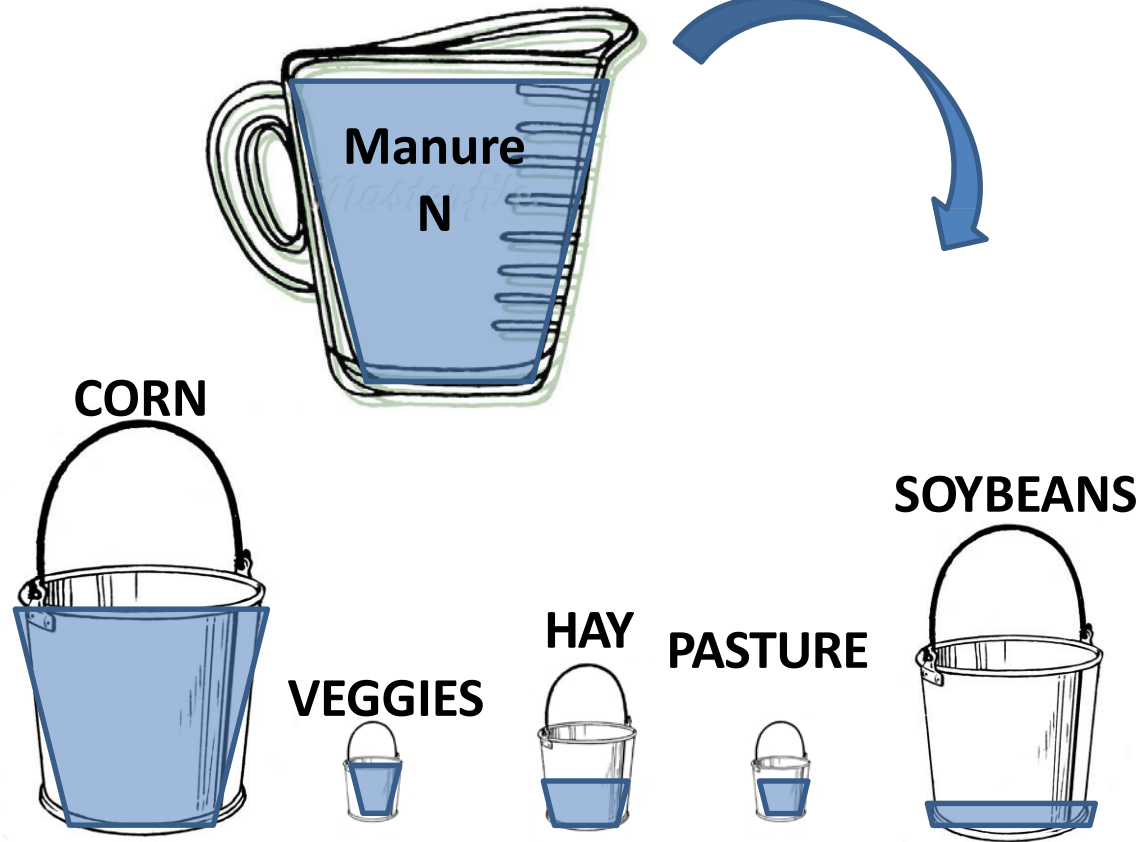
- Yield = 100 bushels/acre
- Acres = 1,000
- Application Goal = 0.92 Lbs N/Bushel
 - Assumption is 100% Core N Nutrient Management
- Corn Application Goal = $100 \times 1,000 \times 0.92 = 92,000$ Lbs N
 - Further broken down into monthly goals, and manure/fertilizer goals
- Application may be higher or lower than 92,000 Lbs N based upon available manure and fertilizer within county.



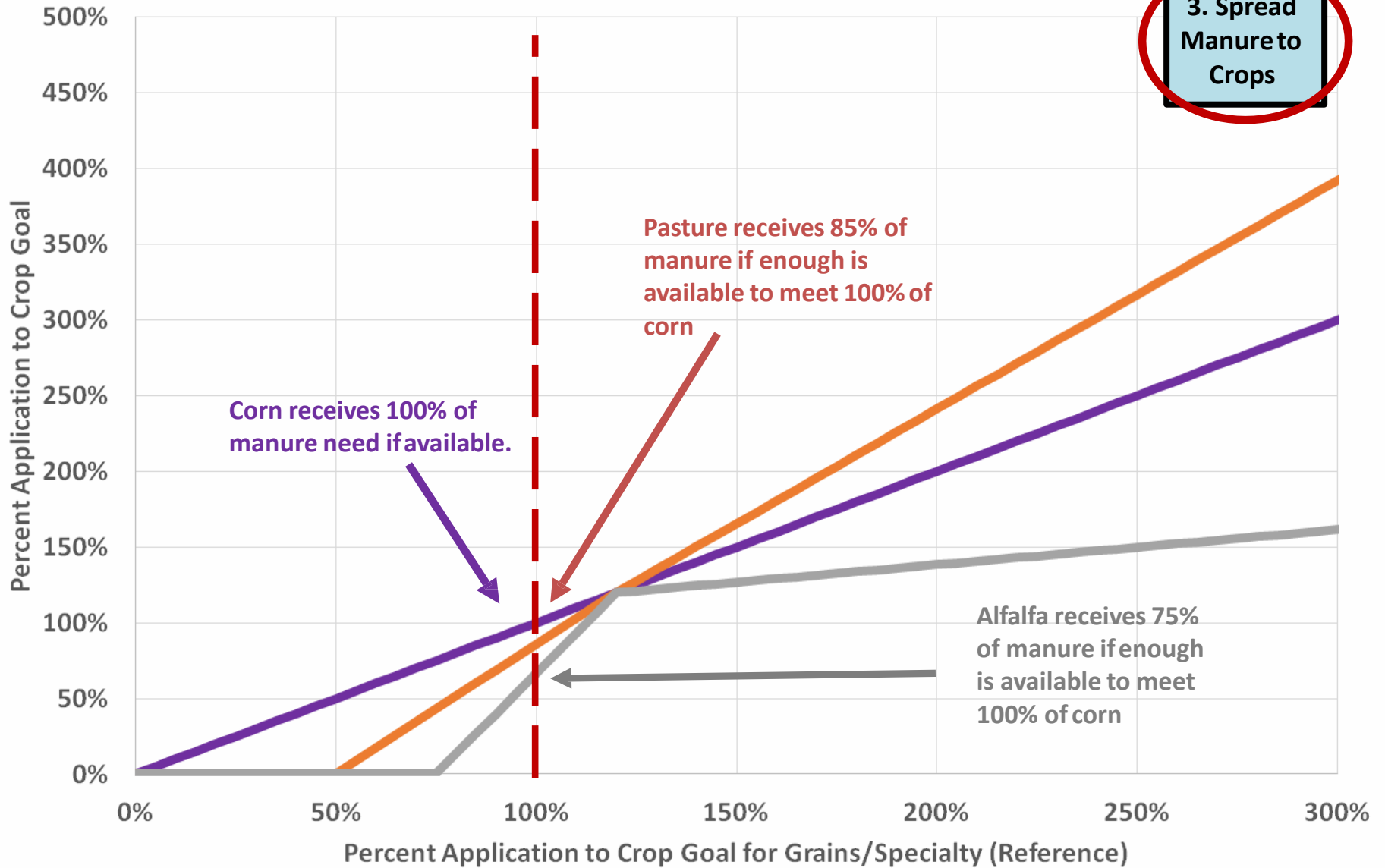


Filling the Buckets of Organic Application Goal

3. Spread Manure to Crops

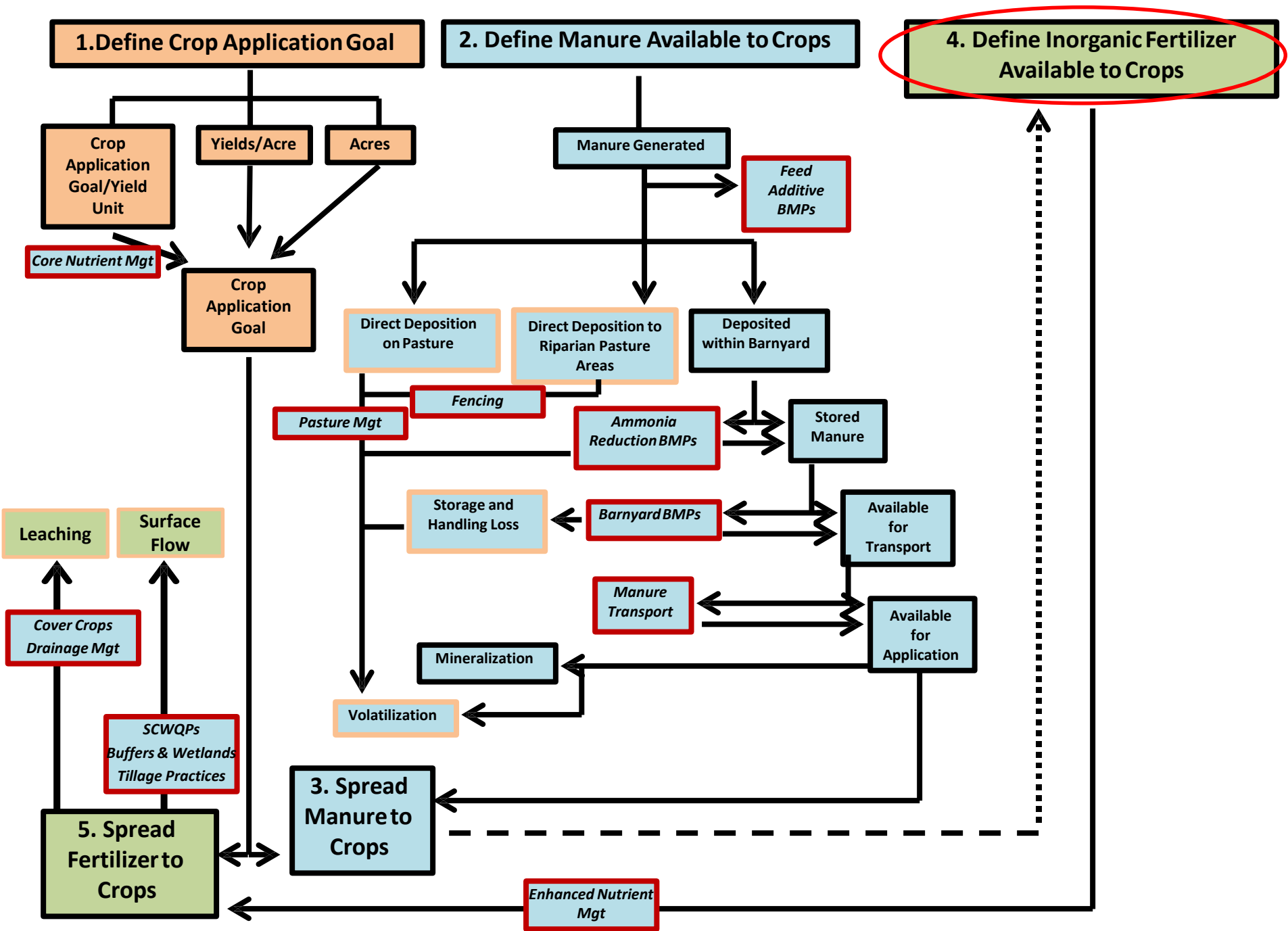


Nutrient Spread Slopes for Manure N



3. Spread Manure to Crops

Grains/Specialty Non-Legume Hay/Pasture Row/Hay Legumes



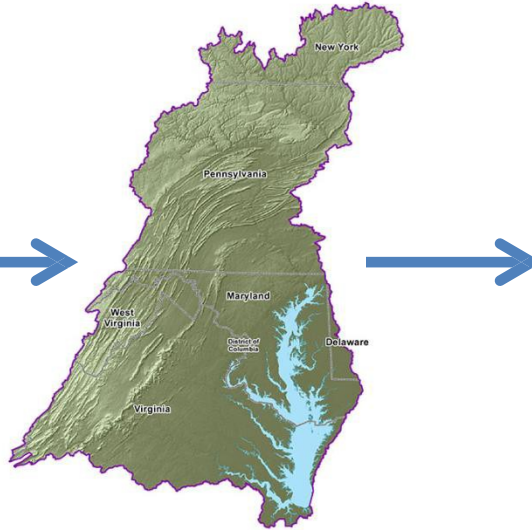
Inorganic: Going from Sales to Use

4. Define Inorganic Fertilizer Available to Crops

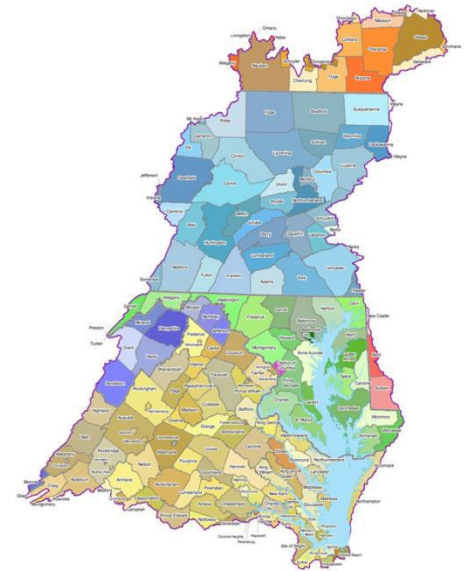
- Begin with regional-level sales, break those down to watershed-level sales, and break those down to county-level



- Sum AAPFCO sales across 6 states, and estimate sales used by farms.



- Calculate dollars spent on fertilizer from Ag Census in counties inside and outside watershed to “clip” watershed-only sales.



- Calculate fertilizer need by county as a fractional fertilizer need after manure is applied. Use value to distribute fertilizer to each county.

Fertilizer Comparisons

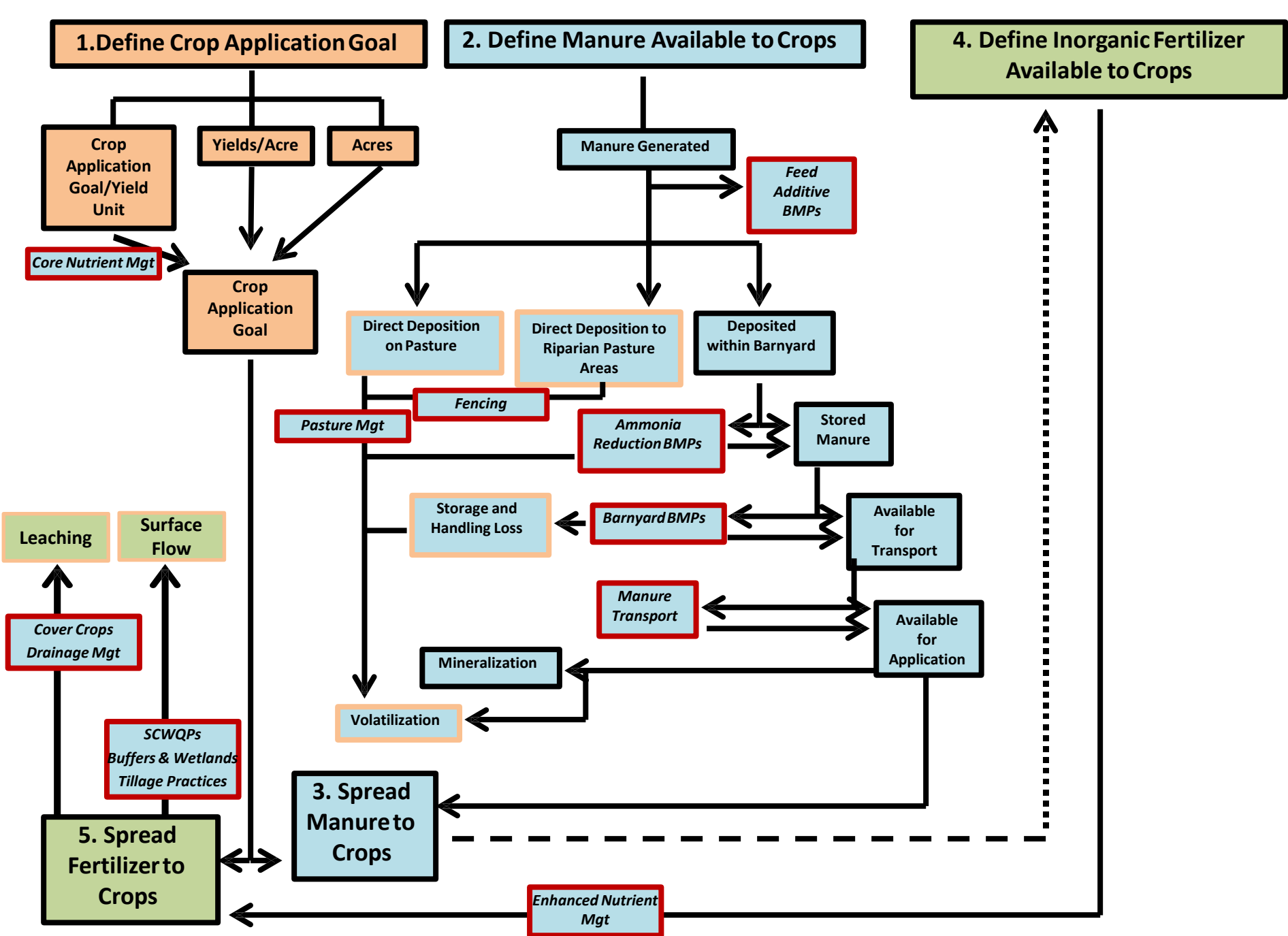
- Compared fertilizer inputs to CEAP and MD-farmer reported AIR data.

Comparing Total Inorganic Applications to Agriculture in Watershed

Data Source	Lbs Inorganic PAN	Lbs Inorganic P	% Delta from CEAP N	% Delta from CEAP P
CEAP	406,020,000	80,870,000	NA	NA
Phase 6 (Avg. 2001-2006)	405,179,787	80,359,516	-0.2%	-0.6%

Comparing Total Inorganic Applications to Agriculture in Maryland in 2012

Scenario	Lbs Inorganic PAN	Lbs Inorganic P	% Delta from AIR for N	% Delta from AIR for P
MD AIR	76,946,211	8,087,974	NA	NA
Phase 6	76,057,166	8,624,024	-1.2%	+6.6%



Chesapeake Bay Model 101



Phase 6 Model Structure

Average Load + Δ Inputs * Sensitivity

*

Land Use Acres

*

BMPs

*

Land to Water

*

Stream Delivery

*

River Delivery

Direct Loads

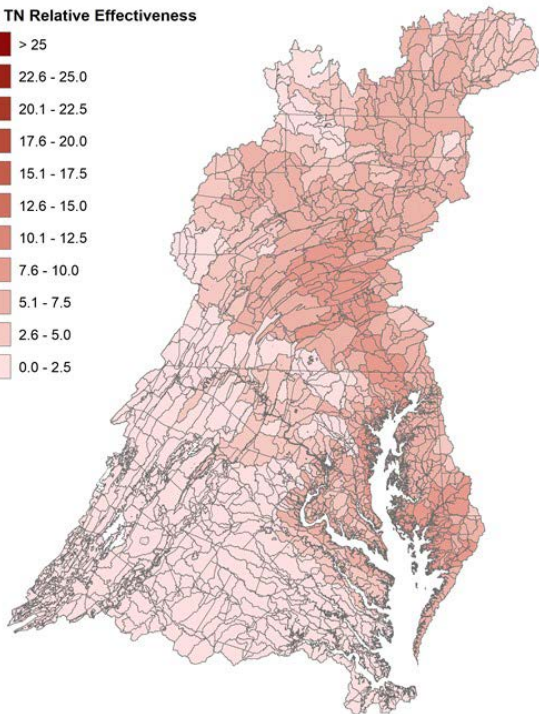
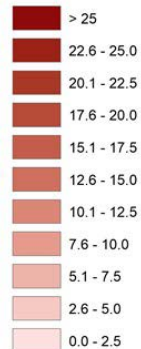
Phase 6



Relative Effectiveness

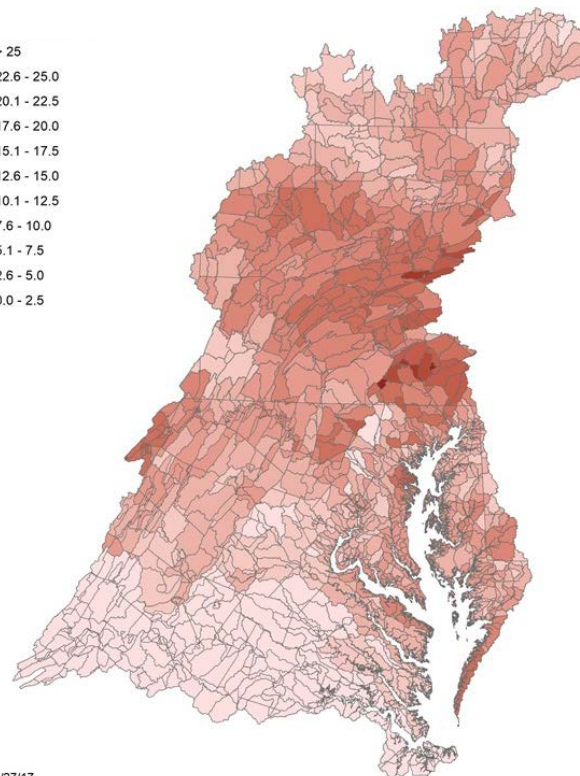
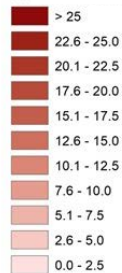
Phase 5 Nitrogen

P 5.3 TN Relative Effectiveness



Phase 6 Nitrogen

Ph
TN



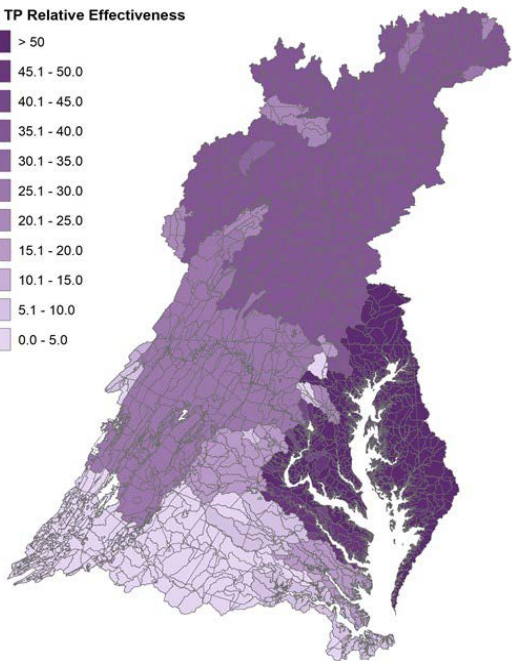
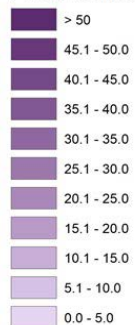
11/27/17



Relative Effectiveness

Phase 5 Phosphorus

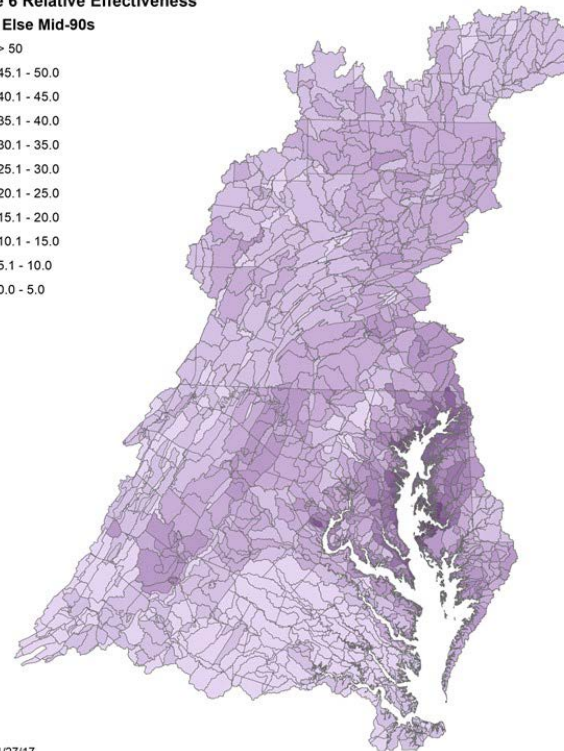
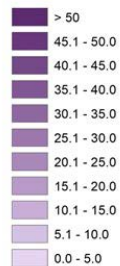
P 5.3 TP Relative Effectiveness



Phase 6 Phosphorus

Phase 6 Relative Effectiveness

TP All Else Mid-90s



11/27/17



Agricultural BMPs for Water Quality

Nutrient Management

Conservation Tillage

Cover Crops

Pasture Grazing BMPs

- Pasture Fencing
- Rotational Grazing
- Horse Pasture Management

Under Review:

- Cropland Irrigation Management
- Ag Stormwater/Nursery Capture and Reuse
- Ag Drainage Management

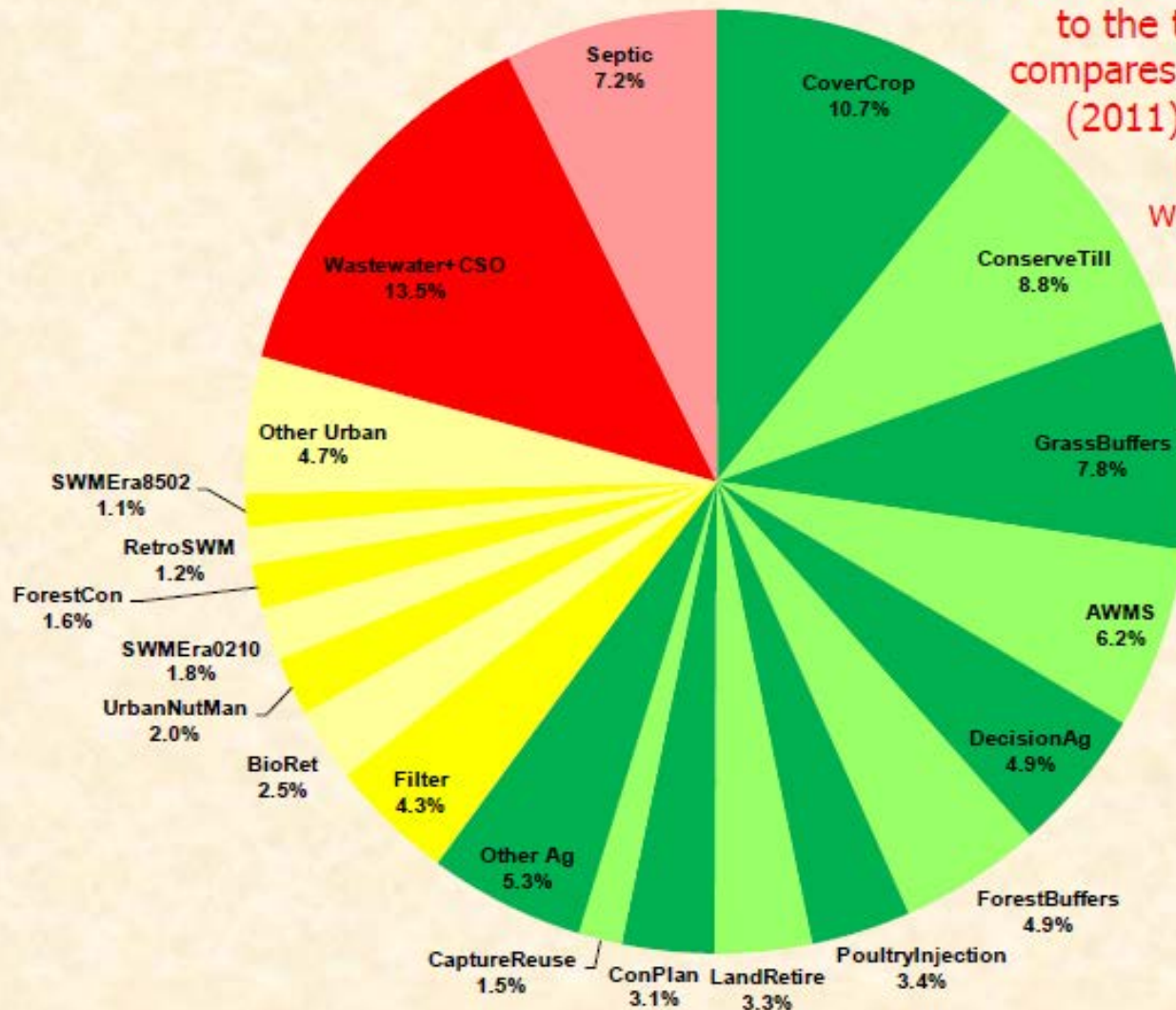
Other Agricultural BMPs

- Forest and Grass Buffers
- Wetland Restoration
- Land Retirement
- Tree Planting
- Carbon Sequestration/Alternative Crops
- Conservation Plans/SCWQP
- Non-Urban Stream Restoration
- Manure Transport
- Animal Waste Management Systems
- Mortality Composters
- Dairy Precision Feed and/or Forage Management
- Barnyard Runoff Controls
- Water Control Structures



Nitrogen Relative Load Reductions Maryland

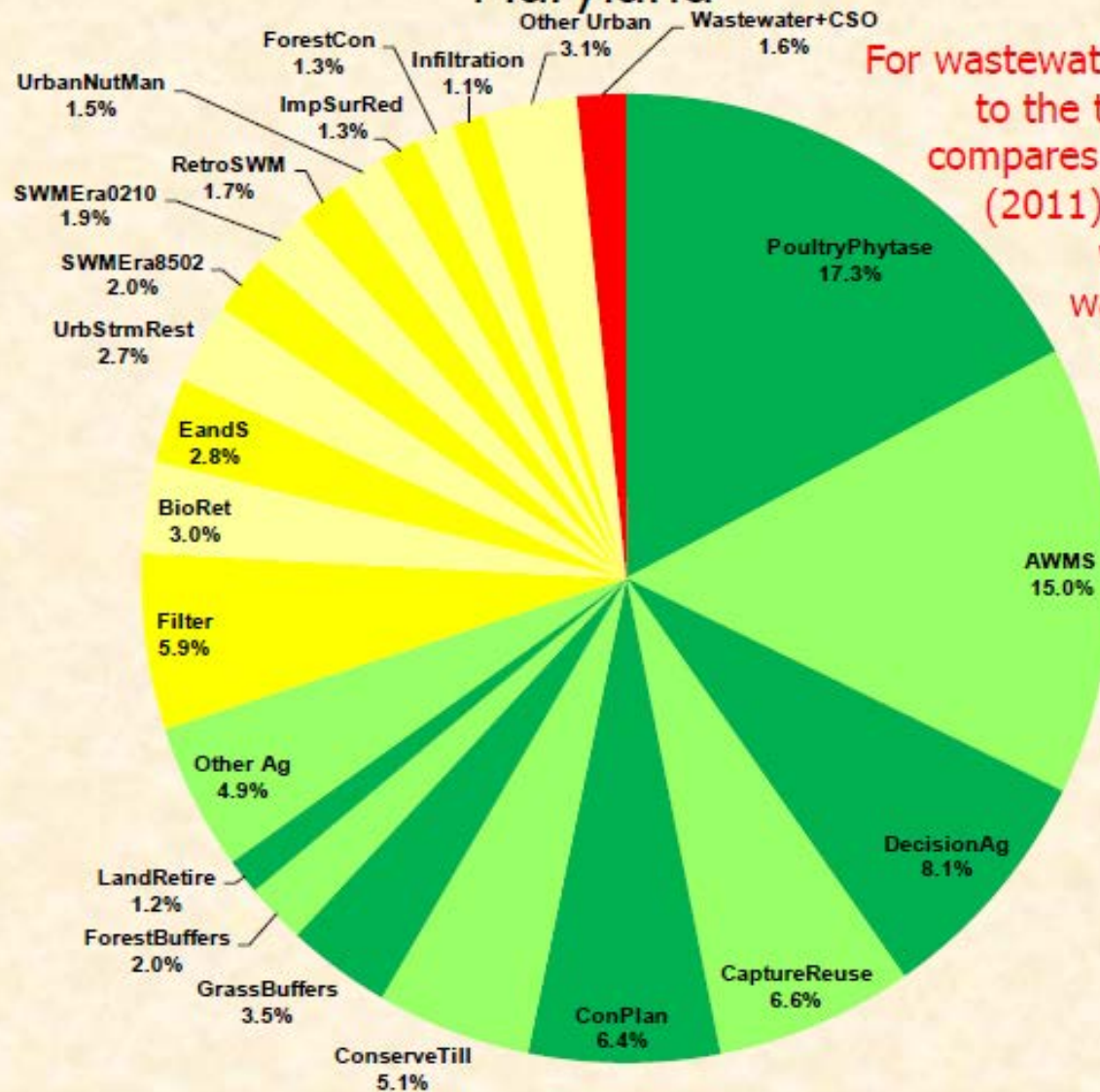
For wastewater, the contribution to the total load reduction compares current discharges (2011) to WIP discharges while BMPs outside wastewater compare No-Action to WIPs.





Phosphorus Relative Load Reductions

Maryland



For wastewater, the contribution to the total load reduction compares current discharges (2011) to WIP discharges while BMPs outside wastewater compare No-Action to WIPs.



Agriculture WIPII Plan Goals

BMP	Unit	2013 Milestones	2017 Goal	2025 Goal
10' Fertilizer Setback	Acres	5,280	3168	5,280
Alternative Crops	Acres	200	498	830
Barnyard Runoff Control	Acres	168	219	1,180
CAFO Manure Application Setback	Acres	2,500	1500	2,500
Conservation Tillage	Acres	764,630	704,198	765,487
Cover Crop	Acres	355,000	424,086	424,086
Cropland Irrigation Management	Acres	92,000	119,728	119,728
Dairy Manure Incorporation	Acres	3,976	16,703	27,838
Decision Agriculture - Cropland	Acres	84,920	356,665	594,441
Enhanced Nutrient Management - Tier I	Acres	14,285	60,000	100,000
Enhanced Nutrient Management - Tier II	Acres	14,285	60,000	100,000
Enhanced Nutrient Management - Tier III	Acres	25,000	105,000	175,000
Forest Buffers	Acres	335	1,406	2,344
Grass Buffers; Vegetated Open Channel - Agriculture	Acres	538	2,258	3,763
Heavy Use Poultry Area Concrete Pads	Operations	19	81	136
Horse Pasture Management	Acres	712	2,994	4,990
Irrigation Water Capture Reuse	Acres	1,000	2,120	3,533
Land Retirement to hay without nutrients (HEL)	Acres	2,030	8,536	14,226
Land Retirement to pasture (HEL)	Acres	5,285	22,200	37,000
Loafing Lot Management	Acres	34	145	241



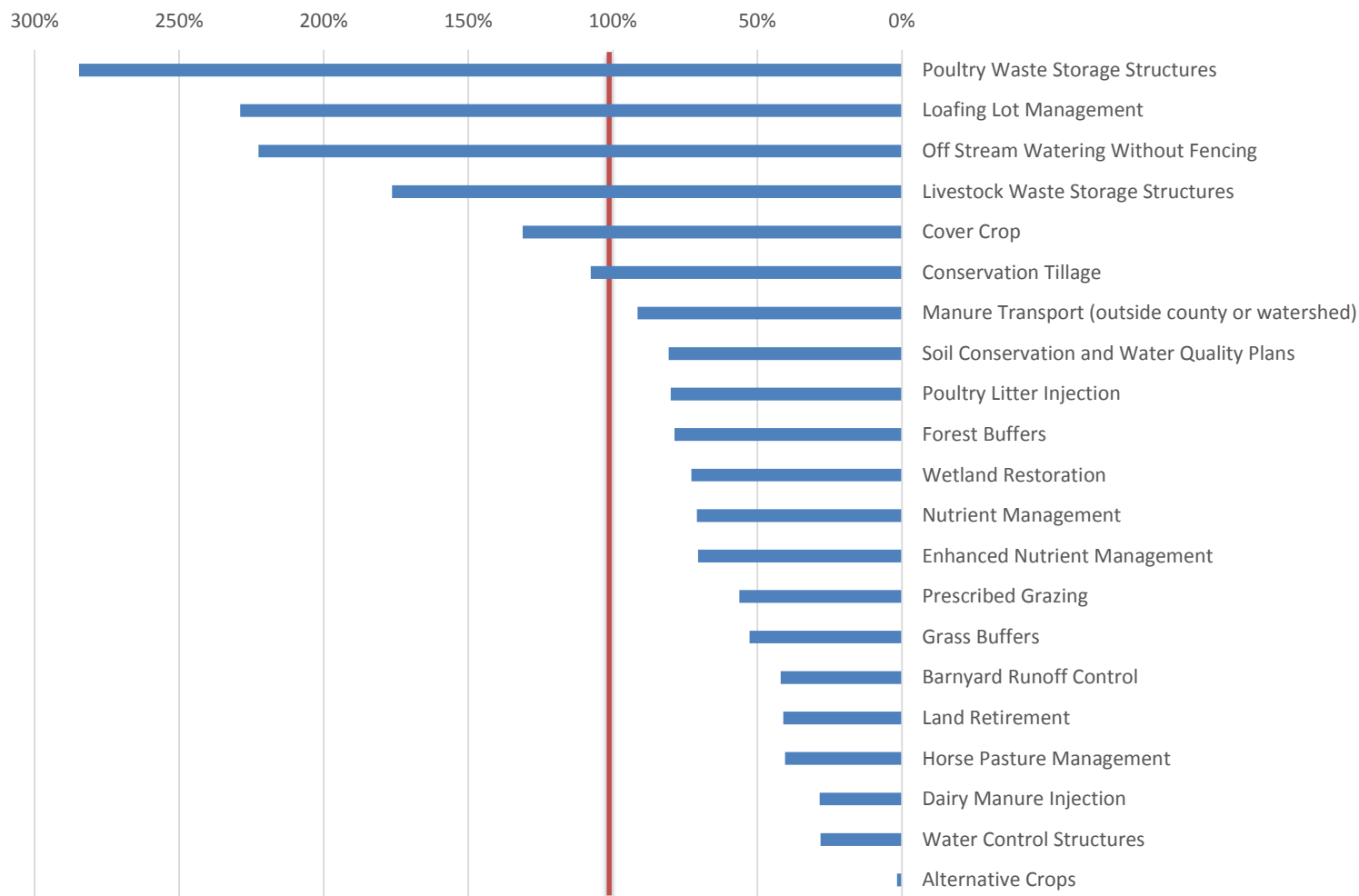
Agriculture WIPII Plan Goals

BMP	Unit	2013 Milestones	2017 Goal	2025 Goal
Manure Transport - Out of Watershed	Tons	37,000	51,000	85,000
Mortality Composters	Operations	20	87	145
Non Urban Stream Restoration	Linear Feet	6,919	29,061	48,435
Nutrient Management - Cropland	Acres	685,000	211,036	351,726
Nutrient Management - Hayland	Acres	75,000	11,207	18,679
Nutrient Management - Nursery	Acres	1,836	1,836	3,060
Off Stream Watering Without Fencing	Acres	655	2,500	4,167
Poultry Litter Incorporation	Acres	23,876	100,283	167,138
Poultry Litter Treatment	Operations	64	270	450
Precision Intensive Rotational Grazing	Acres	398	1,671	2,785
Prescribed Grazing	Acres	2,614	10,982	18,304
Shallow Wildlife Wetland Habitat Management	Acres	35	150	250
Shoreline Erosion Control	Linear Feet	3,649	15,326	25,543
Soil Conservation and Water Quality Plans	Acres	826,000	1,026,413	1,145,326
Sorbing Materials in Ag Ditches	Acres	737	3,097	5,162
Stream Access Control with Fencing	Acres	5,050	20,956	35,355
Tree Planting; Vegetative Environmental Buffers - Poultry	Acres	118	500	830
Water Control Structures	Acres	2,453	10,289	17,173
Wetland Restoration	Acres	502	2,110	3,516
Phytase	%	24%		
Poultry Waste Structures	Operations	7	31	51
Livestock Waste Structures	Operations	20	87	145





Progress Towards WIPII 2025 Goals

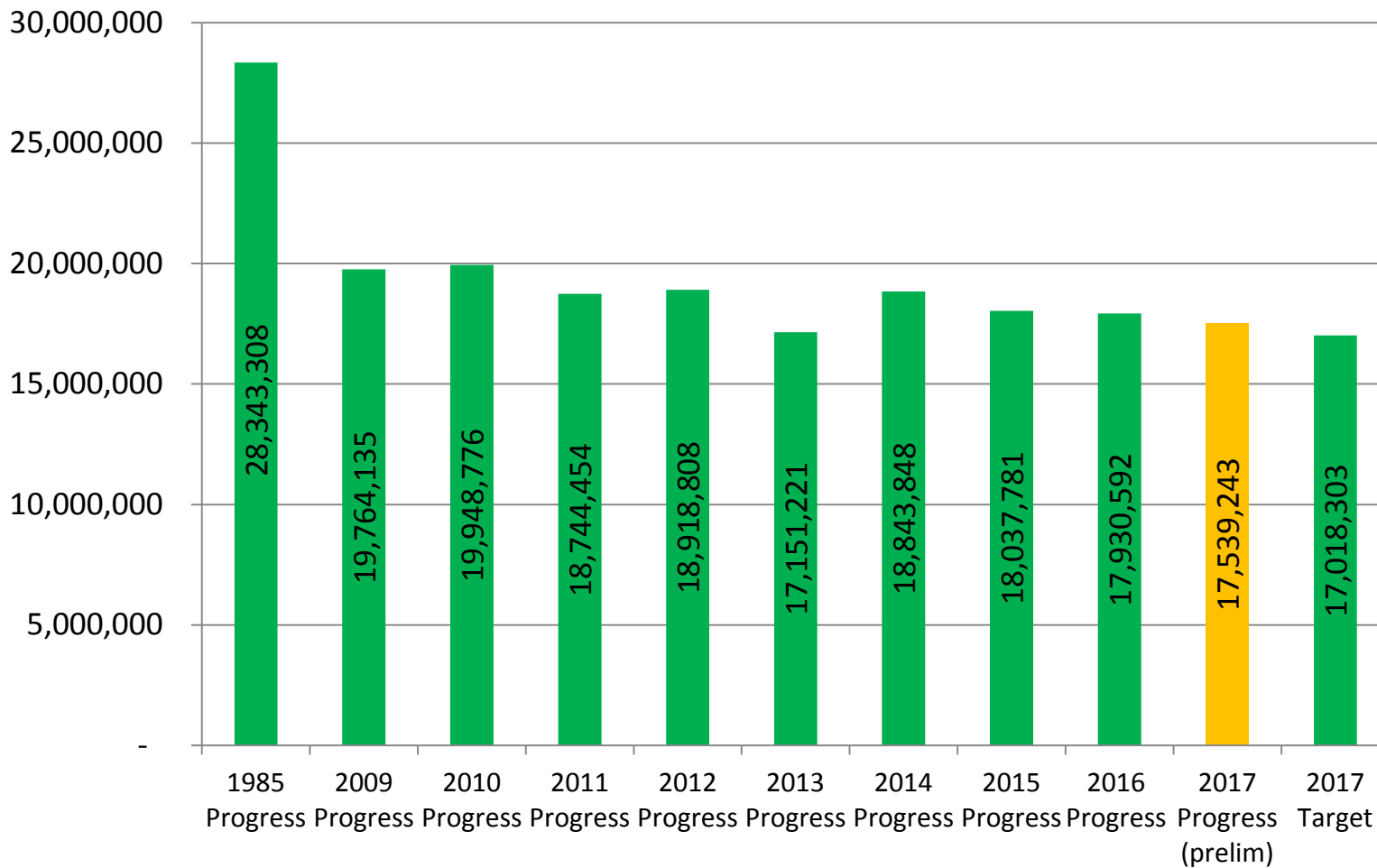


Based on 2017 Progress P5.3.2





Pounds N Delivered to Bay: 2017



Phase 5.3.2





Implementation Highlights

- Fiscal Year 2017
 - 924,000 acres under a Soil Conservation and Water Quality Plan
 - 827,000 acres in compliance with nutrient management regulations
 - 559,000 acres of winter cover crop
 - 794,000 acres of conservation tillage
- Programmatic Highlights
 - Phosphorus Management Tool (PMT) regulations
 - Animal Waste Technology Fund
 - Manure Matching Services
 - Soil Health and Climate Change Initiatives
 - Agricultural Certainty Program
 - Nutrient Trading



Ensuring BMP Performance

- Since 2017, the Chesapeake Bay Program requires all states and sectors to provide enhanced verification of BMPs to receive WIP credit.
- 100% of BMPs have to be verified to receive initial “credit” and ~10% of BMPs will have to be re-verified annually to receive continued “credit”



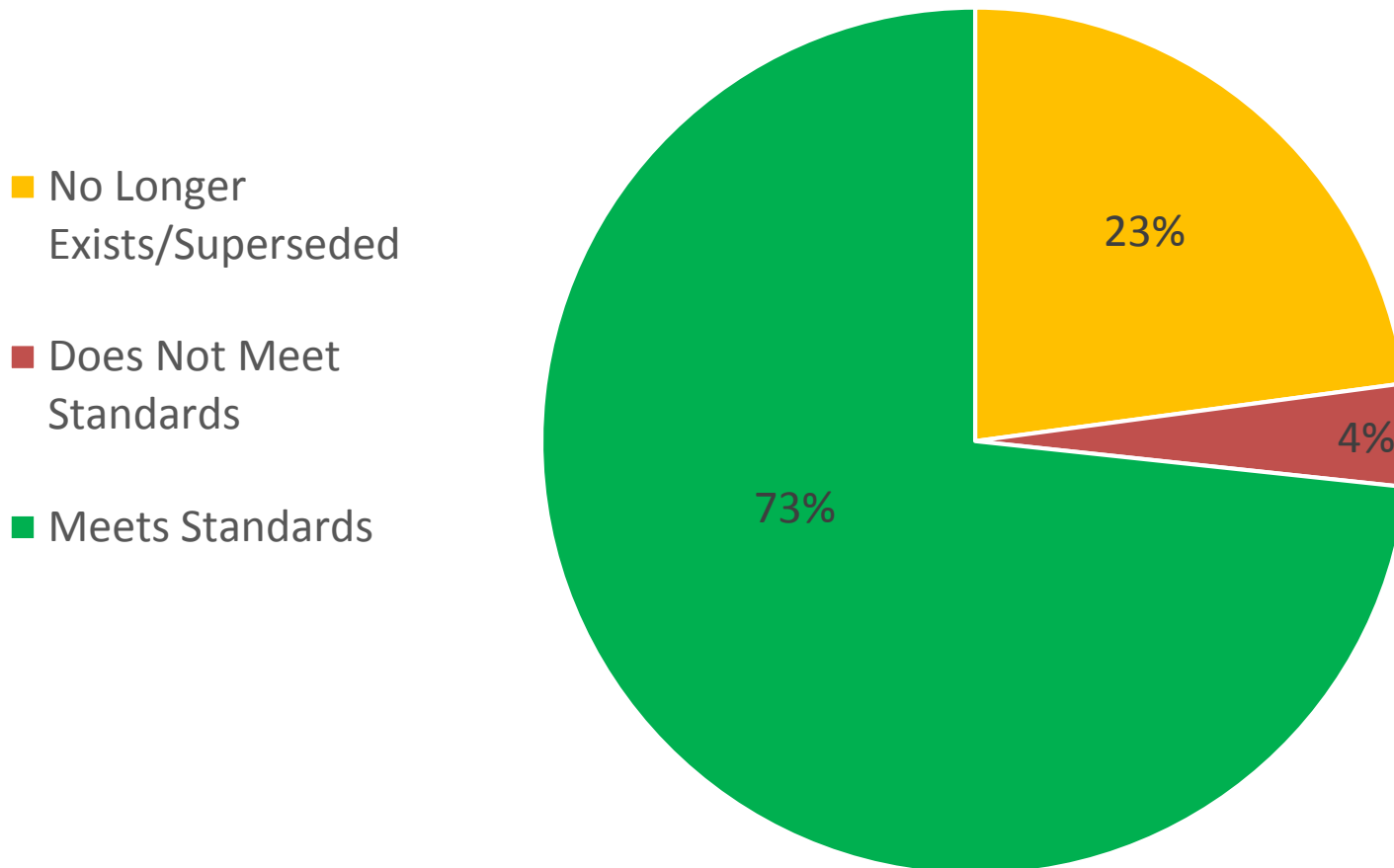
Verification Program Status

- Efforts began with a pilot program October – December 2016, with 5 Soil Conservation Districts
- Building to a team of 6 staff regionally-based
- Parcels prioritized by potential N reductions from existing BMPs
- 73% are still maintained on the landscape and providing water quality benefits
- Spatial component included



Verification Results

More than 8,700 agricultural BMPs reviewed since October 2016





Draft Planning Targets

Draft Agriculture Nitrogen Loads										
			1984	2009	2017	2017 w/Verf	WIP2	Remaining	Remaining w/Verf	% of Total
Agriculture Land Uses										
	Animal									
		Feeding Space	2.34	0.57	0.66	0.66	0.22	(0.44)	(0.44)	19%
		Pasture	3.01	1.79	1.47	1.45	1.06	(0.41)	(0.39)	17%
			5.35	2.36	2.13	2.11	1.28	(0.85)	(0.83)	35%
	Crop									
		Corn/Sorghum	13.93	9.40	8.85	8.51	7.35	(1.50)	(1.16)	49%
		Double Cropped	2.32	2.87	3.38	3.25	3.44	0.06	0.19	-8%
		Other Crop	2.33	1.35	1.29	1.25	1.12	(0.17)	(0.13)	6%
		Silage	3.15	0.98	0.60	0.59	0.37	(0.23)	(0.22)	9%
		Small Grains	2.09	0.99	0.95	0.92	0.71	(0.24)	(0.21)	9%
		Soybean	4.67	3.72	3.96	3.83	3.75	(0.21)	(0.08)	3%
			28.49	19.31	19.03	18.35	16.74	(2.29)	(1.61)	68%
	Hay	Hay	1.37	1.31	1.22	1.22	1.3	0.08	0.08	-3%
Total Agriculture			35.21	22.98	22.38	21.68	19.32	(3.06)	(2.36)	
Natural Influenced by Agriculture										
		Shoreline	1.53	1.53	1.53	1.53	1.53	0.00	0.00	0%
		Streambank	2.55	2.09	2.03	2.01	1.71	(0.32)	(0.30)	103%
		Wetland	0.31	0.30	0.30	0.30	0.31	0.01	0.01	-3%
Total Natural			4.39	3.92	3.86	3.84	3.55	(0.31)	(0.29)	
Total N Agriculture Sector			39.60	26.90	26.24	25.52	22.87	(3.37)	(2.65)	



Draft Planning Targets

Draft Agriculture Phosphorus Loads										
			1984	2009	2017	2017 w/Verf	WIP2	Remaining	Remaining w/Verf	% of Total
Agriculture Land Uses										
Animal										
	Feeding Space		0.11	0.03	0.04	0.04	0.01	(0.03)	(0.03)	23%
	Pasture		0.35	0.17	0.16	0.16	0.07	(0.09)	(0.09)	69%
			0.46	0.20	0.20	0.20	0.08	(0.12)	(0.12)	92%
Crop										
	Corn/Sorghum		0.52	0.16	0.14	0.14	0.13	(0.01)	(0.01)	8%
	Double Cropped		0.14	0.07	0.07	0.07	0.08	0.01	0.01	-8%
	Other Crop		0.24	0.10	0.09	0.09	0.08	(0.01)	(0.01)	8%
	Silage		0.09	0.01	0.01	0.01	0.01	0.00	0.00	0%
	Small Grains		0.11	0.02	0.02	0.02	0.02	0.00	0.00	0%
	Soybean		0.32	0.10	0.09	0.08	0.07	(0.02)	(0.01)	8%
			1.42	0.46	0.42	0.41	0.39	(0.03)	(0.02)	15%
Hay	Hay		0.06	0.02	0.03	0.03	0.04	0.01	0.01	-8%
Total Agriculture			1.94	0.68	0.65	0.64	0.51	(0.14)	(0.13)	
Natural Influenced by Agriculture										
	Shoreline		1.08	1.08	1.08	1.08	1.08	0.00	0.00	0%
	Streambank		0.82	0.42	0.38	0.39	0.41	0.03	0.02	100%
	Wetland		0.02	0.02	0.02	0.02	0.02	0.00	0.00	0%
Total Natural			4.39	3.92	3.86	3.84	3.55	0.03	0.02	
Total P Agriculture Sector			6.33	4.60	4.51	4.48	4.06	(0.11)	(0.11)	



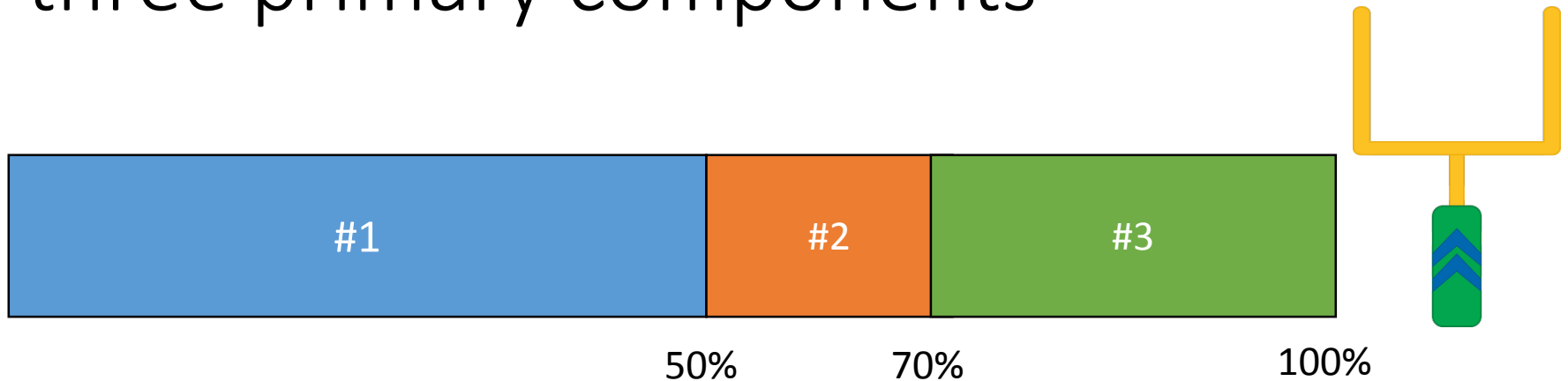
Phase III WIP Strategy

- Regional WIP meetings (all sectors) May and June 2018
- Agriculture engagement Summer 2018 through September 2018
 - MASCD
 - Farmer/Ag Leadership roundtable
 - Local Ag WIP meetings
 - Build Upon Phase II strategy
- Re-evaluate opportunities
 - Feasibility Analysis
- Incorporate new BMPs
- BMP Verification findings
- Draft WIP 3 due March 1, 2019 (final by June 28)

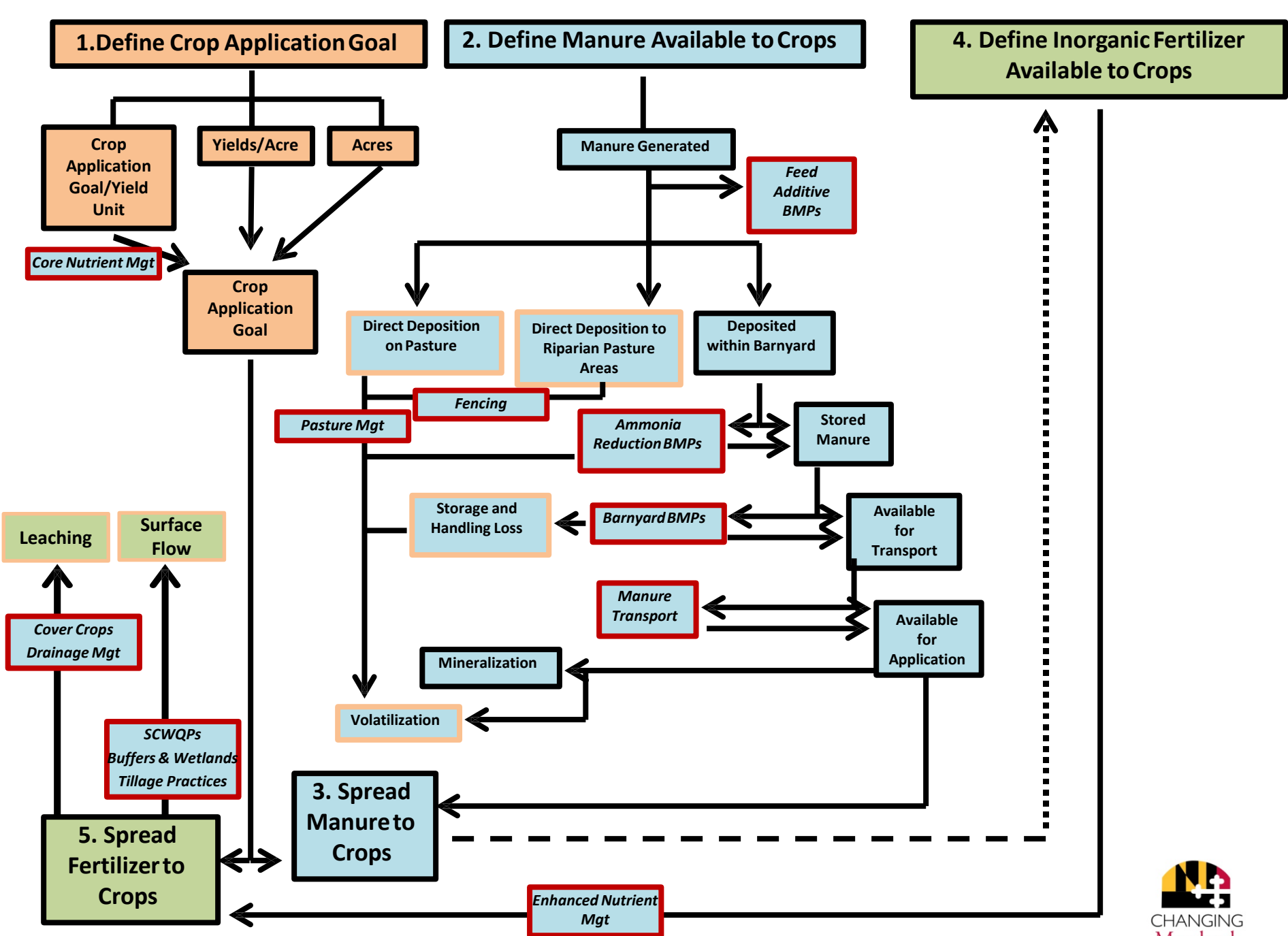
Local SCD meeting tentative calendar

- August 7 – Worcester SCD p.m.
- August 8 – Somerset SCD a.m. and Wicomico SCD p.m.
- August 9 – Dorchester SCD a.m. and Talbot SCD p.m.
- August 21 – Caroline SCD a.m. and Queen Anne's SCD p.m.
- August 22 – Cecil SCD a.m. and Kent SCD p.m.
- August 23 – Harford SCD a.m. and Baltimore Co. SCD p.m.
(*may swap order*)
- August 28 – Carroll SCD a.m. and Frederick SCD p.m.
- August 29 – Howard SCD a.m. and Montgomery SCD p.m.
- August 30 – PG SCD a.m. and Anne Arundel SCD p.m.
- September 5 – Garret SCD p.m.
- September 6 – Allegany SCD a.m. and Washington SCD p.m.
- September 12 – St. Mary's SCD p.m.
- September 13 – Charles SCD a.m. and Calvert SCD p.m.

Reaching our 2025 WIP goal has three primary components



1. Progress toward WIP 2 goals
2. BMP re-verification
3. Maintaining progress and addressing any remaining gap



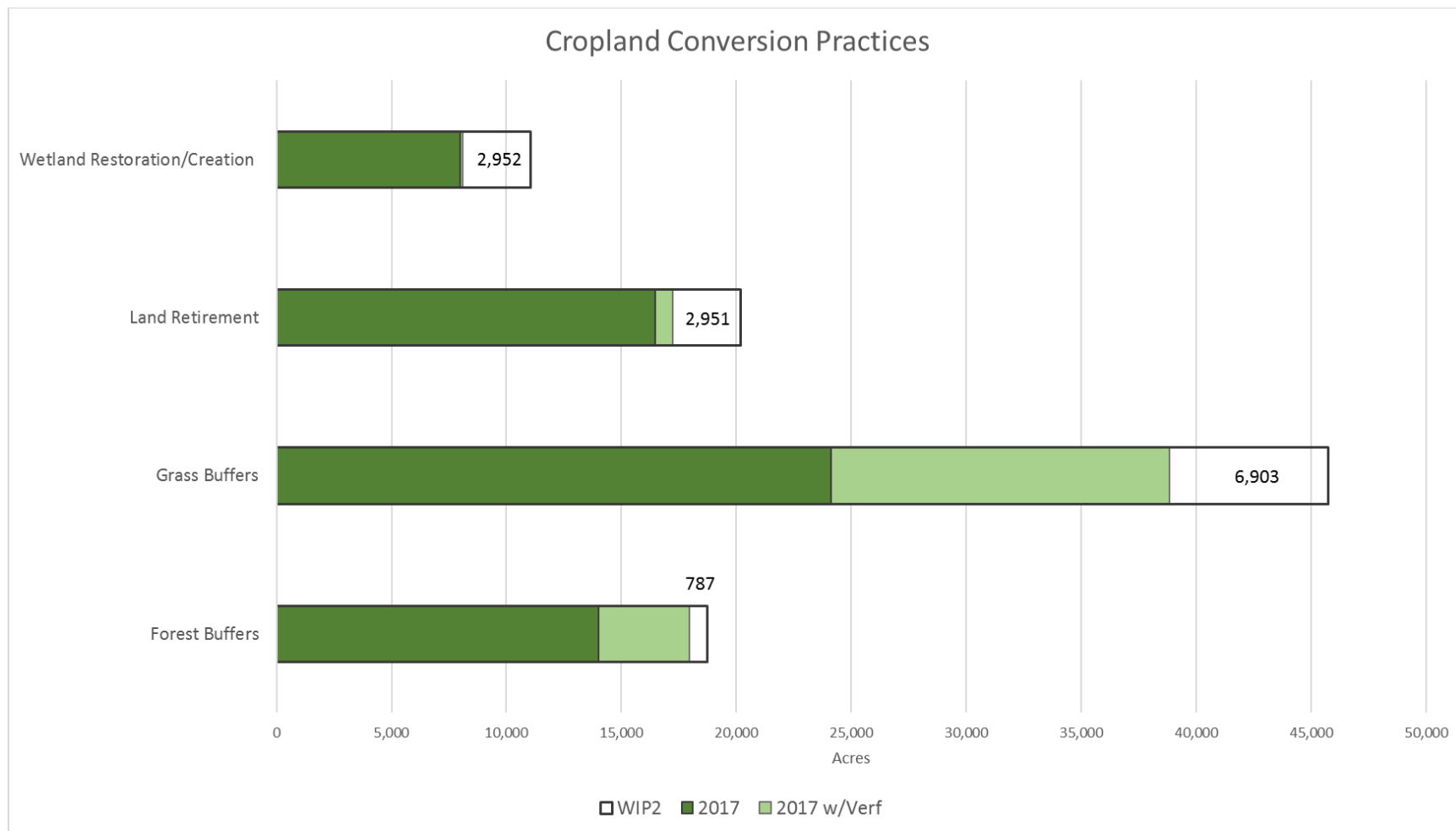


Implementation Gaps to 2025

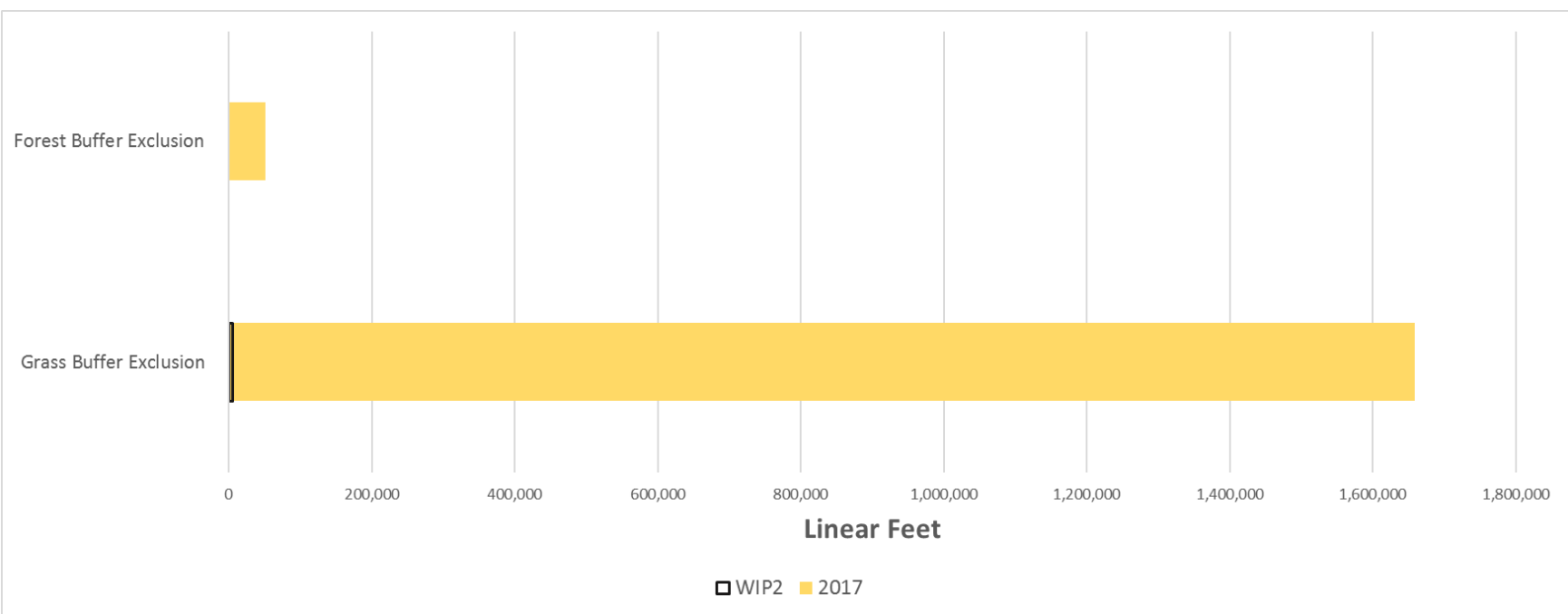
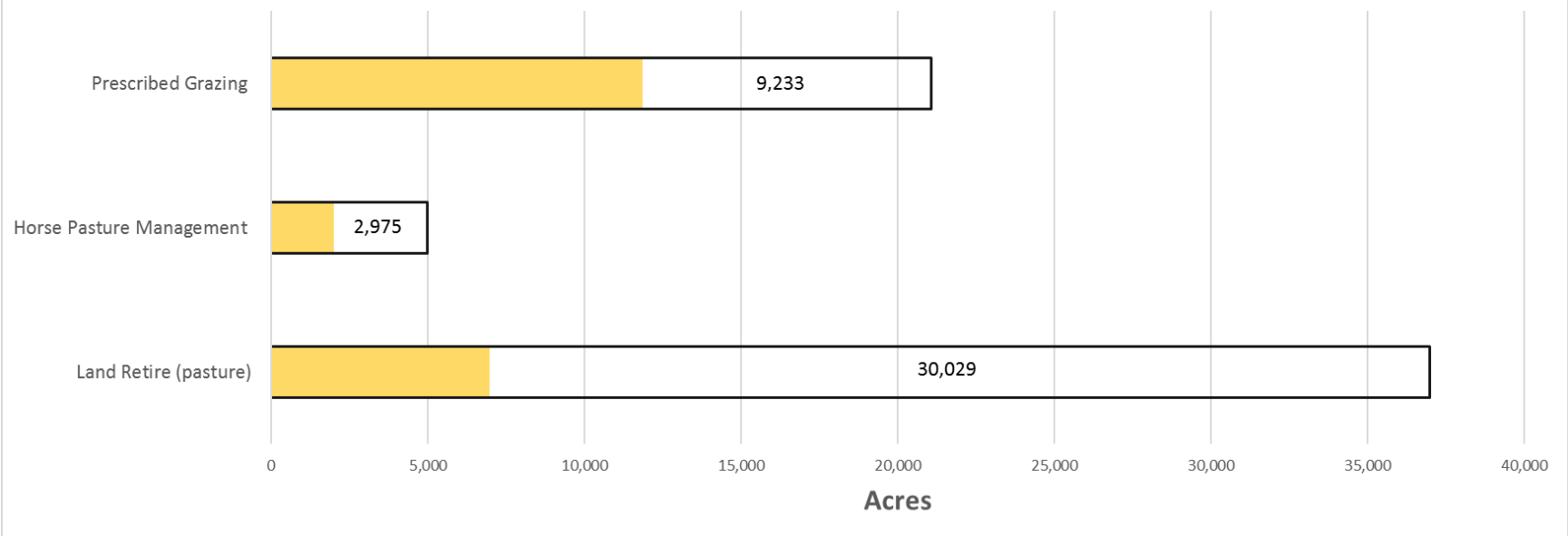
- Nutrient Management
 - Core 65% 70% -> current goal 70% 90%-95%?
 - Enhanced Practices (Rate, Timing, Placement) <10% 30%-40%?
 - Setback requirement data gap
 - Stream Exclusion linear feet -> 90%-95%
- Conservation Planning 60% -> current goal 88% 95%
- Conservation Tillage 59% -> current goal 65% 70%-75%
- Cover Crop 500k -> current goal 425k 700-800k?
- Animal Waste
 - Poultry nearly 100% coverage (regulatory)
 - Dairy ~70-80% (future)



Implementation Gaps to 2025



Pasture Management Practices



□ WIP2 ■ 2017



New BMPs in the “WIP III Toolbox”

- Cropland Irrigation Management
- Agricultural Stormwater Management
- Nursery/Greenhouse water capture and reuse
- Agricultural Drainage Management
- Manure Treatment Technologies
- Manure Incorporation



Questions

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