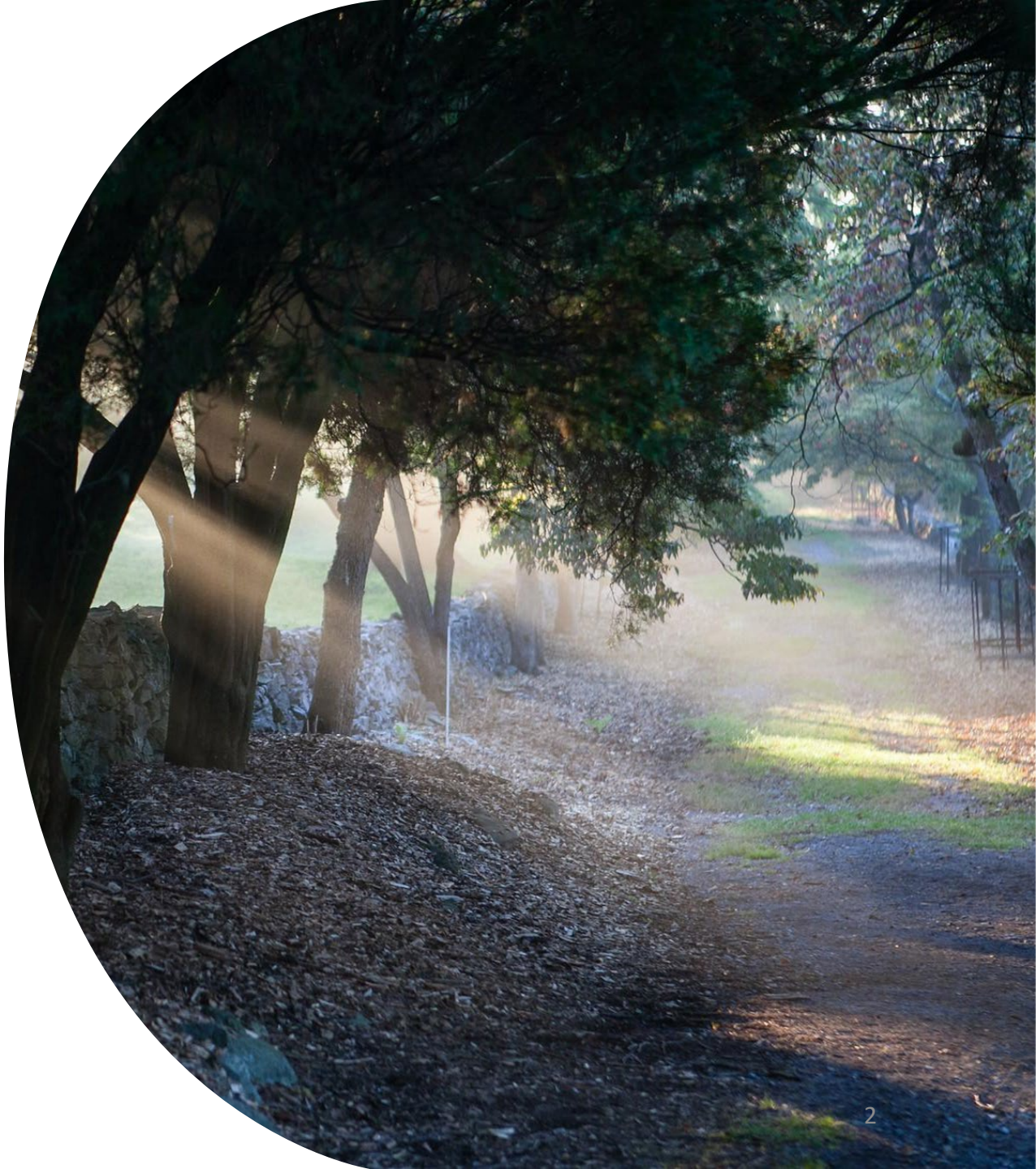
BMPs on Load Sources

Agricultural Modeling Team: November 2023

Agenda

1. Mapped Land Uses
2. Land Uses with Distinct Loading Rates and Management Practice Reporting
3. Questions to Consider

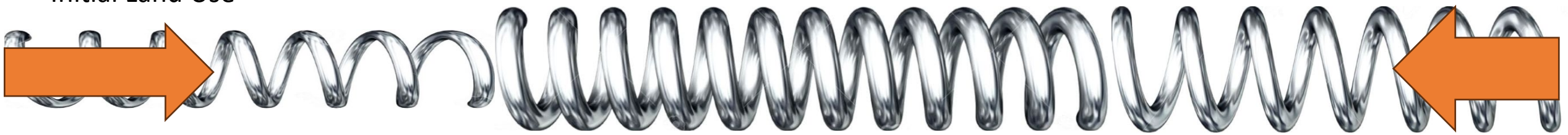


Land Uses

What land uses are mapped, and which of those make it into CAST load sources

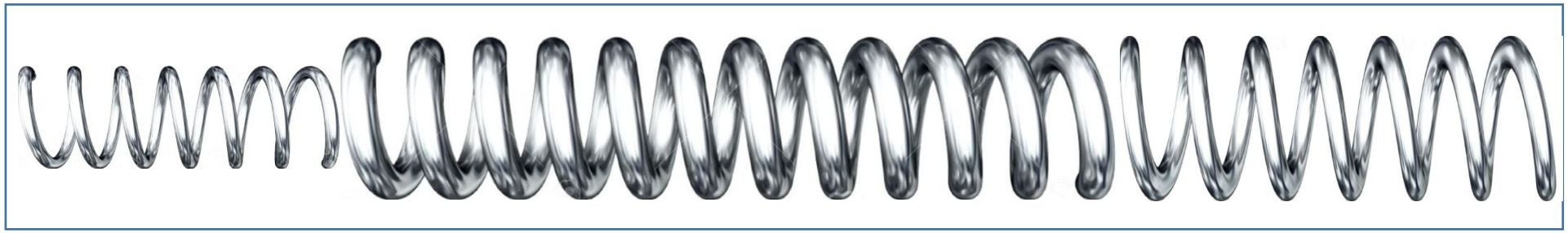
Exact physical analog

Initial Land Use



Land Use Box / LRseg Size

Revised Land Use



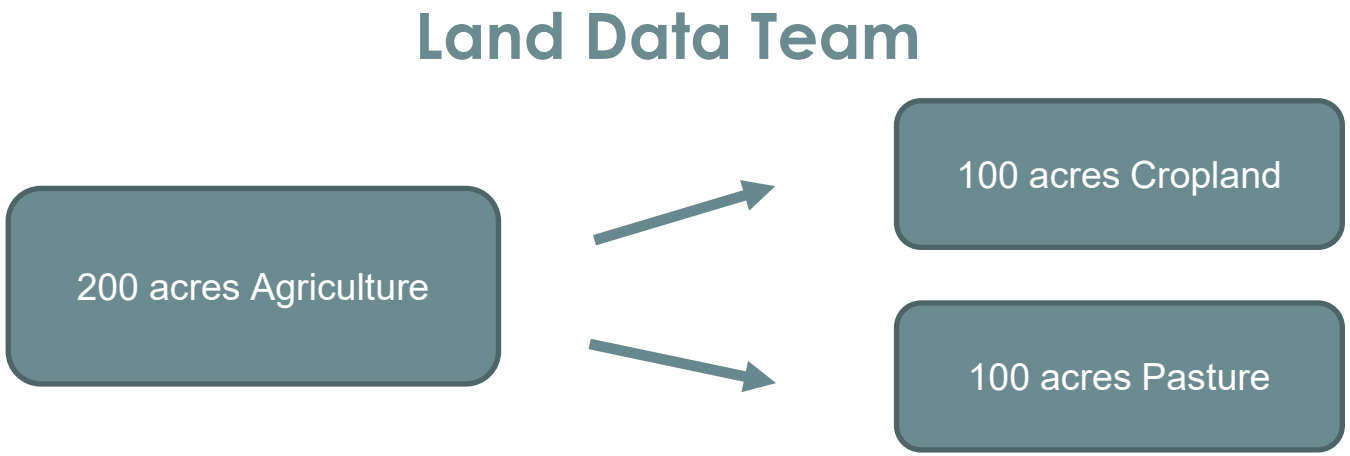
Land Uses

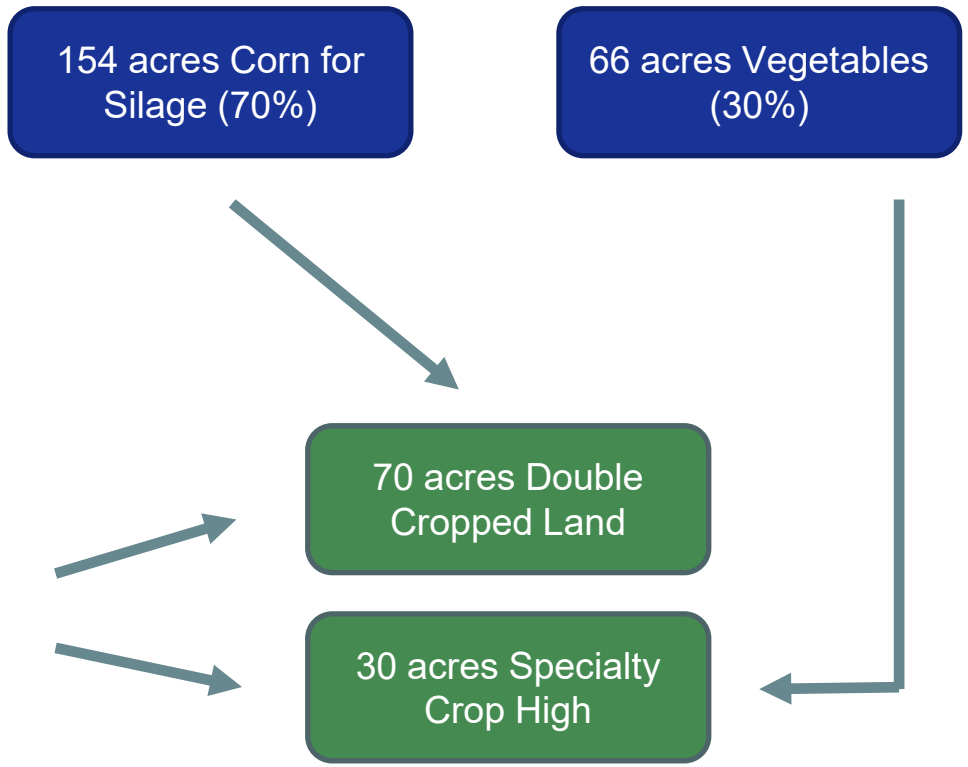
The **mapped** land uses will come from the Land Data Team and include almost 90 different categories.

Of the **mapped** land uses, the acres of cropland and pasture will be used in CAST.

Further breakdowns of those cropland and pasture acres will come from the **Census of Agriculture**.

The Ag Census acres will then be **proportioned** to the total cropland and pasture acres by county, for the corresponding **CAST land uses**.





CAST

The process for the breakdown of pasture is the same as cropland

This is a simplified, hypothetical example

These are the **mapped** land uses

Rollup to Phase 6 Land Use/Cover Classes

Grey classes planned for 2021/22 data released for Phase 7

1. Impervious Roads
- 20 Roads

2. Impervious Non-Roads
- 21 Structures
- 22 Other Impervious (Parking lots, driveways)
- 31 Extractive Impervious
- 32 Solar Field Panel Arrays???
- 90 Agricultural Structures
- 91 Animal Operation Impervious

3. Tree Canopy Over Impervious
- 23 TC over Roads
- 24 TC over Structures
- 25 TC over Other Impervious
- 94 TC over Agricultural Structure
- 95 TC over Animal Operation Impervious

4. Turf Grass
- 27 Turf Grass

5. Tree Canopy over Turf Grass
- 26 Tree Canopy over Turf Grass

6. Forest
- 40 Forest
- 41 Tree Canopy, Other

7. Wetlands, Floodplain
- 50 Riverine Wetlands Barren
- 51 Riverine Wetlands Herbaceous
- 52 Riverine Wetlands Shrubland
- 53 Riverine Wetlands Tree Canopy
- 54 Riverine Wetlands Forest
- 55 Riverine Wetlands Harvested Forest

8. Wetlands, Other
- 60 Terrene Wetlands Barren
- 61 Terrene Wetlands Herbaceous
- 62 Terrene Wetlands Shrubland
- 63 Terrene Wetlands Tree Canopy
- 64 Terrene Wetlands Forest
- 65 Terrene Wetlands Harvested Forest

9. Wetlands, Tidal
- 70 Tidal Wetlands Barren
- 71 Tidal Wetlands Herbaceous
- 72 Tidal Wetlands Shrubland
- 73 Tidal Wetlands Tree Canopy
- 74 Tidal Wetlands Forest
- 75 Tidal Wetlands Harvested Forest

10. Water
- 11 Lakes & Reservoirs
- 12 Riverine Ponds
- 13 Terrene Ponds
- 14 Streams and Rivers (visible water)

11. Mixed Open
- 15 Bare Shore
- 28 Bare Developed
- 30 Extractive Barren
- 33 Solar Field Barren
- 34 Solar Field Herbaceous
- 35 Solar Field Shrubland
- 36 Suspended Succession Barren
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- 38 Suspended Succession Shrubland
- 42 Natural Succession Barren
- 43 Natural Succession Herbaceous
- 44 Natural Succession Shrubland
- 45 Harvested Forest Barren
- 46 Harvested Forest Herbaceous
- 92 Animal Operation Barren
- 93 Animal Operation Herbaceous

12. Cropland
- 80 Cropland Barren
- 81 Cropland Herbaceous
- 82 Orchards and Vineyards Barren
- 83 Orchards and Vineyards Herbaceous
- 84 Orchards and Vineyards Shrubland

13. Pasture
- 85 Pasture Barren
- 86 Pasture Herbaceous
- 87 Hay Barren
- 88 Hay Herbaceous

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These are the **mapped agricultural** land uses

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These are the **CAST mapped** land uses. The subcategories come the AMT recommendations

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CAST Load Sources

CAST is an **average annual model** with the land use representing what is in that calendar year

Cropland

This category includes:

- Full Season Soybeans
- Double Cropped Land
- Silage with Manure
- Small Grains and Grains
- Grain without Manure
- Specialty Crop Low
- Other Agronomic Crops
- Grain with Manure
- Specialty Crop High

Pasture

This category includes:

- Ag Open Space
- Pasture
- Other Hay
- Leguminous Hay

Feeding Space

This category includes:

- Non-Permitted Feeding Space
- Permitted Feeding Space

Loading rate determination

- Ag Modeling Subcommittee
  - The Ag Land Use Loading Rate Subgroup
    - Determined ratios,
    - Modeling Workgroup adopted
- Related loading rates to a reference land use

Chesapeake Bay Average			
Land class	Land Use	Loading Rate Ratio	Loading Rate (pounds per acre per year)
Cropland	Double Cropped Land	0.79	30.9
	Full Season Soybeans	0.71	27.7
	Grain with Manure	1.4	54.7
	Grain without Manure: **Reference land use**	1	39.1
	Other Agronomic Crops	0.45	17.6
	Silage with Manure	1.62	63.3
	Silage without Manure	1.16	45.3
	Small Grains and Grains	0.84	32.8
	Specialty Crop High	1.34	52.4
	Specialty Crop Low	0.31	12.1
Pasture	Ag Open Space	0.43	5.1
	Legume Hay	0.74	8.7
	Other Hay	1.04	12.3
	Pasture: **Reference Land Use**	1	11.8

Update from the Ag Land Use Loading Rate Steering Committee

Draft Agriculture Relative Load Ratio Estimates (07/15/15)

Land Use	Manure	Relative N Loadings (leach. + runoff)	Notes & Updates	Relative P Loadings (sediment-attached P)	Relative P Loadings (dissolved P)	Relative Sediment Loadings (runoff)
Corn grain	No	1.00		1.00	1.00	1.00
Corn silage	No	1.09	in review			
Corn grain	Yes	1.27	likely increase			
Corn silage	Yes	1.59	in review			
Soybean, full seas.	No	0.88	likely decrease	Variability between landuses will be captured as a function of LRseg-based RUSLE2 erosion estimates, so no further relative ratios are proposed.	Variability between landuses will be captured as a function of LRseg-based APLE dissolved P estimates, so no further relative ratios are proposed.	Variability between landuses will be captured as a function of LRseg-based RUSLE2 erosion estimates, so no further relative ratios are proposed.
Small grain & Soybean	No	0.82				
Small grain & Forage	Yes	0.95				
Other Agronomic	Yes	0.55				
Legume or mixed Hay	Yes	0.16				
Grass or other Hay	Yes	0.14				
Pasture	Yes	0.11	in review			
Ag Open Space	No	0.04				
Special Crops, high	Yes	1.41				
Special Crops, low	Yes	0.32				

The Steering Committee has reservations about the old RUSLE rates for pasture and hay relative to cropland (too high) and would like to review the new RUSLE2 rates to ensure better relative representation of these land uses in P6.

Pasture/Hay Literature Review

J. Cropper

Parameter	Units	Average Loading Rates				Ratios to Pasture
		Pasture		Other Hayland		
		Range	(Mean)	Range	(Mean)	
Dissolved P	(lbs/ac)	0.10 - 1.3	(0.70)	0.30 - 0.83	(0.64)	0.91
Total P	(lbs/ac)	0.10 - 1.8	(0.95)	0.32 - 0.91	(0.70)	0.74
Sediment	(lbs/ac)	50 - 200				
Total N	(lbs/ac)	1.3 - 3.84			0.52	0.20

References:

Kilmer, V. J., J. W. Gilliam, J. F. Lutz, R. T. Joyce, and C. D. Eklund. 1974. Nutrient Losses from Fertilized Grassed Watersheds in Western North Carolina. J. Environ. Quality, 3:214-219.

McMullen, R.L. and K.R. Brye. 2012. Leachate Water Quality from Pasture Soil after Long-term Broiler Litter Applications. Wayne E. Sabbe Arkansas Soil Fertility Studies. AAES Research Series 608. pp. 28.

Owens, L. B. and M. J. Shipitalo. 2006. Surface and Subsurface Phosphorus Losses from Fertilized Pasture Systems in Ohio. J. Environ. Qual. 35:1101 -1109.

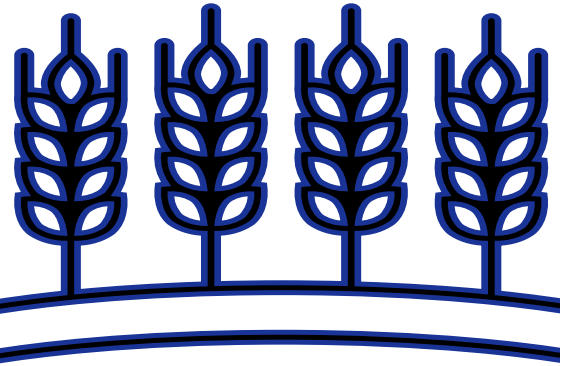
Vadas, P. A., D. L. Busch, J. M. Powell, and G. E. Brink. 2014. Monitoring runoff from cattle-grazed pastures for a phosphorus loss quantification tool. Agriculture, Ecosystems and Environment 199 (2015) 124-131.

Best Management Practices

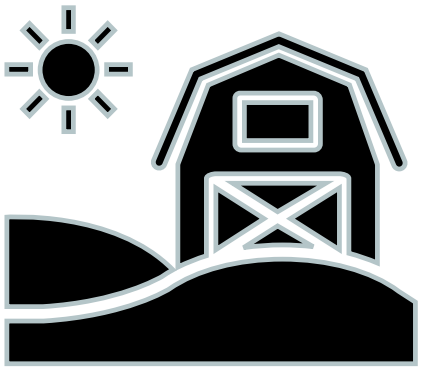
How BMPs are reported and applied to load sources

BMP Reporting on Load Sources

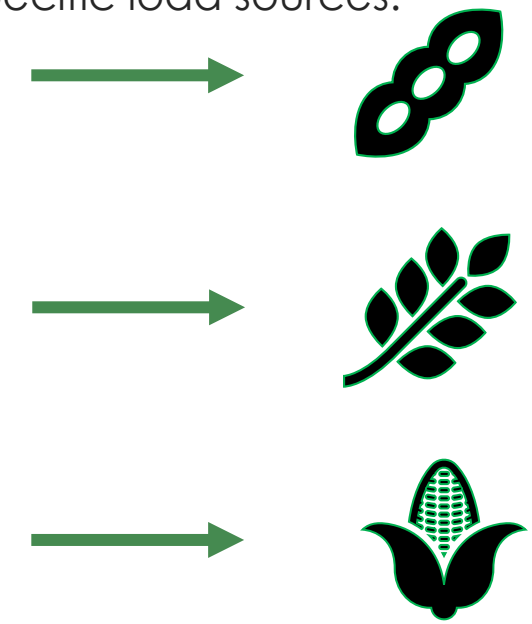
BMPs are reported on either a specific or a default load source.



Agricultural BMP → Default Load Source → Specific Load Sources →



BMPs that are reported on the default load source are then parsed out proportionally to the associated, specific load sources.



For 2022, and most earlier Progress scenarios, all agricultural BMPs were reported on the default land use.

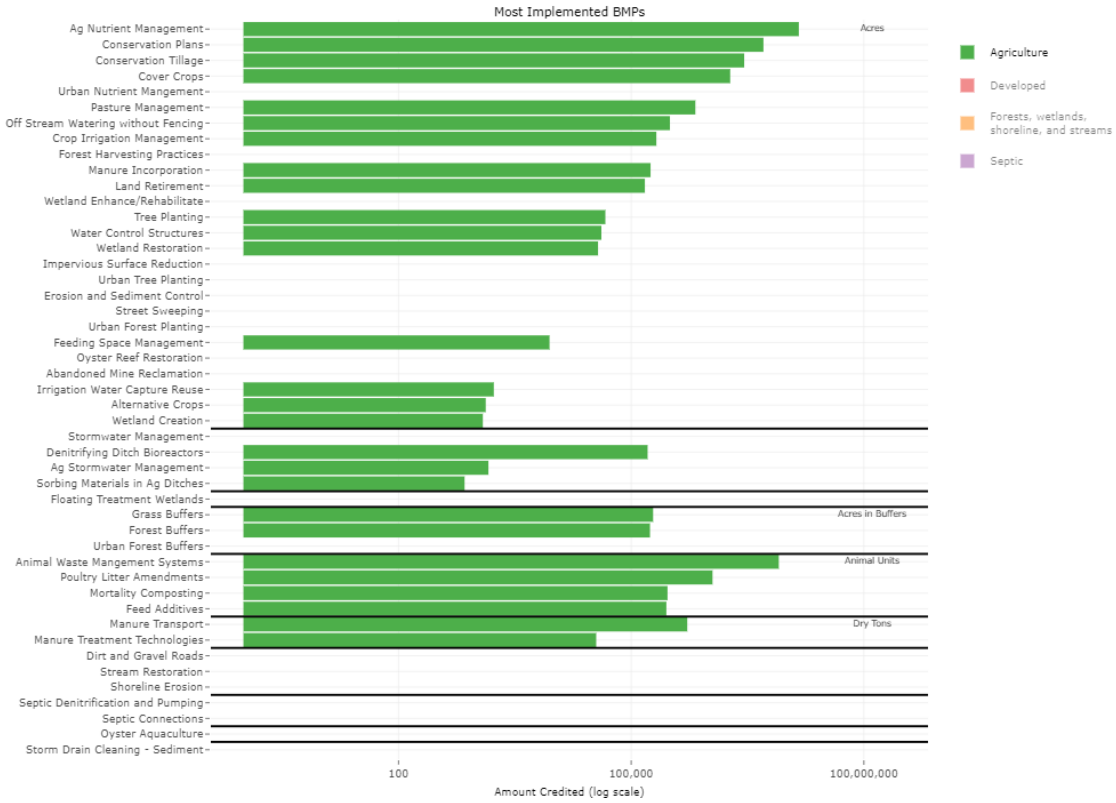
Example BMPs

Common BMPs and their default/specific load sources:

<u>Ag Nutrient Management</u> – **Row+Hay** – **14 Load Sources:** Double Cropped Land, Full Season Soybeans, Grain with Manure, Grain without Manure, Hay, Leguminous Hay, Other Agronomic Crops, Other Hay, Pasture, Silage with Manure, Silage without Manure, Small Grains and Grains, Specialty Crop High, Specialty Crop Low

<u>Conservation Plans</u> – **Agricultural** – **13 Load Sources:** Ag Open Space, Double Cropped Land, Full Season Soybeans, Grain with Manure, Grain without Manure, Leguminous Hay, Other Agronomic Crops, Other Hay, Pasture, Silage with Manure, Small Grains and Grains, Specialty Crop High, Specialty Crop Low

<u>Conservation Tillage</u> – **Row** – **10 Load Sources:** Double Cropped Land, Full Season Soybeans, Grain with Manure, Grain without Manure, Other Agronomic Crops, Silage with Manure, Silage without Manure, Smalls Grains and Grains, Specialty Crop High, Specialty Crop Low



https://cast.chesapeakebay.net/Documentation/wipbmpcharts

Questions to Consider

- What load sources do we need for BMP reporting in Phase 7?
- What level of detail can the ag sector track?
- What can the data reporters report?

Resources

- Land Uses
  - https://www.chesapeakebay.net/who/group/land-use-workgroup
  - https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/SRS_MB_LUMM_02_11_21_Final.pdf

- CAST Load Sources
  - https://cast.chesapeakebay.net/Home/SourceData

- Example BMPs
  - https://cast.chesapeakebay.net/Documentation/wipbmpcharts
  - https://cast.chesapeakebay.net/Home/TmdlTracking#progressReportingSection