Chesapeake Bay Program
Science. Restoration. Partnership.

January 19, 2024

Water Quality Impacts of Agriculture in the Potomac River Basin

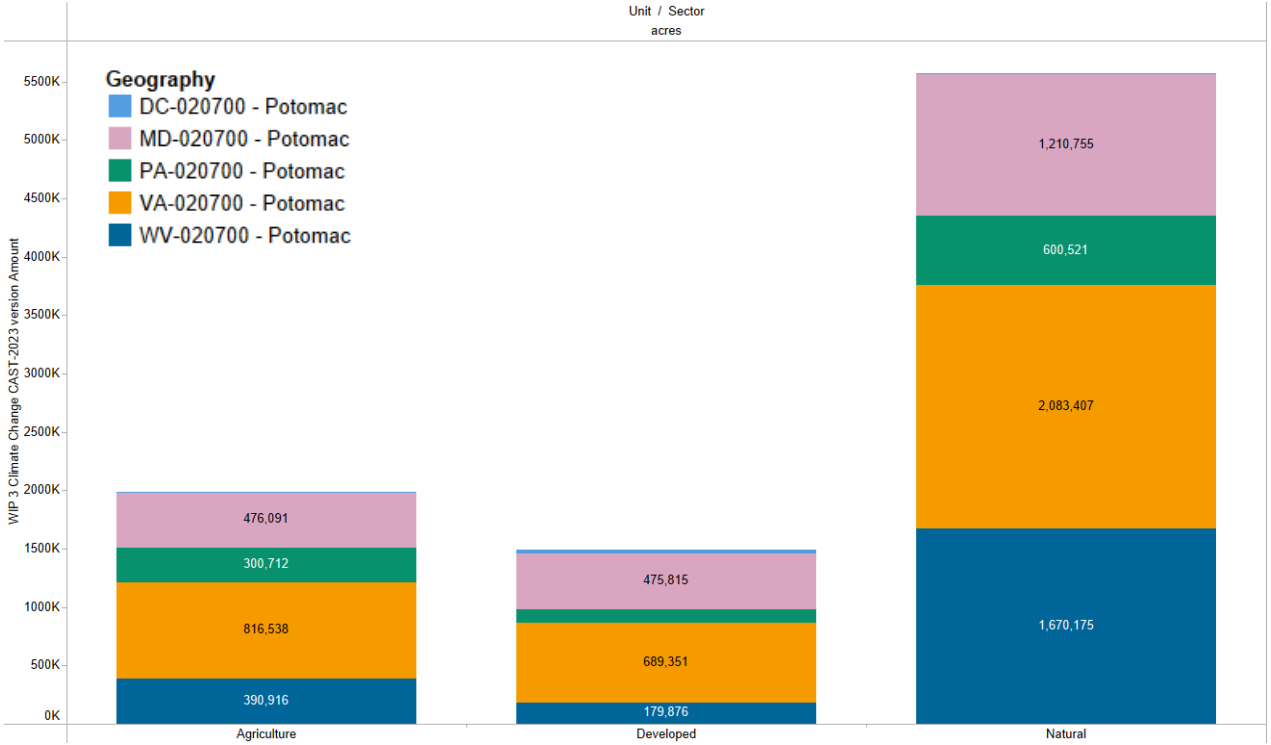
Hello!

My name is Olivia Devereux and I use she/her pronouns. I am a strategic watershed analyst for Devereux Consulting. I develop linked watershed and management practice models and accounting systems. I was the scientific lead in developing the first CAST model and remains the lead in managing CAST. I work closely with NRCS, USGS, the Chesapeake Bay Program and Chesapeake Bay states on water quality and habitat improvements. My education as a soil scientist keeps me grounded!

Agenda

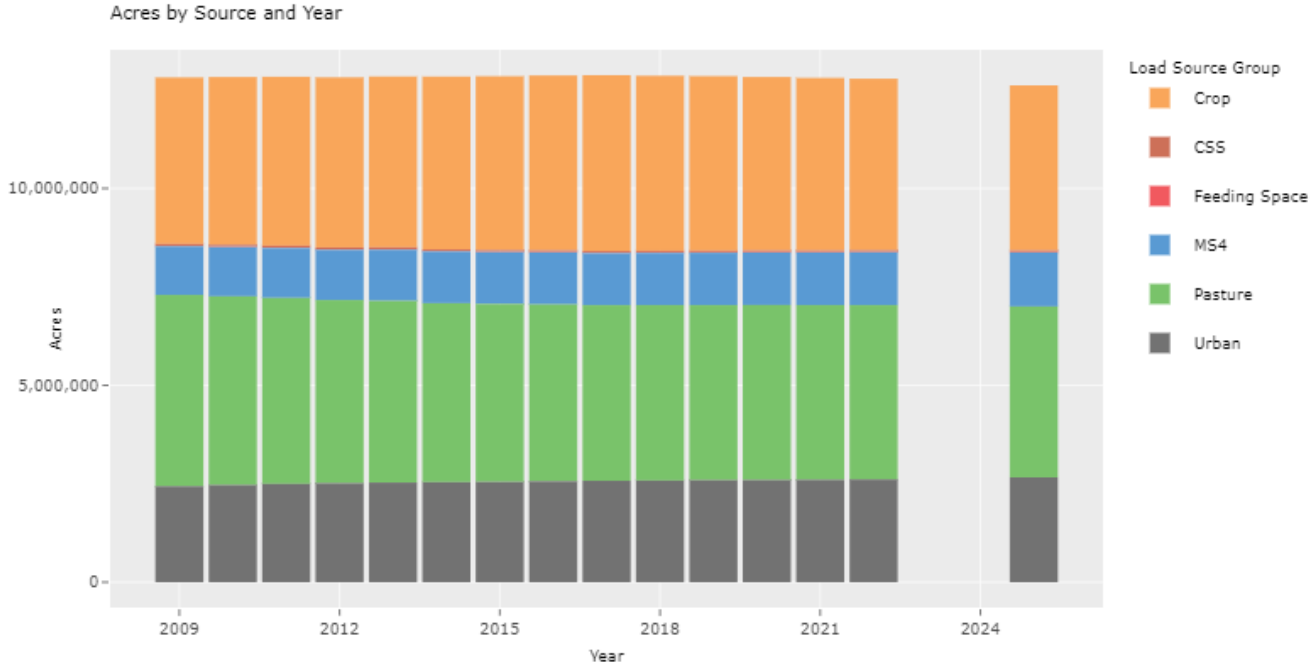
1. **Land Use**
   Agricultural land uses in the Potomac River Basin
2. **Nutrients Applied**
   Manure and inorganic fertilizer applied to crops, hay, and pasture
3. **Role of Conservation Practices in Improving Water Quality**
4. **Nitrogen and Phosphorus Load Trends**
5. **Chesapeake Bay TMDL**
   Planning Goals and Progress to Date

Acres per Sector



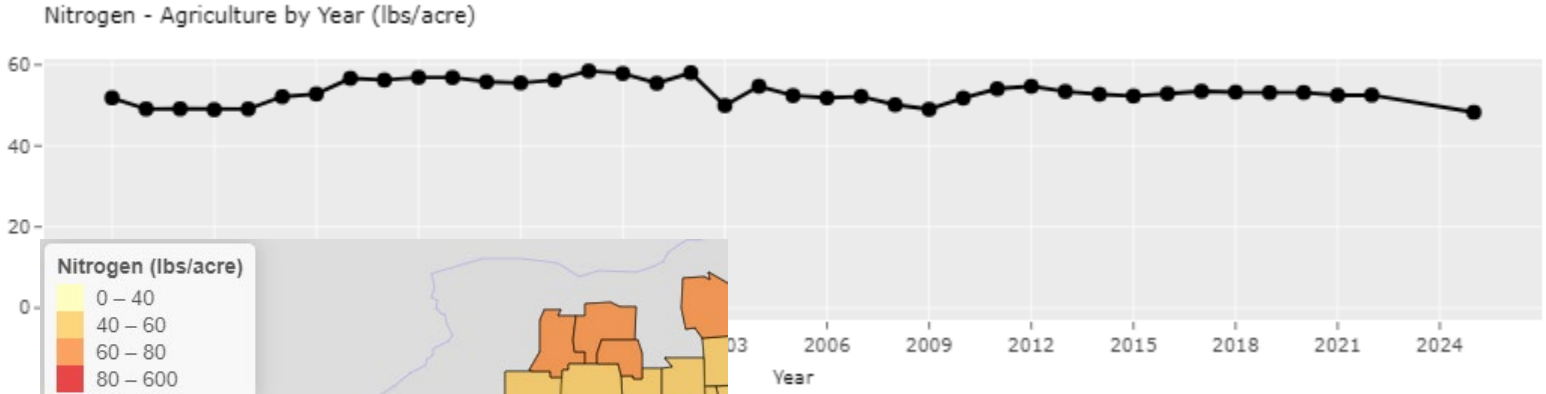
- Projected for 2025
- Agricultural acres have not changed substantially over time in the Potomac River Basin

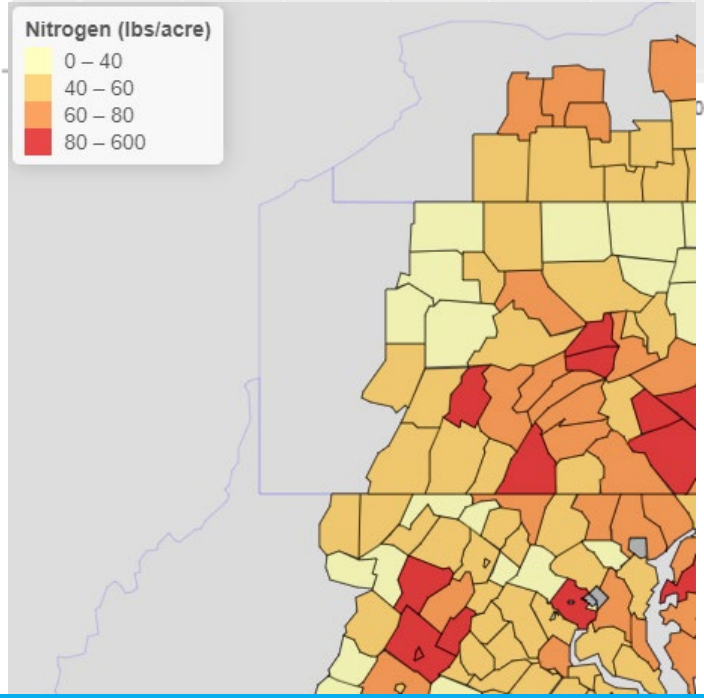
Potomac River Basin States



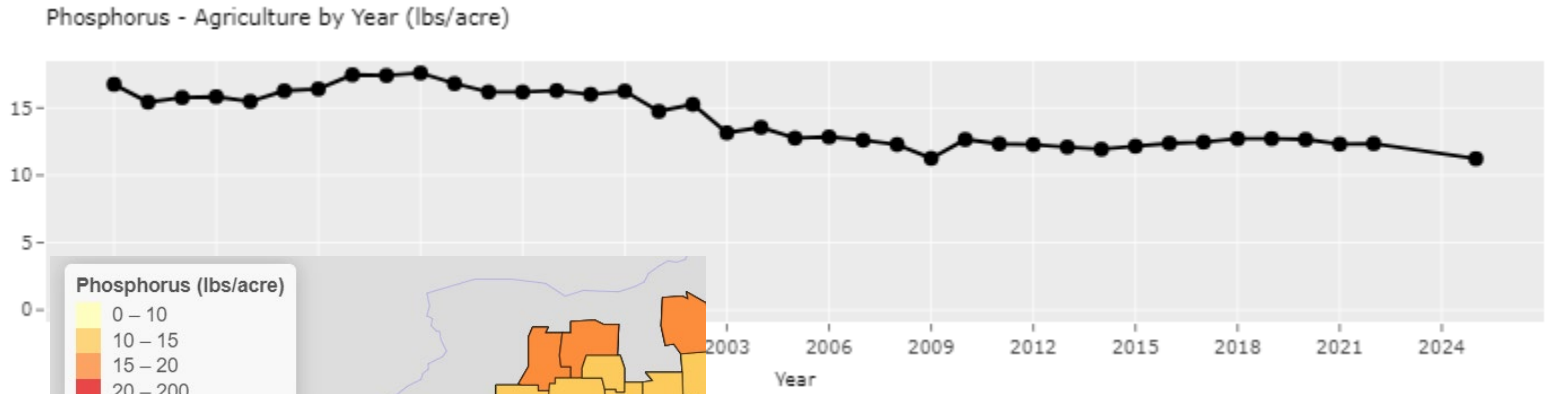
Acres by source and year

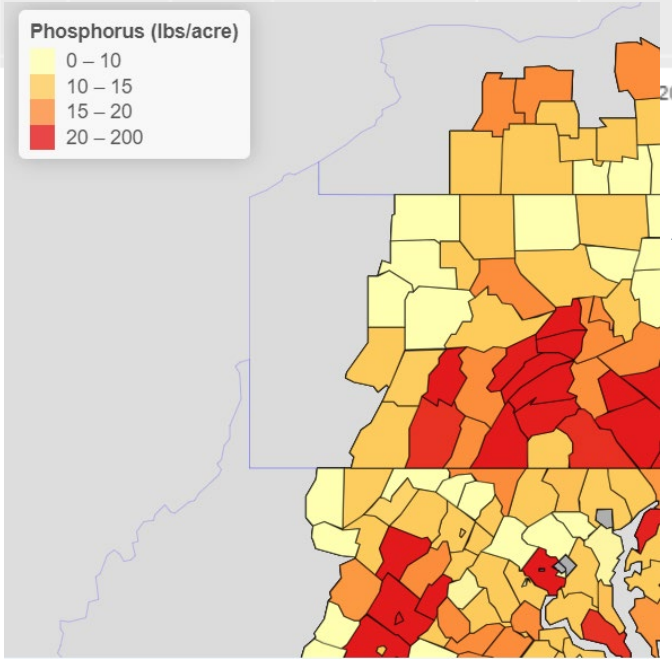
Crop and pasture comprise the most acres in the five states – MD, PA, WV, VA, and DC





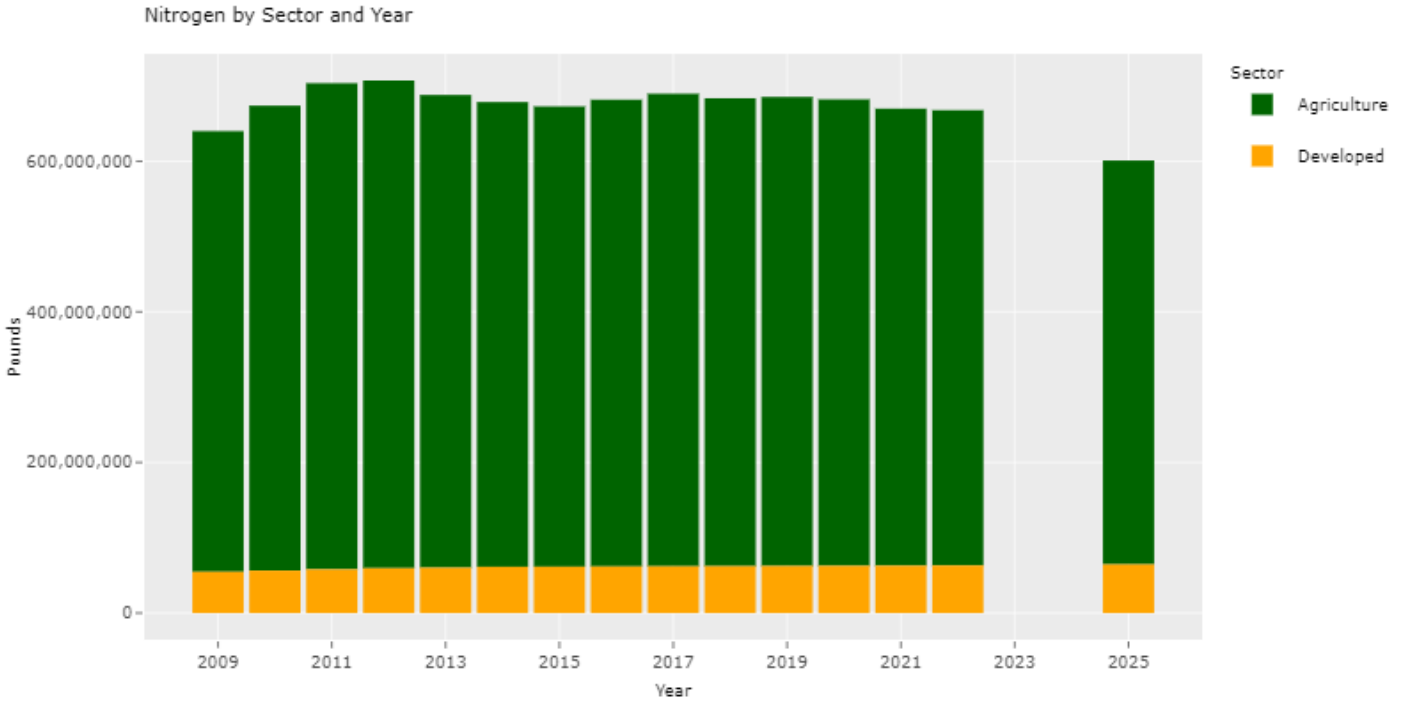
Agricultural TN Applied Lbs/Acre Mapped by County (2022)



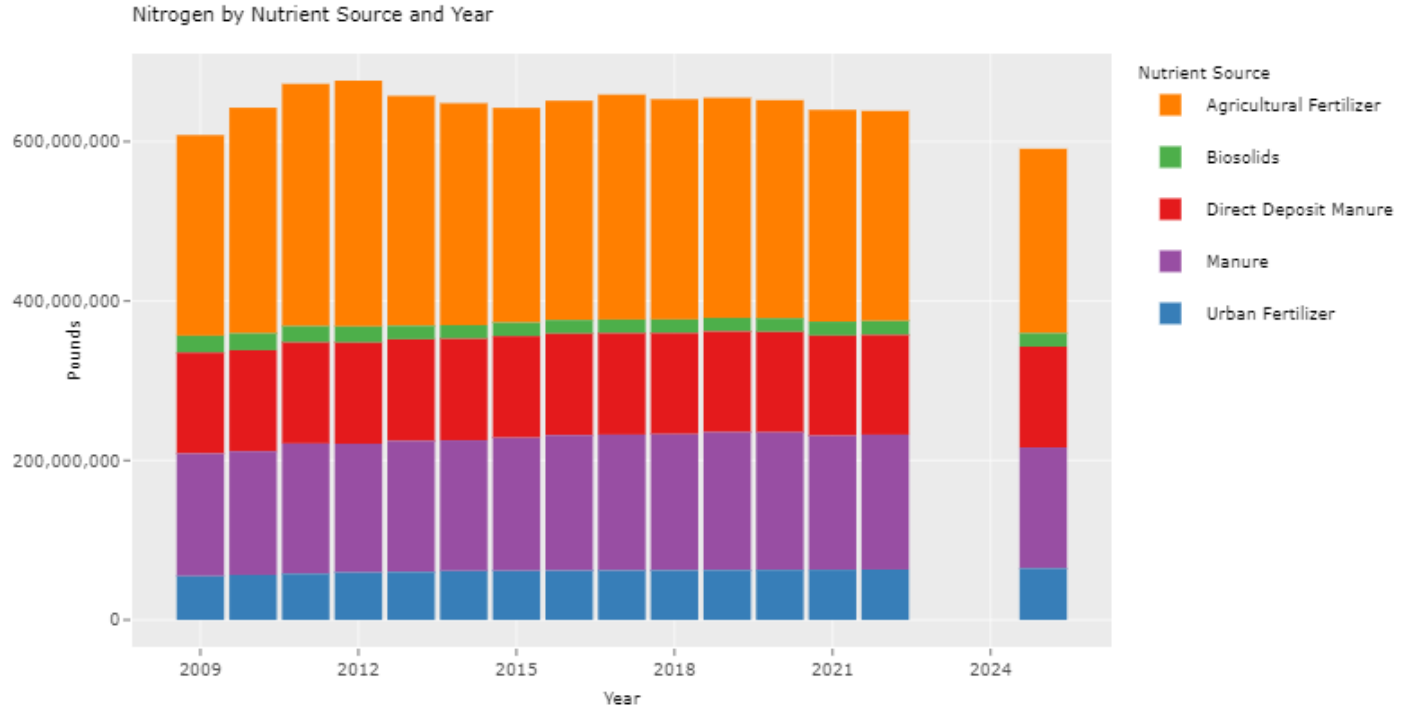


Agricultural TP Applied Lbs/Acre Mapped by County (2022)

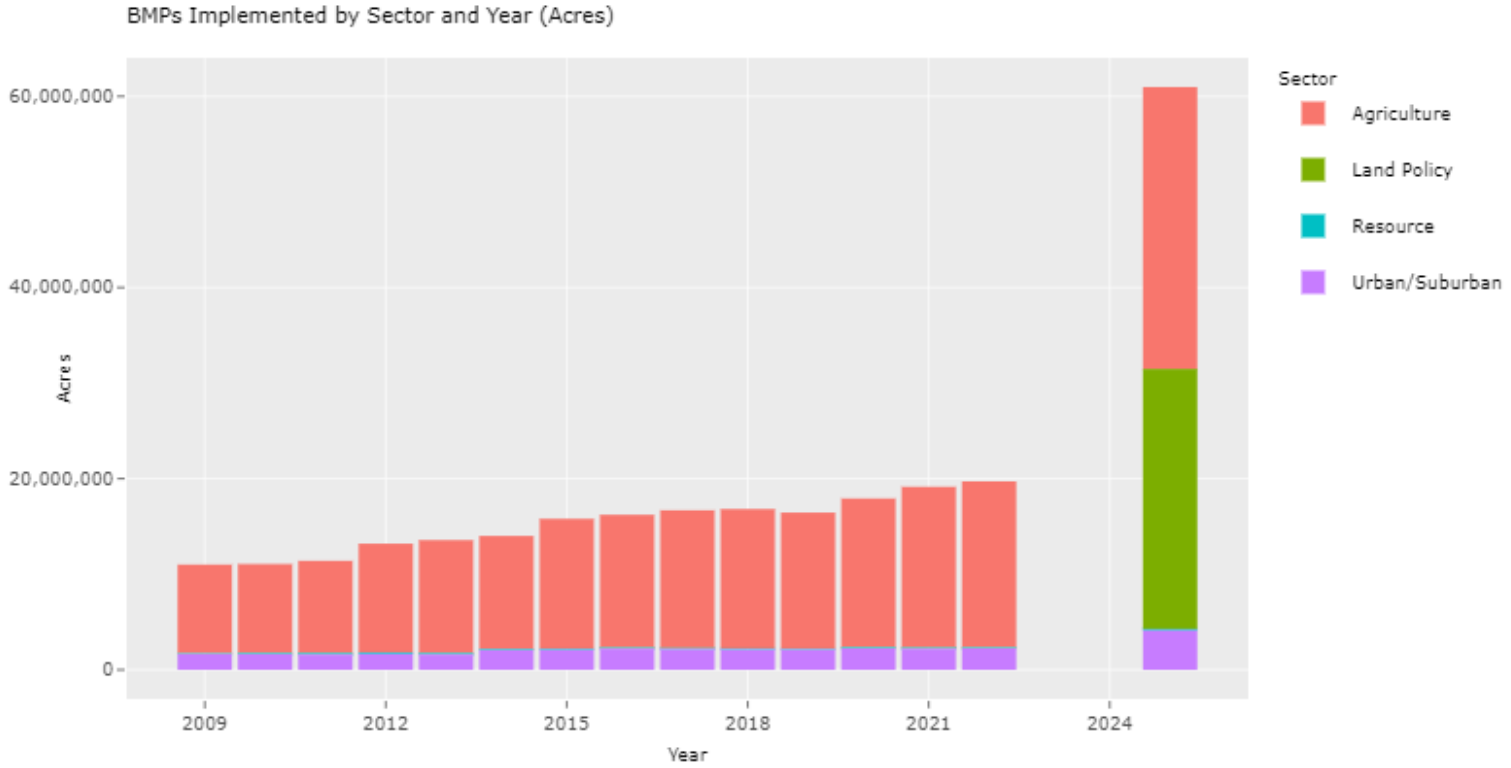
Potomac River Basin States Nutrients By Sector and Year



Potomac River Basin States Nutrients by Source and Year



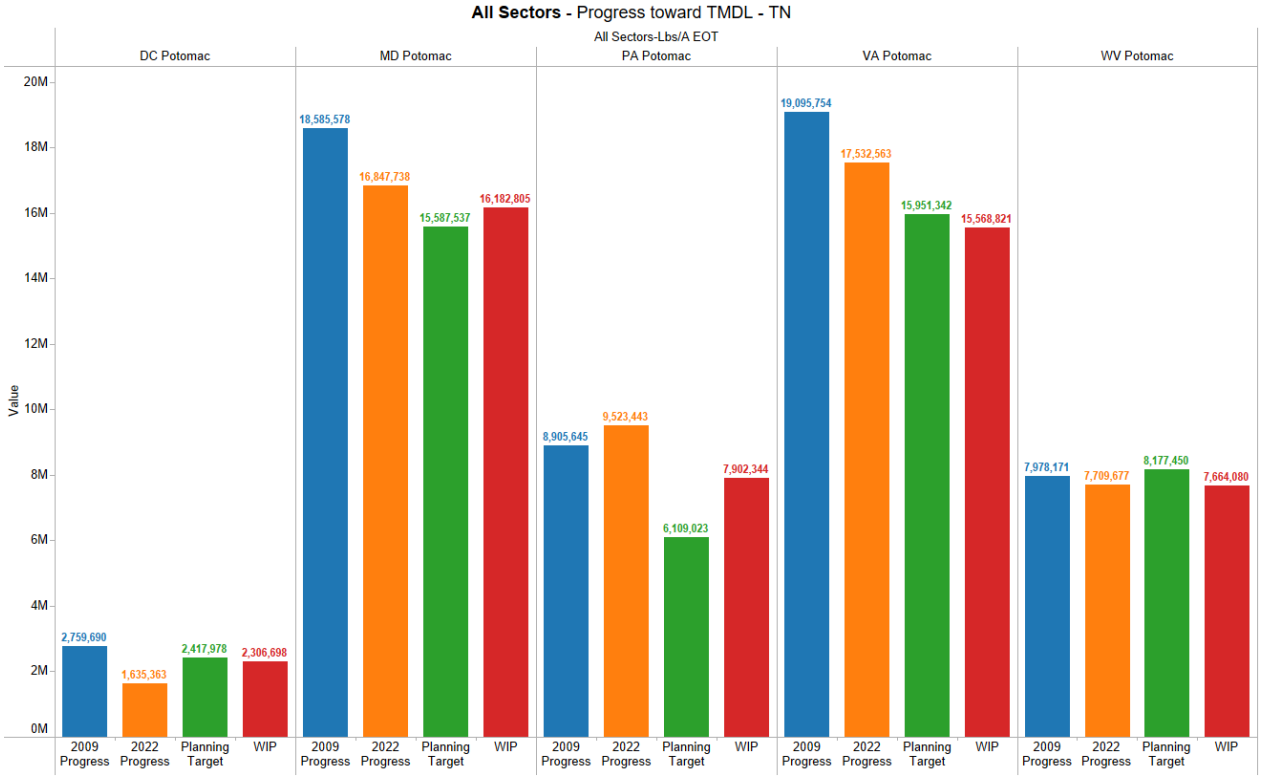
BMPs by Sector



BMPs Implemented and Planned

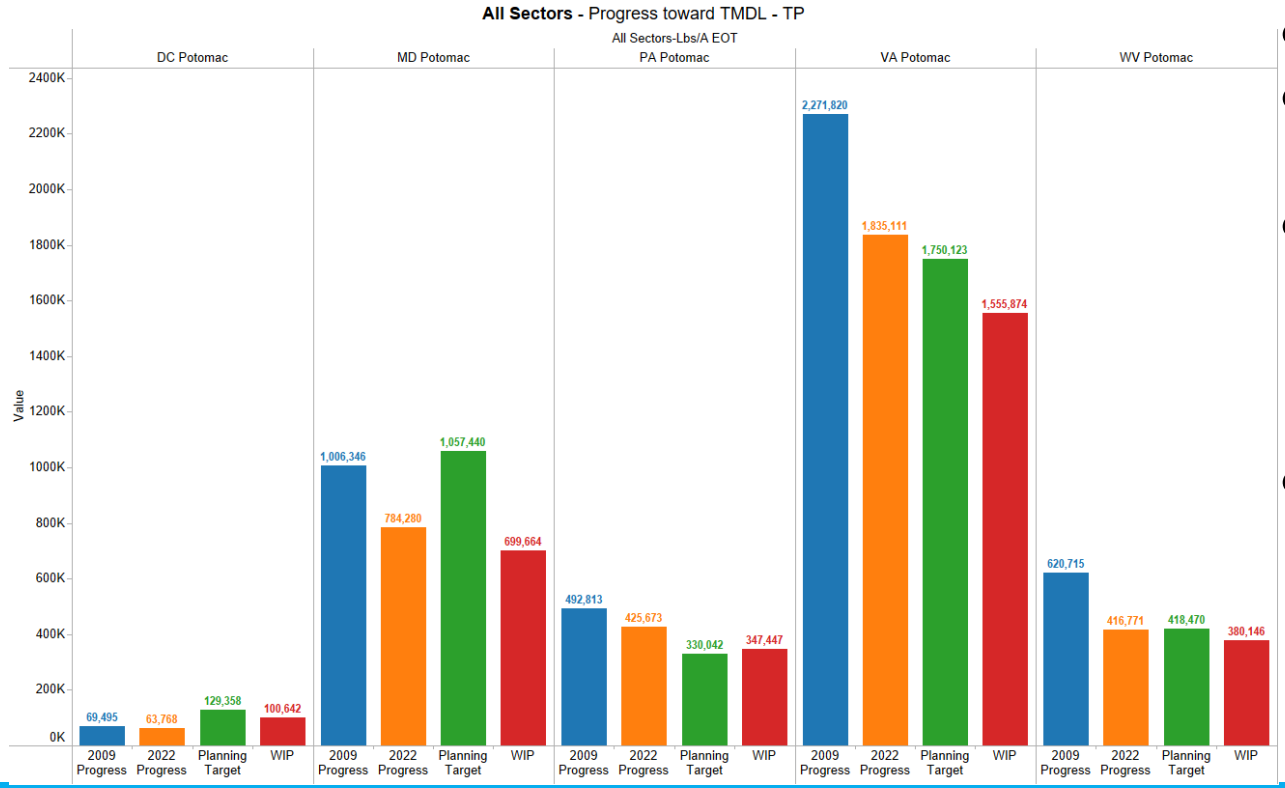
Agriculture Practices	Duration	Unit	020700 - Potomac (CBWS Portion Only) 2022 Progress	020700 - Potomac (CBWS Portion Only) WIP 3 Climate Change CAST-2023 version
Nutrient Application Management Core Nitrogen	annual	Acres	635,822	898,316
Conservation + LowResidue + High Residue Tillage	annual	Acres	520,801	544,673
Commodity + Cover Crop	annual	Acres	192,967	306,680
Pasture Management Composite	cumulative	Acres	256,104	312,562
Total Forest Buffers	cumulative	Acres in Buffers	19,838	25,959
Total Grass Buffers	cumulative	Acres in Buffers	14,179	24,683
Wetland Restoration	cumulative	Acres	812	830
Wetland Creation	cumulative	Acres	343	0
Wetland Rehabilitation	cumulative	Acres	74	182
Land Retirement to Open Space	cumulative	Acres	20,028	30,823
Land Retirement to Pasture	cumulative	Acres	3,953	7,389
Tree Planting	cumulative	Acres	10,264	10,224
Alternative Crops	cumulative	Acres	58	354
Soil and Water Conservation Plan	cumulative	Acres	275,298	959,065
Crop Irrigation Management	cumulative	Acres	-	4,926
Manure Incorporation	annual	Acres	13,851	31,944
Agricultural Drainage Management	cumulative	Acres	2,742	121,533
Capture & Reuse	annual	Acres	-	308
Non Urban Stream Restoration	cumulative	Feet	135,518	593,994
Non Urban Shoreline Management	cumulative	Feet	11,705	17,895
Livestock + Poultry Waste Management Systems	cumulative	Animal Units	886,649	2,042,206
Livestock Mortality Disposal	cumulative	Dead Animal Units	46	3,640
Poultry Mortality Disposal	cumulative	Dead Animal Units	20,679	88,976
Barnyard Runoff Control	cumulative	Acres	1,220	2,575
Loafing Lot Management	cumulative	Acres	120	288
Ag Stormwater Management	cumulative	Acres Treated	63	132
Manure Transport Out Of Area	annual	Dry Tons	25,741	111,135
Manure Transport Into Area	annual	Dry Tons	30,269	578
Manure Treatment Technologies Out Of Area	annual	Dry Tons	-	6,462
Manure Treatment Technologies Into Area	annual	Dry Tons	-	6,462
Dairy Precision Feeding	annual	Animal Units	2,439	77,964
Ammonia Emission Reductions (Litter Amendments)	annual	Animal Units	-	22,554

TN Comparison with Planning Goals



- All Sectors
- Delivery to the Bay (edge of tide)
- WIP 3 in CAST-2023 including reductions for meeting climate change goals
- 2020 Planning Target including Climate Change

TP Comparison with Planning Goals



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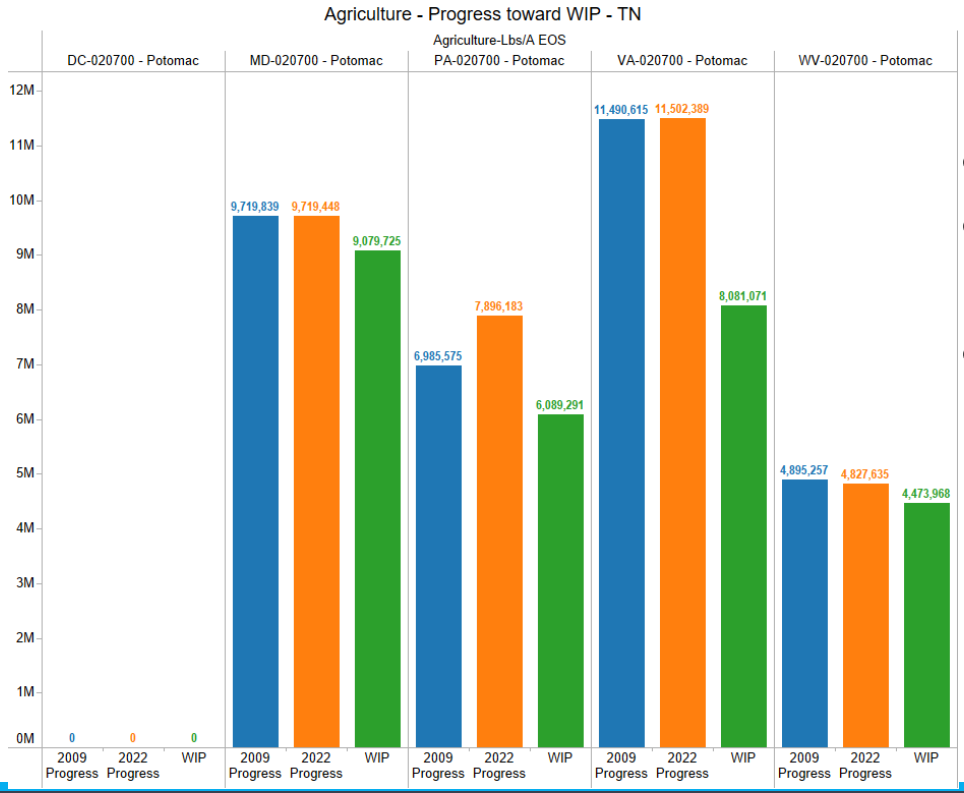
TN Comparison with WIP—Agriculture Only



- Agriculture only
- Delivery to the Streams (edge of stream)
- WIP 3 in CAST-2023 including reductions for meeting climate change goals

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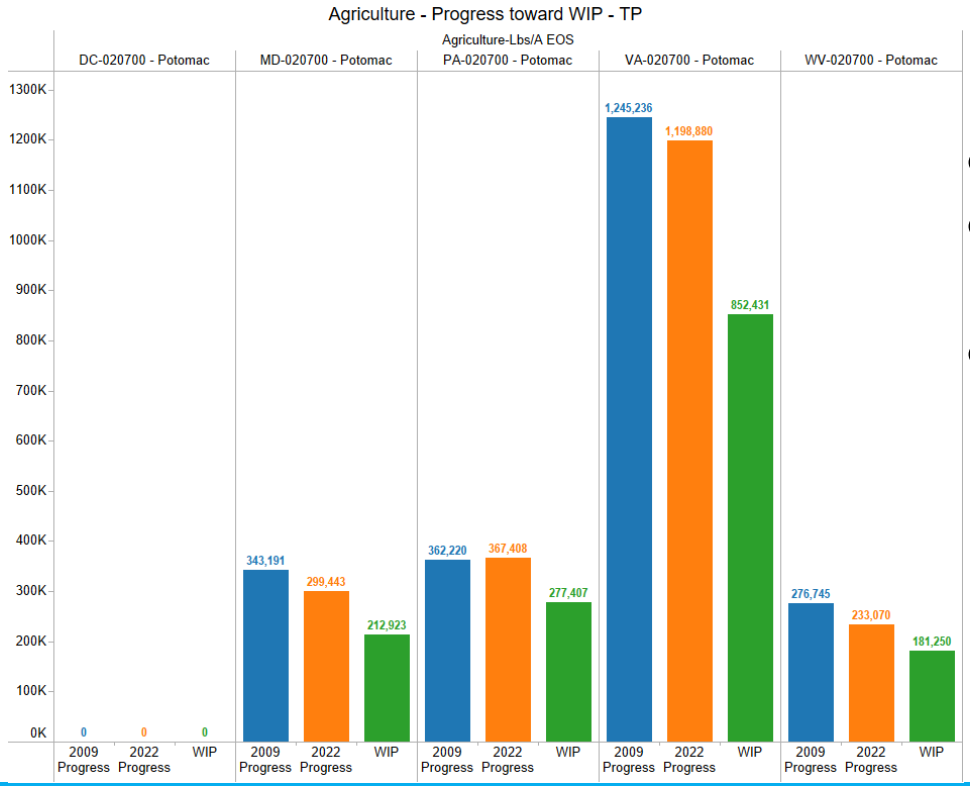

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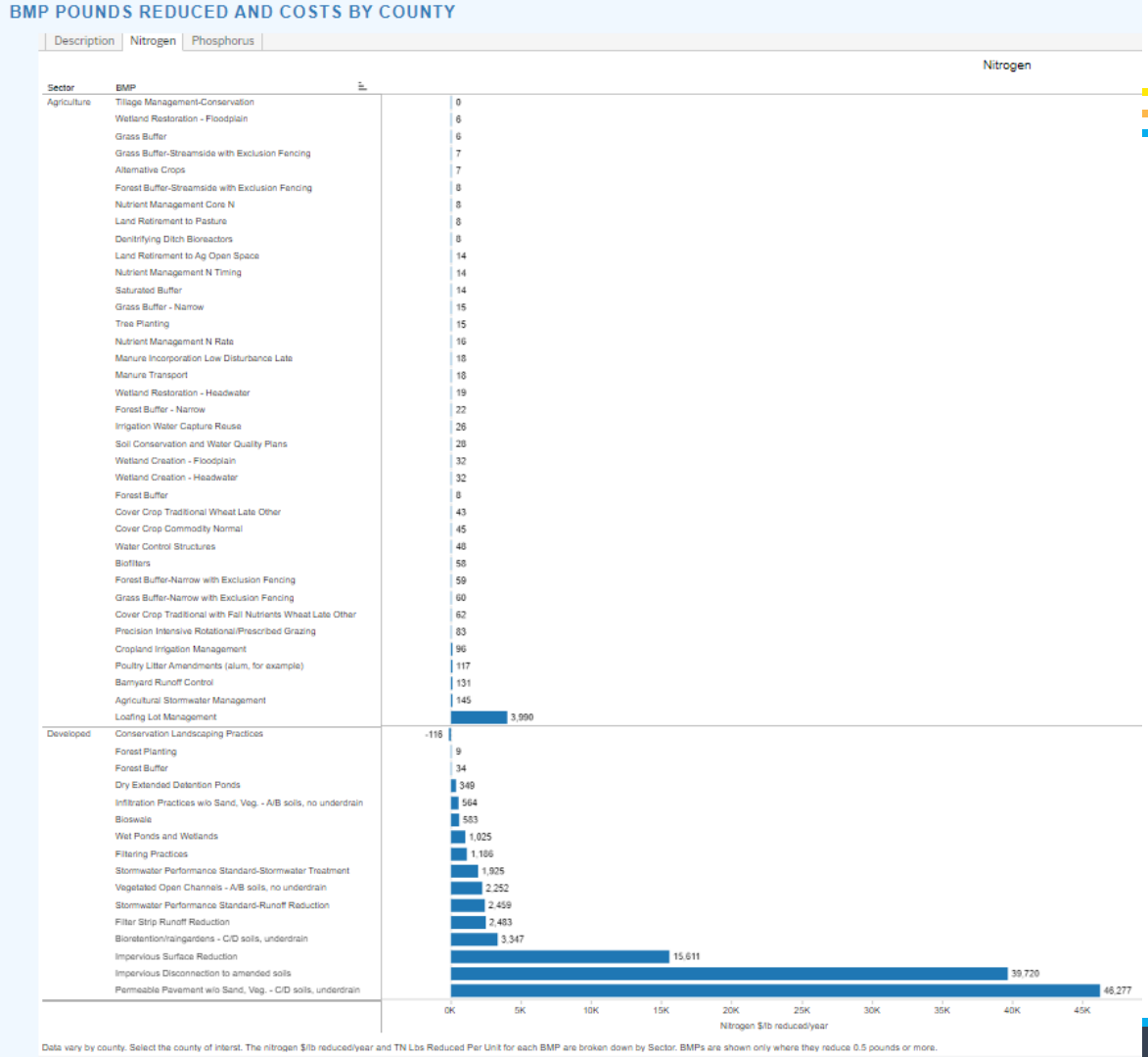
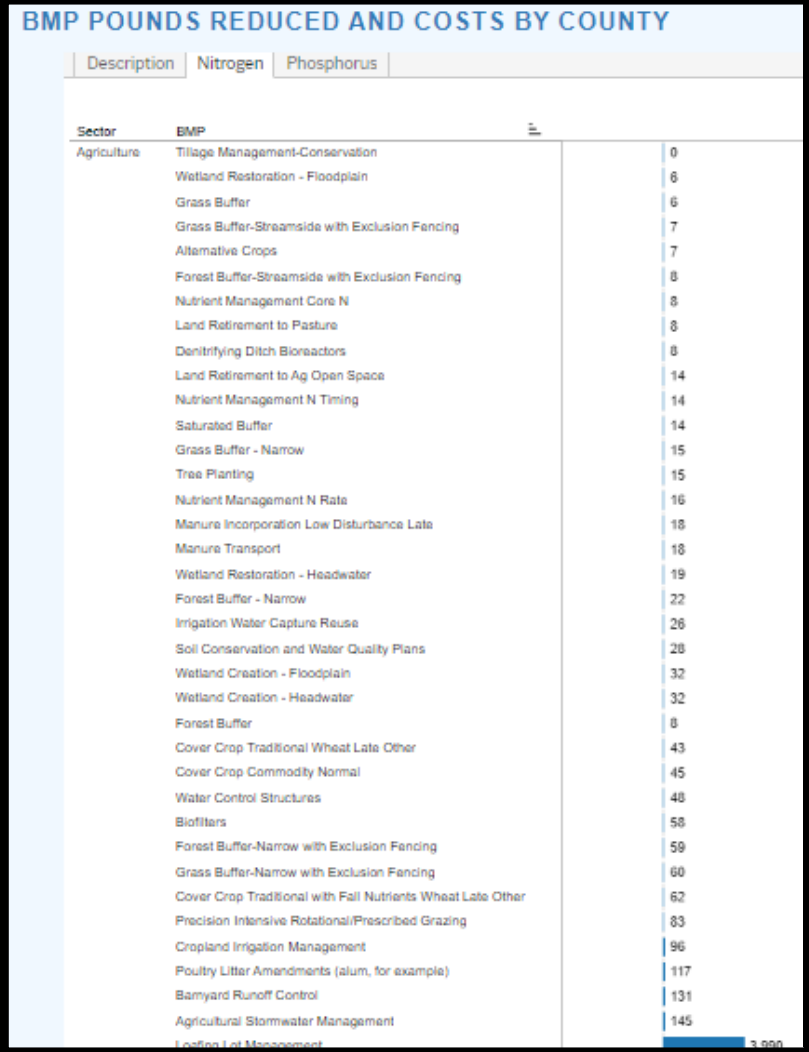


Cost Effective BMPs

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



BMP POUNDS REDUCED AND COSTS BY COUNTY

Description | Nitrogen | Phosphorus

Sector	BMP	
Agriculture	Tillage Management-Conservation	0
	Wetland Restoration - Floodplain	6
	Grass Buffer	6
	Grass Buffer-Streamside with Exclusion Fencing	7
	Alternative Crops	7
	Forest Buffer-Streamside with Exclusion Fencing	8
	Nutrient Management Core N	8
	Land Retirement to Pasture	8
	Denitrifying Ditch Bioreactors	8
	Land Retirement to Ag Open Space	14
	Nutrient Management N Timing	14
	Saturated Buffer	14
	Grass Buffer - Narrow	15
	Tree Planting	15
	Nutrient Management N Rate	16
	Manure Incorporation Low Disturbance Late	18
	Manure Transport	18
	Wetland Restoration - Headwater	19
	Forest Buffer - Narrow	22
	Irrigation Water Capture Reuse	26
	Soil Conservation and Water Quality Plans	28
	Wetland Creation - Floodplain	32
	Wetland Creation - Headwater	32
	Forest Buffer	8
	Cover Crop Traditional Wheat Late Other	43
	Cover Crop Commodity Normal	45
	Water Control Structures	48
	Biofilters	58
	Forest Buffer-Narrow with Exclusion Fencing	59
	Grass Buffer-Narrow with Exclusion Fencing	60
	Cover Crop Traditional with Fall Nutrients Wheat Late Other	62
	Precision Intensive Rotational/Prescribed Grazing	83
	Cropland Irrigation Management	96
	Poultry Litter Amendments (alum, for example)	117
	Barnyard Runoff Control	131
	Agricultural Stormwater Management	145
	Loafing Lot Management	3,990

Cost Effective BMPs

$/Lbs Reduced of TN per Year

Varies Geographically

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

Reducing Nutrient Loads by Implementing BMPs is Effective…

When Nutrient Inputs are Not Simultaneiously Increasing

Devereux Consulting

Data ✦ Research ✦ Analysis ✦ Strategy

Thank you!

Any questions?
You can contact me at
olivia@devereuxconsulting.com

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