

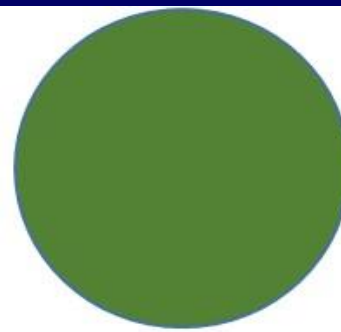
Turfgrass and Open Space Export Rate Targets Phase 6 Watershed Model Calibration



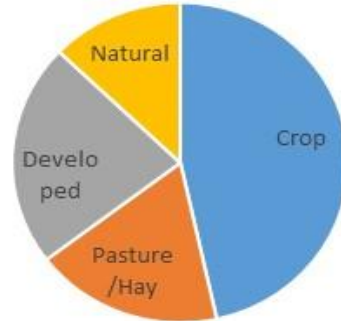
March 2, 2016
Olivia Devereux

Four Steps to Calculating Calibration Export Rates

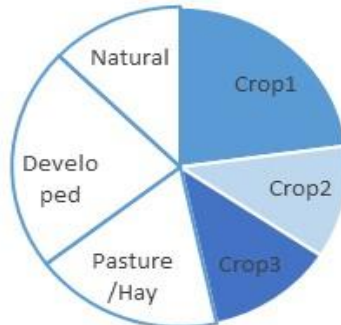
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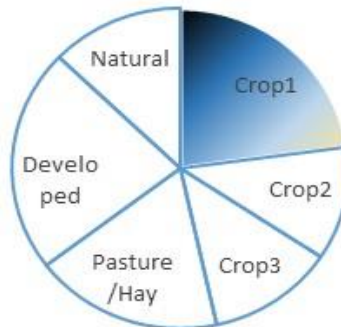
Estimate Total Non-point Source Load
Modeling Workgroup
Monitoring Data



Divide into Broad Classes
Modeling Workgroup
Multiple models



Split Classes into individual land uses
WQGIT Workgroups
Multiple lines of evidence



Assign targets to land uses within land segments
Modeling Workgroup
Multiple models

Target Chesapeake Bay Watershed Edge-of-Small-Stream Loads

Total
Nitrogen

446.2 million

Total
Phosphorus

30.0 million

Total nitrogen target sector loads and average export rates

Sector	Crop	Pasture/ Hay	Developed	Natural
Acres*	4,361,964	5,156,450	5,289,606	24,788,695
P532 Export Rate (pounds per acre)	47.5	19.9	19.4	4.2
CEAP Export Rate (pounds per acre)	42.5	10.2	Not used	1.6
SPARROW Export Rate with BMP effects removed (pounds per acre)	22.9	10.2	8.9	0.4
Average Ratio to Crop Rate	1.00	0.37	0.40	0.05
Average Sector Export Rate (pounds per acre)	46.65	15.36†	18.62	2.26

* Note that no target is calculated for 1,148,100 acres in the land uses: permitted feeding space, non-permitted feeding space, and combined sanitary sewer and water.

† The afo/cfo load of 9,063,059 pounds is removed from pasture.

Target Sector	Land Use	Acres	TN Export Rate Ratio	TN Export Rate (pounds per acre per year)
Developed	<i>Abandoned Mines</i>	0	0.14	4.23
	<i>Active Mines</i>	0	0.14	4.23
	CSS Buildings and Other	48,700	0.79	24.42
	CSS Construction	2,108	1.19	37.07
	CSS Roads	18,061	1.00	31.06
	CSS Tree Canopy over Impervious	732	1.00	31.06
	CSS Tree Canopy over Turfgrass	14,051	0.48	14.89
	CSS Turf Grass	62,259	0.48	14.89
	<i>Farmstead</i>	0	0.79	24.42
	MS4 Buildings and Other	465,504	0.79	24.42
	MS4 Construction	110,775	1.19	37.07
	MS4 Roads	199,232	1.00	31.06
	MS4 Tree Canopy over Impervious	50,589	1.00	31.06
	MS4 Tree Canopy over Turfgrass	383,829	0.48	14.89
	MS4 Turf Grass	1,231,979	0.48	14.89
	Non-Regulated Buildings and Other	256,381	0.79	24.42
	Non-Regulated Roads	292,694	1.00	31.06
	Non-Regulated Tree Canopy over Impervious	102,679	1.00	31.06
	Non-Regulated Tree Canopy over Turfgrass	344,748	0.48	14.89
	Non-Regulated Turf Grass	1,851,191	0.48	14.89

Target Sector	Land Use	Acres	TN Export Rate Ratio	TN Export Rate (pounds per acre per year)
Natural	CSS Tree Canopy over Scrub Shrub	31,337	1.46	2.99
	<i>Disturbed Forest</i>	18	3.10	6.36
	Harvested Forest	302,594	7.07	14.5
	MS4 Tree Canopy over Scrub Shrub	0	1.46	2.99
	Non-Regulated Tree Canopy over Scrub Shrub	343,643	1.46	2.99
	Open Space	1,038,266	1.46	2.99
	<i>Palustrine Emergent Wetland</i>	19	1.00	2.05
	Palustrine Forested Wetland	680,302	1.00	2.05
	Palustrine Scrub-Shrub Wetland	648,184	1.00	2.05
	True Forest	21,775,666	1.00	2.05

Target Sector	Land Use	Acres	TN Export Rate Ratio	TN Export Rate (pounds per acre per year)
Pasture	Ag Open Space	158,000	0.43	6.92
	Legume Hay	790,391	0.74	11.91
	Other Hay	1,528,606	1.04	16.74
	Pasture	2,679,452	1.00	16.09

Target Sector	Land Use	Acres	TN Export Rate Ratio	TN Export Rate (pounds per acre per year)
Cropland	Full Season Soybeans	926,048	0.71	36.98
	Grain with Manure	362,887	1.40	72.93
	Grain without Manure	989,101	1.00	52.09
	Other Agronomic Crops	527,481	0.45	23.44
	Silage with Manure	188,744	1.62	84.39
	Silage without Manure	403,534	1.16	60.42
	Small Grains and Grains	420,426	0.84	43.76
	Small Grains and Soybeans	313,019	0.79	41.15
	Specialty Crop High	66,706	1.34	69.8
	Specialty Crop Low	164,013	0.31	16.15

Developed Turf-NSQD Land Uses

- Residential
- Residential, Low Density
- Residential, Medium Density
- Residential-Lawn
- Turf

Natural Open Space-NSQD Land Uses

- Inst./Open Space
- Open Space
- Pervious

Agricultural Open Space Relative Rate
Established by: *Agricultural Land Use Loading
Rate Subgroup of the Agricultural Modeling
Subcommittee of the Agricultural Workgroup*

- 43% of pasture
- Based on two observations from Angle, et al., 1989, Agr. Ecosystems and Environ. 25:279-286.

FERTILIZER

Urban Fertilizer Applications

- Nitrogen: 42.8 lbs of nitrogen/acre
 - Compared with the average of AAPFCO non-farm fertilizer sales for nitrogen between 1985 and 2010 of 130 million lbs/year with 3 million acres of pervious urban area estimated in Phase 5.3.2
- Phosphorus: 1.3 lbs of phosphorus/acre
 - Ratio of TN:TP in Scotts 29-2-4 fertilizer products and TruGreen's 29-2-4 fertilizer products = 33:1, resulting in an average application rate of 1.3 lbs of phosphorus/acre
- Rates consider that not all acres in urban areas receive fertilizer by using a weighted average.

SPARROW Sources

- Land uses are used as the sources in SPARROW for developing targets
- No assumptions are made about where fertilizer or any other N or P source is applied
- SPARROW merely estimates a mean yield from each land use, but is completely ignorant of what the ultimate source of those nutrients within those land-uses might be.

Reasons to Differentiate Land Uses

- Literature, models, other data sources offer distinct land use loading rates
- BMPs are exclusive to one type of land use (e.g.: stream corridor buffers or fencing)
- Helps jurisdictions for planning and reporting purposes (e.g.: regulated and nonregulated urban, AFO and CFO).

A wide-angle photograph of a body of water under a vast, cloudy sky. The water is dark and textured with small waves. The sky is filled with large, white and grey clouds, with a bright patch of light breaking through near the center. The horizon line is visible in the distance. The word "Questions?" is written in a large, white, sans-serif font across the middle of the image.

Questions?