

Technical Memorandum

Significant Nutrient Nonpoint Sources in the Upper and Middle Chester River Watersheds

The U.S. Environmental Protection Agency requires that Total Maximum Daily Load (TMDL) allocations account for all significant sources of each impairing pollutant. This technical memorandum identifies, in detail, the significant nonpoint sources of total nitrogen (TN) and total phosphorus (TP) in the Upper and Middle Chester River watersheds and their distribution among different land uses. Details are provided for allocating NPS loads for nutrients to different land use categories. These are conceptual values that are within the TMDL thresholds. The Maryland Department of the Environment (MDE) expressly reserves the right to allocate the TMDLs among different sources in any manner that is reasonably calculated to achieve water quality standards.

TMDLs are being established in the Upper and Middle Chester River watersheds for both growing season and average annual flow conditions. The nonpoint source (NPS) loads that were used in the model account for all sources including both “natural” and human-induced components. The growing season NPS loads and the average annual flow NPS were both estimated using the Hydrological Simulation Program FORTRAN (HSPF) model. As explained in the main document, the simulation of the Upper and Middle Chester River Watersheds used the following assumptions: (1) variability in patterns of precipitation were estimated from existing National Oceanic and Atmospheric Administration (NOAA) meteorological stations; (2) hydrologic response of land areas were estimated for a simplified set of land uses in the basin; and (3) agricultural information was estimated from Maryland Department of Planning (MDP) land use data, Agricultural Census Data, Farm Service Agency (FSA) and Delaware Office of State Planning (DOSP) data. The nutrient loads account for contributions from atmospheric deposition, cropland, pasture, feedlots, and forest. Urban land contributions are included in the point sources technical memorandum. The land use information was based on 1997 MDP and DOSP data. These percentages were then applied to the TMDL loads estimated from MDE observed data.

Tables 1A, 1B, 2A and 2B provide one possible scenario for the distribution of average annual nitrogen and phosphorus NPS loads between different land use categories. Tables 3A, 3B, 4A and 4B provide one possible scenario for the distribution of nitrogen and phosphorus NPS loads between different land use categories, during the growing season. Atmospheric deposition to land surfaces is included in the loads attributed to mixed agriculture, forest and other herbaceous, and urban land uses.

Table 1A
Nonpoint Source Nitrogen Loads for the Upper Chester River Average Annual TMDLs

Land Use Category	Percentage of Nonpoint Source Load	TN Nonpoint Source Load (lbs/yr)
Mixed Agricultural	90 %	503,639
Forest and Other Herbaceous	8 %	47,106
Atmospheric Deposition	2 %	10,908
Total	100 %	561,653

Table 1B
Nonpoint Source Nitrogen Loads for the Middle Chester River Average Annual TMDLs

Land Use Category	Percentage of Nonpoint Source Load	TN Nonpoint Source Load (lbs/yr)
Mixed Agricultural	91 %	198,047
Forest and Other Herbaceous	3 %	6,140
Atmospheric Deposition	6 %	13,259
Total	*99 %	217,447

*Rounding of data results do not equal 100%

Table 2A
Nonpoint Source Phosphorus Loads for the Upper Chester River Average Annual TMDLs

Land Use Category	Percentage of Nonpoint Source Load	TN Nonpoint Source Load (lbs/yr)
Mixed Agricultural	96 %	27,859
Forest and Other Herbaceous	1 %	412
Atmospheric Deposition	3 %	807
Total	100 %	29,078

Table 2B
Nonpoint Source Phosphorus Loads for the Middle Chester River Average Annual TMDLs

Land Use Category	Percentage of Nonpoint Source Load	TP Nonpoint Source Load (lbs/yr)
Mixed Agricultural	89 %	9,013
Forest and Other Herbaceous	1 %	54
Atmospheric Deposition	10 %	981
Total	100 %	10,047

Table 3A
Nonpoint Source Nitrogen Loads for the Upper Chester River
Growing Season TMDL (May 1st - October 31st)

Land Use Category	Percentage of Nonpoint Source Load	TN Nonpoint Source Load (lbs/yr)
Mixed Agricultural	88 %	198,114
Forest and Other Herbaceous	9 %	20,207
Atmospheric Deposition	3 %	6,055
Total	100 %	224,376

Table 3B
Nonpoint Source Nitrogen Loads for the Middle Chester River
Growing Season TMDL (May 1st - October 31st)

Land Use Category	Percentage of Nonpoint Source Load	TN Nonpoint Source Load (lbs/yr)
Mixed Agricultural	89 %	82,456
Forest and Other Herbaceous	3 %	2,716
Atmospheric Deposition	8 %	7,361
Total	100 %	92,533

Table 4A
Nonpoint Source Phosphorus Loads for the Upper Chester River
Growing Season TMDL (May 1st - October 31st)

Land Use Category	Percentage of Nonpoint Source Load	TN Nonpoint Source Load (lbs/yr)
Mixed Agricultural	92 %	6,360
Forest and Other Herbaceous	2 %	105
Atmospheric Deposition	6 %	407
Total	100 %	6,872

Table 4B
Nonpoint Source Phosphorus Loads for the Middle Chester River
Growing Season TMDL (May 1st - October 31st)

Land Use Category	Percentage of Nonpoint Source Load	TP Nonpoint Source Load (lbs/yr)
Mixed Agricultural	81 %	2,141
Forest and Other Herbaceous	1 %	14
Atmospheric Deposition	18 %	495
Total	100 %	2,650