

Chesapeake Modeling Tools for Integrating Air and Water Environmental Management

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Atmospheric deposition loads are the highest source of nitrogen loads in the watershed, but also are controlled by a national regulatory program that has the highest rate of nitrogen load reduction from 1985 to the present, relative to other Chesapeake point source and nonpoint source control programs.

To simulate the fate and transport of nutrients in the Chesapeake watershed and airshed as well as the effects of nutrient loads on Chesapeake water quality, the integrated models of the Chesapeake Bay airshed, watershed, estuary, and living resources were developed. Applied in the assessment of the Chesapeake TMDL water quality standards, the models provide the most complete integration of air and water controls yet developed in a large aquatic ecosystem. Atmospheric deposition loads of nitrogen to the coastal ocean are also tracked, as well as its influence on Chesapeake ocean boundary conditions.

The Airshed Model estimates atmospheric deposition loads of nitrogen to the watershed, tidal Bay, and adjacent coastal ocean. The Airshed Model is a combination of two models—a regression model of atmospheric wet deposition and a fully developed air simulation of the North American continent called the CMAQ Model.

In the Chesapeake TMDL, the loads of atmospheric nitrogen deposition that are directly deposited to the tidal waters of the Chesapeake are an explicit TMDL load. The nitrogen TMDL allocation given to the EPA is 15.7 million pounds. Reducing current nitrogen deposition loads to achieve this allocation will be through national regulatory programs of NO_x emission reduction. In addition, State reductions in air emissions of nitrogen loads beyond what's needed to achieve air quality standards can also be included in the TMDL accounting as avoided nitrogen loads delivered to the tidal waters with credit given to the State reducing the emissions.

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