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Modeling Water and Nutrient Runoff from Nursery and Greenhouse Operations in Maryland

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Abstract Text:

The Chesapeake Bay watershed is a 64,000 square mile watershed in the Mid-Atlantic region that collects water from six states and the District of Columbia. Nutrient and sediment runoff into the bay and its tributaries is a major concern because of the impact it has on aquatic plants and animals and the long-term sustainability of the Bay. Much of the research on nitrogen (N), phosphorous (P), and sediment loading into this watershed has focused on the impact of point source inputs and non-point source inputs from traditional farms, with minimal research focusing on nursery and greenhouse operations that produce ornamental plants. There are over 500 of these operations in Maryland, which contain 15% of the irrigated land that can potentially lose significant amounts of nutrient and sediment. The Maryland Department of Agriculture requires every registered nursery and greenhouse operation in Maryland to submit a detailed water and nutrient management plan, which identifies among other things, the species grown, production area, and yearly N and P application rates to that area. We have developed a GIS database that geospatially locates each of these operations at the 12 digit watershed level, together with the relevant production and nutrient application data for each operation. We are also developing models that can more accurately assess the nutrient and sediment runoff from these farms. A model is being developed for each specific type of operation (greenhouse, field, and container-nursery), to help identify those operations which have high potential loading rates, and specify best management practices that will mitigate that runoff. This knowledge will help identify operations and watersheds that would provide the largest N, P and sediment reductions for the lowest cost of implementation, to help meet the goals of the 2010 Chesapeake Bay agreement and promote the long-term sustainability of this sector of agriculture.

Impact Statement:

A model that accurately represents the complexity of a system can be an important tool for understanding the relative impact of each variable on that system. Models that represent the variables in container, field, and greenhouse operations in Maryland will help determine the impact that various management practices have on water-use efficiency, and Nitrogen, Phosphorous, and sediment runoff. Although this research is being done in Maryland, it has the potential to be used throughout the US and in different parts of the world, as it is based on a risk assessment strategy, which can be easily modified for different scenarios.