Contaminants

Inland Bay waters are highly enriched with the nutrients nitrogen and phosphorus, the *contaminants* having the greatest impact on the surface and ground water of the Inland Bays/Atlantic Ocean Basin. While nitrogen and phosphorus are essential for plant and animal growth, when excess amounts enter the bays, water quality can deteriorate as aquatic plant growth accelerates and the level of oxygen is reduced. This process of over-enrichment is called *eutrophication*.

The primary activities accelerating eutrophication in the Inland Bays are urbanization and agricultural activities. Contamination of the basin's ground water by excess nitrogen is critically important because ground water supplies 100% of the basin's drinking water.

Nitrogen and Phosphorus

Phosphorus enters the bays primarily through soil erosion and runoff. Nitrogen enters through a variety of pathways such as *point source* discharges, *atmospheric deposition*, erosion, runoff, and ground-water discharge. As much as 25% of the total nitrogen entering the bays is estimated to be deposited from the atmosphere, while point sources such as wastewater treatment facilities with discharge pipes to *surface waters* account for less than 4%. The remaining nutrient loading comes from land-use activities and is transported by erosion, runoff, and ground-water discharge.

The drinking water standard for nitrate (as nitrogen) is 10 milligrams per liter (mg/l). In the Inland Bays, nitrate concentrations in the ground water vary from less than 0.5 mg/l in wooded or natural areas to greater than 100 mg/l in areas with historically intensive poultry production. More than 23% of all wells in the basin have nitrate levels that exceed the drinking-water standard.

Erosion and stormwater runoff contribute many of the nutrients that reach the Inland Bays. An overload of nutrients to the bays decreases oxygen levels in the aquatic system, threatening marine life.

Urban Nutrient Sources

Numerous urban sources of nutrients are transported to the Inland Bays through erosion, stormwater runoff, and leaching from soils to the ground water. The sources include discharges from on-site *septic systems* and domestic sewage treatment plants as well as fertilizers applied to private and commercial landscapes, nutrient-rich sediments from construction activities, exhaust emissions, and open burning.

Discharges from septic systems contribute the greatest urban loading of nutrients to the bays. More than 18,000 septic systems are permitted in the Inland Bays/Atlantic Ocean Basin, discharging as much as 480,000 pounds of nitrogen and 250,000 pounds of phosphorus to the soils annually. Most of the nitrogen from septic tanks is converted to nitrate-nitrogen, which easily enters the ground water and ultimately the bays or their tributaries.

Many older homes near the bays are on small lots with sandy soils, and some still have substandard on-site wastewater disposal systems like cesspools or seepage pits. As many as 50% of the septic systems in the Inland Bays/Atlantic Ocean Basin would not meet current regulations for on-site wastewater disposal systems for a variety of reasons including inadequate lot sizes and system capacities.

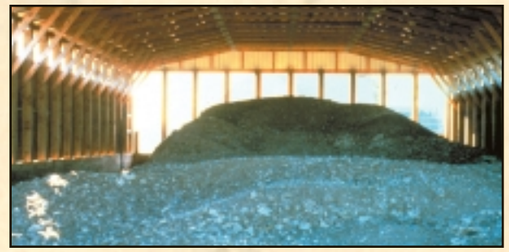
Sussex County has created three regional sewer districts that apply wastewater onto agricultural lands through spray irrigation, which utilizes the nutrients in wastewater as fertilizer to grow crops. This has eliminated more than 14,000 septic systems in the basin.

Inland Bays Septic Systems

Year	New Construction
1997	439
1998	488
1999	306

Agricultural Nutrient Sources

Agricultural settings contribute significant amounts of nitrogen and phosphorus via field applications of manure, litter, and chemical fertilizers that are ultimately transported to the water. Agriculture is the largest land use in the basin, accounting for 32% of the land. In 1997, more than 70 million chickens — 25% of the total raised annually in Delaware — were raised in the basin, generating more than 90,000 tons of manure and litter that typically are applied to the land. Most of the cropland is devoted to growing corn and soybeans. If nutrients are overapplied, the excess may be transported to surface waters.



Of the 241 poultry operations in the basin, over half now have manure storage facilities.

Implementation of comprehensive nutrient management plans can significantly reduce nutrient impacts from agricultural activities. Delaware lawmakers, working with farmers, drafted and passed legislation in June 1999 requiring farmers to develop nutrient management plans to prevent nutrient loss from agricultural sites. Of the 241 poultry operations in the basin, over half now have manure storage facilities. State and federal cost-share funds, as well as low-interest loans, are available to farmers who wish to install manure storage sheds and dead-bird composters. Research is under way to reduce phosphorus levels in manure through modifications in poultry feed.

Non-nutrient Sources of Contaminants

Non-nutrient sources include *hazardous waste* facilities, state and federal Superfund sites, air emissions, and solid waste landfills. The Department's Division of Air and Waste Management actively monitors these emissions and facilities.

"Who would allow their mother's blood to become sick and tainted or to bring about its destruction? Only a people who have forgotten their connection to her, only spoiled children undeserving of her love."

— Charles Clark IV
Assistant Chief, Nanticoke Indian Tribe