To: Advisory Committee, Barnegat Bay National Estuary Program (BBNEP)
From: Science & Technical Advisory Committee (STAC)
Subject: STAC Statement on the scientific justification for fertilizer ordinances
Date: April 13, 2009

Improving our understanding of, and addressing, eutrophication due to nutrient inputs to the Barnegat Bay-Little Egg Harbor estuary have been identified as the highest environmental priorities of the BBNEP in its 2008-2011 Strategic Plan. Since July 2008, the STAC has met with outside academic and government technical experts as part of a Eutrophication Workgroup to better understand eutrophication in the bay, to prioritize data gaps and research needs throughout the watershed, and to become more familiar with the water quality problems (and solutions) in other watersheds with similar challenges.

Available information provides sufficient justification for reducing nutrient inputs from certain sources, especially where nutrient reductions can be achieved at low cost. Thus, the STAC supports enactment of science-based fertilizer ordinances that are based upon the essential best management practices to reduce nitrogen and phosphorus inputs to the Barnegat Bay. The STAC also recognizes that such ordinances must be pursued as components of a comprehensive strategy to protect water quality and conserve water resources in the Barnegat Bay watershed. Additional information about these issues is provided below.

Eutrophication: symptoms and causes

Symptoms of eutrophication in the Barnegat Bay (*e.g.*, seagrass and hard clam decline; blooms of harmful algae [*e.g.*, brown tide], drift algae [*e.g.*, sea lettuce], and other noxious species [*e.g.*, stinging nettle jellyfish]) are increasing and are consistent with symptoms reported in other mid-Atlantic lagoonal ecosystems experiencing eutrophication (1). The specific causes of all of these observed symptoms are not well understood at this time; nonetheless, the causes of certain symptoms in the Barnegat Bay (*e.g.*, phytoplankton and benthic algal blooms) have been established via the results of manipulative experiments (2) and are consistent with findings of similar studies in other systems (3,4). The STAC recognizes that nutrient loadings are undoubtedly a major factor contributing to the bay's highly eutrophic condition.

Barnegat Bay Nutrient Inputs

Several studies have shown that nonpoint sources are the major sources of nutrients to the Barnegat Bay watershed; these sources include atmospheric deposition, groundwater discharging to the estuary, surface water discharging to the estuary, stormwater runoff directly to the estuary, and other sources (5,6). Most of the total nitrogen load to the bay is contributed by the watershed (5). Nitrogen inputs from tributary streams in undeveloped portions of the estuary are low; moreover, the nitrogen inputs from tributary streams generally have increased with the increasing percentage of developed land in the watershed (5). A watershed modeling analysis indicates that fertilizer inputs from residential and agricultural areas account for about 29 percent of the nitrogen load to the bay from watershed (*i.e.*, local) sources (6). Overall, residential fertilizer application accounts for approximately 8-15 percent of the estimated total nitrogen load to the estuary (6,7). The sources and loadings of nitrogen and phosphorus are different; nonetheless, the phosphorus load to the bay is also higher in its more developed tributaries (5).

Because nitrogen and phosphorus are components of many fertilizer formulations, future development to build-out will undoubtedly result in additional nutrient loadings and adverse impacts to water quality due to fertilizer applications to the accompanying, additional areas of residential turf (8). Although other sources account for most of the present nutrient (especially nitrogen) load to the bay, the STAC concludes that management actions which lower the rate of nitrogen and phosphorus inputs throughout the watershed are necessary to reduce the future nitrogen and phosphorus loads delivered to the estuary and improve the future ecological condition of the estuary. Federal and state actions (*e.g.*, restrict and/or eliminate phosphates in detergent and fertilizer; power-plant emission scrubbers to remove nitrogen) to improve air and water quality are being implemented; we have a shared responsibility to protect water quality in coastal ecosystems. The STAC also recognizes that research has shown that excessive inputs of both nitrogen and phosphorus should be addressed in tandem in eutrophic coastal systems (9).

Fertilizer Ordinances

Fertilizer ordinances have been employed elsewhere in New Jersey and in other states to reduce nutrient loadings to estuaries and coastal waters from fertilizer applied to residential or other areas. Although the STAC does not evaluate details of particular proposed ordinances, the STAC concludes that there are key considerations or characteristics necessary for an ordinance to be considered scientifically sound with respect to effectiveness in reducing nutrient inputs. Science-based fertilizer ordinances, individually or in combination, must:

- address both nitrogen and phosphorus;
- restrict the application of fertilizer during non-growing periods of the year;
- restrict application of fertilizer under certain weather conditions (during precipitation events or ice is on the ground);
- restrict application of fertilizer to impervious surfaces;
- promote use of slow-release fertilizer products;
- address soil quality, plant selection, and plant requirements;
- establish buffer zones relevant to local soil condition, plants and proximity of waterways;
- include effective public communication as part of implementation; and
- consider environmentally undesirable secondary effects (such as potential erosion of buffer areas).

Based on available information, the STAC concludes that the adoption and enforcement of a science-based ordinance would likely provide a greater assurance of the following outcomes:

- substantial reduction in the future rate of nutrients released from fertilizer applications in the watershed;
- substantial, long-term, reduction in the future nutrient loads delivered to the estuary; and
- long-term improvement in the future ecological condition of the estuary.

The STAC concludes that this action is one of a suite of essential and inexpensive steps to reduce nutrient loadings to the Barnegat Bay and to improve the ecosystem health of Barnegat Bay. Others

steps that must be taken include upgrades to stormwater systems, application of best management practices throughout the watershed, and the acquisition of open space. These and other measures must be pursued as components of a comprehensive strategy to protect water quality and conserve water resources in the Barnegat Bay watershed. Furthermore, the STAC recognizes the necessity of expanding monitoring and assessment of nutrient and other parameters to guide additional management actions to improve the bay's condition. Finally, the STAC is concerned that the declining water quality and other eutrophic conditions of the Barnegat Bay represent a harbinger of the challenges to other coastal waterbodies in New Jersey; thus, the protection of the Barnegat Bay signifies an important first step in protecting New Jersey's other coastal bays upon which the region's economy and its quality of life depends.

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