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CHAPTER  
THREE

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**NUTRIENTS  
MANAGEMENT PLAN**

To facilitate viewing the many figures that accompany this chapter, all figures have been placed at the end of this chapter.

**OBJECTIVES**

- 1) No net increase in western estuary. Immediately prevent net increases in nitrogen loading to the surface waters of the western estuary (Peconic River and Flanders Bay) to prevent worsening of current dissolved oxygen (DO) stresses in the marine surface waters of the area.
- 2) Long-term reductions in western estuary. Develop and implement a long-term nitrogen load reduction strategy to the western estuary, to optimize surface water conditions for dissolved oxygen, with ancillary consideration of potential benefits to submerged aquatic vegetation (especially eelgrass) habitat.
- 3) Eelgrass habitat optimization in shallow water. Maintain and, where cost-effective, improve conditions with respect to nitrogen (and related chlorophyll-a, light extinction, and possibly other parameters) in shallow waters (less than three meters) to optimize eelgrass habitat.
- 4) Water quality preservation in eastern waters. Implement a “water quality preservation” policy in eastern estuary waters (east of Flanders Bay) to prevent degradation which could adversely impact the high quality of those surface waters.
- 5) Subwatershed management. Focus on characterization of peripheral creeks and embayments and management of their subwatersheds; optimize surface water quality in these areas, which are often highly productive but poorly flushed and subject to environmental stresses.
- 6) Load allocation in the entire watershed. Develop and implement a load allocation strategy for point and nonpoint sources in the entire estuary, which accomplishes the above objectives.



## MEASURABLE GOALS

The PEP's measurable goals with respect to nutrients include:

- Decrease the total nitrogen concentrations in the western estuary to a summer mean of no more than 0.45 mg/l (based on 1994-96 model verification conditions, and measured by surface water nitrogen concentrations as compared to the PEP nitrogen guidelines). [See Actions N-4, N-5, N-10]
- Improve the dissolved oxygen concentrations in the western estuary to ensure that the New York State dissolved oxygen standard (currently 5.0 mg/l) is not violated (measured by surface and bottom dissolved oxygen levels as compared to the New York State dissolved oxygen standard). [See Actions N-1, N-10]
- Ensure that the total nitrogen levels in shallow waters remain at or below 0.4 mg/l to help optimize water clarity, maintaining and potentially improving conditions for eelgrass beds, a critical habitat (based on 1994-96 model verification conditions, and measured by light extinction coefficients as compared to the recommended eelgrass habitat optimization goal of at or below  $0.75 \pm 0.05 \text{ m}^{-1}$ ). [See Actions N-1, N-4, N-5, N-10]
- Ensure that the existing total nitrogen and dissolved oxygen levels are maintained or improved in waters east of Flanders Bay (*i.e.*, do not increase TN nor decrease DO) (measured by surface water total nitrogen concentrations as compared to the PEP nitrogen guidelines and surface and bottom dissolved oxygen levels as compared to the New York State dissolved oxygen standard). [See Actions N-1, N-2, N-4, N-5, N-10]
- Develop a quantitative total nitrogen load allocation strategy for the entire estuary (measured by development of a strategy and timely endorsement by local and State agencies). Preliminary work group estimates, and work performed by other programs, indicate that a 10-25 percent fertilizer reduction goal is a reasonable first order target for existing residential and agricultural fertilizing programs. [See Action N-3]
- Implement a quantitative nitrogen load allocation strategy for the entire estuary (measured by attaining the PEP recommendations including the implementation of the recommended Agricultural Environmental Management (AEM) program as well as other recommendations which may include fertilizer reduction programs, sanitary system upgrade programs, point source controls, etc., as well as monitoring for the impacts on measurable groundwater quality parameters). [See Actions N-3, N-4, N-5, N-10]
- Ensure that there is no substantial net increase in nitrogen loading to areas east of Flanders Bay and reductions in the Peconic River/Flanders Bay region so that an increase in new development would be offset by reductions in loads from pre-existing uses. The nitrogen work groups will develop means of attaining this goal, which may include groundwater performance standards (*e.g.*, nitrogen concentrations in groundwater resulting from post-development discharge/recharge), implementing fertilizer and clearing restrictions, and zoning. [See Actions N-3, N-4, N-5, N-6, N-10]
- Continue sponsoring and coordinating research and information gathering (measured by funding appropriated and research conducted, relative to PEP recommendations). [See Actions N-7, N-8, N-9]
- Continue and expand open space acquisition programs (measured by funding appropriated and acres acquired in target areas). [See Action N-6]



## INTRODUCTION

Nutrients are critical for sustaining the marine ecosystem, but can be harmful to an estuary at excessive levels. “Cultural eutrophication” is the process by which estuaries can become overenriched with nutrients and associated organic carbon, due to human inputs. Nitrogen and phosphorus are the primary nutrients that can impact water quality. Micronutrients, salts, metals, and organic solids can also contribute to the nutrification of an estuary. Nitrogen is the primary nutrient of concern in the marine waters of the Peconic Estuary during critical summer conditions when environmental stresses are greatest.

When nutrients are introduced to the estuary at higher than normal rates from runoff, groundwater inflow, atmospheric deposition, or point source discharges, the excess nutrients stimulate aquatic plant growth, including production of microscopic algae (microscopic plants that live in surface waters). Algae photosynthesize in the day, producing oxygen, which is released into the water column. At night, they undergo respiration, consuming dissolved oxygen (DO) in the water column. This respiration can result in short-term dissolved oxygen depression, which is known as “diurnal” dissolved oxygen variation. In the Peconic Estuary, which is generally a shallow, well-mixed estuary, chronic dissolved oxygen problems due to “stratification” (a deeper layer of water which can experience sustained DO depression) are usually not a problem, as they are in deeper systems such as Long Island Sound.

*In the Peconics, excessive levels of nutrients can harm eelgrass, a critical habitat, due to algal light shading, stimulation of epiphytes (plants which live on eelgrass), and, possibly, direct adverse metabolic impacts. One theory also holds that Brown Tide may be related to levels of dissolved organic nitrogen (DON) in relation to the supply of dissolved inorganic nitrogen (DIN). This, however, is one of several hypotheses, many of which do not implicate nutrients as a causal factor.*

Increased aquatic plant productivity adds organic material to the system, which eventually dies and decays. The decaying organic matter settles to the bottom and depletes oxygen levels in the water which are needed by aquatic organisms in what is known as “sediment oxygen demand” (SOD). From sediments, nutrients can be recycled back into the system (“sediment nutrient flux”), further exacerbating the pollution problem with nitrogen contributions.

### **Sediment Nutrient Flux**

*Sediment Flux (i.e., exchange of chemicals, such as nutrients, between the sediment and water column due to geochemical and bacterial processes) is an internal (recycled) nitrogen source that reflects current and historic anthropogenic pollution inputs. It is greater than any other individual source of point or nonpoint pollution.*

Processes such as diurnal DO depression, sediment oxygen demand, and sediment nutrient flux can result in dissolved oxygen levels which are low enough to be harmful to marine life. Factors and processes which govern oxygen levels are complex, and include temperature, light availability, wind mixing, localized water column stratification (such as the salt wedge which occurs in the Peconic River area), zooplankton grazing, submerged aquatic vegetation (SAV) dynamics, and bio-geochemical and bacterial processes. Low DO levels adversely affect marine life, potentially resulting in mortality and in behavioral and physiological effects on individual species and communities.

The increased production of microscopic algae caused by increased nutrient enrichment results not only in dissolved oxygen problems but also discolors the water, decreases water clarity and diminishes the amount of light received by rooted aquatic plants. Submerged aquatic vegetation that are at a species’ depth limit for clear water conditions would be expected to decline due to the lack of sufficient light energy in turbid waters. Eutrophication will also promote the growth of epiphytes on



eelgrass blades, again shading the plant itself and hindering production. Furthermore, species such as red or green macroalgae, which adsorb nutrients more quickly than eelgrass, may competitively exclude eelgrass plants.

Eutrophication may also impact eelgrass as a result of this species' high nitrate uptake efficiency. Eelgrass lacks a mechanism to terminate nitrate uptake. It is thought that excess nitrate in eelgrass impairs carbohydrate metabolism, resulting in impaired plant health and a decline in shoot production (Cashin Associates, 1996).

Because SAV beds are prime habitat for bay scallops and juvenile fish, the loss of SAV can have repercussions throughout the food chain. SAV beds also provide numerous other functions including a food source, bottom stabilization, and nutrient cycling all that are further discussed in **Chapter 4**.

Nitrogen levels may also be linked to the Brown Tide. One hypothesis is that Brown Tide conditions may be favorable when dissolved organic nitrogen (DON) is elevated in relation to dissolved inorganic nitrogen (DIN) supply. Brown Tide bloom conditions may thus be most favorable in a dry year (LaRoche, 1997; USGS, 1998), where there is a low DIN supply as a result of low groundwater inputs. This may be particularly significant when the dry year follows a wet year, which results in elevated DON levels. Because inorganic nitrogen levels in groundwater appear to have risen substantially, the levels of DON (DIN is "converted" to DON in the marine environment) in surface waters may, too, have become elevated.

Ecosystem impacts due to excessive nutrient inputs are often long-term and difficult to measure. Nitrogen may be having subtle effects on species abundance and distribution in the system. Moreover, nitrogen is often associated with other pollutants, such as organic carbon, and can be considered as one "indicator" measurement of human degradation. Because major, short-term, nitrogen-induced impacts have not been demonstrated in the Peconic Estuary, the PEP is faced with the difficult task of establishing rational, cost-effective preservation policies to prevent impacts which have generally not yet occurred.

*No major eelgrass beds exist west of Shelter Island (except Bullhead Bay), possibly due in part to nitrogen enrichment (see **Figure 3-1**). Also, sediment flux studies and other characterizations suggest eutrophication pressures on the "central estuary" (Great and Little Peconic Bays). Finally, recent research indicates that elevated levels of nitrogen in groundwater input may be one causal factor related to Brown Tide onset.*

For most Peconic Estuary waters, the PEP goal is to establish rational and implementable preservation targets *prior* to degradation and occurrences of use impairments. In the absence of detailed ecosystem data, the PEP was faced with the major challenge of characterizing water segments with respect to nitrogen and dissolved oxygen quality. As part of this characterization process, numerous discrete studies were performed to examine issues such as land use, groundwater, and sediment nutrient flux.

## CHARACTERIZATION OF THE ESTUARY SYSTEM

### *Characterization Studies*

Numerous characterization studies have been completed and others are ongoing to determine the sources, loadings, and impacts of nutrients to the estuary system. The work of past programs, such as the L.I. 208 Study (1978) and BTCAMP (1992), have been refined and expanded with a more comprehensive surface water monitoring program, detailed land use data, and improved sediment



characterizations. A habitat linkage was added with a submerged aquatic vegetation study, and a state-of-the-art model was developed to integrate and use the data.

One overall goal of this characterization process was to bring the amount of information available on the eastern estuary waters (east of Flanders Bay) and watershed (see **Figure 3-2**) to the level of the western estuary, which had been analyzed in great detail in prior studies. The PEP also committed to detailed studies of subwatersheds for peripheral creeks and embayments, such as Meetinghouse Creek, Sag Harbor, and West Neck Bay.

The water and sediment quality technical characterization framework is illustrated, in simplified schematic form, in **Figure 3-3**. Within the watershed, the PEP sought to characterize not only direct loads, such as point source discharges, but also land use and land cover, which greatly affect the nature of nonpoint source loadings. Groundwater quality and quantitative input rates were also the subject of major investigations. Finally, atmospheric (airshed) and direct (*e.g.*, point source) loads to surface waters were evaluated. In the estuary itself, surface water monitoring and modeling were major initiatives. Sediment quality and dynamics were also the foci of major studies, including sediment toxics, sediment nutrient flux, and sediment accretion.

The size of the data sets is tremendous. For example, the Suffolk County Department of Health Services (SCDHS) has collected over 8,000 surface water samples, analyzed for a comprehensive array of physical and chemical parameters (including Brown Tide and coliform bacteria), at 39 routine surface water monitoring stations and 10 routine point source monitoring stations. Also, the Suffolk County Planning Department has developed precise, field-verified land use data for each tax map parcel in the 110,000-acre watershed. Thousands of SCDHS groundwater quality samples were analyzed in conjunction with the U.S. Geological Survey's groundwater budgets and subwatershed models.

This characterization process is discussed in great detail in several characterization reports available from the Peconic Estuary Program Office. Key findings from characterization studies have been used to formulate the proposed nutrient actions in this CCMP. Some of these findings are shown in the accompanying text box.

### ***PEP Hydrodynamic and Eutrophication Model***

The PEP Hydrodynamic and Eutrophication Model will serve as a tool for evaluating main bays water quality, as well as water quality for embayments such as Sag Harbor, West Neck Bay, and Meetinghouse Creek. The model is a three-dimensional hydrodynamic and water quality model with a predictive sediment submodel. It is the only known model to be run for a continuous eight-year simulation robustly, with no intermediate forcings or corrections to the sediment processes.

Model results are still under review by the Peconic Estuary Program Management Conference, and its advisory panel, the Model Evaluation Group. When the model is approved for evaluating preliminary management alternatives, several realistic best-case, worst-case, and intermediate management alternatives will be examined. Economic estimates of various management measures will be developed by a consultant, and costs of various management strategies can be weighed against benefits (*e.g.*, attainment of guidelines and criteria discussed below). Through this process, feasible and quantitative subregional loading targets can be developed, and costs and timeframes for implementation mechanisms can be established. The goal is to make this powerful management tool



available in the near future (calendar year 2001) and to develop an implementable load allocation strategy for the entire watershed.

Specific functions of the PEP water quality model include the following abilities:

- Simulate historic water quality conditions based on data collected since 1988;
- Predict future water quality conditions if present trends continue;
- Predict future water quality conditions in the estuary as a result of management actions;
- Simulate responses of water quality and sediment processes to point and nonpoint source control actions;
- Perform both short-term (seasonal) and long-term (multi-year) simulations;
- Determine the effect of localized management actions in peripheral embayments; and,
- Determine the response time of the estuary to management actions.



### Key Findings Related to Nutrients in the Estuary System

- Overall, the Peconic Estuary main bays and monitored embayments generally have “excellent” water quality with respect to dissolved oxygen (DO), with less than three percent of the area of the estuary exceeding the recommended total nitrogen (TN) guideline for DO attainment purposes (the DO standard is 5.0 mg/l, at all times) (see **Figures 3-4** and **3-5**). Similarly, most of the estuary attains light extinction properties optimal to eelgrass, at least in non-Brown Tide years (see **Figure 3-6**). However, the westernmost estuary (Peconic River and Flanders Bay) and several small embayments violate TN guidelines and exhibit DO stresses (see **Figures 3-7** and **3-8**, discussed further in **Table 3-2**). Also, several studies suggest eutrophic stresses in the “central estuary” (Great and Little Peconic Bay);
- Nitrogen loadings appear to be at an all-time high (see **Figure 3-9**), showing an increase of greater than 200 percent since the 1950s due to increasing residential land use and more pervasive use of highly soluble fertilizers;
- In the early to mid-1900's, western estuary (Peconic River and Flanders Bay) nutrient inputs were dominated by point source duck farm discharges. The decline in duck farming has been more than offset by an increase in nonpoint source nitrogen loading, primarily attributable to residential fertilizer and sanitary systems, coupled with agricultural fertilizers. Water quality trends probably reflect these loading patterns: dramatic improvements in water quality in western estuary creeks and embayments once affected by duck farms, and gradual increases in eutrophication stresses for the waters east of Flanders Bay;
- Fully 40 percent of the study area is still subject to development, posing a substantial potential threat to water quality in the main bays as well as in the embayments (see **Figure 3-10**);
- On a regional basis, over 80 percent of the existing total nitrogen load comes from developed lands and farmland (see **Figure 3-11**). Thus, for existing land uses, on a regional basis, management of residential and agricultural lands is an obvious priority. For medium density residential lands, sanitary waste and fertilizers contribute comparable amounts of nitrogen. At lower densities, fertilizer loadings become more prominent;
- New residential development is the major concern on an estuary-wide basis, particularly in the western estuary and on the South Fork. Under a scenario in which 100 percent of farmland is preserved and developable land is developed, nitrogen loading could increase substantially in every major region of the estuary (see **Figures 3-12** and **3-13**). This scenario is considered “worst case” because farmland has a higher nitrogen loading rate than most other allowable uses on developable lands. Overall, a total nitrogen increase for the estuary study area would be near 40 percent (about 41 percent in eastern estuary, and 34 percent in western estuary). In the eastern estuary, the increase on the South Fork would be most profound (over 60 percent);
- New industrial and commercial development is an issue prominent mainly in the western estuary, particularly in Riverhead Town. Overall, over 90 percent of the developable industrial acreage in the study area, and almost one-half of the developable commercial acreage, is in Riverhead Town;
- Open space acquisition and preservation programs have been tremendously successful in averting potential nitrogen loading increases (see **Figure 3-14**);
- Widespread areas of groundwater are enriched with total nitrogen on about an order of magnitude higher than native groundwater (see **Figure 3-15**). Most of the groundwater entering the estuary system is contributed from the western estuary and South Fork (see **Figure 3-16**); and,
- Low DO levels can adversely affect the feeding, growth, and survival of living marine resources. DO levels tend to be lowest during the summer, unfortunately when the abundance of many finfish and invertebrate species, including eggs, larvae, and juveniles are at their greatest.



## SOURCES AND LOADINGS OF NUTRIENTS IN THE SYSTEM

Many sources contribute nutrients to the Peconic Estuary System, including sediments, groundwater, direct rainfall to surface waters, point source discharges (such as discharges from the Riverhead sewage treatment plant), and stormwater runoff.

Sediments contribute nutrients to the estuary system through a process called sediment flux. Sediment nutrient flux is an internal, recycled source of nitrogen where sediments release nitrogen into the water column. Sediment flux is related to point and nonpoint source nitrogen inputs. Reductions in human nutrient inputs will eventually be reflected in lowered sediment flux rates. The annual sediment flux to the estuary, at about 14,000 pounds per day, is overwhelmingly the largest source of nitrogen to the estuary. This source comprises 51 percent of the total nitrogen loading to the estuary.

Groundwater is one of the largest external sources of nitrogen to the estuary (21 percent of total nitrogen load or about 7,560 pounds/day). It integrates nitrogen from fertilizer, sanitary system waste, and other sources. Atmospheric deposition (to surface waters) contributes substantial nitrogen (26 percent of total load). The remaining load to the estuary, only about 2 percent, is from stormwater runoff and sewage treatment plants. Although these sources represent a small percentage of total nitrogen loading, they may have localized effects.

In the early to mid-1900s, western estuary (Peconic River and Flanders Bay) nutrient inputs were dominated by point source duck farm discharges. The decline in duck farming has been more than offset by an increase in nonpoint source nitrogen loading, primarily attributable to residential fertilizer and sanitary systems, coupled with agricultural fertilizers. The water quality of the Peconic Estuary, on a regional basis, is primarily nonpoint-source impacted. However, point sources such as the Riverhead Sewage Treatment Plant and Meetinghouse Creek (which integrates the Corwin Duck Farm and other upstream sources) are very significant locally due to their direct, concentrated discharge to poorly flushed and stressed areas of the estuary. The Sag Harbor sewage treatment plant, although a relatively small facility, may also have localized effects in Sag Harbor Cove.

Stormwater runoff in the overall western study area is almost negligible from a nitrogen perspective, but may still be significant for water quality in specific embayments. In the far western portions of the estuary, total nitrogen loads may have increased substantially due to nonpoint source loadings from fertilizers and sanitary systems (LaRoche, 1996). This suggests that central main bays water quality may slowly be becoming more enriched with nutrients, via direct contributions from groundwater and indirect recycling from sediment nutrient flux, although this is certainly a “most probable scenario” assessment, in the absence of long-term monitoring data.

For the eastern estuary, sediment flux is, by far, the greatest quantitative source. The only other major, externally controllable source in the eastern estuary is groundwater, which still has significant degradation potential. Point sources and stormwater runoff in the overall eastern study area are minor nitrogen sources, but both may still be significant for water quality in specific embayments.

Nonpoint source nitrogen loading to the estuary appears to be at an all time high. The nature of nonpoint source management is complex and challenging, as it deals with relatively small but extremely pervasive contributions from sanitary systems, fertilizers, and other sources.





Existing nitrogen loads to the estuary are shown in **Table 3-1**, and in **Figures 3-17** and **3-18**. These estimates are derived directly from characterization studies conducted by the PEP and others and are discussed in detail in the SCDHS report, *Point and Nonpoint Source Loading Overview* (1998).

## ENVIRONMENTAL CRITERIA AND RECOMMENDED GUIDELINES

The Clean Water Act (CWA) mandates two types of approaches to meeting water quality standards: technology-based and water quality-based approaches. Section 301 of the Clean Water Act requires the application of technology-based criteria to point source discharges, so that effluent will meet specific effluent limits for the given discharge class. This can be considered a “minimum requirement” for all point source discharges to surface waters.

However, if technology-based standards are not sufficient to achieve water quality standards, then additional pollution control measures may be required of point sources to ensure attainment of the water quality standards. The water quality-based approach under Section 303 of the Clean Water Act results in specific limits applied to discharges so that waterbodies meet standards.

The Clean Water Act requirements are reflected in the New York Code of Rules and Regulations (NYCRR). 6 NYCRR 754.1(a)(I) sets forth the requirement that limitations (more stringent than technology-based limitations) shall be included in State Pollutant Discharge Elimination System (SPDES) permits where necessary to meet water quality standards or to implement total maximum daily loads (TMDLs).

### *Dissolved Oxygen*

Low dissolved oxygen (DO) levels can adversely affect the feeding, growth, and survival of the Peconic Estuary’s living marine resources. Dissolved oxygen levels tend to be lowest in the Peconic Estuary during the summer, which is also when the abundance of many finfish and invertebrate species are at their greatest. Additionally, summer-time is when the eggs, larvae, and juveniles of many marine species are also at their greatest concentrations following the adult spawning events in the spring and summer months. These early life history stages are also known to have increased susceptibility to the effects of low DO concentrations.

New York State has a water quality standard for DO of no less than 5.0 mg/l for all class SA, class SB, and class SC waters (see 6 NYCRR Part 703.3). All of the waters in the Peconic River and Flanders Bay drainage basins fall within the SA, SB, or SC classifications (see 6 NYCRR 921).

In addition to the 5.0 mg/l DO standard, which has regulatory significance, there are other technical “benchmarks” which are used to evaluate surface water quality with respect to DO. This is because 5 mg/l is considered extremely protective, and scientists believe that levels slightly below 5 mg/l can be sustained without harming marine life. For example, the Long Island Sound Study (LISS), a research and management project funded by the National Estuary Program, has developed the following benchmarks: 5.0 mg/l to be fully protective; 3.5 mg/l (one day average) to be protective of most species; and 2.0 mg/l (all times) to prevent major loss.



**Table 3-1. Peconic Estuary Program Total Nitrogen Loading Estimates (Annual Average).**

	West <sup>1</sup>		East		OVERALL	
	(of Flanders Bay)					
	(lb/day)	(% West)	(lb/day)	(% East)	(lb/day)	(% Total)
<b>NONPOINT SOURCES</b>						
Sediment Flux <sup>2</sup>	250	12	13,600	54	13,850	51
Groundwater <sup>3</sup>	1320	61	4,500	18	5,820	21
Atmospheric Dep. <sup>4</sup>	160	7	6,900	28	7,060	26
Stormwater Runoff <sup>5</sup>	30	1	100	0	130	0
<b>TOTAL NONPOINT</b>	<b>1,760</b>	<b>81</b>	<b>25,100</b>	<b>100</b>	<b>26,900</b>	<b>98</b>
<b>POINT SOURCES</b>						
Peconic River <sup>6</sup>	140	6	---	---	140	1
Riverhead STP <sup>7</sup>	170	8	---	---	170	1
Meetinghouse Creek <sup>8</sup>	110	5	---	---	110	0
Sag Harbor STP <sup>9</sup>	---	---	14	0	14	0
SI Heights STP <sup>10</sup>	---	---	3	0	3	0
<b>TOTAL POINT</b>	<b>420</b>	<b>19</b>	<b>20</b>	<b>0</b>	<b>440</b>	<b>2</b>
<b>TOTAL POINT &amp; NONPOINT</b>	<b>2,200</b>		<b>25,100</b>		<b>27,300</b>	
<sup>1</sup> Note: Preliminary analysis of historical duck farm data in the western estuary indicates that duck farms may have discharged 1,400 pounds/day or more for decades through the early 1970s. Discharge dropped to about 500 pounds/day in mid-70s, and 400 pounds/day in early-mid 1980s. In 1988, the last duck farm (Corwin Duck Farm on Meetinghouse Creek) stopped surface water discharge.						
<sup>2</sup> Summer sediment flux rates: 120 pounds/day west, 16,200 pounds/day east.						
<sup>3</sup> Groundwater underflow estimates:						
<b>Area</b>	<b>cfd (per USGS)</b>	<b>mg/l N</b>	<b>lb/day N</b>			
North Fork	3,800,000	9	2130			
South Fork	11,000,000	3	2060			
Shelter Island	1,700,000	3	320			
Peconic River e/o gauge: 20.8 cfs, 6 mg/l N, 670 pounds/day N						
North Flanders: 8.8 cfs, 9 mg/l N, 430 pounds/day N						
South Flanders: 13.8 cfs, 3 mg/l N, 220 pounds/day N						
<sup>4</sup> Uses 6.06 mg/m <sup>2</sup> /day, after Tetra-Tech. Areas: 12.1 km <sup>2</sup> for west, 522 km <sup>2</sup> for east. Eastern study area estimates are for sediment flux analysis study area, including part of Block Island Sound. The modeler will spread the loading rate over the surface area accordingly.						
<sup>5</sup> Load is taken from <i>Brown Tide Comprehensive Assessment &amp; Management Program</i> for west; eastern study area loadings are rough estimates only. Estimates will be refined using land use data.						
<sup>6</sup> Peconic River based on 37 cfs (mean from 1942-96), 0.7 mg/l.						
<sup>7</sup> Based on Riverhead STP Discharger Monitoring Report (DMR) data for Jan-June 1997.						
<sup>8</sup> Meetinghouse Creek: 1.4 cfs, 15 mg/l						
<sup>9</sup> DMR data for 6/96-5/97: 0.083 mgd, 20 mg/l TN.						
<sup>10</sup> DMR data for 6/96-5/97: 0.033 mgd, 9.2 mg/l TN.						



The results of the LISS experiments have shown that short-term exposure to DO levels below 2.0 mg/l can have adverse effects on growth and survival during the larval and juvenile stages of development. The studies also demonstrated that short-term exposure (24 hr) to DO levels in the range of 5.0 - 3.5 mg/l can affect their growth and survival in the larval and juvenile stages.

The LISS studies also showed that exposure to DO levels in the range of 5.0 - 3.5 mg/l for 24 hours significantly reduced the growth of larval marsh grass shrimp (*Palaemonetes vulgaris*), larval longnose spider crab (*Libinia dubia*) and larval sheepshead minnow (*Cyprinodon variegatus*) by 20 percent, 10 percent, and 10 percent, respectively. Additionally, at these DO levels, larval Atlantic rock crab (*Cancer irroratus*) displayed a 10 percent decrease in survival.

Oxygen levels between 3.5 and 2.0 mg/l resulted in a 50 percent reduction in the survival and growth of larval rock crabs and grass shrimp and a 30 percent reduction in the growth of larval sheepshead minnow. Furthermore, exposure to dissolved oxygen levels in this range reduced the growth rates of juvenile grass shrimp by 50 percent and juvenile summer flounder (*Paralichthys dentatus*) by 30 percent.

Short-term exposure to dissolved oxygen levels below 2.0 mg/l resulted in the greatest effects to marine finfish and invertebrate survival. The following species experienced a 50 percent reduction in survival during the juvenile stage: silverside (*Menidia beryllina*), winter flounder (*Pleuronectes americanus*), scup (*Stenotomus chrysops*), Atlantic menhaden (*Brevoortia tyrannus*), summer flounder, sand (*Crangon septemspinosa*) and grass shrimp, tautog (*Tautoga onitis*), windowpane flounder (*Scoptalmus aquosus*), and fourspine stickleback (*Apeltes quadracus*).

While the organisms tested in the LISS experiments are representative of those found in the Peconic Estuary, species such as the bay scallop (*Argopecten irradians*) and bay anchovy (*Anchoa mitchilli*) were not specifically studied. These species are known to be of significant ecological and commercial importance to the Peconic Estuary. Nevertheless, the LISS experiments examined a wide range of finfish and invertebrate species known to occur throughout the Peconics and can, therefore, be used as a guideline to assess the impacts of low DO concentrations to the living resources of the Peconic Estuary.

#### Pollutant Loadings

*Under the Federal Clean Water Act Section 303(d), states develop a list of waterbodies not meeting water quality standards after the implementation of technology-based limitations and must develop Total Maximum Daily Loads (TMDLs) to reduce point and nonpoint sources of pollutants to those waterbodies that do not meet their designated uses. TMDLs are detailed technical water quality assessments which determine the maximum amount of a given pollutant a waterbody can assimilate while still meeting water quality standards and designated uses.*

*A TMDL with waste load allocations and loading allocations prescribing total nitrogen (TN) load reductions to meet the 0.45 mg/l TN guideline and allow attainment of the DO standard of 5.0 mg/l is recommended for the entire Peconic River/Flanders Bay watershed (including subwatersheds for Meetinghouse and East Creek/Riverhead). The PEP will ultimately develop very detailed, waterbody-specific load control strategies for the remainder of the estuary to ensure that existing high water quality is preserved.*

### Nitrogen

New York State has not adopted a general water quality standard for nitrogen. However, to mitigate adverse impacts of dissolved oxygen depletion in marine surface waters, regulatory entities, including



the New York State Department of Environmental Conservation (NYSDEC), control nitrogen discharges from point sources. This is based on the well-documented relationship between nitrogen loading and dissolved oxygen stresses in marine surface waters. In addition, the NYSDEC has adopted a marine surface water total nitrogen guideline for the Peconic River/Flanders Bay of 0.5 mg/l based on 1988-90 conditions. (See the *Brown Tide Comprehensive Assessment and Management Program* and *PEP Action Plan*.) This guideline supports the “no net increase” discharge policy for point sources of nitrogen in the western estuary.

#### Submerged Aquatic Vegetation (SAV)

*SAV provides critical habitat for shellfish and finfish as well as numerous other functions, such as bottom stabilization and nutrient cycling. In the Peconic Estuary, eelgrass is generally considered to be the most valuable SAV species, due largely to its high habitat value. It is a rooted plant and has a vascular system. Other SAV that are present in the estuary include widgeon grass (present in relatively small areas), which is also rooted and vascular. The presence and extent of rooted aquatic plants is a quantitative measure of ecosystem health. Rooted aquatic plants generally are sensitive to conditions of water clarity and associated nutrient concentrations (which result in algal light shading) and suspended particulate levels. Also, research suggests that elevated levels of nutrients may have direct adverse metabolic impacts on eelgrass.*

*Macroalgae are also considered SAV, but they are not rooted or vascular. Rather, they are algal colonies, visible to the eye, and sometimes attached to the bay bottom. They generally have lower habitat value and are, in some cases, considered indicators of environmental degradation.*

*Excess nutrients may result in the displacement of eelgrass by macroalgae (see **Figure 3-21**). In the western and central estuaries (Flanders and Great/Little Peconic Bays), with the exception of Bullhead Bay, there are no known significant beds of eelgrass present.*

For dissolved oxygen management, this Management Plan recommends modification of the NYSDEC’s total nitrogen guideline to 0.45 mg/l, based on 1994-96 data. The SCDHS PEP data analysis, based mainly on the 1994-96 expanded monitoring program, suggests that the mean TN guideline of 0.45 mg/l for summer conditions (July-September), as a benchmark based on 1994-96 conditions, may be a valuable management tool to minimize the risk of DO depression below the 5.0 mg/l New York State dissolved oxygen standard. This recommendation is based mainly on correlating surface water TN levels with the frequency of DO standard violations, using SCDHS data from daytime (non-worst case) conditions (see **Figures 3-19** and **3-20**). The 1994-96 database was used in the empirical analyses because it provided the extensive shallow water and peripheral bays data necessary to assess the relationship between TN and DO, as well as light extinction and chlorophyll-a, within a temporally consistent timeframe of synoptic sampling events.

This proposed guideline will be used to empirically assess relative spatial variations in water quality in given waterbodies over a given time period and to establish modeling benchmarks against which impacts of future load allocations can be assessed. Thus, the proposed guideline is an assessment tool and a vehicle for setting rational load allocations, rather than a standard in the regulatory sense.

To optimize eelgrass habitat and preserve water quality in eelgrass habitat areas, a more stringent total nitrogen criterion of 0.4 mg/l is recommended for shallow estuary waters (three meters or less). This recommendation is based on the relationships between mean summer nitrogen, chlorophyll-a, and light extinction ( $K_d$ ) for the 1994-96 period of the “expanded” SCDHS monitoring program and model verification period, coupled with an analysis of water quality in relation to SAV beds delineated in a 1994 survey (Cashin Associates). Other recommended habitat criteria include  $K_d$  ( $0.75 \pm 0.05 \text{ m}^{-1}$ ), and chlorophyll-a ( $5.5 \pm 0.5 \mu\text{g/l}$ ), which are modest refinements to guidelines recommended in the LISS. A detailed discussion of the methodology and conclusions of the SAV



evaluation are contained in the SCDHS *Peconic Estuary Surface Water Quality* (1998) report. The SAV analysis also provided preliminary guidance to PEP natural resources programs, such as the SAV Long-Term Monitoring Program (Cornell Cooperative Extension) and the Eelgrass Habitat Criteria Study (EEA, Inc., 1999), which is providing more detailed guidance on SAV habitat criteria. These proposed criteria are based on the fact that lower nutrient levels clearly relate to greater water column light penetration, an important factor for eelgrass, which needs adequate light to survive.

For the time being, these criteria are being proposed as “interim” criteria because the scientific community has not come to consensus regarding the causal factors related to eelgrass decline. Substantial additional data from ongoing studies will be available soon. When coupled with the expanded SCDHS monitoring program, with additional sites at eelgrass beds and additional years of data, a more exhaustive analysis will be performed for developing SAV habitat criteria.

## OVERALL QUALITY AND USE IMPAIRMENTS

Based on the recommended total nitrogen guideline of 0.45 mg/l, the PEP Management Conference has developed a water quality hierarchy to describe use impairments and recommend management measures for waterbodies within the Peconic Estuary System (see **Table 3-2**). This hierarchy includes “mitigation priority” waters, “stressed/threatened” waters, and “preservation priority” waters. The water quality hierarchy can be used to better channel resources for best management practices and other land use and pollution control programs and can assist in review and prioritization of potential implementation projects. It can also be used in numerous other programs, such as the State Environmental Quality Review Act, whereby all applications to undertake, fund, or approve an action must undergo rigorous environmental review prior to approval.

The PEP Management Conference’s adoption of the hierarchy has important implications. However, the hierarchy does not imply prioritization among categories. That is, funding for mitigation for Flanders Bay is not presumptively a higher priority than preservation efforts in eastern waters.

### *Mitigation Priority Waters*

In relatively small areas of the estuary, particularly the tidal Peconic River and Flanders Bay (the “western estuary”), Meetinghouse Creek, and East Creek/Riverhead, nitrogen levels need to be reduced to optimize DO conditions. These waters are characterized by substantial violations of the proposed total nitrogen guideline for mean summer conditions. There are also frequent and sometimes “serious” DO standard violations in surface samples. These are extremely small areas, making up far less than one percent of the estuary’s surface waters (see **Table 3-2**).

Management considerations for these waters include mitigation to alleviate these frequent and sometimes serious DO problems. TMDLs are prescribed by Section 303(d) of the Clean Water Act for surface waters not attaining water quality standards. Based on the conditions in mitigation priority waters, a Clean Water Act Section 303(d) listing based on not achieving the state dissolved oxygen standard and a TMDL should be considered for the entire Peconic River/Flanders Bay watershed (including subwatersheds for Meetinghouse Creek and East Creek/Riverhead).



**Table 3-2. Surface Water Characterization and Management Hierarchy.**

	<i>Mitigation Priority Waters</i>	<i>Stressed/Threatened Waters</i>	<i>Preservation Priority Waters</i>
<b>Waterbodies</b>	*Tidal Peconic River/western Flanders Bay *Meetinghouse Creek *East Creek/Riverhead	*Flanders Bay (Central/East) *West Neck Bay *Sag Harbor *East Creek complex/Southold *Town Creek complex *Northwest Creek	*Presumptively all other waters
<b>TN Guideline Attainment</b>	“Extreme” exceedances (>0.6 mg/l TN)	Exceedances (not “extreme”)	Compliance
<b>DO Standard Violation Frequency</b>	Frequent violations (>20% of samples)	Frequent (>20%) or occasional (2-5%) violations for some stations; depressed mean DO for all others.	No more than one violation
<b>DO Standard Violation Severity</b>	Several “serious” violations (below 3.5 & 2 mg/l)	Not “serious” (no DO <3.5 mg/l)	No “serious” violations
<b>Management Implications**</b>	Total Maximum Daily Loads; load reductions***	TN load controls prevent substantial additional loads***	Rational load control targets***

\* Based on nitrogen and DO concerns.

\*\* Does not imply management prioritization among three categories.

\*\*\* Based on total nitrogen guidelines, modeling results, and cost-effectiveness analysis.

### ***Stressed/Threatened Waters***

A small class of waters exists that exhibit marginally “stressed” or “threatened” characteristics with respect to nitrogen and dissolved oxygen concentrations. These waters include:

- West Neck Bay
- Central/Eastern Flanders Bay
- East Creek complex/Southold
- Town Creek complex
- Sag Harbor
- Northwest Creek

These waters are characterized by modest violations of the proposed total nitrogen guideline for mean summer conditions, and “occasional” but no “serious” DO standard violations for surface samples for many of the stations (see **Table 3-2**).



Management considerations include mitigation to reduce nitrogen and ensure optimal DO conditions, and nitrogen reduction controls should be considered and implemented where cost-effective. Neither a Clean Water Act 303(d) listing nor a TMDL establishment is recommended for these waters at this time. However, the subwatersheds to the waterbodies should be the particular focus of load control strategies, with specific load targets developed.

### ***Preservation Priority Waters***

Preservation priority waters include all waters of the Peconic Estuary System not listed as mitigation priority or stressed/threatened waters above. These waters are in compliance with total nitrogen guidelines and exhibit no more than one DO violation and have no “serious” DO violations. Because surface water quality conditions with respect to DO (and related nitrogen) are generally excellent in the Peconic Estuary, much of the estuary falls within this classification. The New York State DO standard of five mg/l is consistently attained in greater than 97 percent of the estuary (see **Table 3-2**).

Recommended management considerations for these waters are that mitigation and nitrogen reduction controls are appropriate where demonstrated to be cost-effective, especially when multiple benefits will accrue (coliforms, toxics, habitat, etc.). Cost-effective preservation also is needed to prevent degradation so that nitrogen levels are maintained at their current levels. In these “preservation priority” waters, model results will be especially critical in evaluating results of best-case and worst-case management scenarios, as well as very discrete management plans.

Even though some of the estuary’s waterbody segments are clearly more enriched than others with respect to nitrogen, most have not demonstrated obvious and acute impairments with respect to conventional dissolved oxygen, such as fish kills. This does not mean, of course, that subtle, long-term ecosystem changes have not occurred due to nitrogen enrichment.

## **MANAGEMENT STRATEGY**

An overarching PEP management principle is to support management decisions based on comprehensive, site-specific studies (monitoring, modeling, land use, etc.) for the main bays and main watershed, as well as in subwatersheds such as West Neck Bay, Sag Harbor, and Meetinghouse Creek. Increasing emphasis is also being placed on linkages with living resource issues, such as submerged aquatic vegetation.

Already, a point source total nitrogen freeze has been implemented for the western estuary (Peconic River and Flanders Bay). Major sewage treatment plant upgrades at Riverhead and Sag Harbor have been funded, in large part, by New York State, two examples of numerous demonstration and early implementation actions.

Overall, the PEP management strategy is based on three distinct, but related, approaches:

- Optimize pre-existing and emerging management programs;
- Provide additional local characterizations, applying water quality and pollutant load assessments; and,
- Utilize the surface water model and economic valuation and financing tools to develop and implement a total nitrogen load allocation strategy for the entire estuary.



The load control strategy includes a recommendation to pursue a Clean Water Act Section 303(d) listing and a TMDL for the Peconic River and Flanders Bay, and a non-regulatory total nitrogen load allocation for the areas east of Flanders Bay. The load reductions targeted for the western estuary appear feasible for nonpoint sources (the primary nitrogen inputs), since only modest increases in the western estuary are likely (13 percent increase maximum) under full build-out over a manageable area. The need for “water quality preservation” in the eastern estuary is highlighted, since greater nitrogen load increases are likely (greater than 20 percent increase) over a much larger area at full build-out.

These approaches are designed to achieve the following goals (based on 1994-96 model calibration conditions):

- Attain 0.45 mg/l TN guideline in all waters, to ensure that the New York State DO standard (5 mg/l) is maintained at all times, thereby minimizing potential adverse impacts to marine life;
- Attain 0.4 mg/l shallow water TN criterion, where feasible and cost-effective, to optimize water clarity, maintaining and potentially improving conditions for eelgrass beds, a critical habitat; and,
- Implement the “preservation policy” in waters east of Flanders Bay, to prevent degradation and maintain nitrogen levels at their current concentrations, where water quality meets or exceeds established standards, criteria, or guidelines.

### ***Existing and Emerging Management Programs***

In addition to the programs noted above, including sewage treatment plant upgrades and a point source nitrogen freeze update, several other programs are critical to nitrogen management. As discussed above, perhaps the most prominent is open space preservation, which continues to protect not only drinking water, but also estuarine water quality (see **Figure 3-14**). Funding available for open space acquisition and farmland preservation along the East End has risen dramatically in recent years. A substantial part of a pool of funding totaling \$361 million could be available, largely for the Suffolk County East End (see **Chapter 9**). Aggressive continuation of open space programs will be a critical aspect of CCMP implementation.

Important regulatory programs discussed in this chapter include the Pine Barrens Program, the East Hampton Harbor Protection Overlay District, the State Environmental Quality Review Act (SEQRA), and the Suffolk County Planning Commission review process.

The Pine Barrens Program has resulted in ensuring the preservation of over 2,000 acres in the Peconic River corridor in their natural state. Were it not for this program, potential additional nitrogen loading to the estuary would be substantial.

A program which occurred during the formative years of the PEP is the Harbor Protection Overlay District in East Hampton Town. This program has instituted several key land management and pollution control measures in areas contributing groundwater and stormwater runoff from all coastal properties in the Town of East Hampton. These include sanitary system upgrades, clearing restrictions, and stormwater containment requirements for structures and driveways.





The SEQRA requires special environmental assessments prior to undertaking, funding, or approving certain types of actions. Most new development and pollution control actions are subject to SEQRA. PEP recommendations and actions will be important factors for State and local agencies that undertake, fund, and review projects.

The Suffolk County Planning Commission is a regional commission that reviews several types of land development applications and plans, including those occurring within 500 feet of the shoreline. An adverse determination by the Commission can only be overridden by a supermajority of the approving town board. Thus, consideration of PEP recommendations and actions by the Commission is an excellent mechanism for CCMP implementation for nearshore areas.

Several other programs with nitrogen implications are ongoing. These include river and wetlands preservation programs including the Wild, Scenic and Recreational Rivers statute and regulations (6 NYCRR Part 666), the Freshwater Wetlands regulations (6 NYCRR Part 663), the Tidal Wetlands Land Use regulations (6 NYCRR Part 661), and the Protection of Waters regulations (6 NYCRR Part 608). These regulations can mitigate nitrogen loads by minimizing stormwater runoff and improving denitrification and uptake. With regard to local government, upzoning efforts, wetland restrictions, clearing restrictions, and clustering requirements have resulted in a much lower pollutant loading potential.

Numerous non-regulatory efforts also have been targeted at nitrogen controls. Perhaps the most prominent of these are public education and outreach initiatives directed at stakeholders such as residential homeowners, tourists, youth groups, and small business owners. These efforts are described in the Public Education and Outreach chapter of this Management Plan. Best management practices (BMPs) are yet another important component of the PEP approach. With respect to residences and commercial and industrial uses, the PEP has developed a draft *Nonpoint Source Inventory* of local programs, which is being translated into management actions. A large part of the process is review and implementation of Section 6217(g) management measures and practices identified as part of the Coastal Zone Act Reauthorization Amendments of 1990.

*In addition to future funding for proposed and ongoing management programs, a total of over \$11 million in Federal and State funds has already been dedicated to performing 55 priority demonstration/implementation projects identified by the PEP. Early nutrient action projects include sewage treatment facility upgrades in Riverhead and Sag Harbor and improved waste treatment systems at the Corwin Duck Farm. Public education and outreach initiatives, an Agricultural Environmental Management (AEM) Initiative, and Clean Water Act Section 319 (Nonpoint Source Management Program) projects are also key components of the management program.*

### ***Additional Planning and Management Based on PEP Characterizations***

The characterization-based management strategies are discussed in the preceding sections. These include a marine surface water total nitrogen (TN) “guideline” (0.45 mg/l) for DO management purposes. Based on that guideline, this CCMP identifies a surface water quality “hierarchy” which can immediately be used in resource allocation and planning efforts and in other programs involving environmental review. The PEP is recommending a presumptively even split for funding of preservation and mitigation efforts (50 percent for preservation, 50 percent for mitigation).

An even more stringent “shallow water criterion” of 0.4 mg/l TN is proposed for the shallow waters (waters three meters deep or less) of the estuary to optimize eelgrass habitat. This is an interim



criterion, subject to interpretation of ongoing modeling efforts and submerged aquatic vegetation studies.

Based on nitrogen loading evaluations, the PEP has determined that management of existing residential and agricultural lands is a priority. Sanitary system and fertilizer actions are emphasized accordingly. For proposed new development, residential development is the major concern on an estuary-wide basis, particularly in the western estuary and on the South Fork. New industrial and commercial development is an issue prominent mainly in the western estuary, particularly in Riverhead Town.

### ***Modeling and Nitrogen Loading Workgroups***

Based on the overall TN guideline, the TN shallow water criterion, and water quality preservation policy, the PEP will establish a total nitrogen loading goal for the entire watershed, based in large part on the results of state-of-the-art surface water modeling of various management alternatives. This model will allow evaluation of future water quality conditions, as compared with current conditions and recommended guidelines and criteria.

Economic consultant data on resource benefits, implementation costs, and financing will be important components of the process. Subwatersheds for stressed/threatened waterbodies will also be the focus of particular planning attention.

Because of the need to accelerate the quantitative nitrogen management process, a short-term, focused set of work groups is recommended, as shown in **Figure 3-22**. These work groups are addressing priority management issues by applying PEP modeling and assessment tools in relation to existing and emerging programs. The goal is to set quantitative loading targets and detailed plans for load management (timing, costs, parties, etc.). Work group members include representatives from the PEP Management Conference as well as Federal, state, and local agency representatives. The work groups convened in September 1999. Each work group will produce a strategy that will lay out the steps and timeframe for setting nitrogen load controls

Lead parties for the work groups will be integrally involved in PEP activities. Therefore, there will be close coordination with other efforts, such as critical natural resource area management and monitoring. The work group leaders will be in close contact with each other, so that all initiatives are coordinated.

The Agricultural Work Group is charged with refining existing agricultural nitrogen loading estimates and developing an implementation plan for regional nitrogen load reductions. This effort includes expanding the Agricultural Environmental Management (AEM) Initiative and considering “Purchase of Development Rights” links to farm management plans.

To date, the Agricultural Work Group has made significant progress towards their goals, including producing agricultural use GIS maps, and determining the nitrogen loading rates and estimates of potential reductions for specific crops. The Work Group has produced an Agricultural Environmental Management Strategy, located in **Appendix H**.

An ambitious Agricultural Environmental Management (AEM) Initiative program has been piloted in the Peconic Estuary. Using the AEM approach, a comprehensive inventory and analysis was conducted for all farms within one sub-watershed to assess the potential impact the farms may have on that part of the Peconic Estuary and shallow aquifer. Plans were developed for a total of 13 farms



within the sub-watershed and high priority BMPs were implemented. This program will be a model for agricultural environmental management at farms throughout the study area.

The focus of the Non-Agricultural Work Group includes both existing and prospective nitrogen loading. For existing loads, the emphasis is on residential uses and BMPs as well as other programs (primarily dealing with fertilizer and sanitary waste). For prospective loads, the Non-Agricultural Work Group will focus on residential uses. Efforts will be directed at land management strategies, including zoning, clustering, clearing restrictions, and model ordinances. This group will address nutrient loadings on publicly held land as well as on private/commercial properties, such as golf courses.

The West Estuary TMDL Work Group is addressing the TMDL process. This process includes refining the loading analysis for the western Peconic River and will consider the costs and benefits of developing a separate model for the freshwater portion of the river. Finally, industrial and commercial planning analysis for the Peconic River watershed will be a crucial component of the work group's efforts.

Each of the work groups will be developing and evaluating a range of options and considering costs and benefits. The surface water model will be used to help assess benefits of the management actions.

*In the Agricultural Environmental Management Strategy, the Agricultural Work Group strongly recommends that the following tasks be pursued:*

**Task I** *Develop a Long Island component to the New York State Agricultural Environmental Management (AEM) program;*

**Task II** *Identify potential pilot projects to demonstrate Best Management Practices and test them, where appropriate;*

**Task III** *Investigate the creation of a farm insurance plan;*

**Task IV** *Provide funding for increased local AEM development and implementation;*

**Task V** *Investigate and implement innovative/alternative finance mechanisms for education and outreach and other tasks noted above; and,*

**Task VI** *Gather and analyze economic data on a regular basis and continue to promote and integrate economic analyses and support mechanisms into the AEM initiatives.*

## MANAGEMENT ACTIONS

A number of important completed actions and accepted policies, as well as new proposed solutions to nutrient-related issues, are included in the nutrients action plan. These include adoption of the water quality hierarchy, endorsement of the nitrogen management work group process, and early commitments to freeze point source nitrogen loading to the western estuary. The actions also reflect major commitments to sewage treatment plant upgrades at Riverhead Town (approximately 85 percent of a \$7 million project to be funded through NYS Clean Water/Clean Air Bond) and Sag Harbor (at least \$500,000 in NYS Clean Water/Clean Air Bond Act funds for a \$2 million project), as well as wastewater treatment enhancements at the Corwin Duck Farm (more than \$270,000 in EPA and NYSDEC funding). The following actions include only the key PEP management recommendations and actions which require additional follow-up attention, commitments, actions, or time to complete.

Within the CCMP, some steps within the actions have been identified as priorities, as indicated under the step number. The PEP will seek to implement priority actions in the near term. Priorities may be either new or ongoing, commitments or recommendations. Completing some priority actions does not require any new or additional resources, because they are being undertaken through "base programs" or with funding that has been committed. In other cases, in order to complete the priority actions, new or additional resources need to be secured by some or all of the responsible entities.



To minimize actions that require tracking, the PEP has not placed “completed” actions accomplished in early implementation actions in the following discussion and table.

### **NUTRIENTS MANAGEMENT ACTIONS**

- N-1. Continue to Use and Refine Water Quality Standards and Guidelines.
- N-2. Preserve Water Quality East of Flanders Bay.
- N-3. Implement a Quantitative Nitrogen Load Allocation Strategy for the Entire Estuary.
- N-4. Control Point Source Discharges from STPs and Other Dischargers.
- N-5. Implement Nonpoint Source Control Plans.
- N-6. Use Land Use Planning to Control Nitrogen Loading Associated with New Development.
- N-7. Ensure that Funding Is Distributed Evenly Between Preservation and Mitigation Projects.
- N-8. Integrate PEP Recommendations into Other Programs.
- N-9. Sponsor and Coordinate Research and Information Gathering.
- N-10. Monitor Conditions within the Estuary System to Determine the Effectiveness of Management Strategies.

**N-1. Continue to Use and Refine Water Quality Standards and Guidelines.****Addresses Nutrients Management Objectives 1, 2, 3 and 6.**

New York State has not adopted a general water quality standard for nitrogen. However, the NYSDEC has adopted a marine surface water total nitrogen guideline for the Peconic River/Flanders Bay of 0.5 mg/l based on 1988-90 conditions. This guideline forms the basis for the “no net increase” discharge policy for point sources of nitrogen in the western estuary.

One basis for the nitrogen criteria is achieving State dissolved oxygen standards. EPA is revising its criteria recommendations for dissolved oxygen in marine waters. The State and PEP will be evaluating EPA’s criteria once proposed and issued. Any revision to the State standard for dissolved oxygen may affect future PEP recommendations for total nitrogen criteria.

For dissolved oxygen management, this action recommends evaluation of a modification of the NYSDEC’s total nitrogen guideline to 0.45 mg/l, based on 1994-96 data. This guideline is exceeded in tidal portions of the Peconic River and western and central Flanders Bay and a few peripheral embayments. The total nitrogen guideline will be used as an assessment tool to screen relative water quality in various bays in relation to dissolved oxygen conditions for a given time period, a benchmark against which to evaluate model management alternative runs, and to evaluate the need to develop a TMDL under the Clean Water Act.

To optimize eelgrass habitat and preserve water quality in eelgrass habitat areas, a more stringent total nitrogen criterion of 0.4 mg/l is recommended for shallow estuary waters (three meters or less). The LISS eelgrass habitat criteria values were provisionally adopted as working guidelines for developing this criterion. A preliminary SCDHS analysis of mean seasonal water quality parameters and light extinction (Kd) with respect to existing SAV beds further refined the LISS parameters for the Peconic Estuary. Based on this analysis, the following criteria are proposed as working criteria for optimizing eelgrass habitat: Kd:  $0.75 \pm 0.05$  ( $m^{-1}$ ); chlorophyll-a:  $5.5 \pm 0.5$  ( $\mu g/l$ ); and TN: 0.4 (mg/l) (for “shallow waters,” three meters deep or less). These proposed criteria are based on the fact that lower nutrient levels clearly relate to greater water column light penetration, an important factor for eelgrass, which needs adequate light to survive.

The shallow water criteria are particularly important for the eastern estuary, due to the potential for optimizing eelgrass habitat, as well as the opportunity for preservation of water quality in those areas. The costs and benefits of nitrogen reductions for the relatively small areas that exceed the more stringent 0.4 mg/l TN criterion will be carefully examined based on the results of ongoing studies.

For the time being, the shallow water criteria are being proposed as “interim” criteria because the scientific community has not come to consensus regarding the causal factors related to eelgrass decline. Substantial additional data from the SAV Long-Term Monitoring Program (Cornell Cooperative Extension) and the Eelgrass Habitat Criteria Study (EEA, Inc., 1999) will be synthesized shortly. When coupled with the expanded SCDHS monitoring program, with additional sites at eelgrass beds and additional years of data, a more exhaustive analysis will be performed to refine the “interim” criteria.



### ***Steps***

- N-1.1 **Priority** Integrate monitoring and modeling data, studies, and reports to evaluate the application of the 0.45 mg/l total nitrogen guideline to the Peconic Estuary as a means of attaining and maintaining dissolved oxygen standards and for use in developing regional load allocation strategies, a CWA Section 303(d) listing, and TMDL establishment, to attain and maintain the dissolved oxygen standard.
- N-1.2 **Priority** Integrate monitoring and modeling data, studies, and reports to evaluate the use of the recommended 0.4 mg/l total nitrogen guideline for the shallow waters of the estuary to optimize eelgrass habitats and for use in developing regional load allocation strategies, a CWA Section 303(d) listing, and TMDL establishment.
- N-1.3 Review and revise as appropriate the marine dissolved oxygen standards based on LISS efforts to develop area-specific dissolved oxygen targets and EPA efforts to develop dissolved oxygen criteria for marine waters.

### ***Responsible Entities***

- N-1.1 PEP Management Conference (lead), NYSDEC, SCDHS, and Contractor Tetra-Tech, Inc.
- N-1.2 PEP Management Conference (lead), NYSDEC, SCDHS, and Contractor Tetra-Tech, Inc.
- N-1.3 NYSDEC



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<b>N-2    Preserve Water Quality East of Flanders Bay.</b>
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**Addresses Nutrients Management Objectives 4 and 6.**

Eastern estuary waters (east of Flanders Bay) are of high quality. Preservation plans are needed to prevent degradation so these waters are maintained at their current high level of water quality. Therefore, in areas east of Flanders Bay, including embayments, water quality that meets or exceeds water quality standards, criteria, or guidelines should be maintained.

Preservation plans will be developed based on the nitrogen criteria guidelines discussed above and the recommendations of the nitrogen loading work groups.

***Steps***

N-2.1      Develop and implement water quality preservation plans to protect existing water quality  
**Priority**      for waters east of Flanders Bay where water quality meets or exceeds established standards, criteria, or guidelines. Plans should address potential point and nonpoint pollutant sources as well as strategies for preventing and/or mitigating impacts.

***Responsible Entities***

N-2.1      NYSDEC, SCDHS (co-leads), EPA, SCPD, PEP Management Conference, and Towns



### **N-3 Implement a Quantitative Nitrogen Load Allocation Strategy for the Entire Estuary.**

#### **Addresses Nutrients Management Objectives 1, 2, 4, 5 and 6.**

Under the Federal Clean Water Act Section 303(d), States must estimate load allocations for point and nonpoint source pollutants for waterbodies that do not meet their designated uses. TMDLs are detailed technical water quality assessments, which determine the maximum amount of a given pollutant a waterbody can assimilate while still meeting water quality standards for designated uses.

The State will be evaluating data to determine waters of the Peconic system that should be included on the State's 2002 303(d) list submittal for violations/exceedances of the New York State dissolved oxygen criterion. The State will establish a schedule for the development of TMDLs for waterbody segments, if any, included on that list. This schedule will take into account the status of the PEP water quality computer model and any revisions to the State's water quality standard for dissolved oxygen (see Action N-1.1). The computer model, once calibrated and verified, will be used to evaluate management alternatives for point source and nonpoint source controls. The State will then develop a TMDL for any waterbodies listed on the 303(d) list and associated wasteload allocations for point sources and loading allocations for nonpoint sources.

A formal regulatory TMDL is not recommended for waters not included on the 303(d) list at this time. However, in the future, the PEP will establish a total nitrogen loading goal for the entire watershed, based on modeling results and nitrogen guidelines.

A variety of computer modeling exercises can be used to determine appropriate management actions for the estuary. For example, the PEP Hydrodynamic and Eutrophication Model will be a key tool in developing a nitrogen load control target for the overall estuary.

The surface water computer model can be used to evaluate management alternatives for land use and pollution control. The approach is to initially run "coarse" (best and worst-case runs) management alternatives. The results will be evaluated against the water quality guidelines currently in use. More detailed management alternatives will be developed to provide more specific guidance for regional load targets. These will include land use and pollution control alternatives and other management measures, such as reversing the Shinnecock Canal flow regimen. Once completed, options for load reductions, such as advanced treatment and outfall relocation in the case of a STP, can be evaluated, as well as the significance of atmospheric deposition as a source of nitrogen to the estuary.

United States Geological Survey (USGS) embayment modeling for West Neck Bay, Sag Harbor, and Meetinghouse Creek is complete, and the USGS is performing a North Fork modeling study. USGS seismic reflection work for Flanders Bay was completed this past summer and they are currently analyzing the data. A Camp, Dresser and McKee regional groundwater model, which will include the North and South Forks and Shelter Island, is ongoing. Results from these modeling efforts will need to be incorporated in PEP characterization, modeling, and management activities.





**Steps**

- N-3.1 **Priority** Initiate the development of load allocation targets and implementation strategies for nitrogen loading to the entire estuary, with particular emphasis on subwatersheds for peripheral creeks and embayments (*e.g.*, Meetinghouse Creek, West Neck Bay, and Sag Harbor). Any subsequent Clean Water Act Section 303(d) listing and Total Maximum Daily Load (TMDL) established for the “western estuary,” the Peconic River/Flanders Bay area (see following actions) can incorporate these interim steps. These load allocation targets will be based on surface water nitrogen guideline attainment. In addition, the appropriate Nitrogen Management Work Groups and the Management Committee, will evaluate nonpoint source pollution effects on groundwater quality, coupled with groundwater impacts on the surface water nitrogen guideline, and will thereby consider the viability of subregional groundwater quality targets as a means to protect surface water quality.
- N-3.2 **Priority** Review all PEP data to identify water segments to be included in New York State’s 2002 303(d) list.
- N-3.3 **Priority** Establish schedule for development of TMDL for Peconic River/Flanders Bay segments included on 303(d) list based on completion of water quality model and adoption of revised dissolved oxygen standard.
- N-3.4 Complete calibration and verification of hydrodynamic and eutrophication models to evaluate management alternatives for TMDL land use and pollution control.
- N-3.5 Use PEP hydrodynamic and eutrophication models to evaluate management alternatives.
- N-3.6 Develop, as appropriate, TMDL/wasteload allocation and load allocation for Peconic River and Flanders Bay watershed.
- N-3.7 Evaluate the need for additional assessment and modeling to evaluate issues such as sedimentary denitrification.

**Responsible Entities**

- N-3.1 Suffolk County with NYSDEC, Towns, and Nitrogen Management Work Groups
- N-3.2 NYSDEC
- N-3.3 NYSDEC
- N-3.4 PEP
- N-3.5 PEP
- N-3.6 NYSDEC
- N-3.7 PEP



## **N-4 Control Point Source Discharges from STPs and Other Dischargers.**

### **Addresses Nutrients Management Objectives 1, 2, and 6.**

Any new or incremental increases in point source nitrogen loading to surface waters should be prohibited if the discharge is to surface waters in the environmentally stressed region of the tidal Peconic River and western Flanders Bay. The surface water point source nitrogen freeze applies to all facilities, including the sewage treatment plants at Brookhaven National Laboratory and the former Grumman plant. Throughout the entire Peconic River groundwater-contributing area, any substantial new or incremental point source nitrogen loading should be limited if it discharges to surface waters. Substantial groundwater degradation, which adversely affects surface waters, should also be limited. This means that new groundwater-discharging sewage treatment plants in the Peconic River groundwater-contributing area generally should be carefully scrutinized.

As a long-range management goal, upgrades to the Riverhead STP (above and beyond those funded by the NYS Clean Water/Clean Air Bond Act) should be evaluated with respect to attainment of the surface water quality total nitrogen guideline of 0.45 mg/l. Such evaluations can be performed through modeling and nitrogen management work group assessments.

Long-range Riverhead STP upgrades could be in the form of a groundwater discharge (10 mg/l total nitrogen, using conventional denitrification), a relocated surface water discharge at central or eastern Flanders Bay (approximately 25 mg/l total nitrogen, the current discharge concentration), or a surface water discharge at the existing location (approximately four mg/l total nitrogen, using advanced denitrification); environmental impacts of these and other alternatives would require assessment before selection. Beneficial reuse of treated wastewater (*i.e.*, application on agricultural land, golf courses, or soccer fields, including seasonal application) should also be evaluated.

Recommendations and actions regarding groundwater discharges and the Riverhead STP will be consistent with any TMDL work and Clean Water Act section 303(d) listing (see Action N-3).

### ***Steps***

- N-4.1 Evaluate the appropriateness of applying for a “Discharge Restriction Category” to prevent new nitrogen discharges from point sources in the Peconic River and the western portion of the Peconic Estuary.
- N-4.2 Ensure continued implementation of the “no-net increase” policy for nitrogen loading from point sources to surface waters of the western estuary.
- N-4.3 Determine the necessity of decreasing nitrogen loads from the Riverhead STP and other permitted discharges and develop nitrogen loading limits as needed to meet the site-specific nitrogen guideline and to protect against DO standard violations, based on TMDL work. (See Action N-3.5.)



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- N-4.4 Consider a groundwater application of the point source nitrogen freeze in the Peconic River/Flanders Bay watershed, (currently applied only to surface water discharges), based upon Nitrogen Management Work Group recommendations and TMDL work. (See Actions N-3.1 and N-3.5.)
  - N-4.5 Upgrade the Sag Harbor Sewage Treatment Plant and continue to monitor and model Sag Harbor Cove to assess impacts and track effectiveness of implementation.
  - N-4.6 Evaluate and consider implementing a beneficial reuse program where reclaimed STP water and/or sludge could be used on selected golf courses, playing fields, and farms.

***Responsible Entities***

- N-4.1 SCDHS (lead for nomination) and PEP
- N-4.2 NYSDEC (lead) and PEP
- N-4.3 NYSDEC (lead) and PEP Management Conference
- N-4.4 PEP (lead)
- N-4.5 Sag Harbor Village, NYSDEC (co-leads), SCDHS (lead for monitoring), and PEP
- N-4.6 SCDHS and NYSDEC (co-leads)



## **N-5 Implement Nonpoint Source Control Plans.**

### **Addresses Nutrients Management Objectives 2, 4, and 6.**

Many nonpoint sources contribute nutrients to the estuary system, including on-site disposal systems (cesspools or septic systems), domestic fertilizer use, agricultural fertilizer applications, and stormwater runoff. Section 6217(g) of the Coastal Zone Act Reauthorization Amendments (CZARA) requires States to develop management measures to address nonpoint sources of pollutants in coastal areas. In accordance with Section 6217(g), the PEP should ensure that appropriate nonpoint source control plans are developed for each nonpoint source category that the PEP identifies as contributing significantly to adverse ecosystem impacts (marinas/boating are addressed in the pathogens module). The control plan will include, but will not be limited to, identification and assessment of management practices and ways to implement the appropriate practices. In addition, the plan will determine whether the control measures are adequate to solve water quality problems and will identify additional control measures that may be necessary. The PEP will utilize the Base Program Analysis, Nonpoint Source Management Plan Inventory (PEP, 1995), in conjunction with the nitrogen management work group process to complete this action.

Substantial degradation of existing groundwater quality should be prevented, especially in the Peconic River area. On-site disposal systems or sanitary systems/cesspools, along with fertilizer applications, contribute most of the locally derived anthropogenic nitrogen load to the Peconic estuary.

A number of BMPs, restrictions, and incentives can be used to target nitrogen reduction from these nonpoint sources.

Mechanisms for sanitary system management may include:

- Tax credits (such as for upgrades) and other incentive programs;
- Mandatory system upgrades within defined districts on property transfers or on issuance of building permits for expansion;
- Use of innovative and alternative systems;
- General sanitary system regulation reviews to evaluate possible areas for improvement;
- Best management practices such as the proper and periodic maintenance of sanitary systems; and,
- Use of wastewater management districts or utilities.

The SCDHS already has policies that establish thresholds as to when existing sanitary systems should be upgraded or completely relocated (*e.g.*, when additional habitable area is being added to an existing dwelling as is the case with new bedrooms). In addition, the NYSDEC Region 1 Tidal Wetlands permitting program also applies similar strategies to existing sanitary systems. Consideration should be given to formalizing such policies at all levels of government for programs relevant to the Peconic Estuary.



Mechanisms for fertilizer management may include:

- Tax credits (such as for using native plants in landscaping) and other incentives;
- Restrictions on the sale and/or use of some products (*e.g.*, liquid fertilizers);
- Land use management measures;
- Best management practices, such as low maintenance lawns, slow-release fertilizers, modification of fertilizer application rates; and,
- Organic and/or slow-release fertilizers (via a tax on inorganic fertilizers, public relation endorsements of “good” products, educational campaigns for retailers and consumers, etc.).

Agriculture also is a major nonpoint source of nitrogen to the estuary. The Agricultural Work Group has been charged with refining existing agricultural nitrogen loading estimates and developing an implementation plan for regional nitrogen load reductions. This effort will include:

- Expanding the Agricultural Environmental Management (AEM) Initiative;
- Considering “Purchase of Development Rights” links to farm management plans; and,
- Promoting organic farming methods.

Under the ambitious AEM Initiative program piloted in the Peconic Estuary, a comprehensive inventory and analysis was conducted for all the farms within one sub-watershed to assess the potential impact the farms may have on the Peconic Estuary and shallow aquifer. Plans were developed for the 13 farms and high priority BMPs were implemented. This program will be a model for agricultural environmental management at farms throughout the study area.

A recent SCDHS study investigating groundwater impacts entitled *Water Quality Monitoring Program to Detect Pesticide Contamination in Groundwaters of Nassau and Suffolk Counties, NY* (1999) has found that the golf courses examined were not having major, adverse environmental impacts with respect to nutrient loading, particularly as compared with traditional row crop farms. The 1999 report documented the testing of 31 wells at 18 Long Island golf courses and found that the average nitrate concentration was 4.3 mg/l (the median nitrate concentration was 2.6 mg/l), which is the equivalent of a housing density of less than one residence per acre. At agricultural sites, the 1999 study found an average nitrate concentration of 11.7 mg/l and the SCDHS 1996 study entitled *Nitrate and Pesticide Impacts of Agriculture on Groundwater Quality Suffolk County, NY* found a 20 year nitrate average of 11.3 mg/l. Turf management practices at golf courses do effectively limit nitrogen inputs, however, monitoring should continue, as should aggressive golf course BMP implementation.

The SCDHS has done a follow-up study this year with an expanded list of analytes and with new monitoring wells at five more golf courses in the county, including Shinnecock, National, and Maidstone. Preliminary data suggest that nitrogen is generally relatively well controlled. The NYSDEC has been funding the monitoring program for three years at about \$100,000 per year. The NYSDEC recently agreed to a three-year one million-dollar commitment with the SCDHS to expand the monitoring program.

Stormwater, although not one of the most significant inputs on a regular basis, may be locally important. Therefore, subwatershed management practices should also consider the management of stormwater nitrogen loads.



### ***Steps***

- N-5.1 Ensure that the Section 6217(g) management measures of CZARA are appropriately implemented, in support of the overall nitrogen management plan.
- N-5.2 Investigate feasible implementation mechanisms and develop a plan to prevent increases and encourage decreases in nitrogen in groundwater underflow due to domestic fertilizer use.  
**Priority**
- N-5.3 Investigate feasible implementation mechanisms and develop a plan to prevent increases and encourage decreases in nitrogen in groundwater underflow due to on-site disposal systems (sanitary systems).  
**Priority**
- N-5.4 Develop a regional implementation plan for agricultural nitrogen load reductions which would include promoting agricultural best management practices, expanding agricultural environmental management (AEM) strategies, and promoting organic farming among other initiatives.  
**Priority**
- N-5.5 Manage stormwater runoff on a subwatershed basis to control nitrogen inputs.

### ***Responsible Entities***

- N-5.1 NYDOS (lead), PEP, EPA, NOAA, and Nitrogen Management Work Groups
- N-5.2 PEP Management Conference and Nitrogen Management Work Groups
- N-5.3 PEP Management Conference and Nitrogen Management Work Groups
- N-5.4 Nitrogen Management Work Groups, SCSWCD (co-leads), Cornell Cooperative Extension, and NYSDEC
- N-5.5 PEP Management Conference (lead), Consultant Horsley and Witten, Inc., SCDHS, SCPD, and SCSWCD



## **N-6 Use Land Use Planning to Control Nitrogen Loading Associated with New Development.**

### **Addresses Nutrients Management Objectives 2, 3, and 4.**

Fully 40 percent of the Peconic Estuary is still subject to development, posing a substantial potential threat to water quality in the main bays as well as in the embayments. For proposed new development, residential development is the major concern on an estuary-wide basis, particularly in the western estuary and on the South Fork. Under a scenario in which 100 percent of farmland is also preserved, nitrogen loading could increase substantially in every major region of the estuary (see **Figures 3-12** and **3-13**). Overall, a total nitrogen increase for the estuary study area would be near 40 percent (about 41 percent in eastern estuary, and 34 percent in western estuary). In the eastern estuary, the increase on the South Fork would be most profound (over 60 percent).

A number of land use planning measures can be used to minimize surface water quality degradation related to nitrogen loading, including zoning restrictions, development plan review, open space preservation, and use of model ordinances.

The *Brown Tide Comprehensive Assessment Management Plan* and the Peconic Estuary Program *Action Plan* recommended that undeveloped land in unsewered areas of the Peconic River groundwater-contributing area should be upzoned to a minimum of two acres per unit (or its commercial, industrial, or institutional equivalent) where feasible, subject to exceptions where necessary, to attain even more substantial regional nitrogen controls (*e.g.*, “receiving area” and “Compatible Growth Area” parcels necessary to implement the Pine Barrens Land Use Plan). Additional natural resources benefits can be attained by even more stringent land use controls. The Nitrogen Management Work Groups will review coordination between the PEP and the Pine Barrens Plan and will evaluate the degree to which PEP *Action Plan* recommendations have been implemented.

Funding available for open space acquisition and farmland preservation along the East End has risen dramatically in recent years. A substantial part of a pool of funding totaling \$361 million could be available, largely for the Suffolk County East End. These funding sources will be invaluable in open space acquisition, which will have important pollution prevention implications.

The public is extremely supportive of farmland preservation, as evidenced by the recent voter-approved farmland preservation programs. Also, the PEP Economic Value Assessment study found that the public was willing to pay more for farmland preservation than several other environmental programs. Thus, the PEP operates under the presumption that farmland preservation goals will be met, and deals with nitrogen loading issues associated with farmland through the Agricultural Nitrogen Management Work Group.

Several model ordinances, such as the Harbor Protection Overlay District and model stormwater runoff ordinances, exist and can be applied to the watershed. Such ordinances need to be coordinated on an interjurisdictional basis to maximize benefits to the estuary.



### ***Steps***

- N-6.1 Continue and expand aggressive open space preservation programs that protect habitat and living resources, as well as groundwater and surface water quality (see **Chapter 7** for a description of how nitrogen stressed subwatersheds are factored into recommendations).
- N-6.2 Evaluate the degree to which the *Brown Tide Comprehensive Assessment Management Plan* and Peconic Estuary Program *Action Plan* land use and zoning recommendations have been implemented.
- N-6.3 Encourage evaluation of design alternatives for Pine Barrens credit “receiving area” parcels, (*e.g.*, clustering away from the river, clearing limits, turf area restrictions, xeriscaping, etc.), where feasible to minimize nitrogen loading. (Subject to and recognizing the overarching provisions of the Pine Barrens Land Use Plan and New York State Environmental Conservation Law [ECL] Article 57.)
- N-6.4 Review the Pine Barrens Land Use Plan “guidelines” (non-binding) for development in the Compatible Growth Area and develop proposals for additional “standards” (binding) for development based on Peconic River water quality protection goals.
- N-6.5 Evaluate nitrogen loading impacts when reviewing Core Preservation Area hardship applications.
- N-6.6 Ensure that the public acquisition of private, vacant lands in Core Preservation Areas within the Peconic River ground watershed is given high priority.
- N-6.7 Utilize the strictest practicable standards when reviewing Peconic River Development Plans (*e.g.*, require open space dedications, maximum practicable setbacks from the river, and natural landscaping to eliminate or minimize fertilizer use).
- N-6.8 Evaluate the application of model ordinances such as the Harbor Protection Overlay District and model stormwater runoff ordinances.

### ***Responsible Entities***

- N-6.1 Local governments, Suffolk County, and New York State
- N-6.2 SCDHS (lead), NYSDEC, SCPD, PEP Management Conference, and local governments (to be coordinated with Nitrogen Management Work Group)
- N-6.3 SCDHS, NYSDEC, SCPD, PEP Management Conference, and local governments (to be coordinated with Nitrogen Management Work Group)
- N-6.4 SCDHS, NYSDEC, SCPD, PEP Management Conference, and local governments (to be coordinated with Nitrogen Management Work Group)
- N-6.5 SCDHS, NYSDEC, SCPD, PEP Management Conference, and local governments (to be coordinated with Nitrogen Management Work Group)





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- N-6.6 SCDHS, NYSDEC, SCPD, local governments (co-leads), and PEP Management Conference (to be coordinated with Nitrogen Management Work Group)
  - N-6.7 SCDHS, NYSDEC, SCPD, local governments (co-leads), and PEP Management Conference (to be coordinated with Nitrogen Management Work Group)
  - N-6.8 PEP Management Conference and Local Government Committee



**N-7 Ensure that Funding is Distributed Evenly Between Preservation and Mitigation Projects.**

**Addresses Nutrients Management Objectives 2, 3, and 4.**

The PEP is recommending a presumptively even split for funding of preservation and mitigation efforts (50 percent for preservation, 50 percent for mitigation). This is subject to feasibility within given programs, and would apply in the absence of detailed cost-benefit analyses, which would indicate other appropriate allocations.

***Steps***

N-7.1 Evaluate programs in which a 50/50 split for funding of preservation and mitigation efforts can be applied (*e.g.*, Section 319 Nonpoint Source Implementation; NYS Clean Water/Clean Air Bond Act) and determine mechanisms for its implementation.  
**Priority**

***Responsible Entity***

N-7.1 PEP Management Conference



## **N-8 Integrate PEP Recommendations into Other Programs.**

### **Addresses Nutrients Management Objectives 1, 2, 3, 4, and 5.**

Many regulatory and nonregulatory programs, such as the Pine Barrens Program, the East Hampton Harbor Protection Overlay District, the State Environmental Quality Review Act (SEQRA), and the Suffolk County Planning Commission review process may be important mechanisms for implementation of PEP recommendations. Some of these programs may need to be reviewed to ensure smooth coordination and determine whether any programmatic changes are needed to improve management of the Peconic Estuary.

#### ***Steps***

- N-8.1** Integrate PEP recommendations into existing land use and regulatory programs, including the SEQRA regulations (6NYCRR Part 617), Article 8 of the Environmental Conservation Law, Suffolk County Water Quality Coordinating Committee, Suffolk County Planning Commission and Suffolk County Council on Environmental Quality reviews, the Southold Ground Watershed Protection and Water Supply Management Strategy, the Wild, Scenic and Recreational Rivers statute and regulations (6NYCRR Part 666), the Freshwater Wetlands regulations (6 NYCRR Part 663), the Tidal Wetlands Land Use regulations (6 NYCRR Part 661), and the Protection of Waters regulations (6 NYCRR Part 608).
- Priority**

#### ***Responsible Entities***

- N-8.1** PEP Management Conference (lead), Nitrogen Management Work Groups, Suffolk County Planning Commission, and NYSDEC



## **N-9 Sponsor and Coordinate Research and Information Gathering.**

### **Addresses Nutrients Management Objectives 2, 3, 4, and 5.**

The National Estuary Program is designed to develop effective management plans based on available or readily obtainable data, using measurable performance indicators such as ambient nitrogen levels, dissolved oxygen and light extinction. However, continued research and information gathering will be needed to evaluate the status of the estuary's water and sediment quality and ecology/living resources, to track the effectiveness of proposed actions, and to run computer modeling programs. Therefore, the PEP long-term monitoring and assessment effort will continue in a coordinated fashion with several other programs. The Brown Tide Research Initiative (see **Chapter 2**) is one key program that will be extremely useful with respect to ecosystem dynamics and nutrient budgets (*e.g.*, sediment nutrient flux). Another program sponsored or supported by the PEP includes the Living Resources Research and Monitoring Plan. Efforts such as this one will help to develop a strategy for assessing linkages between submerged aquatic vegetation habitat criteria and other water quality issues. They will also provide the long-term data necessary to assess subtle individual and synergistic ecosystem impacts, at various trophic levels. The PEP also supports efforts by the Suffolk County Planning Department and others to maintain up to date land use and land cover databases for use in continuing water quality and habitat/living resources assessments. These databases can be used to document trends in land use and land cover and characterize habitat types and pollution loading potential.

Also, PEP modeling has been focused on the estuary. However, the Peconic River itself is a significant freshwater resource well worth investigating and managing. Biological resources and processes, physical modifications (dams), and sedimentation (and possibility for dredging/removal) are all important and related topics. Integrated investigations of the river (nutrients, toxics, radionuclides, etc.) and modeling should be pursued. The PEP will continue to leverage its resources with respect to the River, where possible (*e.g.*, toxic monitoring), and other programs and sources of funding should be sought to expand freshwater investigations and management.

### ***Steps***

- N-9.1 Continue to sponsor and coordinate research efforts addressing nutrient-related issues.
  - N-9.2 Establish a PEP land cover initiative to assist in nutrient loading analyses.
  - N-9.3 Update the land use database on a regular basis and prepare a proposal outlining the objectives and needs for a long-term monitoring program.
- Priority**
- N-9.4 Continue to integrate atmospheric deposition data into PEP modeling and management activities. Assess how reductions in atmospheric sources through the Clean Air Act will affect nitrogen loadings in the Peconic System.
  - N-9.5 Continue to incorporate groundwater information in PEP characterization, modeling, and management activities. This includes ongoing groundwater monitoring programs, as well as improvements to modeling.



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N-9.6 Continue to incorporate PEP TAC and external peer review in the modeling development and application process, which includes dependent analyses of water quality and pollution input studies. As the model process is completed, continue to solicit and use TAC and external peer review in developing programs and interpreting and applying data.

***Responsible Entities***

- N-9.1 PEP Technical Advisory Committee (TAC) (lead)
- N-9.2 PEP Management Conference through contractor (lead) and NYSDOS
- N-9.3 SCPD (lead) and PEP Management Conference
- N-9.4 PEP (lead) and EPA
- N-9.5 PEP Management Conference (lead)
- N-9.6 Model Evaluation Group and PEP TAC (co-lead)



**N-10 Monitor Conditions Within the Estuary System to Determine the Effectiveness of Management Strategies.**

**Addresses Nutrients Management Objectives 2, 3, 4, and 5.**

Monitoring is critical for measuring water quality and determining the need for continued or expanded management efforts. A number of water monitoring efforts already exist within the Peconic Estuary. One such program monitors environmental conditions at Meetinghouse Creek. Continued monitoring at this site is needed to determine if and when remediation is technologically, economically, and environmentally feasible. The need for additional actions at the Corwin Duck Farm will be evaluated using modeling and nitrogen management work group assessments. Other efforts that are needed include a long-term surface water monitoring program, a triennial surface water quality report from the SCDHS, and the continuation of marine surface water quality monitoring. This last effort should be linked to other efforts, such as eelgrass monitoring.

***Steps***

- N-10.1 Continue monitoring the effectiveness of remedial actions at the Corwin Duck Farm.
- N-10.2 Develop and conduct a long-term surface water monitoring program, with input from the PEP TAC.
- N-10.3 Issue a biannual update to the SCDHS surface water quality report.
- N-10.4 Continue monitoring groundwater impacts of various land uses, such as residences, farms, and golf courses.

***Responsible Entities***

- N-10.1 USDA-NRCS, SCSWCD (co-leads) and Nitrogen Management Work Groups
- N-10.2 SCDHS (lead) and PEP
- N-10.3 SCDHS (lead)
- N-10.4 SCDHS (lead)



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## BENEFITS OF MANAGEMENT ACTIONS

Because the Peconic Estuary is generally of high quality with respect to dissolved oxygen, the chief benefit will be to prevent substantial degradation to surface water quality, thereby enhancing a healthy (oxygen-rich) marine habitat and promoting species abundance and diversity. Conditions in the stressed western estuary should be improved. Submerged aquatic vegetation habitat may be enhanced, and there could even be beneficial implications with respect to severity and frequency of future Brown Tide blooms.

Surface water model results will be evaluated against the nitrogen guideline as one measure of “benefits,” and economic consultant input will be used to determine costs and financing methods. Programs for measuring ecosystem health and potential degradation with respect to submerged aquatic vegetation, benthic community structure, and other issues are being developed by the Habitat and Living Resources Plan. These are long-term programs, and may be helpful in better quantifying benefits of nutrient controls. However, useful results are not likely in the immediately foreseeable future. Moreover, documentation of severe and widespread adverse impacts due solely to nutrients is not likely. Therefore, immediate implementation of rational and cost-effective preservation policies and actions is critical, to avoid the need to document severe adverse impacts and implement more costly mitigation strategies. This is particularly critical, given the fact that about 40 percent of the watershed is subject to development, and development pressures are rapidly accelerating.

## COSTS OF MANAGEMENT ACTIONS

Because the Peconic Estuary is generally of high quality with respect to nutrients, many management actions are currently targeted at preservation. Many of these actions rely on optimizing the pre-existing and emerging regulatory and non-regulatory programs discussed above with no immediate additional costs projected.

Costs of key individual management actions, such as sewage treatment plant upgrades and duck farm waste treatment systems, are included with individual management actions discussed in this chapter. Key implementation funding sources are also noted and are discussed in greater detail in the Financing Chapter.

The most important element in developing and implementing regional nitrogen load controls is the nitrogen work group process, which will be integrally coupled with the completion of the surface water modeling and economic value assessment/finance plan efforts. The work group process will be conducted using existing PEP resources.

Several detailed cost estimates could not be completed in time for inclusion. With respect to the Non-Agricultural Work Group, the costs and benefits of a wide variety of regulatory and incentive programs related to fertilizers and sanitary systems will be evaluated. Public input will be crucial in guiding these recommendations and actions. Open space targets and structural mitigation efforts also will be considered. The costs and benefits of additional modeling for the freshwater Peconic River will be evaluated.

The total cost of all actions proposed for nutrient management is \$767,500 in new one-time costs and \$1,372,500 in new annual costs. This estimate does not include the full estimated costs of



implementing agricultural best management practices. (See “Action Costs” in **Chapter 1** for an explanation of how these costs were determined.)

## NUTRIENTS ACTIONS SUMMARY TABLE

**Table 3-3** provides the following summary information about each of the actions presented in this chapter.

### *Status*

An action’s status is designated in the table by either an “R” for “Recommendation” or a “C” for “Commitment.” Actions that are commitments are being implemented because resources or funding and organizational support is available to carry them out. Actions that are “recommendations” require new or additional resources by some or all of the responsible entities. “O” refers to ongoing activities; “N” indicates new actions.

### *Timeframe*

This category refers to the general timeframe for action implementation. Some actions are ongoing or nearing completion; implementation of other actions is not anticipated until some time in the future.

### *Cost*

Information in the cost column represents the PEP’s best estimate of the costs associated with action implementation. “Base Program” means that no new or additional funds will be needed outside of the responsible entity’s operating budget to implement the action. Where additional funding is needed, resources to implement an action may be expressed as dollar amounts or work years or both. One full time equivalent employee or “FTE” is estimated as costing \$75,000 per year, which includes salary, fringe benefits, and indirect costs. The “Action Costs” description in both **Chapter 1** and **Chapter 9** provides an expanded explanation of base programs and action costs.



Table 3-3. Nutrients Management Plan Actions.

	Action	Responsible Entity	Timeframe	Cost	Status
<b>N-1</b>	<b>Continue to Use and Refine Water Quality Standards and Guidelines. (Objectives 1, 2, 3, and 6)</b>				
<b>N-1.1 Priority</b>	Integrate monitoring and modeling data, studies, and reports to evaluate the application of the 0.45 mg/l total nitrogen guideline to the Peconic Estuary as a means of attaining and maintaining DO standards and for use in developing regional load allocation strategies, a CWA Section 303(d) listing, and TMDL establishment, to attain and maintain the dissolved oxygen standard.	PEP Management Conference (lead), NYSDEC, SCDHS, Contractor Tetra-Tech, Inc.	2001	EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE	C/N
<b>N-1.2 Priority</b>	Integrate monitoring and modeling data, studies, and reports to evaluate the use of the recommended 0.4 mg/l total nitrogen guideline for the shallow waters of the estuary to optimize eelgrass habitats and for use in developing regional load allocation strategies, a CWA Section 303(d) listing, and TMDL establishment.	PEP Management Conference (lead), NYSDEC, SCDHS, Contractor Tetra-Tech, Inc.	2001	Included in Step N-1.1	C/N
<b>N-1.3</b>	Review and revise as appropriate the marine DO standards based on LISS efforts to develop area-specific DO targets and EPA efforts to develop DO criteria for marine waters.	NYSDEC	Initiate after release of EPA criteria	NYSDEC – 0.1 FTE	C/N
<b>N-2</b>	<b>Preserve Water Quality East of Flanders Bay. (Objectives 4 and 6)</b>				
<b>N-2.1 Priority</b>	Develop and implement water quality preservation plans to protect existing water quality for waters east of Flanders Bay where water quality meets or exceeds established standards, criteria, or guidelines. Plans should address potential point and nonpoint pollutant sources as well as strategies for preventing and/or mitigating impacts.	NYSDEC, SCDHS (co-leads), EPA, SCPD, PEP Management Conference, Towns	December 2001	EPA – 0.2 FTE NYSDEC – 0.2 FTE SCDHS – 0.2 FTE SCPD – 0.2 FTE Towns – 0.2 FTE each of five towns	C/N

Table continued on next page



Table 3-3. Nutrients Management Plan Actions. (continued)

	Action	Responsible Entity	Timeframe	Cost	Status
<b>N-3</b>	<b>Implement a Quantitative Nitrogen Load Allocation Strategy for the Entire Estuary. (Objectives 1, 2, 4, 5, and 6)</b>				
<b>N-3.1 Priority</b>	Initiate the development of load allocation targets and implementation strategies for nitrogen loading to the entire estuary, with particular emphasis on subwatersheds for peripheral creeks and embayment (e.g., Meetinghouse Creek, West Neck Bay, and Sag Harbor). Any subsequent Clean Water Act Section 303(d) listing and Total Maximum Daily Load (TMDL) established for the “western estuary,” the Peconic River/Flanders Bay area (see following actions) can incorporate these interim steps. These load allocation targets will be based on surface water nitrogen guideline attainment. In addition, the appropriate Nitrogen Management Work Groups and the Management Committee, will evaluate nonpoint source pollution effects on groundwater quality, coupled with groundwater impacts on the surface water nitrogen guideline, and will thereby consider the viability of subregional groundwater quality targets as a means to protect surface water quality.	Suffolk County with NYSDEC, Towns, Nitrogen Management Workgroups	2000 - 2001 (Nitrogen Management Workgroups convene; 2001 (strategy produced))	Included in Actions N-1 and N-2.	C/N
<b>N-3.2 Priority</b>	Review all PEP data to identify water segments to be included in New York State’s 2002 303(d) list.	NYSDEC	2001	NYSDEC – 0.05 FTE	C/N
<b>N-3.3 Priority</b>	Establish schedule for development of TMDL for Peconic River/Flanders Bay segments included on 303(d) list based on completion of water quality model and adoption of revised dissolved oxygen standard.	NYSDEC	Develop schedule: 2001 Complete TMDL: December, 2002 Implementation schedule: To be determined	Included in Step N-3.2	C/N

Table continued on next page



Table 3-3. Nutrients Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-3.4	Complete calibration and verification of hydrodynamic and eutrophication models to evaluate management alternatives for TMDL land use and pollution control.	PEP	2001	(Contractor – part of \$225,000 contract)	C/O
N-3.5	Use PEP hydrodynamic and eutrophication models to evaluate management alternatives.	PEP	2001	Included in Actions N-1 and N-2	C/O
N-3.6	Develop, as appropriate, TMDL/wasteload allocation and load allocation for Peconic River and Flanders Bay watershed.	NYSDEC	Contingent upon actions N-1.1, N-3.3, and N-3.4	Included in Action N-1 and Step N-3.2	C/N
N-3.7	Evaluate the need for additional assessment and modeling to evaluate issues such as sedimentary denitrification.	PEP	2001	Included in Actions N-1 and N-2	C/O
<b>N-4</b>	<b>Control Point Source Discharges from STPs and Other Dischargers. (Objectives 1, 2, and 6)</b>				
N-4.1	Evaluate the appropriateness of applying for a “Discharge Restriction Category” to prevent new nitrogen discharges from point sources in the Peconic River and the western portion of the Peconic Estuary.	SCDHS (lead for nomination), PEP	2001	Included in Actions N-1 and N-3	R
N-4.2	Ensure continued implementation of the “no-net increase” policy for nitrogen loading from point sources to surface waters of the western estuary.	NYSDEC (lead), PEP	Ongoing	Included in Actions N-1 and N-2	C/O
N-4.3	Determine the necessity of decreasing nitrogen loads from the Riverhead STP and other permitted discharges and develop nitrogen loading limits as needed to meet the site-specific nitrogen guideline and to protect against DO standard violations, based on TMDL work. (See Action N-3.5.)	NYSDEC (lead), PEP Management Conference	Contingent upon actions N-1.1, N-3.3, and N-3.4	Included in Actions N-1 and N-3	C/N
N-4.4	Consider a groundwater application of the point source nitrogen freeze in the Peconic River/Flanders Bay watershed, (currently applied only to surface water discharges), based upon Nitrogen Management Work Group recommendations and TMDL work. (See Actions N-3.1 and N-3.5)	PEP (lead)	Contingent upon actions N-1.1, N-3.3, and N-3.4	Included in Actions N-1 and N-3	R

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Table 3-3. Nutrients Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-4.5	Upgrade the Sag Harbor Sewage Treatment Plant and continue to monitor and model Sag Harbor Cove to assess impacts and track effectiveness of implementation.	Sag Harbor Village, NYSDEC (co-leads), SCDHS (lead for monitoring), PEP	2001	(Implementation: \$2 million upgrade, using at least \$500,000 in NYS Clean Water/Clean Air Bond Act funds) Monitoring: Base Program	C/O
N-4.6	Evaluate and consider implementing a beneficial reuse program where reclaimed STP water and/or sludge could be used on selected golf courses, playing fields, and farms.	SCDHS, NYSDEC (co-leads)	2001	NYSDEC – 0.1 FTE SCDHS – 0.1 FTE \$50,000	R
<b>N-5 Implement Nonpoint Source Control Plans. (Objectives 2, 4, and 6)</b>					
N-5.1	Ensure that the Section 6217(g) management measures of CZARA are appropriately implemented, in support of the overall nitrogen management plan.	NYDOS (lead), PEP, EPA, NOAA, Nitrogen Management Work Groups	Ongoing	EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE NYSDOS – 0.1 FTE NOAA – 0.1 FTE	C/O
N-5.2 <b>Priority</b>	Investigate feasible implementation mechanisms and develop a plan to prevent increases and encourage decreases in nitrogen in groundwater underflow due to domestic fertilizer use.	PEP Management Conference, Nitrogen Management Work Groups	Strategy: 2001 Implementation: Post-CCMP	Plan Development: EPA – 0.2 FTE NYSDEC – 0.2 FTE SCDHS – 0.2 FTE Implementation: To be determined	C/N
N-5.3 <b>Priority</b>	Investigate feasible implementation mechanisms and develop a plan to prevent increases and encourage decreases in nitrogen in groundwater underflow due to on-site disposal systems (sanitary systems).	PEP Management Conference, Nitrogen Management Work Groups	Strategy: 2001 Implementation: Post-CCMP	Included in Step N-5.2	C/N

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Table 3-3. Nutrients Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-5.4 <b>Priority</b>	Develop a regional implementation plan for agricultural nitrogen load reductions which would include promoting agricultural best management practices, expanding agricultural environmental management (AEM) strategies, and promoting organic farming among other initiatives.	Nitrogen Management Work Groups, SCSWCD (co-leads), Cornell Cooperative Extension, NYSDEC	Strategy: December 2000 Implementation: Post-CCMP	EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE SCSWCD - \$175,000/yr for staff CCE - \$175,000/yr for staff \$250,000 - \$500,000 for program development \$1 million annually for implementation, start up	C/N (Strategy) R (Implementation)
N-5.5	Manage stormwater runoff on a subwatershed basis to control nitrogen inputs.	PEP Management Conference (lead), Consultant Horsley and Witten, Inc., SCDHS, SCPD, SCSWCD	Post-CCMP	SCDHS – 0.2 FTE SCPD – 0.2 FTE SCSWCD – 0.2 FTE (Contractor – Part of \$191,600 contract (Regional Stormwater Runoff Management Plan and Subwatershed Plan))	R
<b>N-6</b>	<b>Use Land Use Planning to Control Nitrogen Loading Associated with New Development. (Objectives 2, 3, and 4)</b>				
N-6.1	Continue and expand aggressive open space preservation programs that protect habitat and living resources, as well as groundwater and surface water quality (see <b>Chapter 7</b> for a description of how nitrogen stressed subwatersheds are factored into recommendations).	Local governments, Suffolk County, New York State	Ongoing	(Part of \$361 million (sum of 1/4 % sales tax, East End Land Bank, Greenway Fund, and Community Preservation Fund monies))	C/O
N-6.2	Evaluate the degree to which the <i>Brown Tide Comprehensive Assessment Management Plan</i> and <i>Peconic Estuary Program Action Plan</i> land use and zoning recommendations have been implemented.	SCDHS (lead), NYSDEC, SCPD, PEP Management Conference, local governments (to be coordinated with Nitrogen Management Work Group)	2001	Included in Actions N-1, N-2, N-3, and N-5	R

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**Table 3-3. Nutrients Management Plan Actions (continued)**

Action		Responsible Entity	Timeframe	Cost	Status
N-6.3	Encourage evaluation of design alternatives for Pine Barrens credit “receiving area” parcels, ( <i>e.g.</i> , clustering away from the river, clearing limits, turf area restrictions, xeriscaping, etc.), where feasible to minimize nitrogen loading (Subject to and recognizing the overarching provisions of the Pine Barrens Land Use Plan and New York State Environmental Conservation Law [ECL] Article 57).	SCDHS, NYSDEC, SCPD, PEP Management Conference, local governments (to be coordinated with Nitrogen Management Work Group)	Ongoing	Included in Actions N-1, N-2, N-3, and N-5	C/O
N-6.4	Review the Pine Barrens Land Use Plan “guidelines” (non-binding) for development in the Compatible Growth Area and develop proposals for additional “standards” (binding) for development based on Peconic River water quality protection goals.	SCDHS, NYSDEC, SCPD, PEP Management Conference, local governments (to be coordinated with Nitrogen Management Work Group)	Post-CCMP	EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE SCPD – 0.1 FTE	R
N-6.5	Evaluate nitrogen loading impacts when reviewing Core Preservation Area hardship applications.	SCDHS, NYSDEC, SCPD, PEP Management Conference, local governments (to be coordinated with Nitrogen Management Work Group)	Ongoing	Included in Actions N-1 and N-2	C/O

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Table 3-3. Nutrients Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-6.6	Ensure that the public acquisition of private, vacant lands in Core Preservation Areas within the Peconic River ground watershed are given high priority.	SCDHS, NYSDEC, SCPD, local governments (co-leads), PEP Management Conference (to be coordinated with Nitrogen Management Work Group)	Ongoing	Included in Actions N-1 and N-2, and Step N-6.1	R
N-6.7	Utilize the strictest practicable standards when reviewing Peconic River Development Plans ( <i>e.g.</i> , require open space dedications, maximum practicable setbacks from the river, and natural landscaping to eliminate or minimize fertilizer use).	SCDHS, NYSDEC, SCPD, local governments (co-leads), PEP Management Conference (to be coordinated with Nitrogen Management Work Group)	Ongoing	Included in Actions N-1, N-2, and N-3	R
N-6.8	Evaluate the application of model ordinances such as the Harbor Protection Overlay District and model stormwater runoff ordinances.	PEP Management Conference, Local Government Committee	Post-CCMP	LGC – 0.1 FTE for each town	R
<b>N-7</b>	<b>Ensure that Funding is Distributed Evenly Between Preservation and Mitigation Projects. (Objectives 2, 3, and 4)</b>				
N-7.1 <b>Priority</b>	Evaluate programs in which a 50/50 split for funding of preservation and mitigation efforts can be applied ( <i>e.g.</i> , Section 319 Nonpoint Source Implementation; NYS Clean Water/Clean Air Bond Act) and determine mechanisms for its implementation.	PEP Management Conference	Post-CCMP	Base Program	C/N

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Table 3-3. Nutrients Management Plan Actions. (continued)

	Action	Responsible Entity	Timeframe	Cost	Status
<b>N-8</b>	<b>Integrate PEP Recommendations into Other Programs. (Objectives 1, 2, 3, 4, and 5)</b>				
<b>N-8.1 Priority</b>	Integrate PEP recommendations into existing land use and regulatory programs, including the SEQRA regulations (6NYCRR Part 617), Article 8 of the Environmental Conservation Law, Suffolk County Water Quality Coordinating Committee, Suffolk County Planning Commission reviews, the Southold Ground Watershed Protection and Water Supply Management Strategy, the Wild, Scenic and Recreational Rivers statute and regulations (6NYCRR Part 666), the Freshwater Wetlands regulations (6 NYCRR Part 663), the Tidal Wetlands Land Use regulations (6 NYCRR Part 661), and the Protection of Waters regulations (6 NYCRR Part 608).	PEP Management Conference (lead), Nitrogen Management Work Groups, Suffolk County Planning Commission, NYSDEC	Post-CCMP	No new FTEs	R
<b>N-9</b>	<b>Sponsor and Coordinate Research and Information Gathering. (Objectives 2, 3, 4, and 5)</b>				
N-9.1	Continue to sponsor and coordinate research efforts addressing nutrient-related issues.	PEP Technical Advisory Committee (TAC) (lead)	Ongoing	EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE	C/N
N-9.2	Establish a PEP land cover initiative to assist in nutrient loading analyses.	PEP Management Conference through contractor (lead), NYSDOS	Begun Fall 1999	(\$75,000 initial effort)	C/O
<b>N-9.3 Priority</b>	Update the land use database on a regular basis and prepare a proposal outlining the objectives and needs for a long-term monitoring program.	SCPD (lead), PEP Management Conference	2002	SCPD – 0.2 FTE/yr	R
N-9.4	Continue to integrate atmospheric deposition data into PEP modeling and management activities. Assess how reductions in atmospheric sources through the Clean Air Act will affect nitrogen loadings in the Peconic System.	PEP (lead), EPA	Ongoing	EPA – 0.1 FTE	C/O

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Table 3-3. Nutrients Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-9.5	Continue to incorporate groundwater information in PEP characterization, modeling, and management activities. This includes ongoing groundwater monitoring programs, as well as improvements to modeling.	PEP Management Conference (lead)	Ongoing	SCDHS – 0.1 FTE	C/O
N-9.6	Continue to incorporate PEP TAC and external peer review in the modeling development and application process, which includes dependent analyses of water quality and pollution input studies. As the model process is completed, continue to solicit and use TAC and external peer review in developing programs and interpreting and applying data.	Model Evaluation Group, PEP TAC (co-leads)	Ongoing	Included in Actions N-1 and N-3	C/O
<b>N-10</b>	<b>Monitor Conditions Within the Estuary System to Determine the Effectiveness of Management Strategies. (Objectives 2, 3, 4, and 5)</b>				
N-10.1	Continue monitoring the effectiveness of remedial actions at the Corwin Duck Farm.	USDA-NRCS, SCSWCD (co-leads), Nitrogen Management Work Groups	Ongoing	USDA-NRCS – 0.05 FTE SCSWCD – 0.05 FTE	C/O
N-10.2	Develop and conduct a long-term surface water monitoring program, with input from the PEP TAC.	SCDHS (lead), PEP	Post-CCMP	See Environmental Monitoring Plan	C/O
N-10.3	Issue a biannual update to the SCDHS surface water quality report.	SCDHS (lead)	Post-CCMP	SCDHS – 0.1 FTE/ year	R
N-10.4	Continue monitoring groundwater impacts of various land uses, such as residences, farms, and golf courses.	SCDHS (lead)	Ongoing	SCDHS – 0.2 FTE	C/O



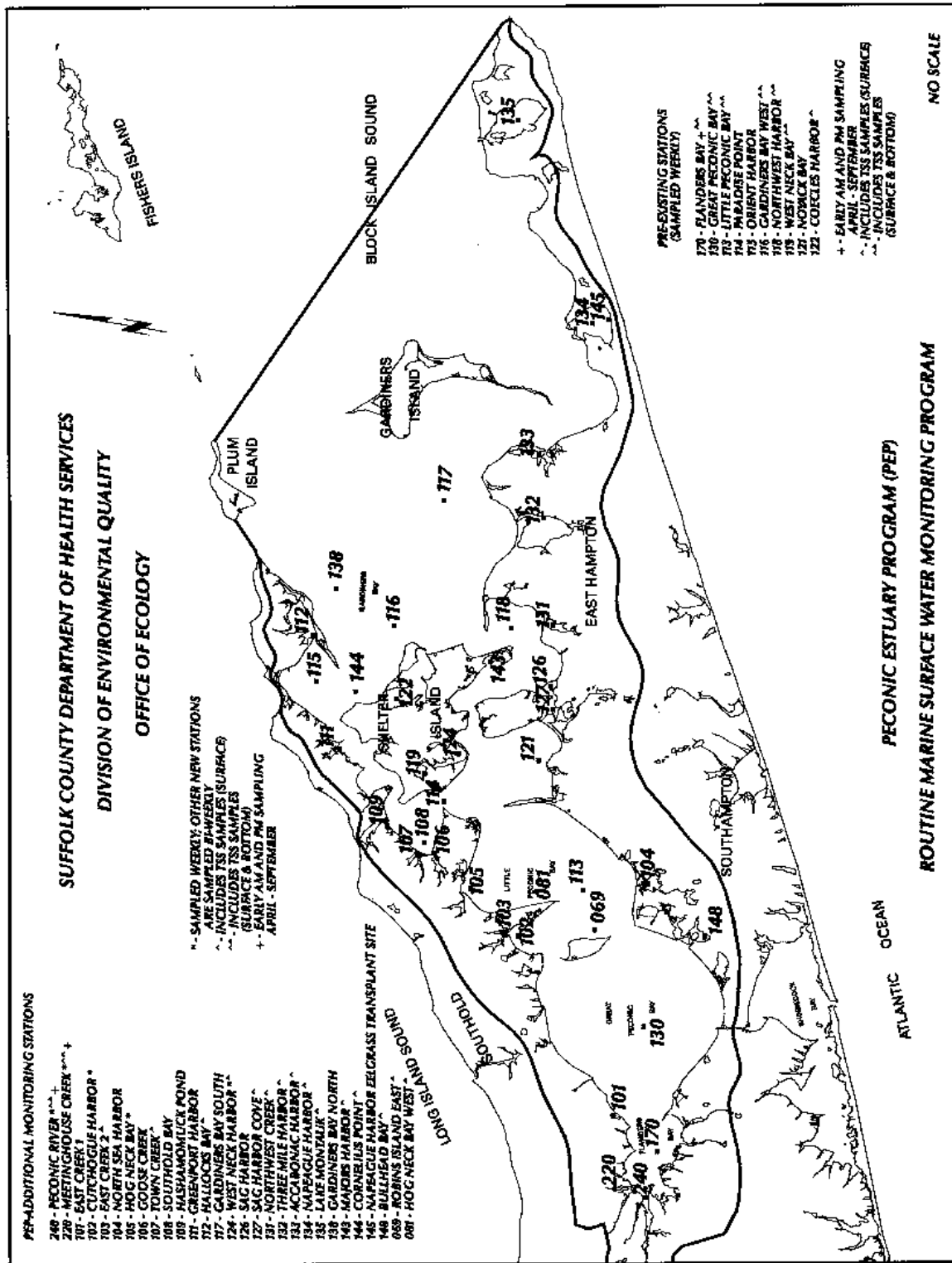


Figure 3-1. Location of Eelgrass Beds & Routine Marine Surface Water Monitoring Stations.

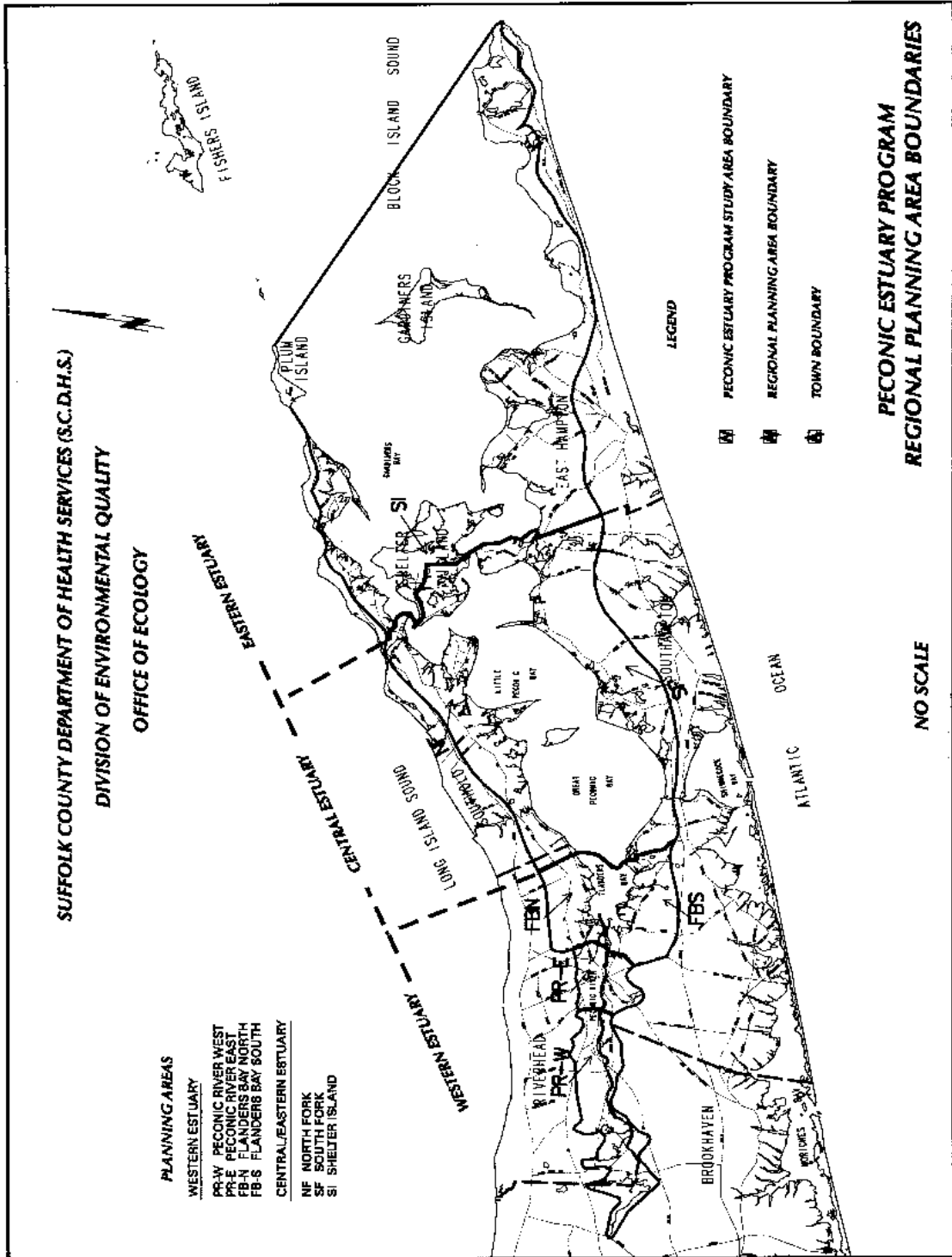


Figure 3-2. Regional Planning Area Boundaries.

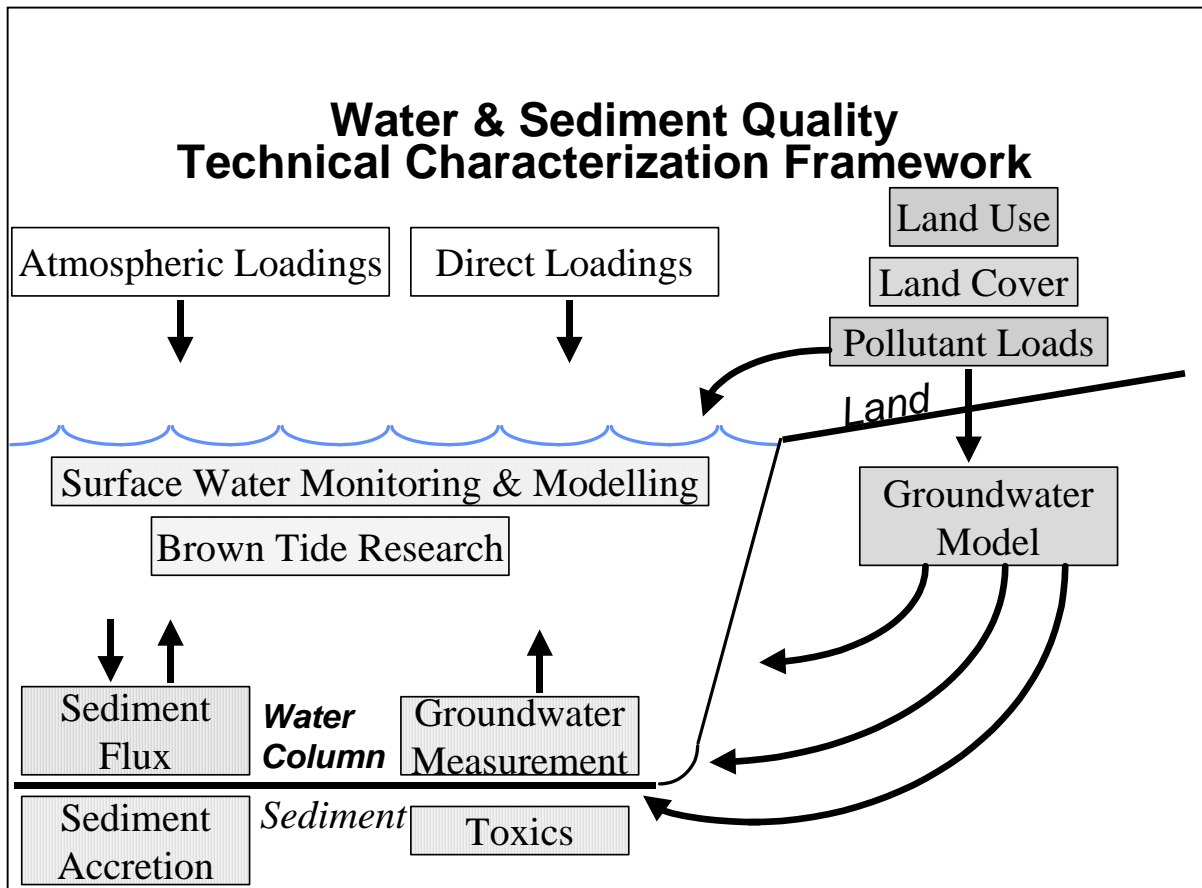


Figure 3-3. Water and Sediment Quality Technical Characterization Framework.

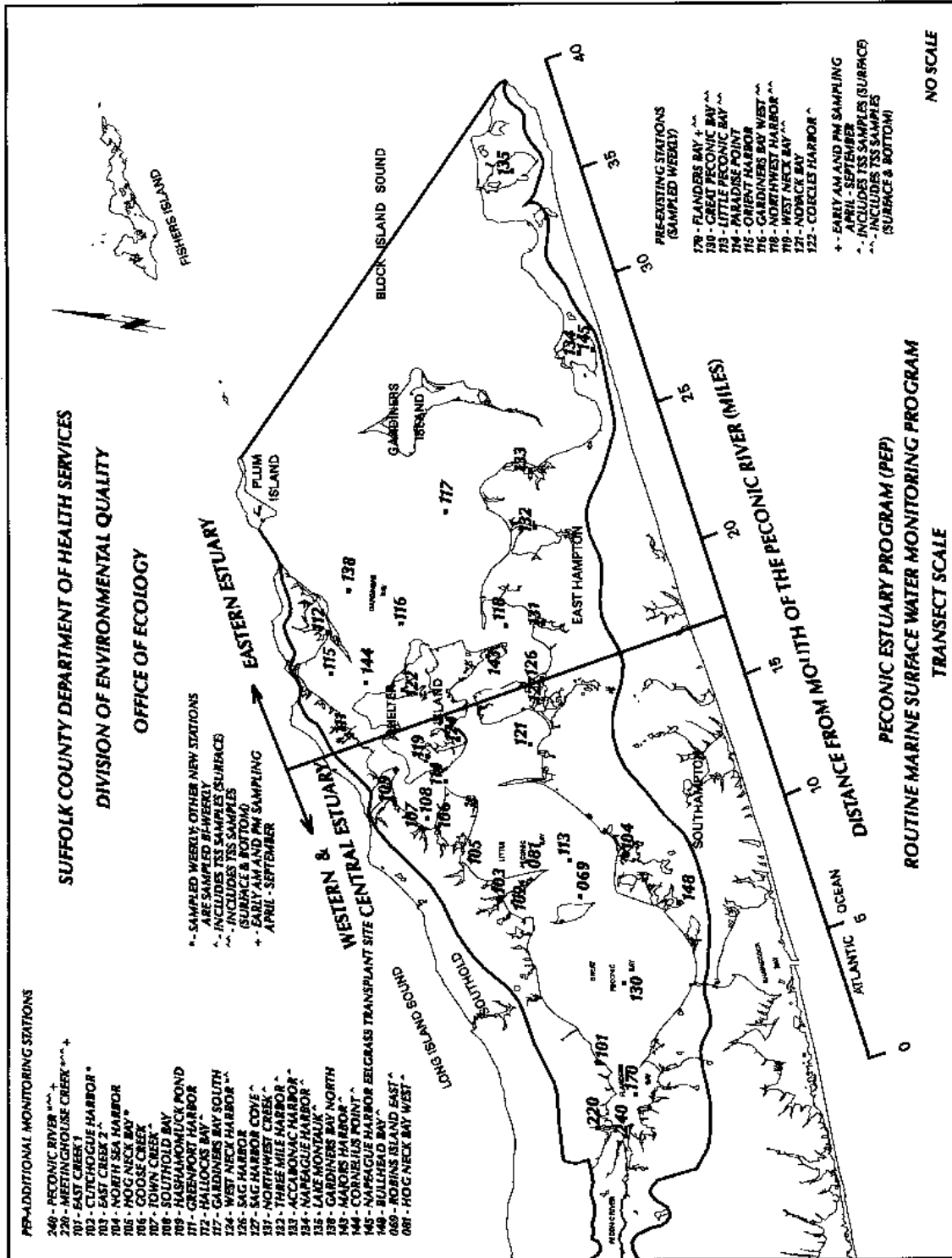


Figure 3-4. Routine Marine Surface Water Monitoring Program.

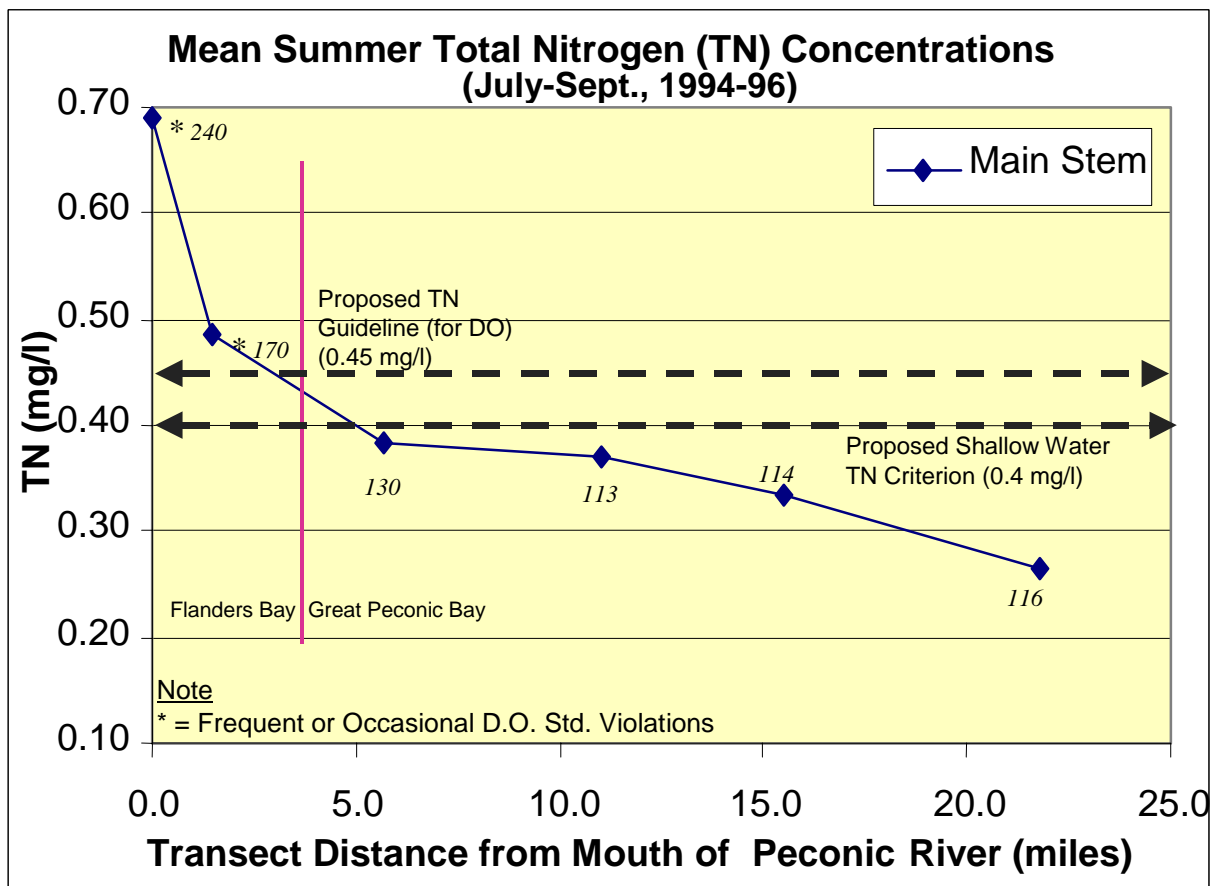


Figure 3-5. Mean Summer Total Nitrogen Concentrations.

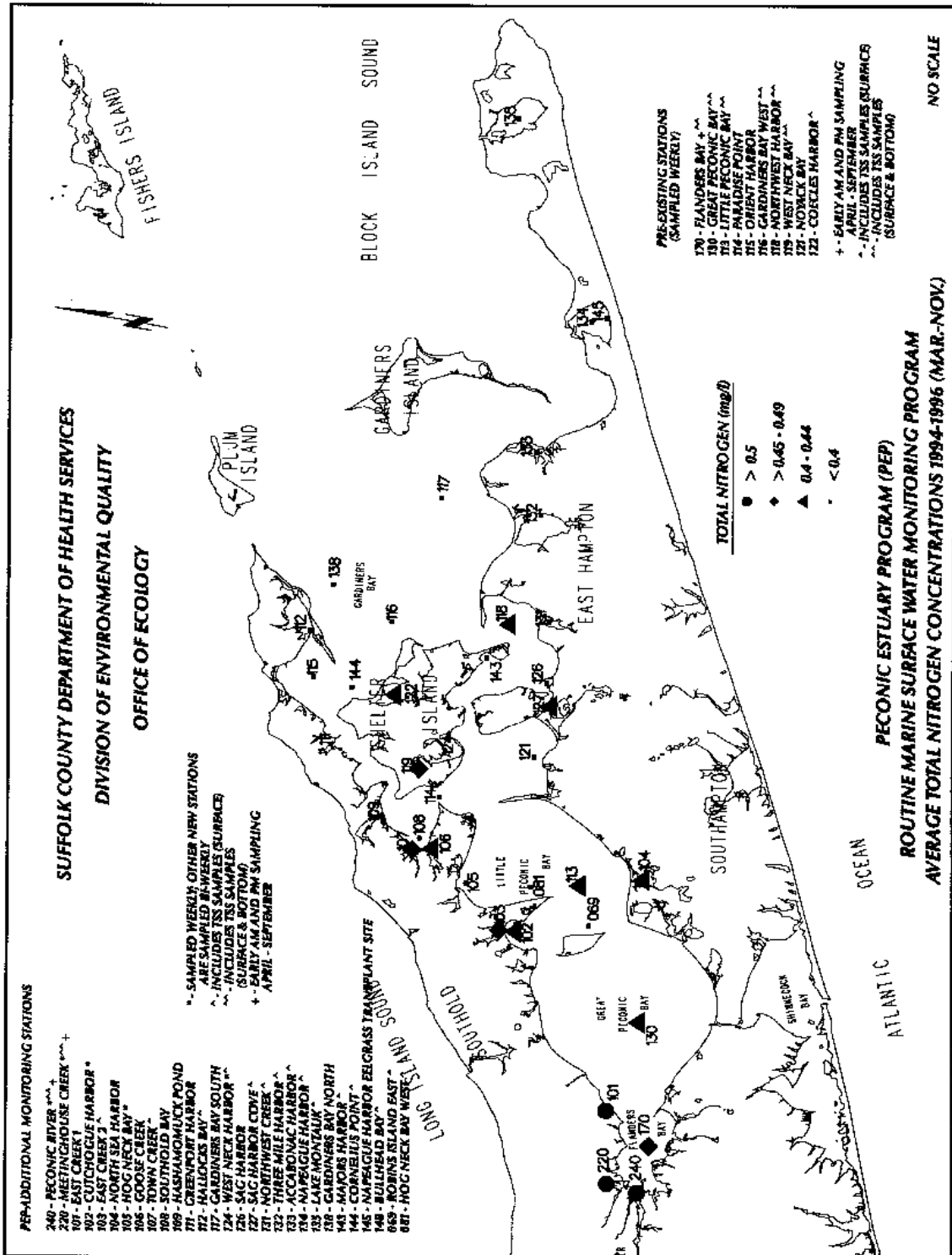


Figure 3-6. Average Summer Light Extinction Coefficients.

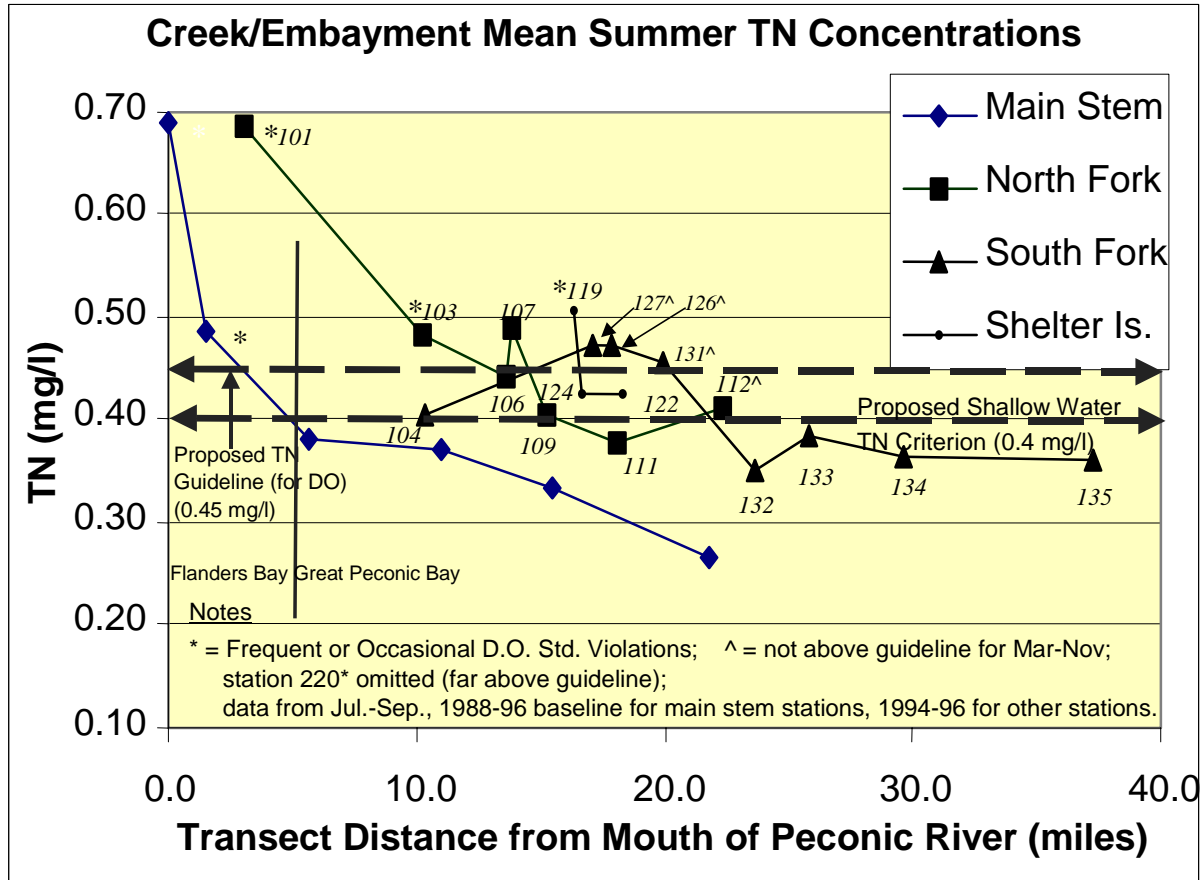


Figure 3-7. Creek Embayment Mean Summer Total Nitrogen Concentrations.





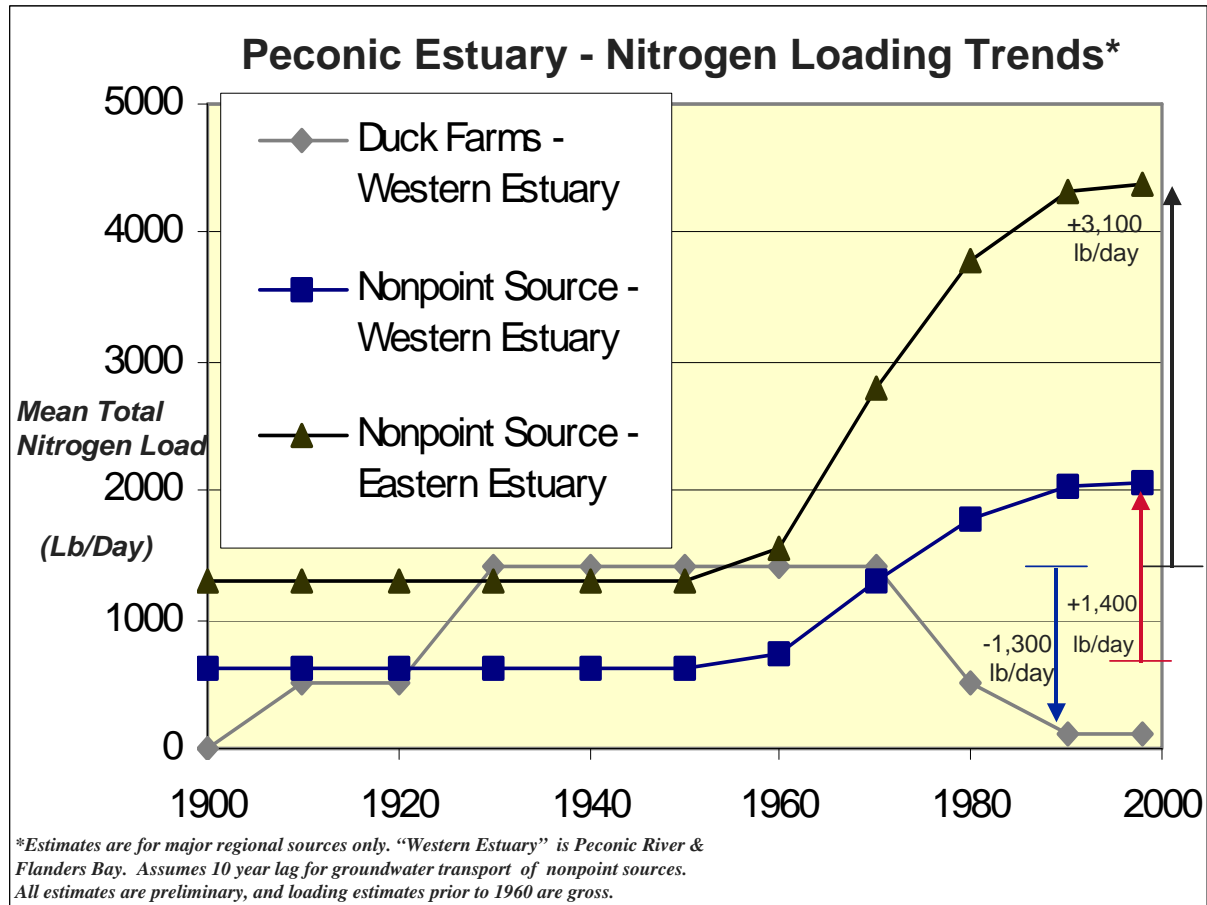
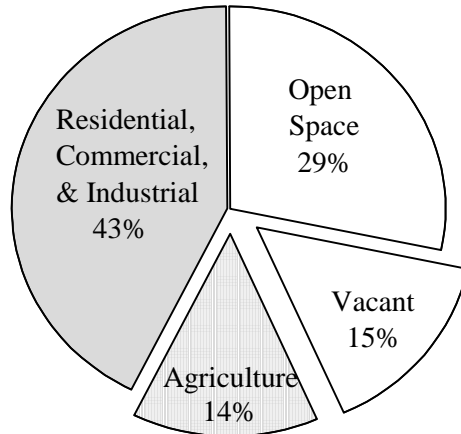


Figure 3-9. Nitrogen Loading Trends.



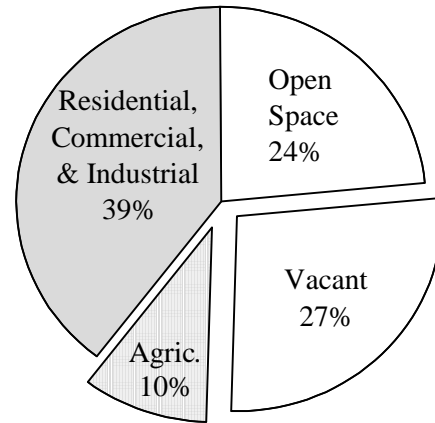
# Land Uses in Peconic Estuary Study Area (1995)

## Western Area



**41,200 Acres**

## Eastern Area



**87,100 Acres**

**40% Of Study Area Acreage is Subject to Development**

Figure 3-10. Land Uses in Peconic Estuary Study Area (1995).

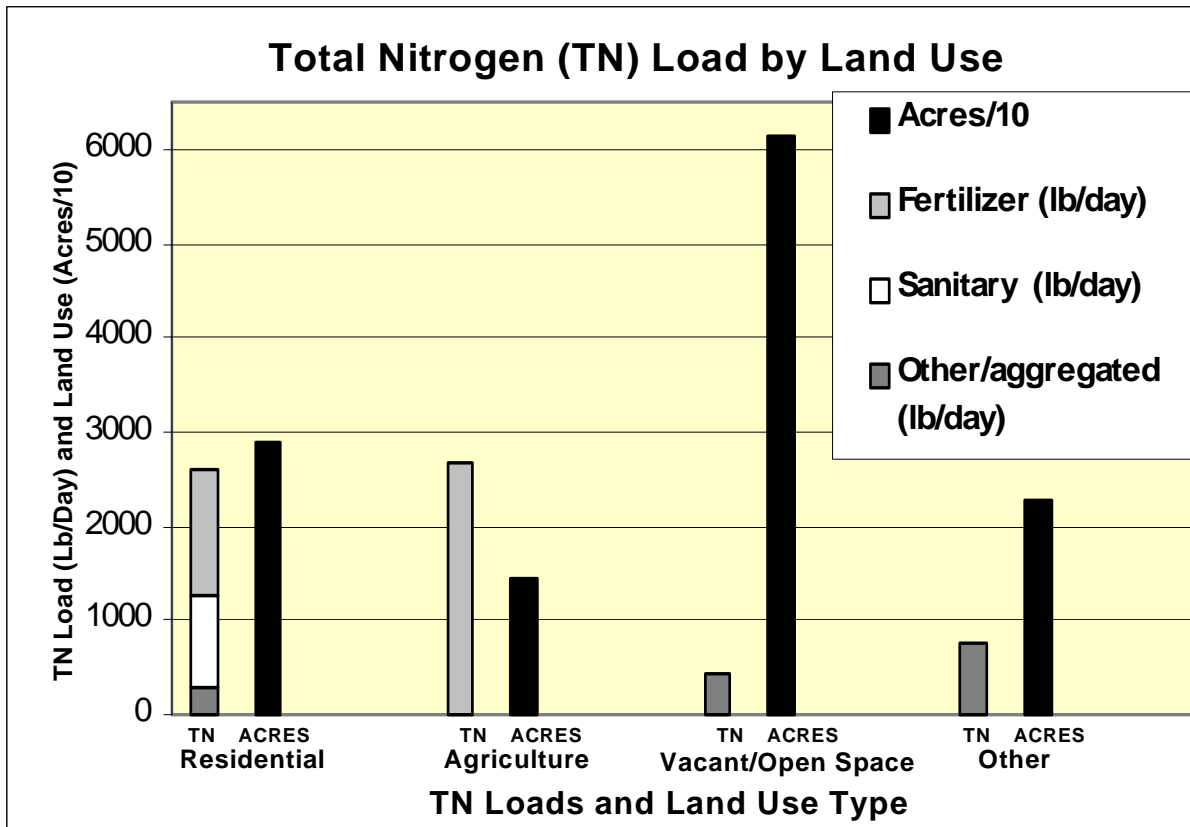


Figure 3-11. Total Nitrogen Load by Land Use.

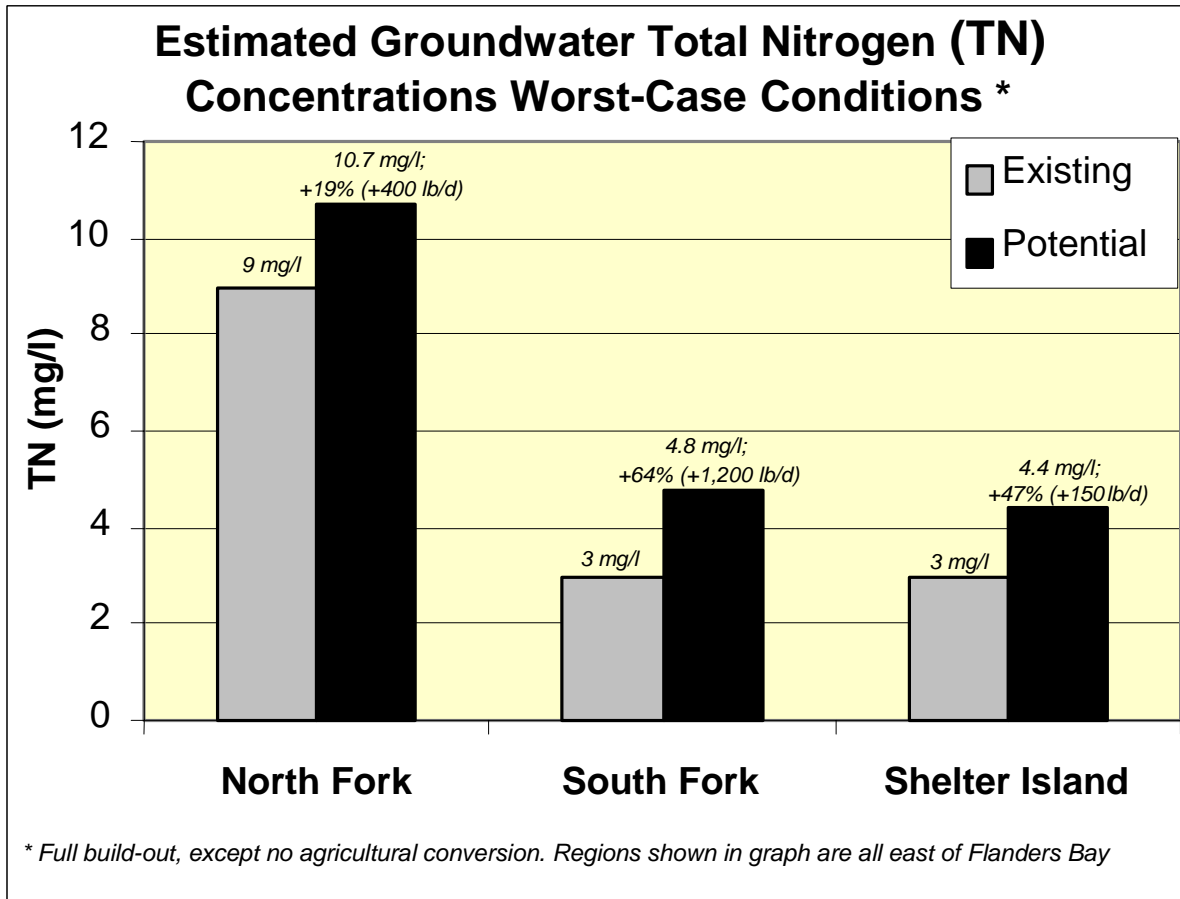


Figure 3-12. Estimated Groundwater Total Nitrogen Concentrations Worst-Case Conditions.

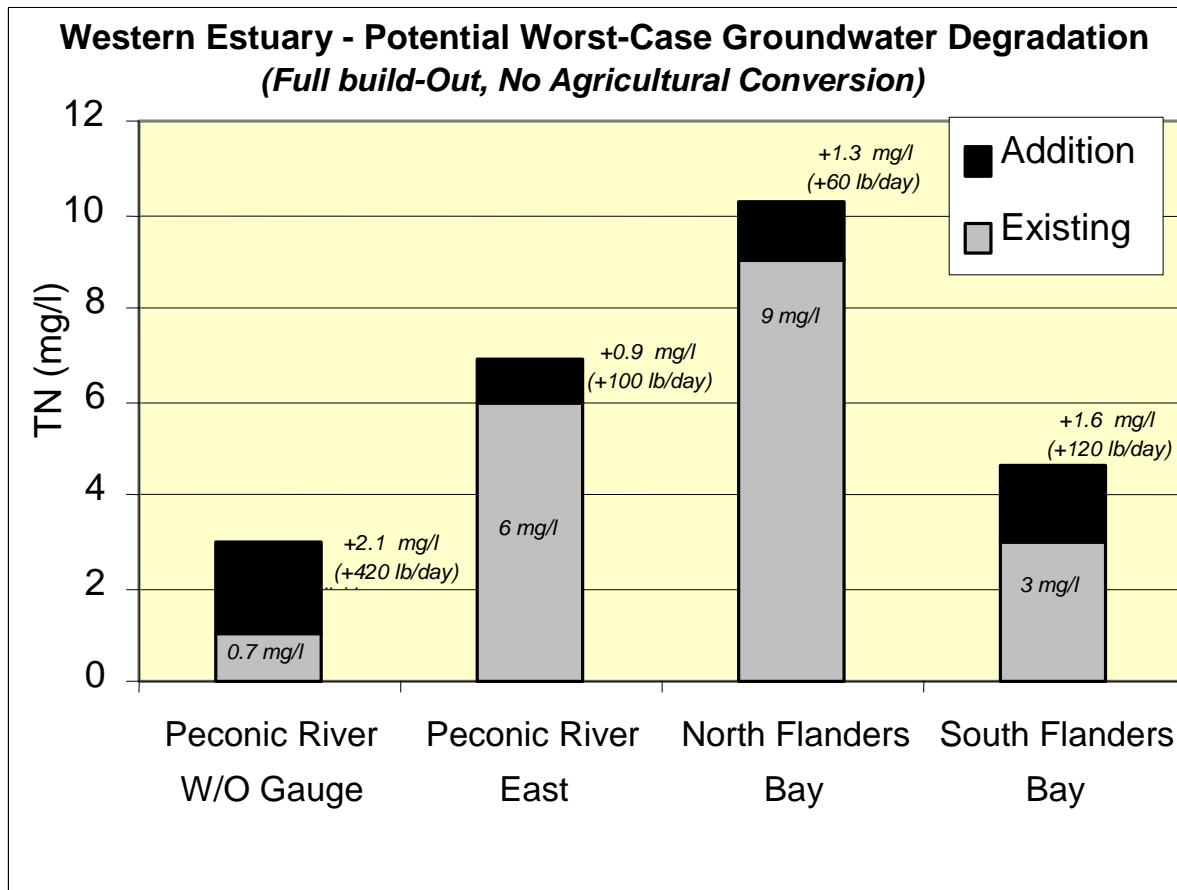
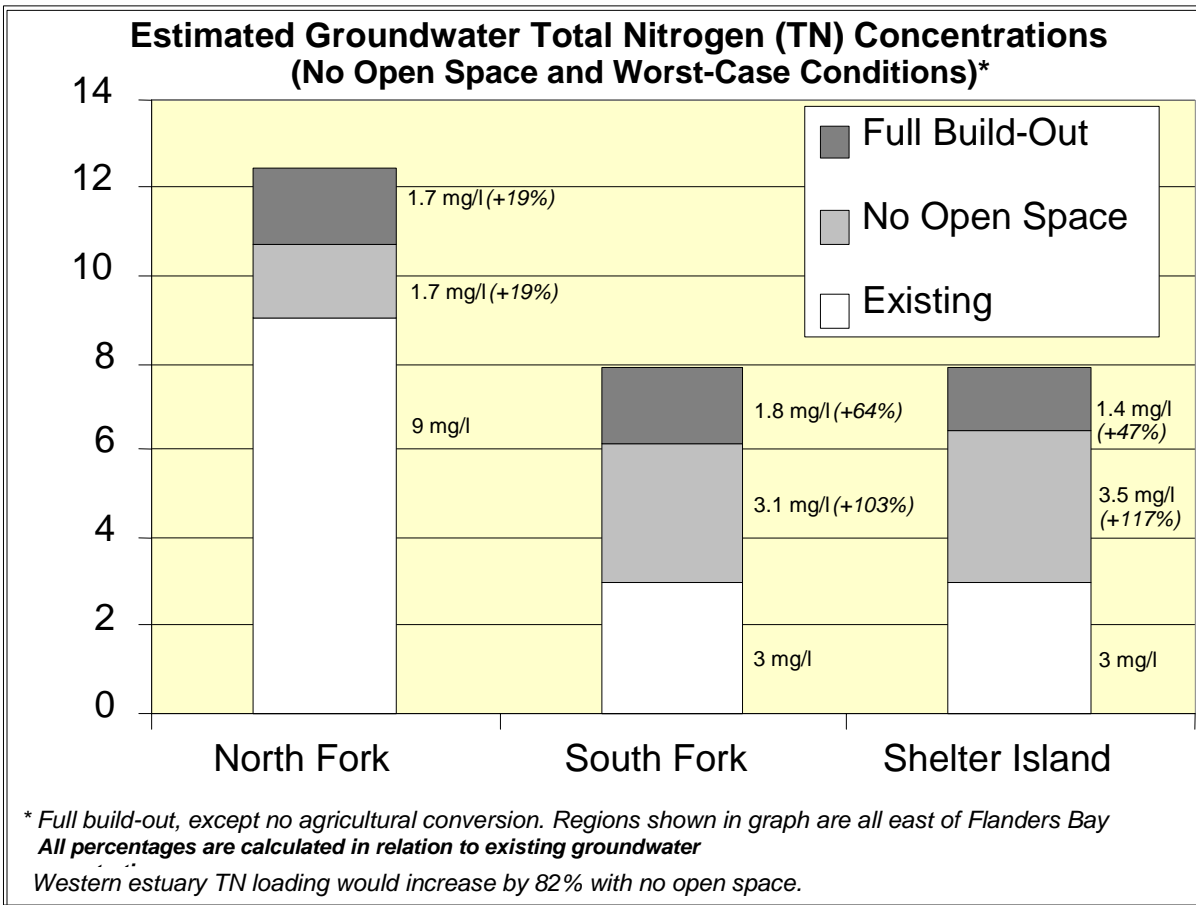


Figure 3-13. Western Estuary - Potential Worst-Case Groundwater Degradation.



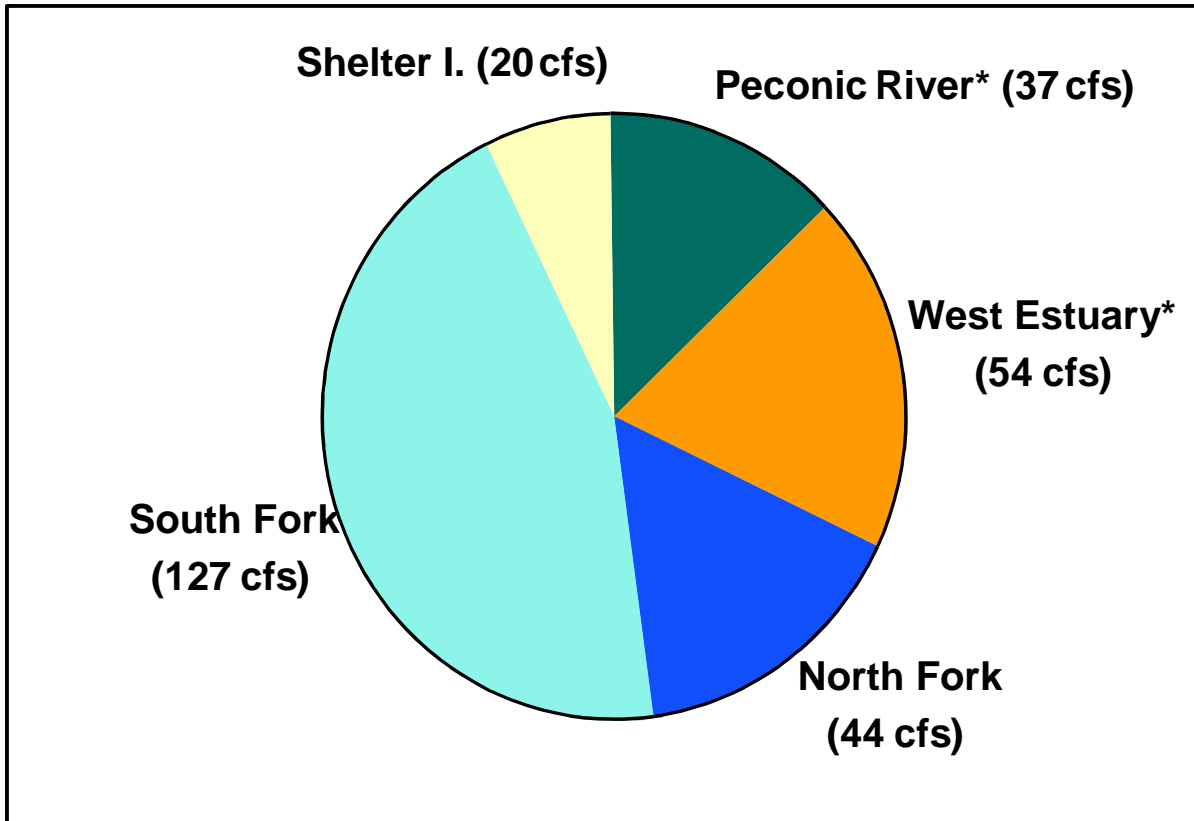
**Figure 3-14. Estimated Groundwater Total Nitrogen Concentrations No Open Space and Worst-Case Conditions.**







## Groundwater Inflow Budget



\* Peconic River long-term mean flow as measured at USGS gauge.

\*\* West Estuary is downstream of USGS gauge, and includes Flanders Bay & western Great Peconic Bay.

cfs = cubic feet per second

**Figure 3-16. Groundwater Inflow Budget.**

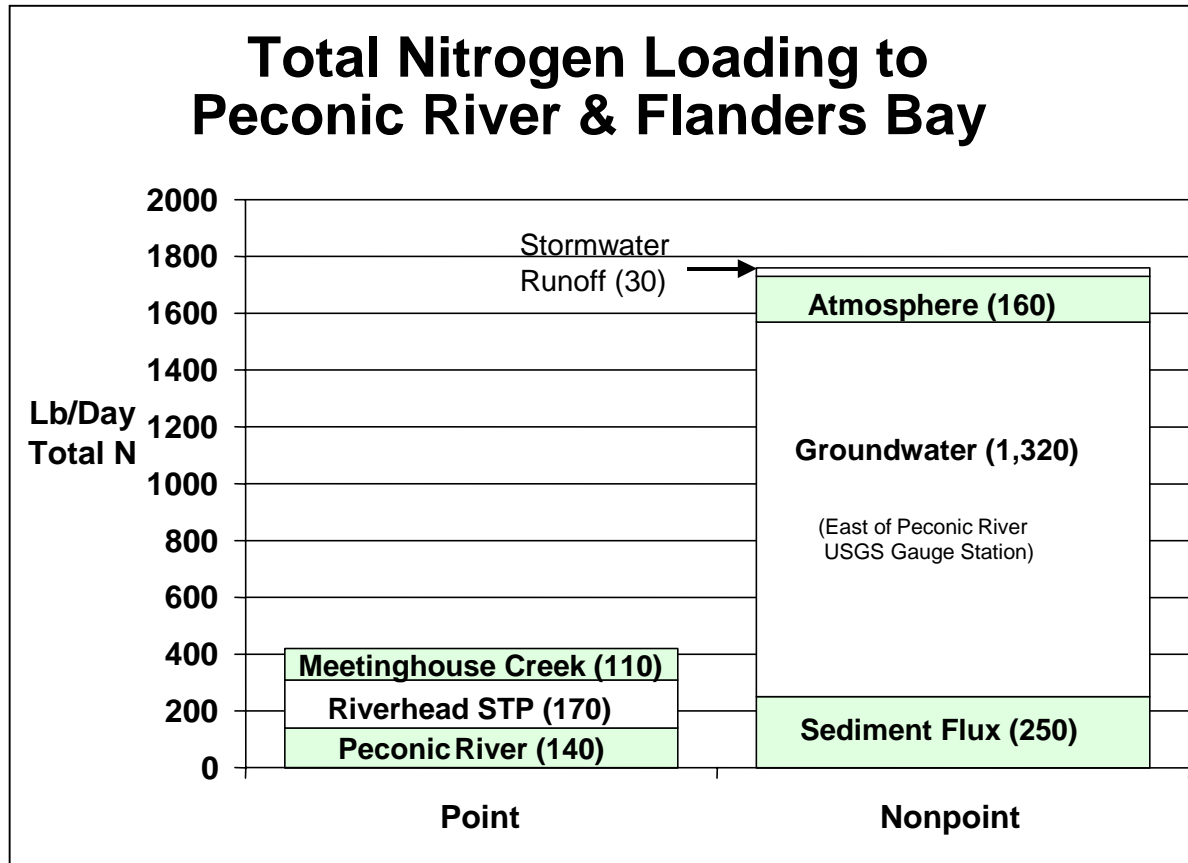


Figure 3-17. Total Nitrogen Loading to Peconic River and Flanders Bay.

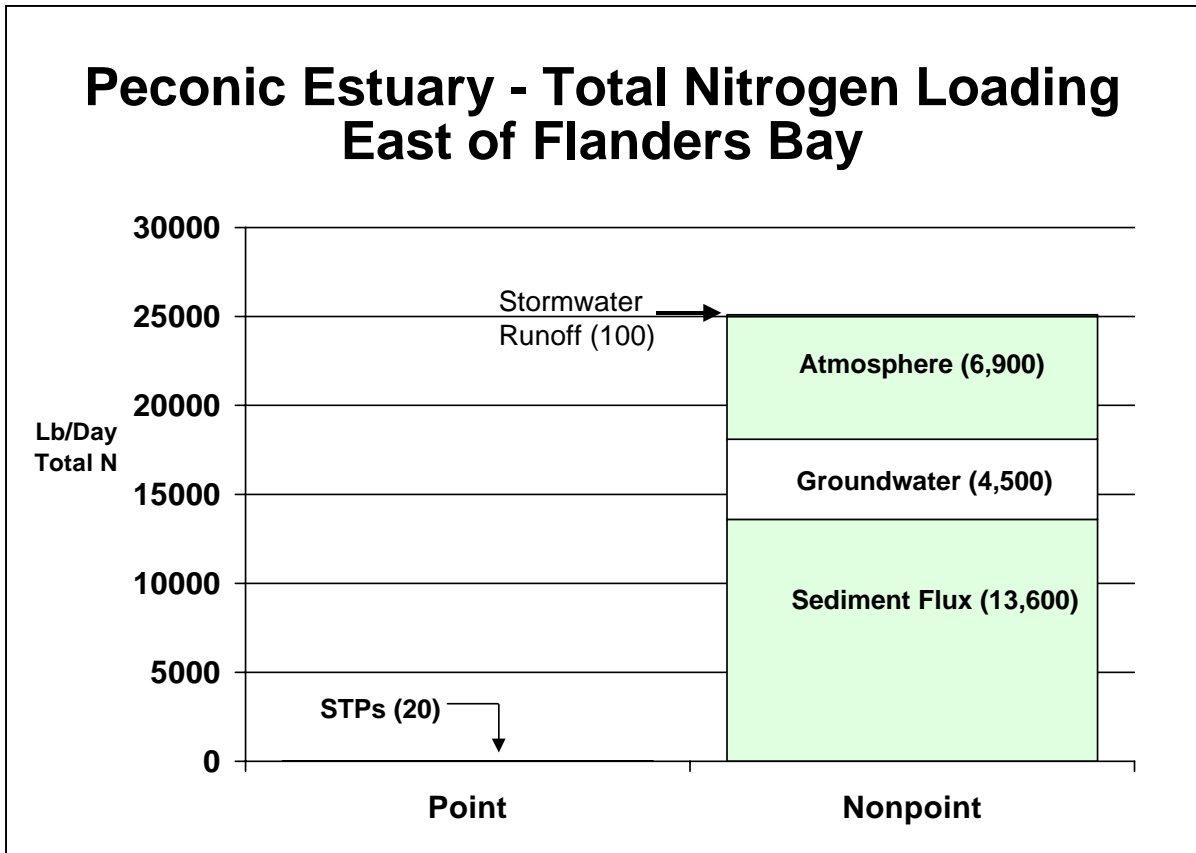
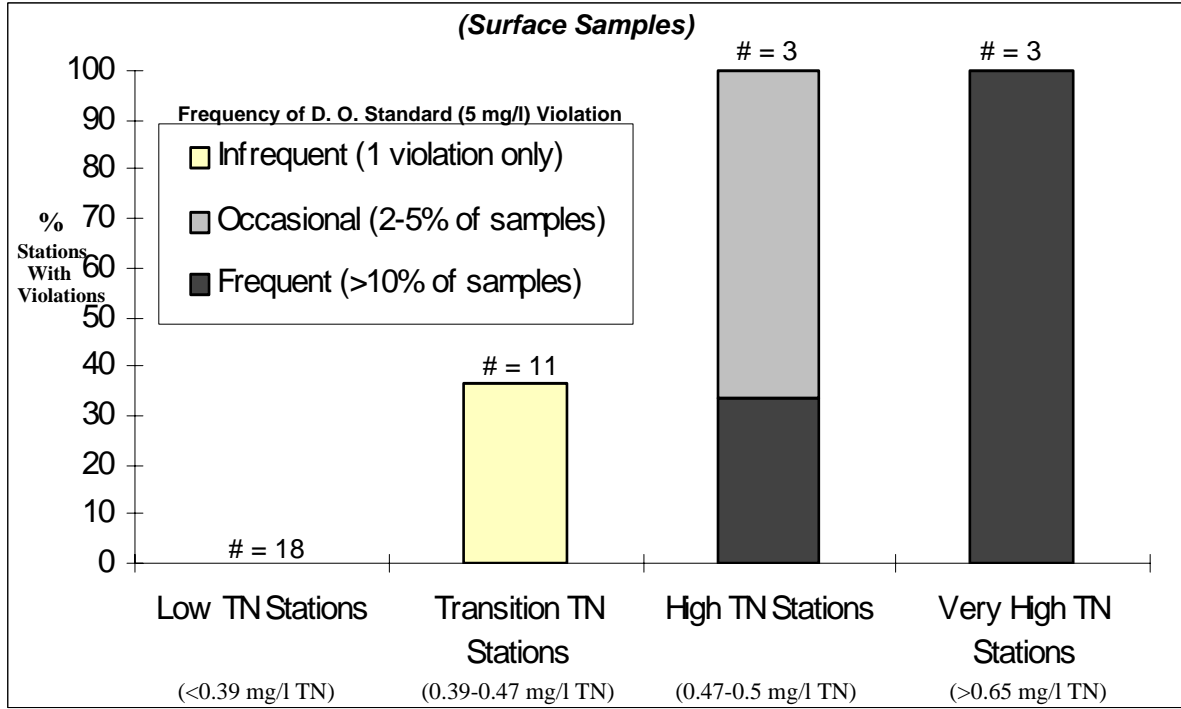


Figure 3-18. Total Nitrogen Loading East of Flanders Bay.



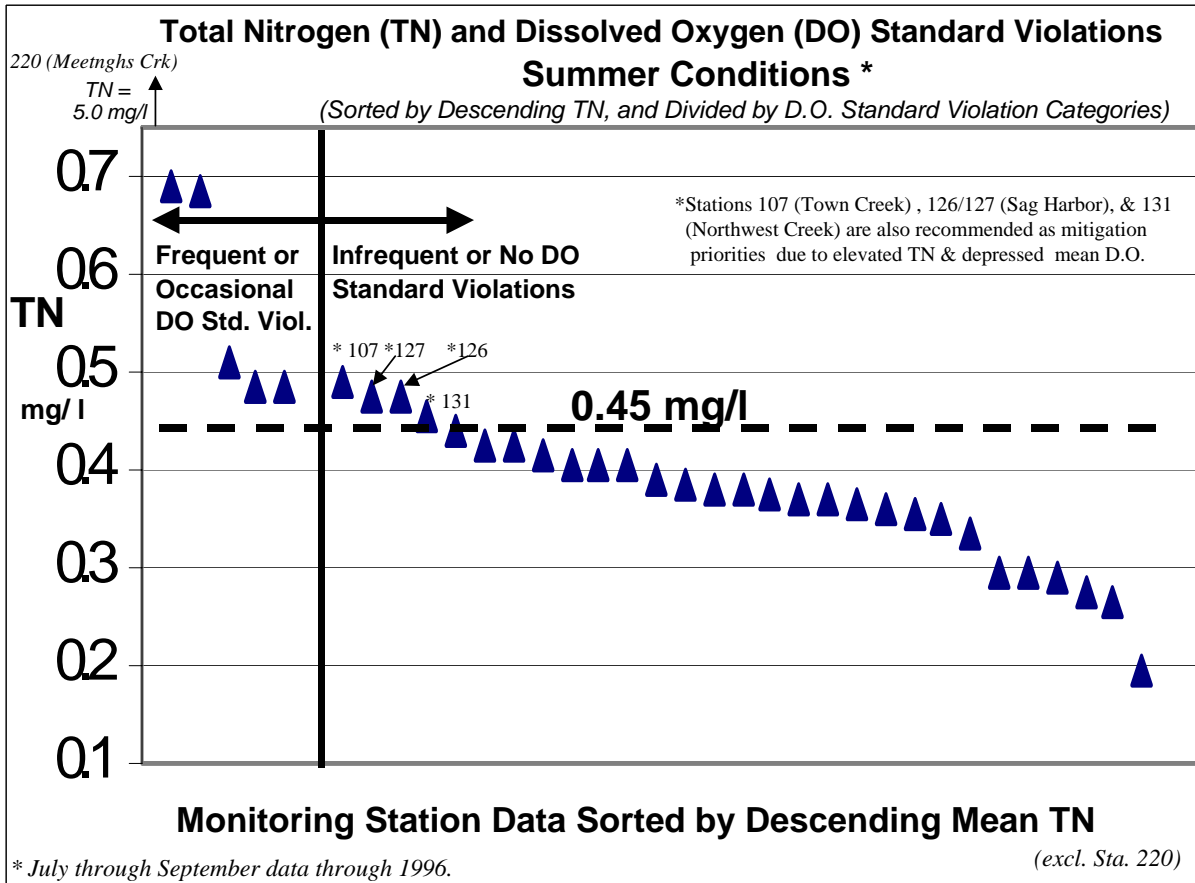
**Peconic Estuary Surface Water Monitoring Program  
Percentage of Stations with Dissolved Oxygen (D.O.) Standard Violations vs TN Ranges**



**Station Groups by Average Total Nitrogen (TN) Ranges**

(#=number of stations in each TN range; TN data averaged for 1994-96)

**Figure 3-19. Surface Water Monitoring Program Percentage of Stations with Dissolved Oxygen (DO) Standard Violations vs. Total Nitrogen (TN) Ranges.**



**Figure 3-20. Total Nitrogen (TN) and Dissolved Oxygen (DO) Standard Violations Summer Conditions.**





**Peconic Estuary Program  
NITROGEN MANAGEMENT WORK GROUPS**

**General Process and Charges**

- Timing 2000-2001 (initial meetings): 2001 (strategy)
- Leads: Office of the Suffolk County Executive (Agricultural Work Group); EPA (Non-Agricultural Work Group); SCDHS (West Estuary TMDL Work Group)
- Start-up: Review PEP background & nitrogen management process  
Establish committee membership list, charges, and goals/timelines
- Process/Charges:
  - Use existing PEP guidance/data (land use, water quality, pollution loading, model results, etc.)
  - Evaluate existing programs, as needed (land use and pollution control)
  - Develop strategy (including timeline, responsibilities, and cost evaluation) for setting and attaining loading targets and implementing load controls (considering alternatives, cost & benefits)
  - Coordinate management and monitoring with other efforts (e.g., critical natural resource areas)

(1) Agricultural Work Group (Leads: Office of Suffolk County Executive and PEP Citizens' Advisory Committee representative)

*Core Membership:*

- Cornell Coop. Ext., SCSWCD/NRCS, CCE, L.I. Farm Bureau, NYS Dept. of Ag. & Markets
- NYSSWCC
- NYSDEC, EPA, SC, Town Reps
- Also: Other interested MC, TAC, & CAC reps

*Specific Goals:*

- Refine agricultural total nitrogen (TN) loading estimates
- Develop implementation plan for regional TN load reductions, and possibly other pollutants
  - Expand Agricultural Environmental Management Initiative
  - Consider "Purchase of Development Rights" link to farm management plans

(2) Non-Agricultural (mainly residential) Work Group (Leads: EPA and Local Government Committee designee)

*Core Membership:*

- EPA, NYSDEC, SC, Town Reps
- Also: Other interested MC, TAC, & CAC reps

*Specific Goals:*

- Develop implementation plan strategy for:
  - existing TN loading (*primarily residential BMP-type abatement*)
  - potential new development TN loading (*primarily residential land use planning*)
  - possibly other pollutants (toxics, coliforms, etc.)
- May include recommendations on land use and pollution control, including model programs, zoning, clearing restrictions, clustering, fertilizer controls, etc.

(3) West Estuary Total Maximum Daily Load (TMDL) Work Group (SCDHS lead)

*Core Membership:*

- SC, NYSDEC, EPA, Brookhaven, Riverhead, and Southampton Towns
- Other interested MC, TAC, & CAC reps

*Specific Goals:*

- Refine TN loading estimates in westernmost Peconic Estuary
- Develop strategy for setting and implementing regional TN load reductions
  - Provide support for including dissolved oxygen-impaired waters on the New York State 2002 Clean Water Act Section 303(d) list and the establishment of a TMDL as a management tool; consider Peconic River (freshwater) model
  - Additional industrial/commercial land use/pollution control planning is required

**Figure 3-22. Proposed Nitrogen Management Work Groups.**



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