



CITIZENS' GUIDE TO ESTUARINE PROTECTION:

NITROGEN MANAGEMENT FOR THE RIVER COMPLEX WATERSHEDS
2004

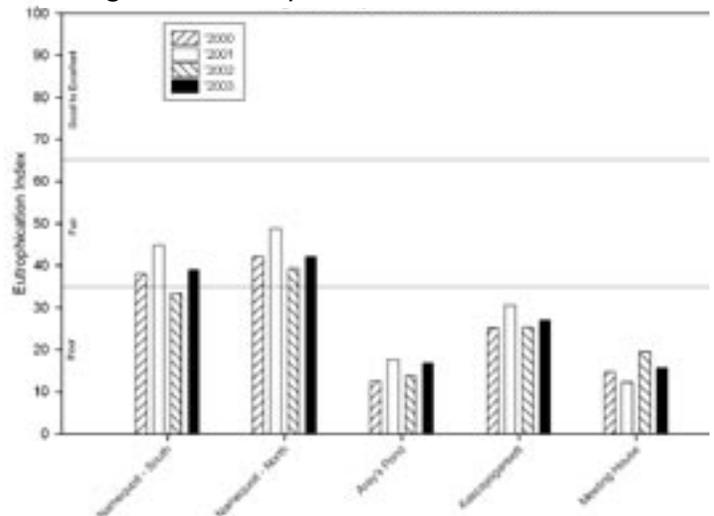
The River, Meetinghouse Pond, Kescayogansett (Lonnie's) Pond, Arey's Pond and Pochet Creek are all special places enjoyed for boating, shellfishing, swimming, nature viewing and much more. For many years, residents and visitors enjoyed these waters without concern about how changes in water quality might affect shellfishing, swimming, or the variety of wildlife and vegetation. More recently, greater focus has been placed on the fact that nitrogen—a byproduct of septic systems, fertilizers, road runoff and rainfall—threatens the many values we enjoy in these waters. Water quality monitoring conducted by the Pleasant Bay Alliance and by the Town of Orleans is detecting excess amounts of nitrogen in many areas throughout the system.

The effect of nitrogen on water quality can be shown using a Eutrophication Index. Eutrophication—caused by the oversupply of nutrients to a water body—causes marine water to become very clouded or murky, resulting in the loss of oxygen in the water. While not a direct threat to human health, eutrophication can cause aquatic plants and animals to die, and degrade the overall quality of the ecosystem.

The Eutrophication Index incorporates the mean of the five parameters: oxygen saturation, water transparency (measured by Secchi depth), phytoplankton pigments, dissolved inorganic nitrogen, and total organic nitrogen. Once calculated, the index is related to a scale to determine water quality.

<i>Water Quality Based on Eutrophication Index</i>	
Water Quality Condition	Eutrophication Index
Good to Excellent	65-100
Fair	35-65
Eutrophic	<35

Figure 1. Eutrophication indices 2000-2003



Why is this happening?

A 1998 study by the Cape Cod Commission indicated that nitrogen coming from the increasing number of houses and residents within the watershed is overwhelming the capacity of the tides to flush the nitrogen out efficiently. As shown above, water quality data generated by the Pleasant Bay Citizen Water Quality Monitoring Program have confirmed these findings. The flow of nitrogen from septic systems could be greater still if the full development potential of the area is achieved. An analysis of development potential within the watersheds of Pleasant Bay shows that more than 300 new residences could be built in the watersheds of the River Complex and Pochet Creek, an increase of 28%.

These water quality concerns are troubling for watershed residents, but they also threaten a resource that has been granted special state and local designations as an environmentally sensitive area. The River Complex encompasses several water bodies that are part of the Pleasant Bay system: Kescayogansett (Lonnie's) Pond, Arey's Pond, Meetinghouse Pond, Pochet Creek and The River. The Bay, one of the most biologically diverse and productive marine habitats on the East Coast, is designated as an Area of Critical Environmental Concern (ACEC). Because it is an ACEC, the Bay is classified by the state as *Outstanding Resource Water*. To maintain this designation the waters must continue to be:

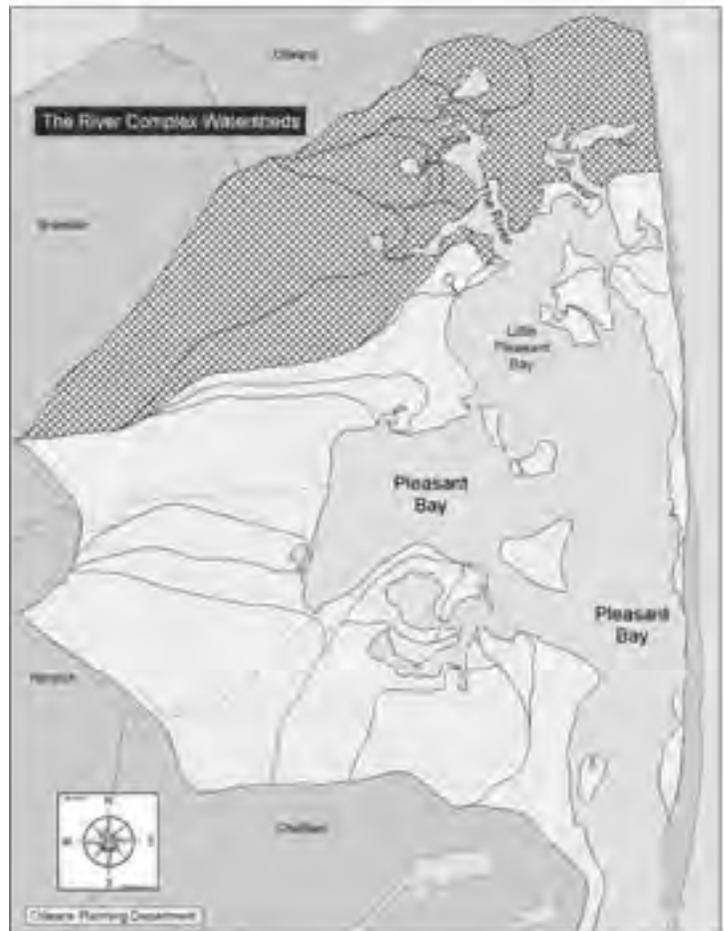
- Suitable for shellfishing without depuration,
- Excellent habitat for fish and other aquatic life, and
- Of excellent aesthetic value.

The increase of nitrogen in the River Complex and Pochet Creek is of concern because of impacts to resources in these waters and also because of potential negative impacts on water quality and marine life throughout the Pleasant Bay system.

Features of the River Complex Watersheds

Land Acres in Watershed	6,588
Number of Residential Properties	1,557
Number of Bedrooms	4,671
Number of Developed Commercial Properties	39
Acres of Paved Road	159
Acres of Developable Land	392
Acres of Dedicated Open Space	1,795

Source: Orleans GIS, 2003; Brewster GIC 1996 Cape Cod Commission



Summary of Development Potential in The River Complex Watersheds

The River Complex Watersheds	Existing Lots	Potential New Lots	Total	Increase over Existing Lots
Kescayogansett (Lonnie's) Pond 1	11	5	16	45 %
Kescayogansett (Lonnie's) Pond 2	94	35	129	37 %
Meetinghouse Pond	269	23	292	9 %
Mid Meetinghouse Pond	113	13	126	12 %
Arey's Pond	228	121	349	53%
Upper Pochet Neck	427	89	516	20 %
Pochet Neck	10	6	16	60 %
The River	139	68	207	49 %
Total	1,291	360	1,651	28 %

Source: Pleasant Bay Resource Management Alliance Build-out Analysis, 2002

How does Nitrogen affect an estuary?

Pleasant Bay is an estuary, a place where coastal waters and fresh waters meet. Estuaries are among the most productive ecosystems on earth. The beaches, marshes, and expansive eelgrass beds found in the Pleasant Bay estuary provide spawning, nursery and feeding areas to countless species of shellfish, finfish, and birds. Crabs, worms and other invertebrates inhabiting these areas provide vital food sources for other species.

Estuaries are extremely sensitive to the effects of nitrogen. It is not the nutrients themselves that cause problems, but the increased plant growth they cause. Certain algae—opportunistic seaweed and phytoplankton—become so abundant that they shade the bottom and decrease light penetration. As the plants decay they use up oxygen and the plant remains settle to the bottom. The excessive production and decay can reduce the amount of oxygen in the water column and can ultimately lead to anoxic (no oxygen) or hypoxic (little oxygen) conditions. Even short periods of low oxygen can cause serious damage to bottom dwelling organisms and eventually lead to “fish kills” and losses of other plant and animal species.

Nitrogen travels to an estuary through the groundwater or over the land as run-off. It can take years for nitrogen traveling via groundwater to reach a receiving coastal water body. Thus, even if nitrogen inputs stopped today nitrogen would continue to arrive at the estuary over a long period of time.

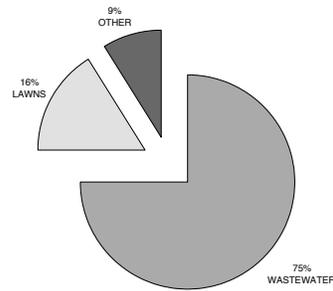
Where Does Nitrogen Come From?

Most nitrogen comes from wastewater, which in turn comes from individual septic systems. Wastewater from septic systems, lawn fertilizer and other sources contributes an estimated 30,000 pounds of nitrogen to the waters of The River Complex each year. Water quality



data collected by the Pleasant Bay Alliance and the Town of Orleans show that the amount of nitrogen entering these waters exceeds the amount that the system can

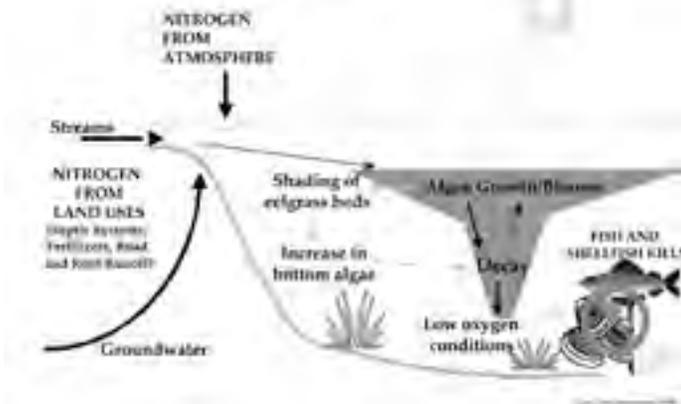
NITROGEN SOURCES



naturally absorb and remain healthy. The consensus is that the community will need to look at strategies to reduce the amount of nitrogen entering these waters.



Generalized Eutrophication in Coastal Embayments



What Happens Next?

The Pleasant Bay Resource Management Plan, the Orleans comprehensive wastewater management plan, and the Orleans Comprehensive Plan document a growing awareness that changes in policies and regulations are necessary to ensure the protection of our valuable coastal resources. These efforts have generated a great deal of technical data that have deepened our understanding of the effects of nitrogen on water quality.



Research on nitrogen impacts in the Bay began in 1998, when the Alliance towns contracted with the Cape Cod Commission to assess nitrogen entering the Bay from surrounding land uses. That study, which relied on computer modeling, indicated that most of Upper Pleasant Bay was receiving too much nitrogen. In 2000, the Alliance's Citizen water quality monitoring program began collecting water quality samples throughout the Bay and analyzing them for nitrogen content. As noted above, water quality data confirms the earlier findings by the Cape Cod Commission.

The Town's and the Alliance's investigations have taken a further step through involvement in the Massachusetts Estuaries Project (MEP). The MEP is combining actual water quality data collected by the Alliance and the Town of Orleans, as well as other data concerning habitat conditions, to develop a comprehensive assessment of nitrogen flow and impacts throughout the Bay. The MEP assessment will provide a sound basis for developing policies and recommendations for nitrogen management.

Illustrative Community Strategies for Wastewater and Nitrogen Management

- ◆ Increase lot sizes through zoning
- ◆ Limit density of development through zoning
- ◆ Purchase undeveloped land for open space
- ◆ Use de-nitrifying septic systems
- ◆ Reduce or eliminate use of lawn fertilizer
- ◆ Build community sewer systems for high density areas

Learning More...

What is a watershed?

A watershed is the defined area of land that contributes groundwater or surface water to a stream, river, pond, estuary or other water body. As it flows, water travels from higher to lower elevations, whether it flows over the surface or as groundwater. On Cape Cod, groundwater elevations generally determine watersheds or recharge areas rather than land surface elevations. Within one watershed, all water travels to the same place. For example, rain falling on land in the River Complex watershed will flow to one of the water bodies in the complex, the lowest elevation. There are smaller watersheds within larger watersheds. The smaller watersheds are sometimes called sub-watersheds of the larger watershed. The River Complex watershed is a sub-watershed within the Pleasant Bay watershed.



Why do we hear so much about watersheds these days?

Watersheds are a very sensible unit for managing and preserving natural resources. Everything that is absorbed into the ground within a watershed affects the quality of ground water and the water body that the watershed drains into. Managing what goes on within a watershed is believed to be the most effective way to protect groundwater and surface water resources.

Watershed planning encompasses many factors that can affect the quality of groundwater and surface waters. These factors include the potential for toxic substances to reach the groundwater or marine waters, nitrogen management and stormwater management. Nitrogen management is believed to be the most important factor for protecting water quality in Pleasant Bay.

Watershed planning is most effective when strategies are tailored as much as possible. For example, recommendations to change zoning may be effective in an area with a great deal of undeveloped land, but have little potential benefit in an area that is already substantially developed. By working on a sub-watershed level strategies can be tailored to the particular conditions within an area.



What Can You Do to Protect Estuarine Waters?

First and foremost, support the completion and implementation of the Orleans wastewater management plan.

In your home...

- * Consider converting to a septic system designed to remove nitrogen.
- * Have your septic system pumped out every 3-5 years or as recommended by your local Board of Health.
- * Do not allow household hazardous products to be flushed down drains. Participate in local household hazardous waste disposal days.
- * Conserve water both indoors and outdoors.

In your yard...

- * Select grass types that are appropriate for the area—tall or fine fescues mixed with rye grass are a good choice for this region.
- * Keep your grass 2-3 inches long, this height will shade roots and keep moisture in. Leave grass clippings; nutrients from clippings will help fertilize the lawn.
- * Use only slow release organic fertilizers of which at least 1/3 is in water-soluble form. Apply fertilizer after mid-April and before mid-November. At other times of the year temperatures are generally too cold for grass to absorb nitrogen and it may wash away. Apply only 1/2 pound of nitrogen per thousand square feet of lawn in each application.

Watch out for phosphates...

Phosphorous is a nutrient that affects freshwater systems. Too much phosphorous causes eutrophication of **freshwater** ponds and lakes.

- * Avoid using household detergents and cleaning products containing phosphorous.
- * Purchase household cleaners that have low or no phosphates. State law limits phosphate content of most cleaners. However automatic dishwasher detergents are allowed a higher phosphate content. The following brands of automatic dishwasher detergents contain no phosphates and can be found at local health food stores and some larger supermarkets: Bi-O-Kleen; Country Save; Earth Friendly; Ecover; Ultra Citra Solve; Global Balance; Lifetree; Planet; Seventh Generation.
- * Eliminate or reduce the use of polishes or industrial strength cleaners.

Clean up after your pet...

Animal feces left on roadsides, walking paths, beaches and other open areas contributes nitrogen and bacteria to nearby wetlands and coastal waters. It is every dog owner's responsibility to clean up after his or her pet. Many public access areas now have Mutt Mitts dispensers but—just to be sure—bring your own plastic bag to secure waste and dispose of it at home.

**PLEASANT BAY RESOURCE
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About this project...

The Pleasant Bay Resource Management Alliance was established by the Towns of Orleans, Chatham and Harwich to implement the resource management plan (adopted in 1998) and plan update (adopted in 2003) for Pleasant Bay. The plan and update call for the development of nitrogen management strategies for the watersheds of water bodies within the Pleasant Bay system that are experiencing excessive nitrogen levels. The *Citizens' Guide to Estuarine Protection* is intended to report on those findings, and to support public action to protect the quality of our groundwater, ponds and coastal waters.



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