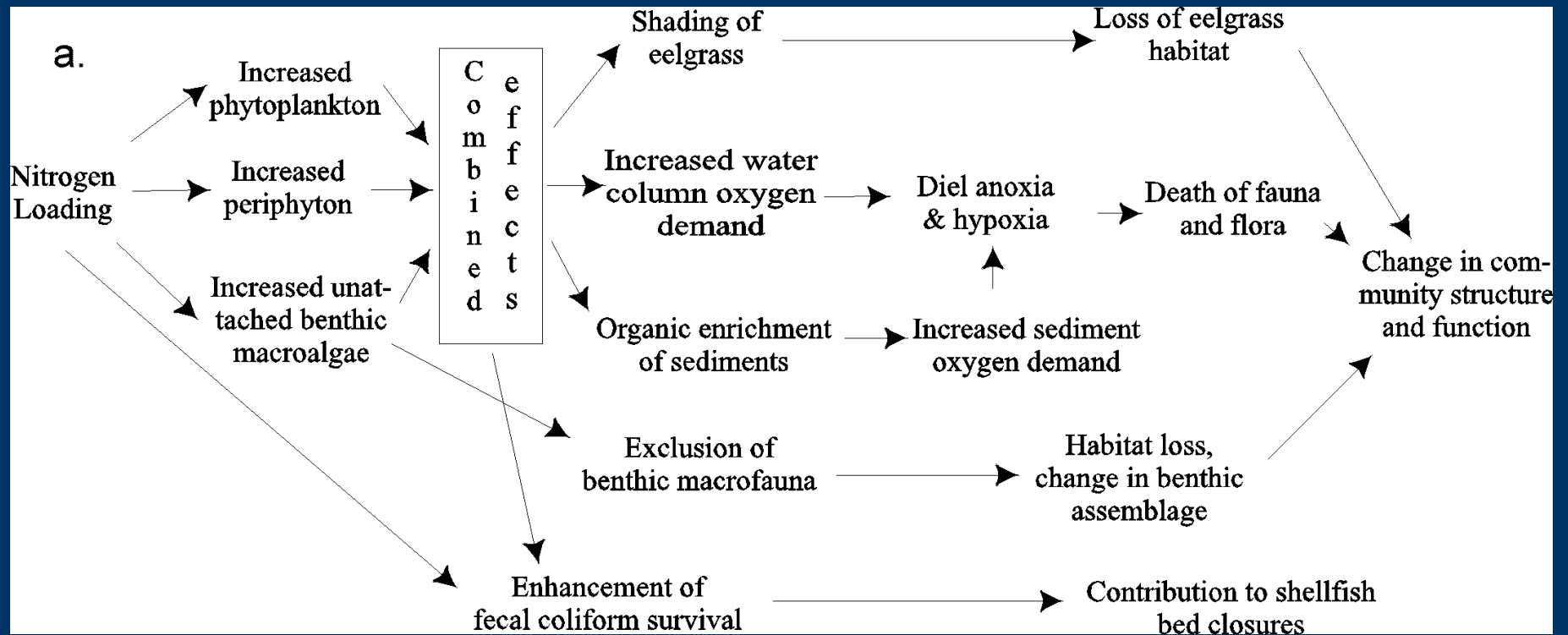


The Problem with Nitrogen

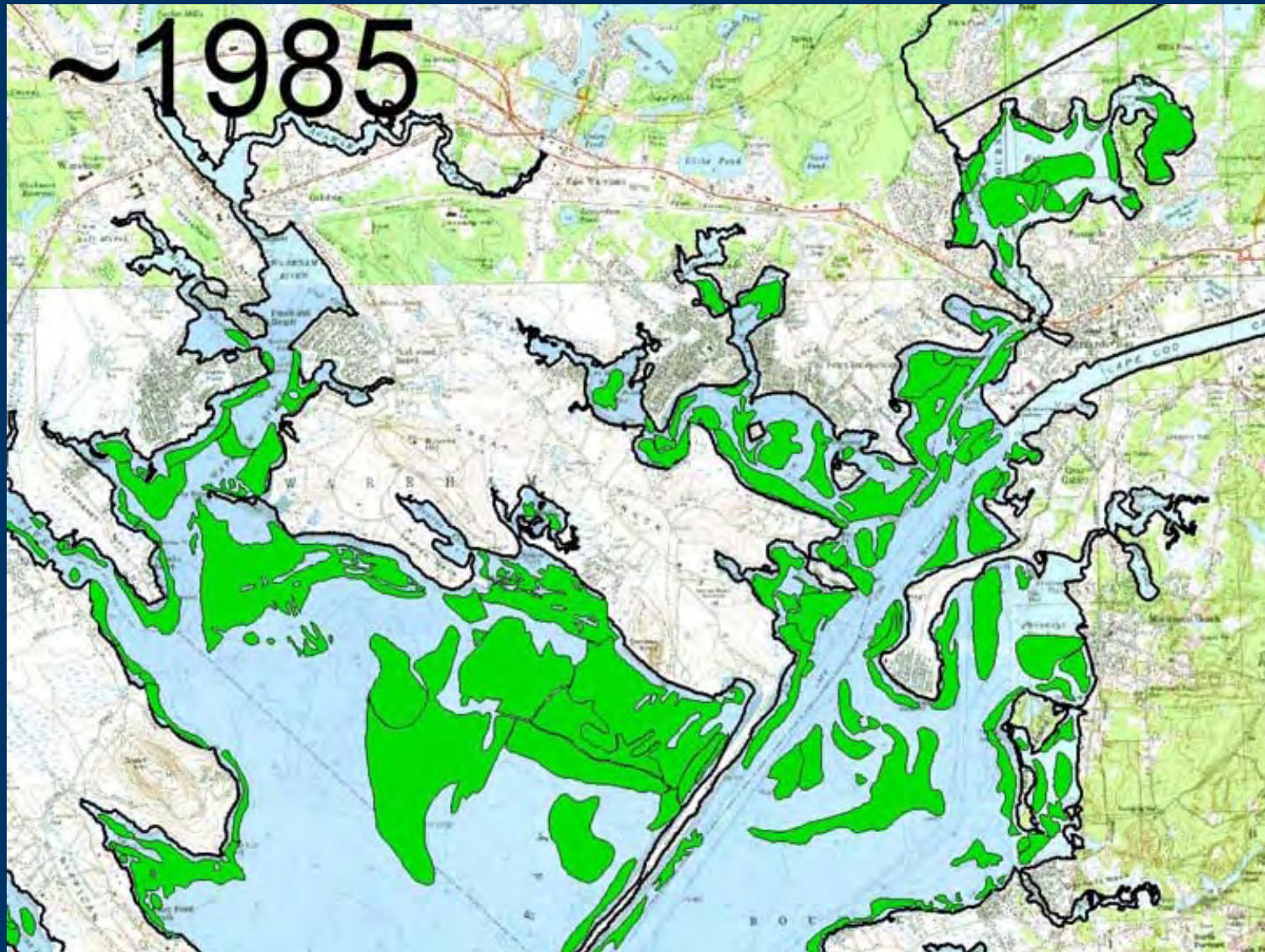


More Nitrogen >> More Algae
>> Less Eelgrass, Less Oxygen,
Less Shellfish Habitat, Poor Water Quality,
and even fish kills

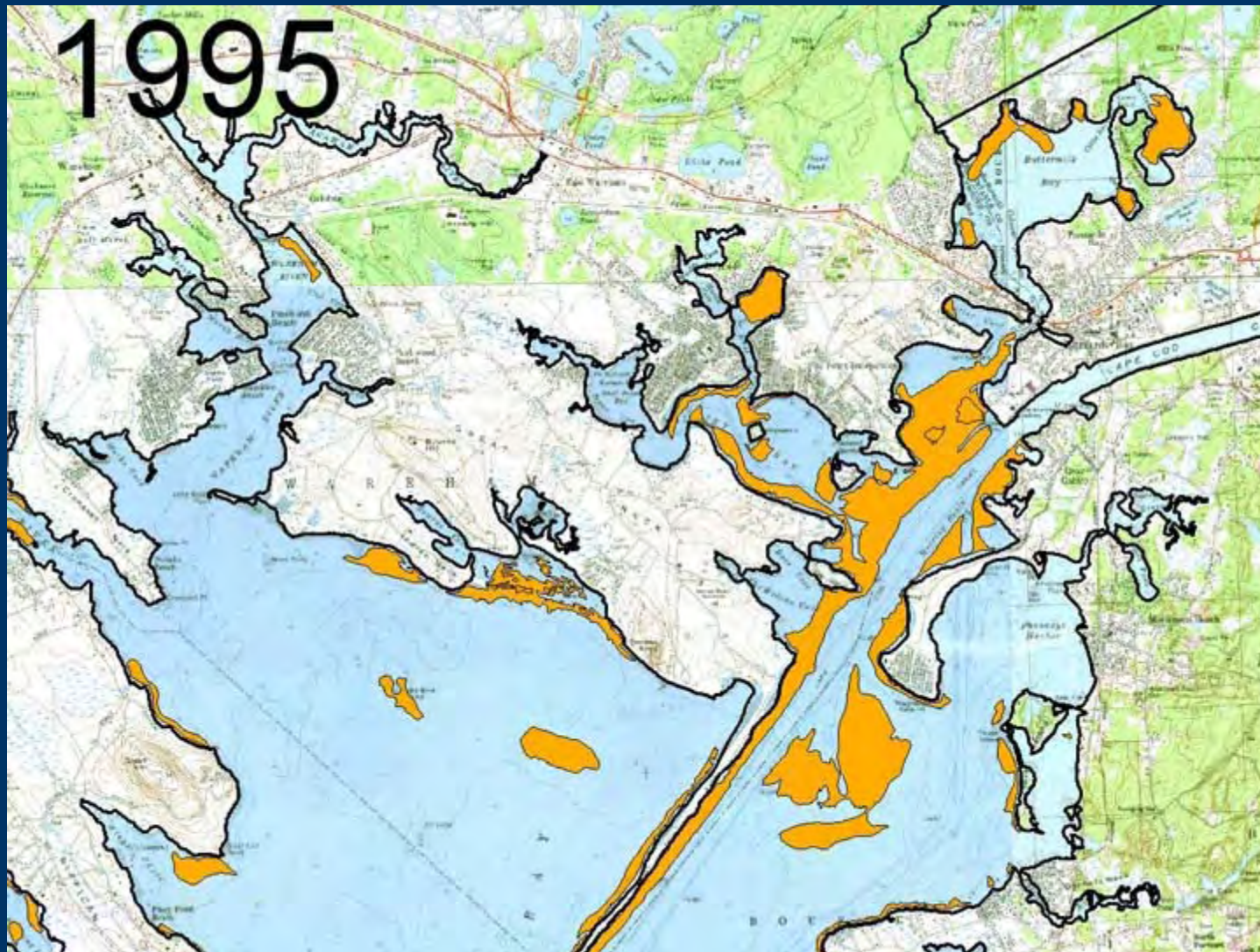
One Problem with Nitrogen: Eelgrass Loss



Dramatic Loss of Eelgrass in Wareham - 1985



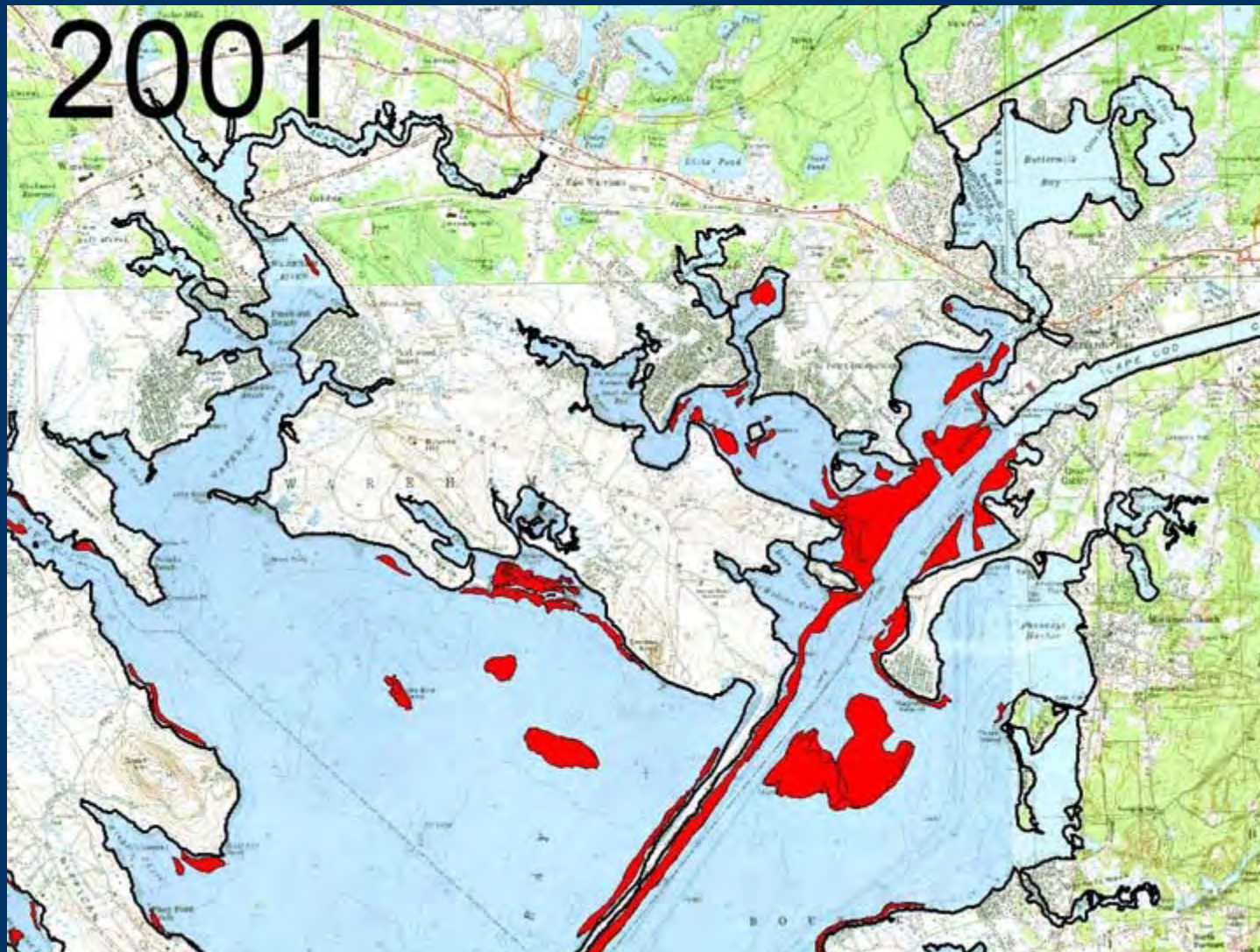
Dramatic Loss of Eelgrass in Wareham - 1995



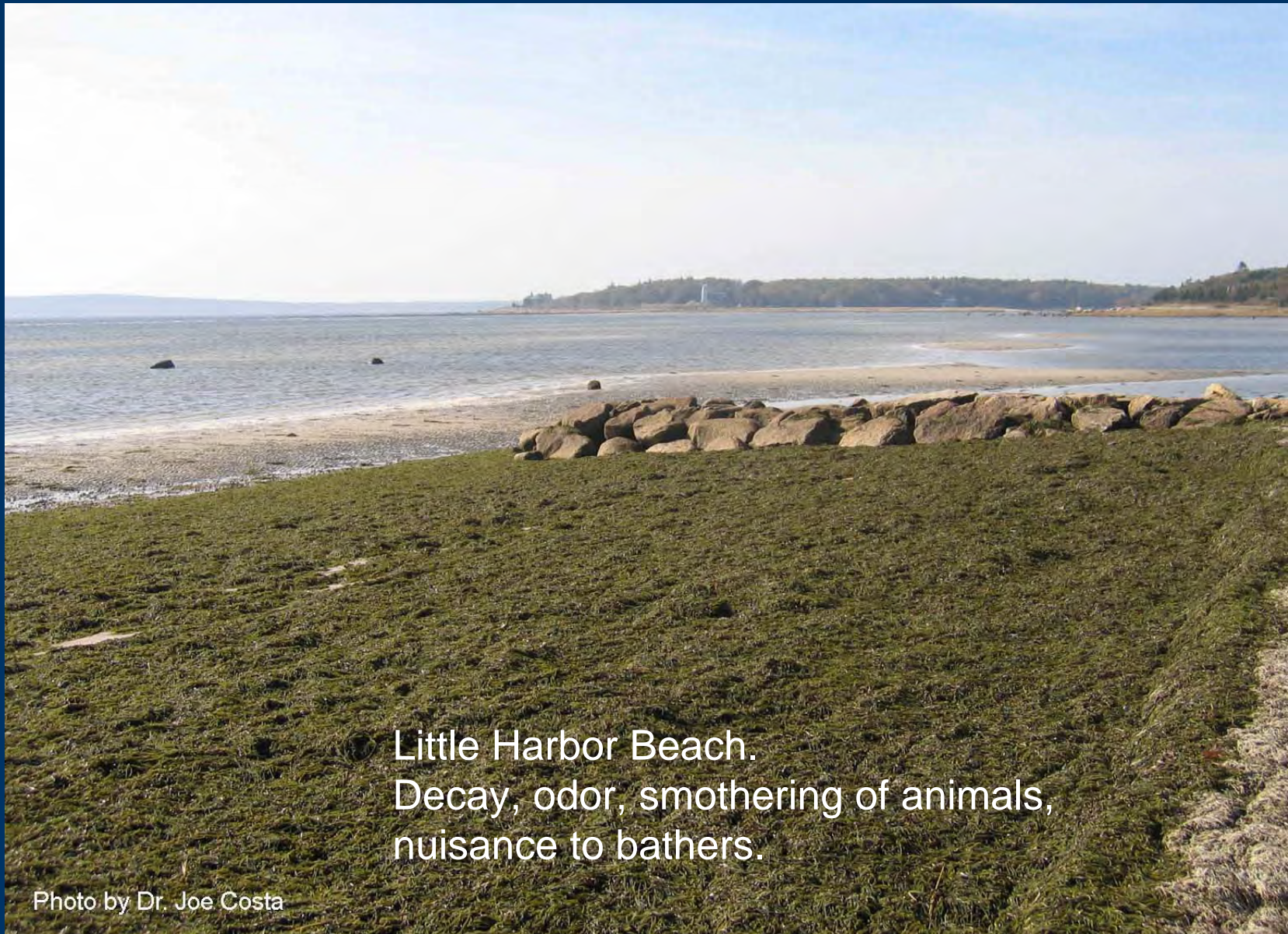
Dramatic Loss of Eelgrass in Wareham -

2001

3,165 acres to 956 acres
=70% decline



What's replacing eelgrass? Algae



Little Harbor Beach.
Decay, odor, smothering of animals,
nuisance to bathers.

Photo by Dr. Joe Costa

Shellfish Loss Vs. Shellfish Closure

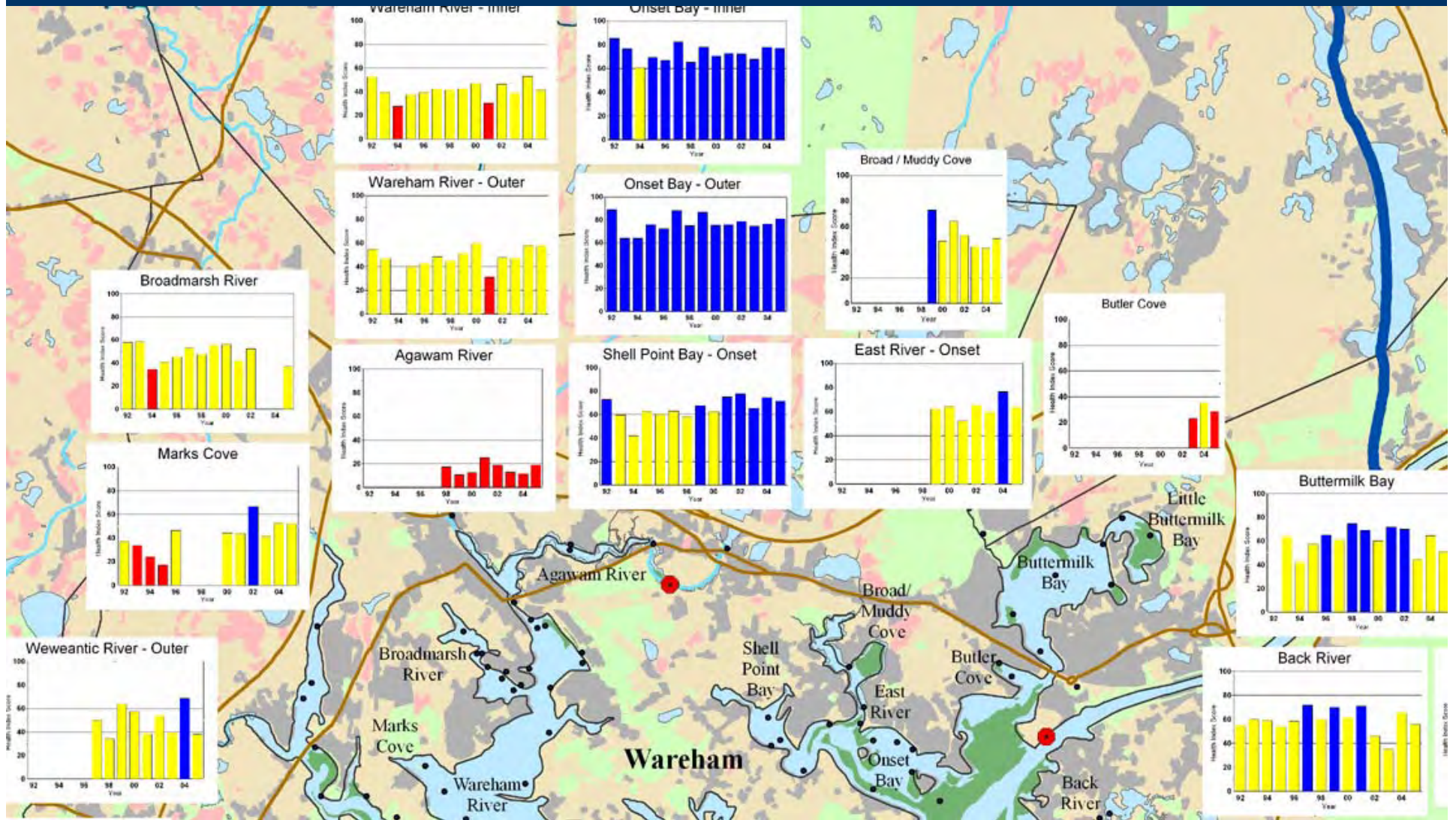
- Unlike bacteria pollution, the shellfish die
-
- no eelgrass or good bottom habitat
- Bottom like Black Mayonnaise
- Shellfish catch declines, shellfish permits



Fish Kills in summer during the right conditions



Coalition for BB Water Quality Monitoring



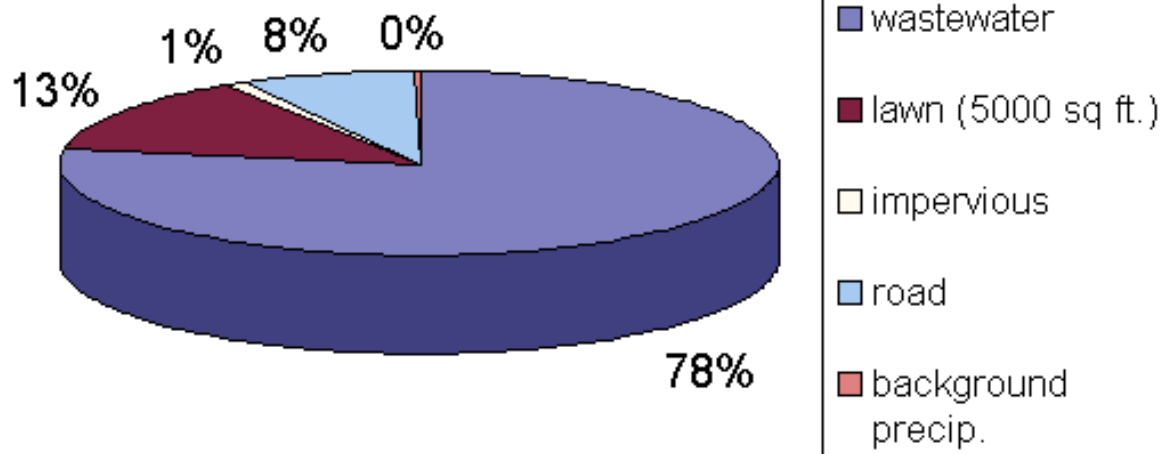
Wareham's waters already degraded

- Agawam River Estuary classified as “B” salt waters (only 3 in Buzzards Bay)
- Wareham River, Weweantic River Estuary, Agawam River Estuary already classified as Impaired (degraded)
- Buttermilk Bay and Onset Bay Fair to Good, but threatened by more nitrogen

Where is most of the nitrogen coming from?

<u>Specific N loading source</u>		<u>units and rates</u>
Septic systems	2.7	kg yr ⁻¹ capita ⁻¹
Occupancy rate (area average) residential unit; use actual census data ^a	3.0	persons per
Lawns	1.4	per 5000sq. ft

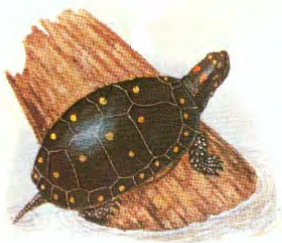
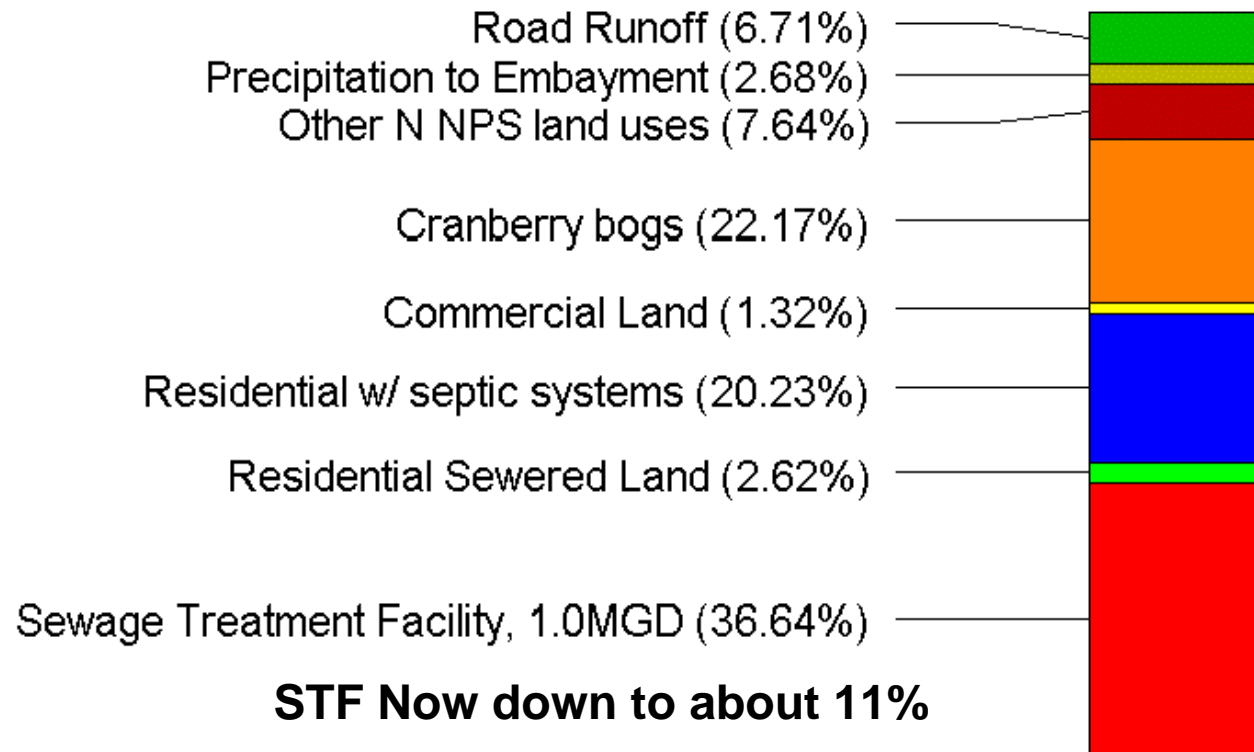
Implications of BBP loading model Residential Lot Annual Loading= 10.4 Kg N



1/2 acre lot, 3 person occupancy, 5000 sq. ft lawn, 2 μ m GW

Wareham River Nitrogen Sources- from 1998 report, before upgrades

N sources in the Wareham River Estuary



Feds Required Sewage Treatment Facility upgrade in Wareham

Expanded sewerage and better treatment will improve Wareham's waters during the next decade.

Wareham Nitrogen loading analysis: Benefits of sewerage of proposed assume sewage ppm = 5		(results independent)		
	existing units	potential units	existing (kg/y)	potential new (kg/y)
Inside of Watershed				
Beaver Dam (act. partial)	37	3	190	15
Cromset Park	93	0	479	0
Linwood/Ldd Ave	36	0	185	0
Mayflower Ridge	41	5	211	26
Oakdale	142	86	731	443
Parkwood Beach	280	157	1441	808
Tempest Knob	73	1	376	5
TOTALS:	702	252	3612	1297
NPS N loss (kg/y):			3612	1297
WTF gain (kg/y):			521	187
Outside of Watershed				
Agawam Beach	75	65	386	334
Briarwood Beach	136	23	700	118
Rose Point	201	23	1034	118
Sunset Island	17	7	87	36
Weweantic Shores	230	20	1183	103
TOTALS:	659	138	3391	710
NPS N loss (kg/y):			0	0
WTF gain (kg/y):			490	103

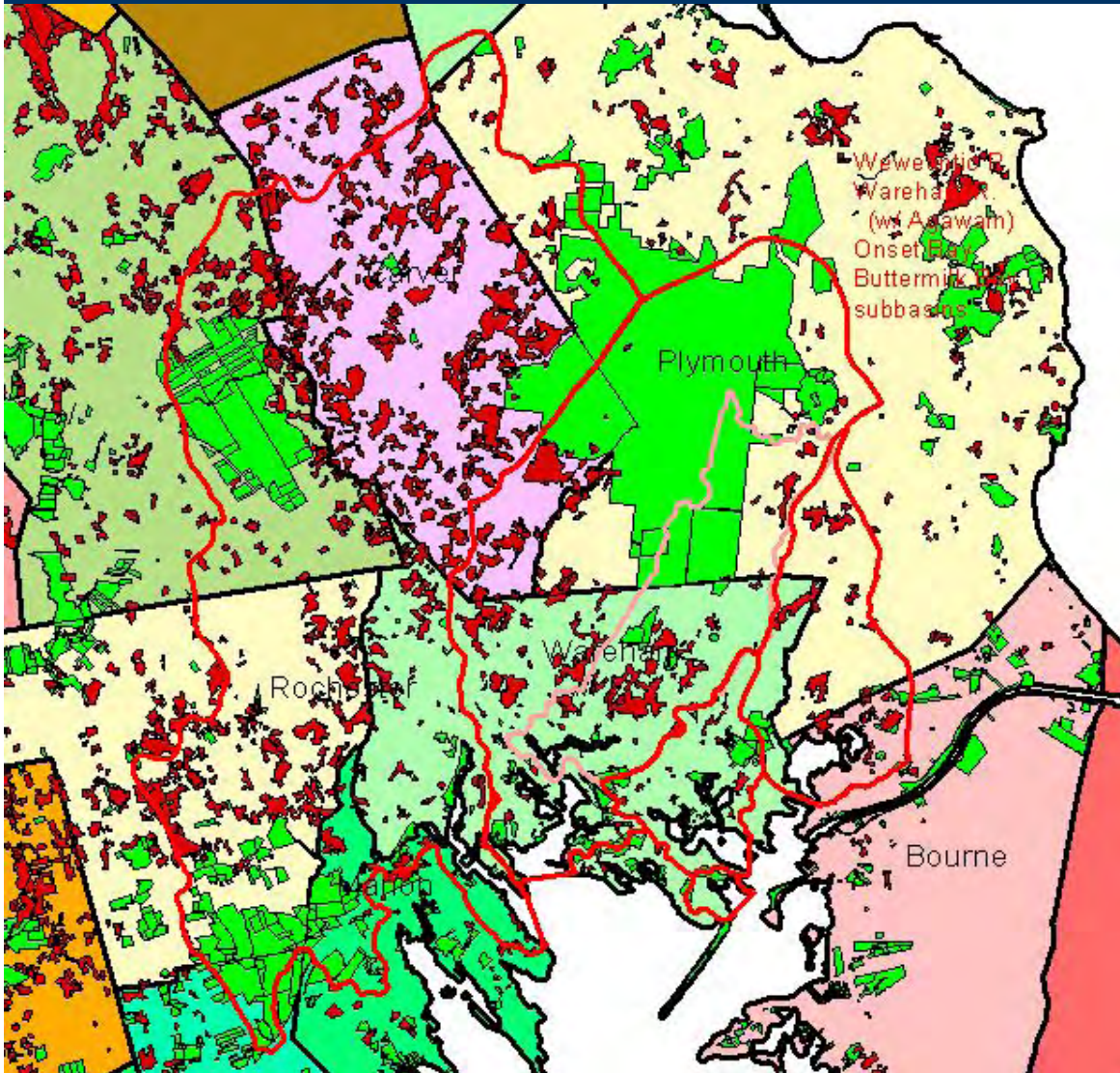
New Treatment level 4ppm for 7 month:

Sewering and better treatment:

Reducing 60,000+ lbs/yr to the Wareham River

\$27 million dollars for the plant, plus millions for the sewer expansion

But new Development can negate the benefits of sewerage and the Sewage facility upgrade



Reducing 60,000 lbs/yr to the Wareham River,

but your growth potential is for thousands more new homes in Wareham alone, let alone upstream in Carver, Plymouth, Middleborough and Rochester.

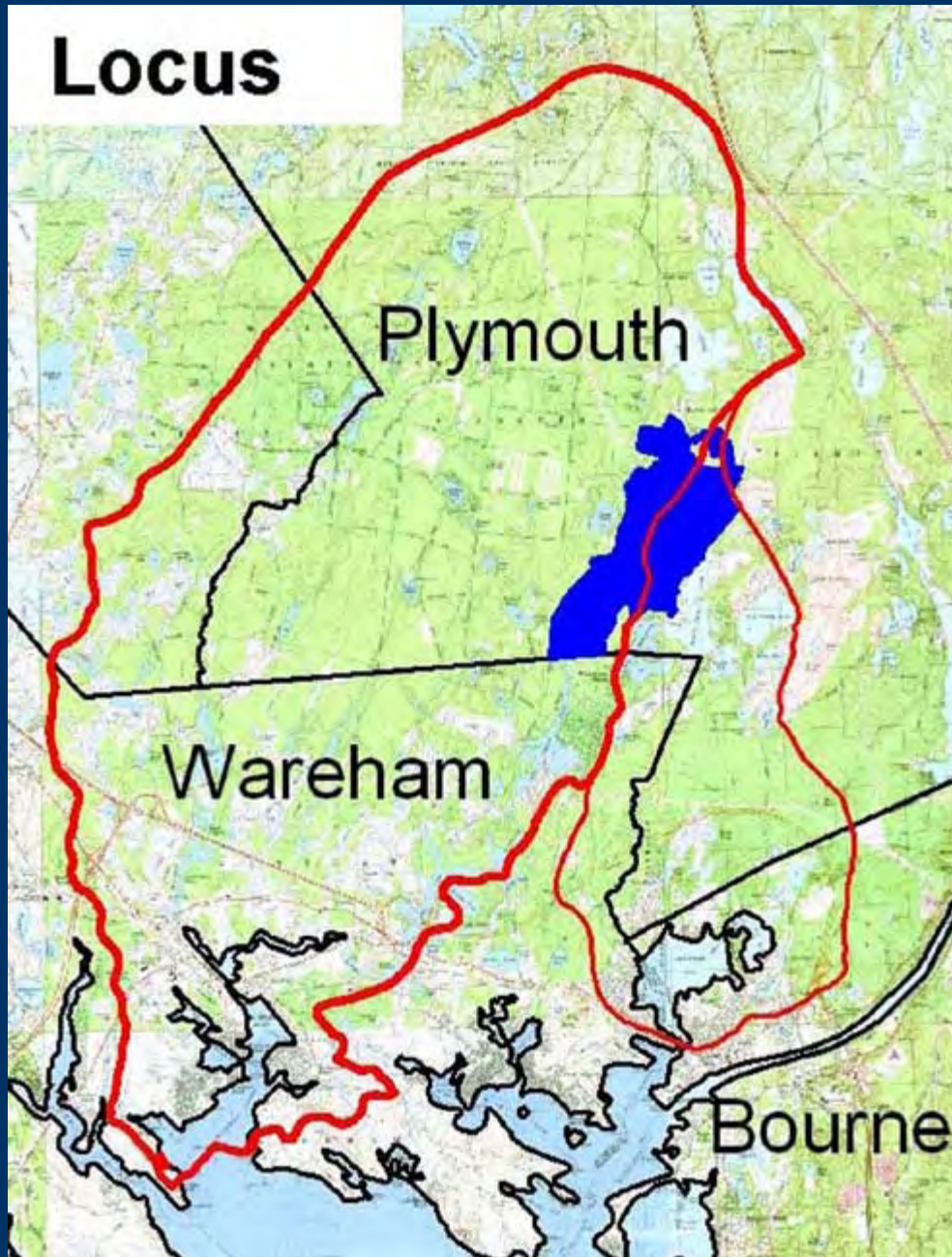
Unmanaged development will take away the millions you have invested to improve water quality.

Protected Open Space and Cranberry Bog

Aerial View



Locus



Problems to watch out for

ADM Agawam: Given large density bonus for cluster development.

Instead of 330 homes, 1,079 homes, 800,000 sq. ft. village center, 90,000 sq ft commercial.

Conventional: all sources: 8,000 lbs (5,000 reaching bay)

Proposed: 16,000 pounds (10,600 reaching the bay)

Need to go lower on Nitrogen.

Must be "Nitrogen neutral."

Who is carrying the burden for clean water in Wareham?

**5,550 current customers,
and another 2,000 soon-to be customers.**

\$662 annual sewer fees

\$12,000 sewer expansion or betterment fees

Septic system owners have had a free ride.

Census 2000: 10,000 housing units (5- 6,000 with septic?)

Town Growth potential: 4,000 units?

Sewered areas



Existing Sewers and Pumping Stations

Town of Wareham, MA
 Figure S-1
 Date: January, 1998
CDM Camp Dresser & McKee

Management Tools for Wareham

- Sewering, STF upgrades, community wastewater systems
- Zoning Overlay Management District requiring special permits limits limits on pounds per acre for pro, etc, enforced by Planning Boards
- BOHs adopt regs (e.g. all systems > 2000 gpd must discharge 10 ppm N or less)
- Protecting Open Space
- General Bylaw
- Better Stormwater regulations
- Agricultural and Turf BMPs
- Education (for lawns and other “non-point” sources)

Other Sources besides wastewater.

You can develop strategies for those sources.

This bylaw will address only wastewater.

DEP's Massachusetts Estuaries Project
Will eventually result in "Total Maximum Daily
Load" (TMDL) permits for its for each municipality

Results from the Cape:

Most homes will need to be sewerred.

Falmouth says it will cost \$500 million
(\$80,000 to \$100,000 per house)

Chatham says \$350 million
(\$100,000 to \$150,000 per house)

"Just around the corner?"

Long Term Practical Nitrogen Management Strategy for Wareham

Sewer as much as you can.

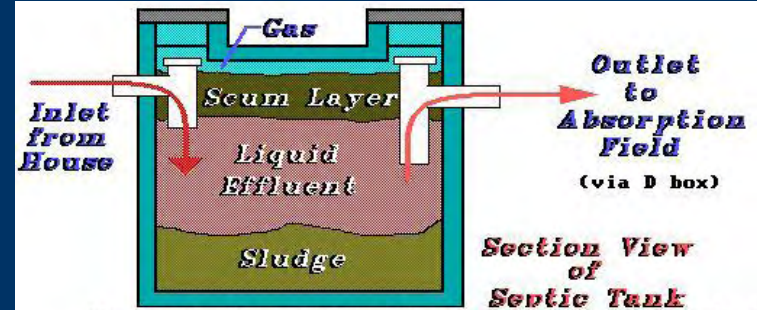
**(but you could never afford to sewer everything.
Costs can skyrocket with lots >1 acre)**

All new large developments and projects must have their own wastewater treatment systems with advanced nitrogen removal. [Anything over 10,000 gpd must already discharge 10 ppm or less]

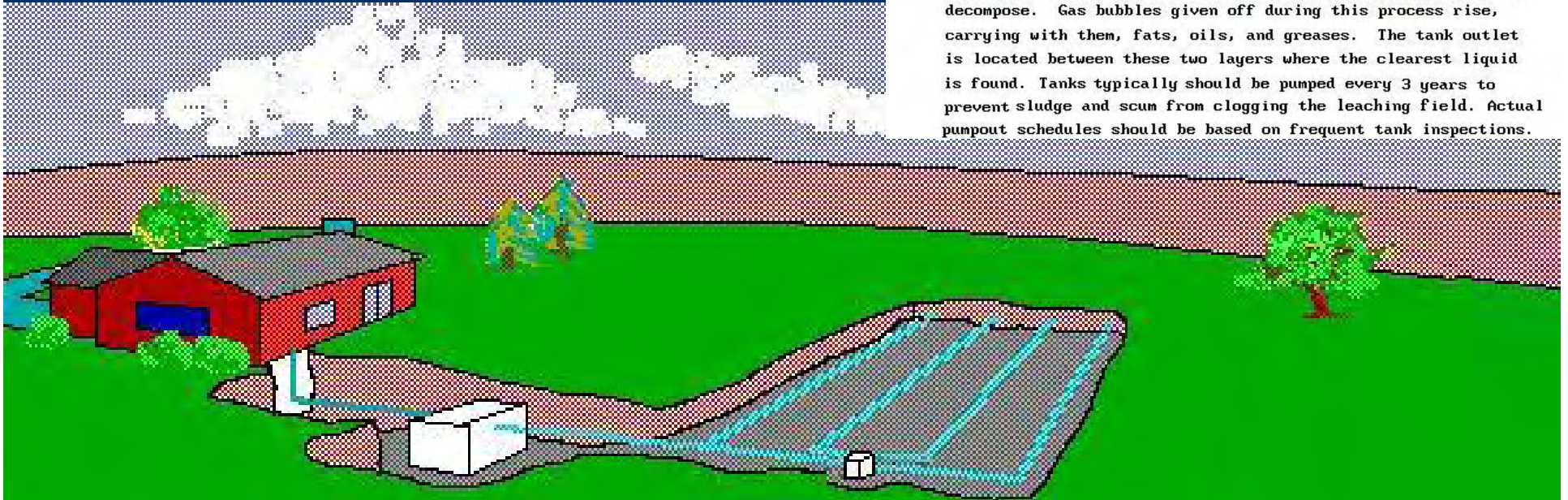
New construction and upgrades to existing systems on small lots that will not be sewered must eventually be switched to nitrogen removal septic systems.

Conventional Septic System removes modest amounts of nitrogen

Working number is typically 30-34 ppm reaching groundwater.



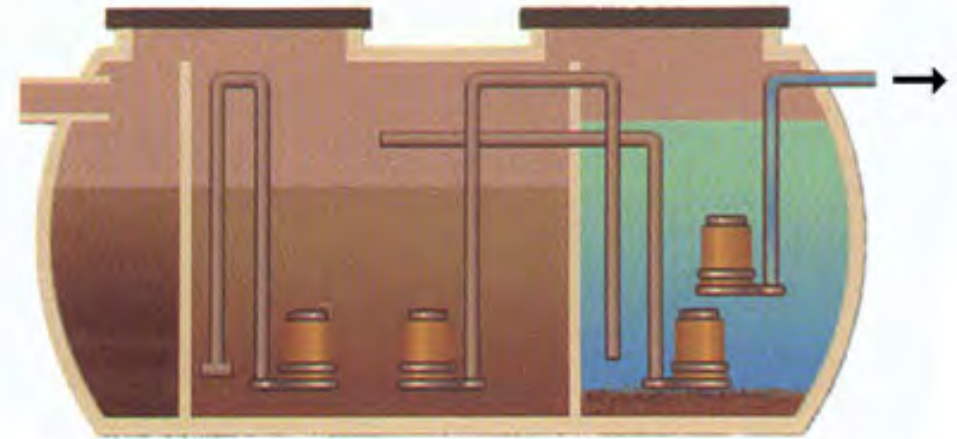
The solids that settle to the bottom of the septic tank slowly decompose. Gas bubbles given off during this process rise, carrying with them, fats, oils, and greases. The tank outlet is located between these two layers where the clearest liquid is found. Tanks typically should be pumped every 3 years to prevent sludge and scum from clogging the leaching field. Actual pumpout schedules should be based on frequent tank inspections.



A typical septic system has three main components.

N-Removal Septic Systems

Step 4 - Discharge to Leach Facility



A typical septic system has three main components.

MA Septic Test Center Completed, Testing Commences 1999



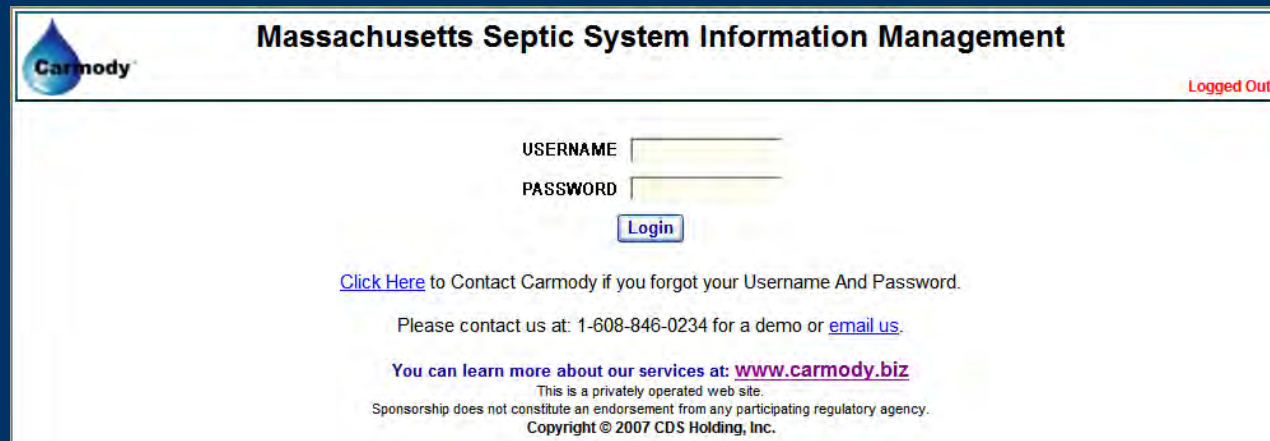
Barnstable County Experience for Cape Cod

On Cape Cod there are 1,100 alternative septic systems for nitrogen removal (19 ppm)

~80% of these are for individual homes

~13% for condos or cluster residential

~7% for businesses, shopping plazas, etc. Supermarkets had discharge limits of 25 ppm.



The screenshot shows the login page for the Massachusetts Septic System Information Management system. The page features the Carmody logo in the top left corner, the title "Massachusetts Septic System Information Management" in the top center, and a "Logged Out" status in the top right. The login form includes fields for "USERNAME" and "PASSWORD", a "Login" button, and a link to "Click Here" for forgotten credentials. Below the form, there is contact information for Carmody, including a phone number and an email link. At the bottom, there is a disclaimer stating that the site is privately operated and that the sponsorship does not constitute an endorsement from any participating regulatory agency. The copyright notice is "Copyright © 2007 CDS Holding, Inc."

Carmody

Massachusetts Septic System Information Management

Logged Out

USERNAME

PASSWORD

Login

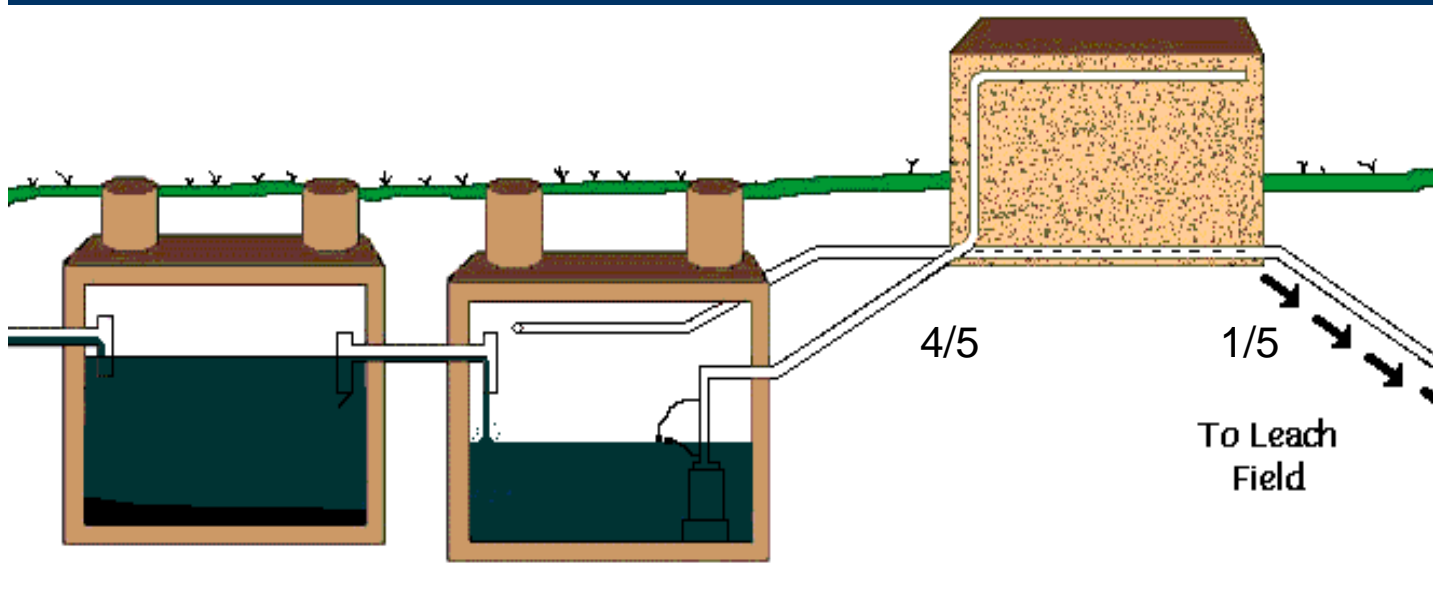
[Click Here](#) to Contact Carmody if you forgot your Username And Password.

Please contact us at: 1-608-846-0234 for a demo or [email us](#).

You can learn more about our services at: www.carmody.biz

This is a privately operated web site.
Sponsorship does not constitute an endorsement from any participating regulatory agency.
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Generic Recirculating Sand Filter (General Approval)



New Innovative design uses wood chips for very high levels of removal.

Alternative Septic System Nitrogen Removal

Approved and certified by DEP, two now have general use permits, 7 provisional, more on the way. (see packet)

- Better alternative systems discharge less than half the nitrogen (or better) of a conventional system Title 5 system. Some better ones are in the way.

Alternative Septic System Costs

Cape Cod Prices:

On an “Easy Lot”, a conventional might cost \$10-\$12,000

The cheapest alternatives would add \$3,000-\$6,000

The most expensive would double the costs.

Operation and Maintenance contracts \$350+

Electricity \$6 to \$30 per month (refrigerator \$12/mo Cape prices

Wastewater N Management General Bylaw 1

Simple Majority for Approval

Can be amended on the floor (as opposed to a zoning article)

No town board, officer, or employees thereof shall issue a permit or approval for the installation, repair, or replacement of an onsite wastewater disposal system, or use thereof, that will result in the discharge of a wastewater nitrogen loading rate that exceeds 7.5 pounds per acre.

Enforced by multiple Boards, but especially building department and Board of Health.

Wastewater N Management General Bylaw 2

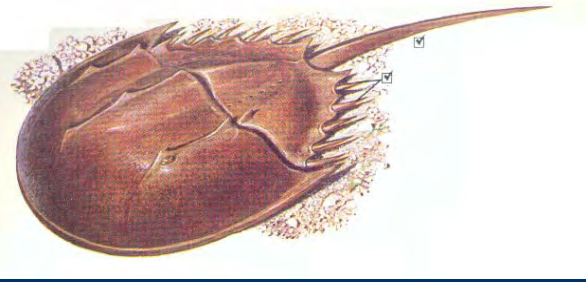
Sets a nitrogen standard of 2.5 bedrooms per acre or equivalent for commercial permits as standard

- 1) Sewered areas, and planned sewered areas are exempt from the bylaw
- 2) Existing homes unaffected (except for bedroom expansion)
- 3) 4 bedroom homes on 1.6 acres or greater unaffected
- 4) Guarantees a 3 bedroom lot on any parcel on any small lot, irrespective of size, but require a N removal system
- 5) Would require N removal systems on most bigger projects, but encourages creative solutions by developers like open space protection and transfer of development rights.

Businesses

package facility design flow
package facility discharge limit
Total nitrogen

2000 gpd
10 ppm
61 Pounds



END