

Oyster Pond Comprehensive Wastewater Management Plan Task 1 – Needs Assessment

Falmouth, Massachusetts

Presented by:



Project Team

- **Consultant**
 - Wright-Pierce
 - Woods Hole Group
 - LEC Environmental Consultants
- **Town**
 - Oyster Pond Working Group
 - Staff

Oyster Pond CWMP

- Targeted CWMP to:
 - Identify water quality needs
 - Identify options/solutions
 - Recommend capital improvements
 - Identify funding mechanisms and schedule
- Driver is:
 - Mass. Estuaries Project TMDL

3

Project Status

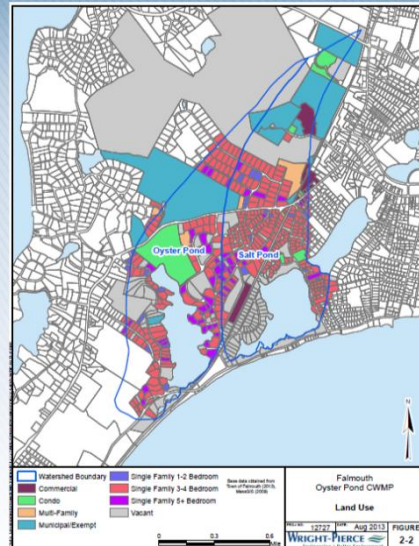
- **Task 1: Needs Assessment**
- **Task 2: Screen Alternatives**
- **Task 3: Develop Recommended Plan**

4

Watershed Information

- Land Use
 - 211 parcels/ 727 acres total
 - 166 parcels/ 271 acres dev.
 - 225 dwelling units
 - 603 bedrooms
 - 48% seasonal use
 - 24% of land in conservation
 - 8% of remaining vacant land is developable

- Wastewater
 - 28,900-gpd, annual average

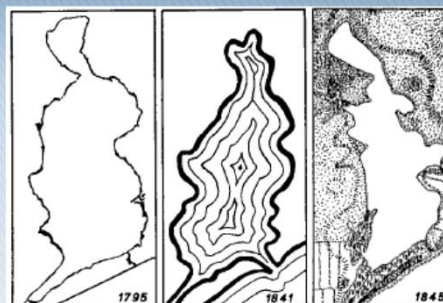


5

Oyster Pond Information

- Size
 - 63 acres
 - 0 to 6 meters deep
 - 2 to 7 ppt salinity (typ.)

- History
 - Kettle holes
 - Sea level rise >3000 yrs ago
 - Longshore drifts (1700s)
 - Railroad (1800s)
 - Oysters no longer survive (early 1900s)
 - New culvert (1980s)
 - Weir (1998)



Source: "A Coastal Pond", K.O. Emery, Fig 4

6

Key Issues

- Development
 - 160 dwelling units added since 1977
- Water column nitrogen
- Highly variable system
 - Thermal Stratification
 - Density Stratification
 - Trunk River sill

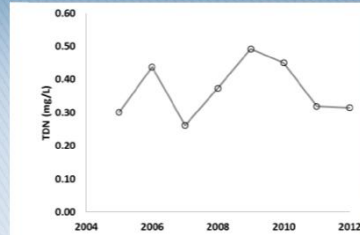


Figure 3. Mean summer (May through September) surface layer TDN concentrations for Oyster Pond sampling stations OP1, OP2, and OP3.

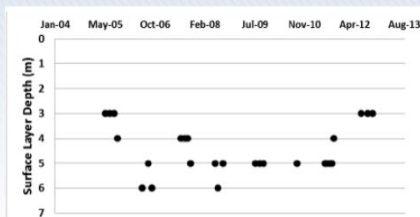


Figure 9. Depths of summer pycnoclines at station OP3 between 2005 and 2012 (defined as depth where salinity < 4 ppt).

7

Water Resource Protection

- Current and future wastewater needs:
 - Ensuring sanitary condition
 - Protecting public and private water supplies
 - Protecting surface waters from nutrient enrichment
 - Addressing convenience & aesthetics issues
 - Enabling sustainable economic development

8

Protection of Surface Water

- Nitrogen
 - MEP TMDL (2001)
 - SWQS SA criteria of >6.0 mg/l dissolved oxygen
 - Nitrogen mgmt required
 - Compliance on a "subwatershed basis"

- Phosphorus
 - Not part of TMDL
 - Appears to be a limiting nutrient under certain conditions
 - Phosphorus mgmt warranted

9

Compliance by Subwatershed

Table ES-2. Present Watershed Loads, Thresholds Loads, and the percent reductions necessary to achieve the Thresholds Loads for the Oyster Pond system, Town of Falmouth, Massachusetts. Threshold loading for Oyster Pond is based upon removal required to achieve 3.8, 5.0 or 6.0 mg/L DO concentration in the deepest basin of the Pond.

Sub-embayments	Present Watershed Load ¹ (kg/day)	Target Threshold Watershed Load ² (kg/day)	Direct Atmospheric Deposition (kg/day)	Benthic Flux Net ³ (kg/day)	TMDL ⁴ (kg/day)	Percent watershed reductions needed to achieve threshold load levels
GREAT POND SYSTEM						
Oyster Pond	4 181	DO 3.8: 2855 DO 5.0: 1967 DO 6.0: 1 233	0.773	DO 3.8: -1.342 DO 5.0: -1.080 DO 6.0: -0.883	DO 3.8: 2 286 DO 5.0: 1 660 DO 6.0: 1 143	DO 3.8: -31.7% DO 5.0: -53.0% DO 6.0: -70.5%
Oyster Pond Lagoon	0.293	0.293	0.027	DO 3.8: -0.037 DO 5.0: -0.030 DO 6.0: -0.024	DO 3.8: 0.283 DO 5.0: 0.290 DO 6.0: 0.296	DO 3.8: 0.0 DO 5.0: 0.0 DO 6.0: 0.0
Oyster Pond System Total	4.474	DO 3.8: 3 148 DO 5.0: 2 260 DO 6.0: 1 526	0.800	DO 3.8: -1.379 DO 5.0: -1.110 DO 6.0: -0.887	DO 3.8: 2 569 DO 5.0: 1 950 DO 6.0: 1 439	DO 3.8: -29.6% DO 5.0: -49.5% DO 6.0: -65.9%

(1) Composed of combined natural background, fertilizer, runoff, and septic system loadings.
 (2) Target threshold watershed load is the load from the watershed needed to meet the embayment threshold concentration identified in Table ES-1.
 (3) Projected future flux (present rates reduced approximately proportional to watershed load reductions).
 (4) Sum of target threshold watershed load, atmospheric deposition load, and benthic flux load.

10

Compliance Strategies

- Account for Non-Septic Load Reductions
 - Fertilizer use
 - Storm drainage
 - Atmospheric deposition

- Selected “medium” non-septic load reductions

- Results in 65% septic removal requirement from watershed (68.2% from selected subwshds)

11

Implications of Disposal Location

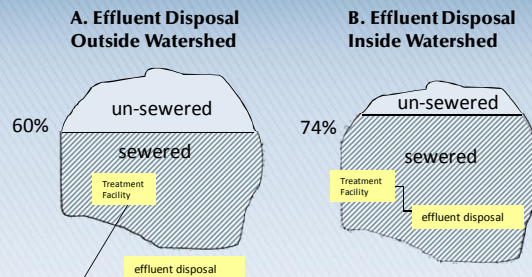
Table 3-4 - Septic Nitrogen Removal by Subwatershed for EPA-Approved TMDL with Scenario 3 (out-of-watershed disposal)									
Oyster Pond Embayment	Wastewater Load, Unatten. (kg/yr)	Removal Req'd to Meet TMDL	Remaining Load, Unatten. (kg/yr)	Natural Atten.	Remaining Load, Atten. (kg/yr)	No. of Developed Parcels	No. of Developed Parcels to be Addressed	No. of Developed Parcels w/in 300-ft Buffer	Additional Parcels Needed Outside Buffer
Current Conditions	1,364.00					166			
1-Oyster Pond GT 10N	366.46	68.2%	116.53	0%	116.53	46	31	-	31
2-Oyster Pond GT 10W	43.06	68.2%	13.69	0%	13.69	16	11	-	11
3-Mosquito Creek_Oyster Pond	10.10	68.2%	3.21	30%	2.25	5	3	3	-
4-Oyster Pond_Main	860.41	68.2%	273.61	0%	273.61	85	58	48	10
5-Oyster Pond_South	83.85	0%	83.85	0%	83.85	14	-	2	-
			490.90		489.94	166	103	53	52
Allowable Septic Nitrogen Remaining per Table 3-3, Scenario 3 >>						491.00			
Table 3-5 - Septic Nitrogen Removal by Subwatershed for EPA-Approved TMDL with Scenario 3 (in-watershed disposal with new WWTF)									
Oyster Pond Embayment	Wastewater Load, Unatten. (kg/yr)	Removal Req'd to Meet TMDL	Remaining Load, Unatten. (kg/yr)	Natural Atten.	Remaining Load, Atten. (kg/yr)	No. of Developed Parcels	No. of Developed Parcels to be Addressed	No. of Developed Parcels w/in 300-ft Buffer	Additional Parcels Needed Outside Buffer
Current Conditions	1,364.00					166			
1-Oyster Pond GT 10N	366.46	84.0%	58.63	0%	58.63	46	39	-	39
2-Oyster Pond GT 10W	43.06	84.0%	6.89	0%	6.89	16	13	-	13
3-Mosquito Creek_Oyster Pond	10.10	84.0%	1.62	30%	1.13	5	4	3	1
4-Oyster Pond_Main	860.41	84.0%	137.66	0%	137.66	85	71	48	23
4A - Hypothetical New WWTF			203.20	0%	203.20				
5-Oyster Pond_South	83.85	0%	83.85	0%	83.85	14	-	2	-
			491.86		491.37	166	127	53	76
Allowable Septic Nitrogen Remaining per Table 3-3, Scenario 3 >>						491.00			

12

In-Watershed Disposal

Example Watershed

- 100 homes on septic systems
- Septic nitrogen load = 1,000 lb/yr
- TMDL = 400 lb/yr
- Required septic load removal = 60%



Nitrogen from un-sewered parcels (26 mg/l)	400 lb/yr	260 lb/yr
Nitrogen from effluent disposal (in watershed assumed 5 mg/l)	0	140
Total wastewater-related load	400 lb/yr	400 lb/yr
Parcels sewered	60	74 (24% more)

13

Next Steps

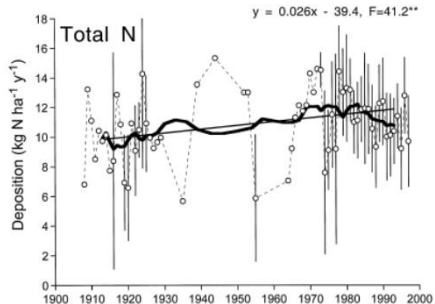
- Address WQMC/public questions & comments
- Decide:
 - whether to pursue “alternative criteria”
 - on approach to non-septic load reductions
- Request:
 - full suite of MEP data
 - additional MEP models run(s)
- Collect additional data
 - Rain gauge, sonde at OP-3, algae bloom report form
- Initiate Task 2 alternatives analysis

14

Questions & Discussion

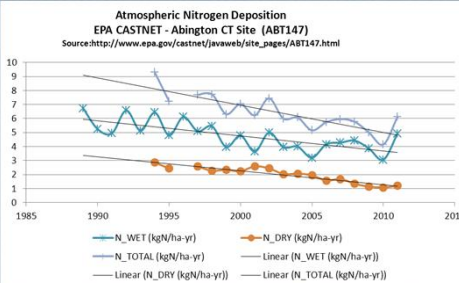


Atmospheric Deposition

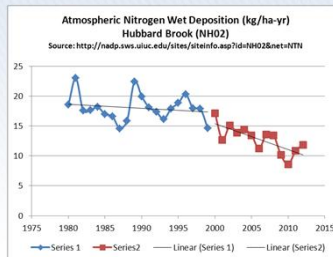


Source: "Historical Changes in Atmospheric Deposition to Cape Cod", Bowen, Valiela, 2001, Fig. 5

Data Source: <http://nadp.sws.uiuc.edu>



Data Source: www.epa.gov/castnet



16