

Date: September 18, 2025 (Revised October 17, 2025)
Project No.: 20985
To: George Meservey
From: Mike Giggey
Subject: Orleans Nitrogen Management in Mill Pond Sub-Watershed
Fertilizer Management

Ten options have been identified for reduction of nitrogen load in the Mill Pond sub-watershed. One of those options is the improved management of residential fertilizer to reduce watershed nitrogen loads. This option is described and evaluated in this memo.

Description

This option involves the implementation of tighter controls over residential use of lawn and garden fertilizers. Homeowners buy fertilizer and apply it to their properties, creating a nitrogen load to the groundwater that eventually reaches Mill Pond. Some homeowners may instead hire landscaping companies to professionally apply fertilizers and other lawn care products. Homeowners choose to use fertilizers to improve the appearance of their properties, and this activity is purely voluntary and could be curtailed from current practices or perhaps even eliminated via a town-wide ban.

Ownership and Control

Decisions on the type, location and timing of fertilizer application are made by individual homeowners, in some cases based on input from commercial landscaping companies. Homeowners and their contractors must comply with Town bylaws, specifically Chapter 103: Fertilizer Nitrogen and Phosphorus Control, (enacted October 2024), which supplements the Town Select Board and Parks Commissioners policy dated April 11, 2012. The homeowner may not be aware of the bylaw or may view it as voluntary. Further, the Town is unable to provide strict enforcement.

Performance and Extent

The reports from the Massachusetts Estuaries Project include lawn and garden fertilization in all of their watershed loading estimates. Based on past fertilization surveys at several Cape Cod towns, a standardized MEP approach was developed that is based on average lawn size of 5,000 square feet, a fertilizer application rate of 3.0 pound of nitrogen per 1000 square feet, an average application frequency of 1.44 times per year, and 20% leaching of applied nitrogen reaching the groundwater. This translates to an average of 1.08 pound per year per home. MEP found that groundwater impacts can be significantly higher when landscaping companies apply under a formal program, but that factor is not included in the MEP standard calculation. The MEP estimate of fertilizer load in the Mill Pond sub-watershed is about 140 kg/yr, or about 8% of the total controllable load. (UMass-Dartmouth updated its 2005 evaluation of fertilizer use in a report dated January 2016. It found that fertilizer practices in Orleans are similar and concluded that no change is warranted in how watershed loadings are computed.)

The Cape Cod Commission has suggested that towns take credit for 25% reduction in fertilizer load if the town has in place an appropriate fertilizer control regulation or bylaw. In planning for sewerage in the Pleasant Bay watershed, Orleans has used that 25% credit to reduce the amount of sewerage otherwise needed. If in reality the Town bylaw is largely ignored and not enforced, then the 25% credit is generous. If a more stringent bylaw were in place, or even a fertilizer ban, one might expect much more than 25% removal of the fertilizer load. Here are the nitrogen load reductions in Mill Pond associated with various assumptions on the effectiveness of fertilizer control plans:

- | | | |
|---------------|---------------------|------------------------------------|
| • 25% credit | 38 kg/yr reduction | 5% of overall target of 750 kg/yr |
| • 50% credit | 75 kg/yr reduction | 10% of overall target of 750 kg/yr |
| • 75% credit | 113 kg/yr reduction | 15% of overall target of 750 kg/yr |
| • 100% credit | 150 kg/yr reduction | 20% of overall target of 750 kg/yr |

The Town has a policy of strictly limiting fertilizer use on town-owned property, so the 25% allowance is probably low on those town parcels. However, there are no significant town-owned parcels in this sub-watershed.

If sewers were planned for this sub-watershed, the 25% fertilizer credit would mean 7 fewer homes would need to be connected, compared to no credit. A 50% fertilizer credit would avoid sewerage for 7 more homes and a 75% credit would avoid sewerage for a total of 21 homes. Compared to a per-home credit of 5.4 kg/yr for sewers, enhanced fertilizer controls would provide 0.25 kg/yr per home at 50% credit and 0.37 kg/yr per home at 75%.

It is impractical to precisely estimate the amount of fertilizer applied in this sub-watershed, and nearly impossible to measure the resulting impact on the groundwater. Because of these difficulties, and the fact that fertilizer loads are typically less than 10% of the total load, the use of the 25% credit is a reasonable approach. Nonetheless, some savings in nitrogen management costs can be justified if a more active and stringent approach is taken.

Costs

Control of residential fertilizer use is one of the nitrogen management options that can actually save money. Homeowners spend money on fertilizer, or for lawn care services, which would be reduced or avoided if fertilizer use were to be curtailed. Offsetting those savings would be the Town costs for administering/policing a more stringent bylaw. Even with a strong Town program, this should be considered a low-cost nitrogen control option.

Speed in Water Quality Improvement

Fertilized lawns are located near existing septic systems, so this option has the same speed of clean-up as other residential source control alternatives, like sewerage or I/A systems. For a home at the far reaches of this sub-watershed, prior fertilizer applications would continue traveling with the groundwater for many years before the reduced load would reach Mill Pond. A more rapid impact would occur for homes close to the pond. In general, the benefits of fertilizer reduction would not be achieved for 10 or more years after cessation or reduction of applications.

Predictability of Performance

The MEP method of estimating fertilizer loads is quite approximate, so any computed credits based on a certain percentage reduction must also be considered to be rough estimates.

Reliability

Homeowner decisions to apply lawn fertilizer are made annually or several times per year. If this is to be an effective control option, it can be relied upon only if homeowners commit to (or are compelled to) reduce or eliminate fertilizer use every year for many years. This is not a reliable option if an initial strong public education campaign is successful, but not carried forward, or if Town oversight and enforcement are not ongoing.

Need for Large Town Capital Expenditure

Town costs would include bylaw strengthening, a public education campaign, and ongoing enforcement activities. These would be considered small costs when compared to traditional options such as sewerage.

Regulatory Acceptability

In watershed permitting, DEP has allowed towns to use the 25% fertilizer credit to defer the costs of traditional nitrogen control measures, but with the understanding that overall loads must be reduced sufficiently to allow achievement of target nitrogen concentrations in the embayment. Regardless of the estimated reduction of fertilizer use, the towns may be faced with additional nitrogen control measures if the full program, including a fertilizer credit, is not successful. At the heart of this approach is the fact that actual fertilizer load reductions cannot be practically measured, so actual effectiveness cannot be demonstrated. It is assumed that DEP's stance would be the same if the town were able to make the case that an expanded program will further reduce nitrogen loads.

Public Acceptability

Based solely on costs, this option should be generally acceptable to the public. However, there may be homeowners who value the appearance of their lawns and plantings more than they value water quality. Those individuals might react negatively to the implementation of this alternative, and could be a hurdle to full effectiveness of this option. The support of neighborhood associations will be important.

Flexibility in Face of Unknown TMDL and Applicability to a Phased Approach

This option is very amenable to a phased multi-pronged approach. Given that fertilizer controls, alone, are unlikely to remove enough nitrogen load to significantly improve water quality, this alternative would be coupled with one or more other alternatives. Those other alternatives could be flexible enough to allow them to be expanded over time if the actual water quality improvements turned out to be less than originally predicted.

Environmental Impacts

The environmental impacts of fertilizer control are only positive. In addition to reducing fertilizer nitrogen loading, the town should expect reductions in phosphorus compounds, pesticides and herbicides, and other potential contaminants.

One potential drawback is related to lawn health. If grass dies during drought conditions, perhaps in part due to lack of fertilization, then there will be an increase in bare soil that is much more easily eroded, creating the potential for runoff of soil to roadways and eventually to the Pond. Such problems can be mitigated by targeting watering.

Impact on the Orleans WWTF

The existing Orleans wastewater treatment facility (WWTF) has a finite capacity to treat and dispose of municipal wastewater. It will need to be expanded to handle all of the wastewater that would be collected in the current 16-phase sewer master plan. Reduction in fertilizer use avoids some sewerage and thus incrementally reduces the wastewater volume that would otherwise go to the WWTF if this sub-watershed were served by a traditional sewer system, thus helping to forestall the expected large capital expense of WWTF expansion.

Ease of Implementation

Unlike structural nitrogen removal options, this alternative relies exclusively on a bylaw, public acceptability and the town's enforcement actions. Its ability to be successfully implemented depends on a good bylaw, significant public goodwill, and appropriate Town enforcement activities. However, past attempts to ban fertilizer use on Cape Cod have been stymied by "restraint of trade" concerns at the state level and these issues may be significant hurdles to a large reduction in fertilizer loads.

Summary of Advantages and Disadvantages

The reduction of fertilizer use has these principal benefits:

- This is a very low-cost option.
- It avoids a small wastewater flow to the WWTF (compared with sewerage).
- It reduces the impacts of other lawn-care-related contaminants such as phosphorus and pesticides.
- It is easily combined with other alternatives

The principal drawbacks include:

- The amount of nitrogen reduction is small.
- It relies on the goodwill and diligence of homeowners.
- It may not be effective without a revised town bylaw and a strict enforcement program.

The September 18, 2025 draft of this memo was reviewed by the WMAC at its September 25, 2025 meeting. This updated memo reflects comments made by the WMAC and Town staff at that meeting.