LAGOON POND ASSOCIATION
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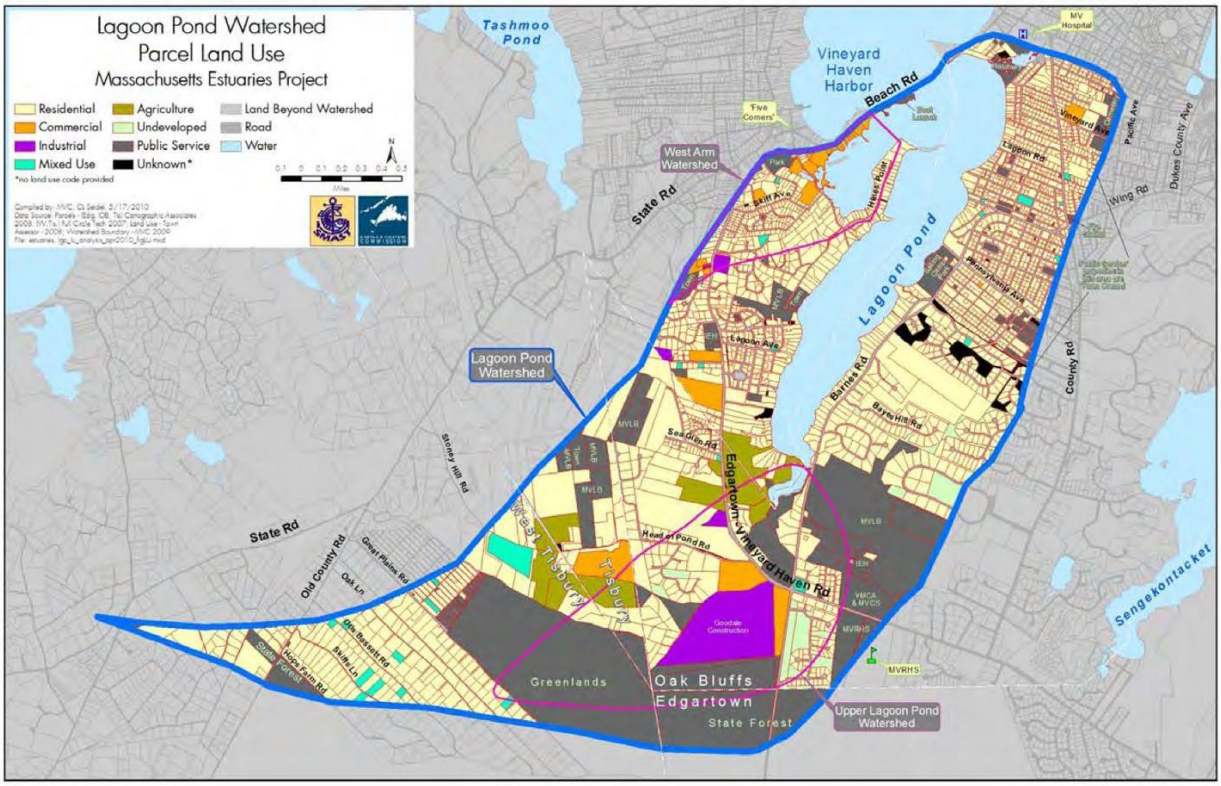
Talking Candidly about Martha's Vineyard Lagoon Pond and Eco-Sanitation

The Problem

Lagoon Pond is suffocating, and our septic waste is the major culprit. This waste contributes over 75% of the nitrogen and phosphorus that enter Lagoon Pond, and when these nutrients arrive, they feed algae blooms that block sunlight from sea grasses. When the algae die, bacteria monopolize the oxygen needed by the Lagoon's plant and animal life while it digests the decaying algae. This is the process of eutrophication. Eutrophication consumes the water's dissolved oxygen, making it unable to sustain life.

Septic nitrogen and phosphorus enter wastewater primarily as urine. Unfortunately, in conventional septic systems, most of the nitrogen and phosphorus in the systems' leach fields sinks into the groundwater, then flows into the Lagoon, before it can be taken up by nearby plants.

If your house is in the Lagoon Pond watershed (outlined in blue below) and still relies on a conventional septic system or cesspool, we need your HELP! Please find your location on the diagram and consider what you can do to control the amount of nitrogen coming from your house.



What's Required

The damage to Lagoon Pond is extensive, and an intensive effort is necessary to restore its health. If as few as 1,200 households in the Lagoon Pond watershed prevented their septic nitrogen from entering the groundwater, the Lagoon Pond could maintain a robust and safe environment for plants and aquatic life.

Water quality, and the resulting problems caused by excess nitrogen and phosphorus entering the Lagoon Pond watershed, was studied extensively by the Massachusetts Estuary Project (MEP) and presented in the technical report titled Linked Watershed – Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Lagoon Pond Embayment System, Oak Bluffs and Tisbury, Massachusetts dated 2010. The MEP study estimated that the Lagoon Pond watershed was receiving 47 kg/day of nitrogen and that nitrogen sources within the watershed would need to be reduced by 16 kg/day to achieve the Total Maximum Daily Load (TMDL), the maximum amount consistent with a healthy aquatic ecosystem. Of the total 47 kg/day of nitrogen input, the MEP estimated that the nitrogen from septic systems was 34 kg/day.

What's required to reduce 34 kg/day of septic nitrogen by 16 kg/day? Based on the assumption that each household contains 2.3 people/yr (as determined by water use records) and each person contributes 2.1 kg/yr of nitrogen (MEP study), each household within the watershed contributes 4.8 kg/yr of nitrogen, or 0.013 kg/day. Approximately 1,200 households times 0.013 kg/day provides the required 16 kg/day reduction to reach the required TMDL.

Solutions

There are several ways to keep septic nutrients out of Lagoon Pond. Innovative/alternative (I/A) septic and municipal sewage systems prevent nitrogen and phosphorus from entering the groundwater. Both are expensive, and municipal sewage is not always available or feasible. An alternative and more affordable approach is eco-sanitation. There are several versions of eco-sanitation, but Urine Diversion (UD) is of particular interest. UD separates the urine at the source, keeping most of the nitrogen and phosphorus out of the septic system. In fact, the nitrogen and phosphorus can be harvested and recycled for intentional reuse as a terrestrial fertilizer, rather than an unintentional marine algae fertilizer. Composting and incinerating eco-toilets further reduce the nitrogen and phosphorus from entering the groundwater by converting solid human waste into usable fertilizer in the form of compost or ash, but simply removing the urine-derived nitrogen alone solves most of the problem.

Urine Diversion (UD)

Urine makes up only about 1% of municipal wastewater volume, but contains 80% of the nitrogen and 55% of the phosphorus contained in that wastewater. Phosphorus is a limited resource that is mined and needed in agriculture, but it is projected to be depleted globally in the next 25-30 years. Nitrogen is also needed as an agricultural fertilizer but unlike phosphorus it can be produced through an industrial process, although that process is very energy intensive. UD provides the opportunity to capture and recycle both nitrogen and phosphorus as essential agricultural fertilizers which can help improve global food security, reduce energy consumption and increase overall ecological sustainability of our communities.

In UD systems the urine is collected and treated separately from feces and paper. The urine flows through a separate pipe into a holding tank, generally in the basement of a building. UD toilet fixtures can be waterless or water flushed with smaller amounts of water than conventional mixed waste flush toilets. Typical urine diverting toilets have front and rear drains to collect and channel urine and feces separately and require sitting use. Standard waterless urinals are an alternative for males, offering no change in user experience.

Special "split bowl" UD toilets are designed to collect urine in the front of the bowl and are now being designed and sold by major manufacturers. This allows separation and requires the user to sit. Urine flows through piping into a holding tank, which is pumped periodically. The urine can then be treated and processed as fertilizer.

Use of urine as fertilizer provides an opportunity for a renewable resource and could reduce the amount of chemical fertilizer needed by farmers. The excess nitrogen not used for plant growth still enters the groundwater, but at much less volume than direct inputs from septic systems.

Separation and storage of urine provides the bulk of the nitrogen and phosphorous reduction to the groundwater, and in the simplest version of eco-sanitation, standard septic systems continue to collect the solid waste. Implementing urine diversion alone could put the goal of a healthy Lagoon within reach. Additional reduction can be achieved with composting toilets, which convert solid waste to compost, or incinerating toilets, which convert waste to sterile ash.

There are many potential benefits and savings from eco-sanitation: decreased costs, water conservation, nutrient recycling, and energy savings. Special toilets and infrastructure cost more than traditional toilets, but they are still significantly more affordable than the tens of thousands of dollars for innovative/alternative septic systems or sewering. Operating costs are lower as well. In dry UD systems water usage is significantly reduced. Utilizing urine as fertilizer reduces purchased fertilizer needs and energy requirements. Depending on the type of system implemented, energy savings can be realized at the building, as well as at the wastewater treatment plant. Manufacturing and transportation savings are also possible if fertilizer is used locally.

Other considerations are public perception and social acceptance, as well as concerns regarding pharmaceuticals in urine being incorporated by the fertilized plants. We must remember that, in the not too distant past, people thought indoor toilets were a disgusting idea but we have adapted as a society. Now we are at another apex where our current practices are devastating our environment and we must adapt if we want to improve conditions. With respect to pharmaceuticals, scientific consensus is that the risk is low for plants to take up these substances in harmful amounts.

Conclusions

It is clear that our existing controls of septic waste entering the Lagoon are woefully insufficient. Sewers and innovative and alternative system rollouts, while effective at reducing nitrogen, are expensive and require decades to implement. The Lagoon does not have the luxury of time. It is battling increased nitrogen, phosphorus and resulting algal blooms, as well as warming waters from global climate trends. We must use every tool in our toolbox to begin to improve the quality of the water in the Lagoon. Eco-sanitation, in all of its forms, is a cost effective and timely alternative. We must urge our lawmakers and the manufacturers of these systems to approve and develop UD alternatives that work for all of us. The time is now, before the Lagoon becomes fully eutrophic -- a stagnant and lifeless Pond. It is up to all of us.

For more information and how you can help, go to: https://www.lagoonpondassoc.org/

Many thanks go to Bryan Horsley and the Massachusetts Septic Test Center (MASSTC) for their contributions to this paper. If you would like to learn more or volunteer to join a UD test project, please go to: https://www.masstc.org/