Vermont Legislative Research Servirpn1Tf6g ;"
ernative wastewater systems consisting of alternative toilets and
entfor hand-pumped or hand-carried water to accommodatelow-impact

[1] Vermont's current system does not allow for low-impact wastewater systems,such as alternative toilets,in personal residences,which some individuals who are perusinglow-impact lifestyles would like tobe able use. Traditional 3 Definitions

Systems for obtaining potable water and

The EPA defines "blackwater" as "any waste from toilets or urinals," and "greywater" as "wastewater that has been used for washing, laundering, bathing, or showering."

[2] Blackwater and greywater together are considered wastewater. Low-impact wastewater systems must dispose of all wastewaters, although they may be through different structures (such as composting toilets for blackwater and constructed

holding tank."[4] Finally, the EPA defines a vault privy as a "modern outhouse" which is "set over a watertight tank," often made of concrete, plastic, or fiberglass.[5]

The regulation of greywater disposal systems varies greatly between states and some states' departments do not acknowledge greywater at all.[6] States that do have code regarding greywater management sometimes allow for an alternative system that does not require a septic tank. Generally, these alternative approaches, such as a leaching field, filtering, or re-use of greywater in the household after filtration have a lesser environmental impact than traditional septic systems.[7] The proposed legislation is considering leaching fields for hand-carried or hand-pumped greywater.

Low-Impact Greywater Systems

Low-impact greywater systems dispose of wastewater from showers, sinks, and washing machines. This is separated from blackwater, which is from toilets. Greywater systems must be hooked up to a septic system or soil disposal system to be disposed of properly because it contains harmful substances. Nitrogen, phosphorous and pathogens such as viruses and bacteria are of particular concern.[8] State-approved greywater disposal systems are necessary to prevent environmental harm and risks to public health.[9] Soil filtration systems work because greywater that can seep into soils filters properly and does not pose risks.[10]

There are three levels of greywater treatment: in the first, settleable and suspended solids are removed; in the second, biodegradable organic matter is removed; and in the third, nutrients are removed and the wastewater is disinfected.[11] Untreated greywater should not be directly spread on plants. Untreated greywater can still cause public health and environmental

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[4] U.S. Environmental Protection Agency, September 1999, https://www.epa.gov/sites/production/files/2015-06/documents/incinera.pdf.

[5] Kansas Department of Health and Environment, , 2020, https://www.kdheks.gov/nps/lepp/ChVIIIWaterConservingFinal.pdf.

[6] Greywater Action, "Greywater Codes and Policy," accessed February 18th 2021, https://greywateraction.org/greywater-codes-and-policy/.

[7] Greywater Action, "Greywater Codes and Policy," accessed February 18th, 2021, https://greywateraction.org/greywater-codes-and-policy/.

[8] Massachusetts Department of Environmental Protection, , April 2005, https://www.mass.gov/doc/composting-toilets-greywater/download#:~:text=Title%205%20(310%20CMR%2015.289,contained%20units)%2C%20unless%20DEP%20has.

[9] A. Gross et al. "Environmental impact and health risks associated with greywater irrigation: a case study," 52, no 11 (2005): 168.

[10] Peter L. M. Veneman and Bonnie Stewart, "Greywater Characterization and Treatment Efficiency," final report for (December 2002): 26.

[11] Dilip Ghaitidak and Kunwar Yadav, "Characteristics and treatment of greywater—a review," 20 (May 2013): 2799.

Another option for disposing of blackwater material is for it to be put into a leach field. Leach fields are “the portion of a soil-based wastewater system used to disperse wastewater into the soil,” according to the Vermont Department of Environmental Conservation.[16] The solid waste is buried into a leach field, which is permanent. However, soils must be suitable for such activity, adhering to the rules put forth by the Vermont Department of Environmental Conservation which means they are deep enough and allow for proper percolation. There remains a risk for water contamination from this process if the leach field is improperly placed relative to the groundwater location and level.

As it stands, the Vermont Department of Environmental Conservation policy for disposing of blackwater from a composting or incinerating toilet is through “shallow burial at a location approved by the Secretary in a permit, provided the location meets the following requirements: (A) complies with the isolation distances and isolation zones required pursuant to § 1-912 for locating an in-ground each field; and (B) maintains a 3-foot separation between the bottom of the excavation for the contents to the seasonal high-water table and a 4-foot separation between the bottom of excavation for the contents to bedrock.”[17]

If blackwater cannot be disposed of on private property,t (g)2 .005 T12.1 8 Td[(I)7 (0 (w)1Ab20 ƀDC 0.001 T(c)8

in remote areas where sewage systems are impractical or expensive to install due to shallow soil, severe cold temperatures, steep slopes and high groundwater levels.[20]

However, incinerating toilets have drawbacks as well. While they save water, they increase energy use which incurs both an added cost and air pollution.[21]

Vault Toilets

Vault toilets are emptied similarly to how septic systems are emptied. A septic company will empty the vault through a hose, which must be done periodically as the vault will fill up. Instead of having blackwater go to a septic system, vault privies eliminate the need for piping since the waste is held directly under the toilet in a vault system.[22]

Health Considerations of Alternative Toilets

Composting toilets must correctly manage aerobic decomposition of organic waste, which makes it safe to reincorporate into soil. Correct composting provides nutritional value and creates healthy soils. Composting human waste is a particularly hard process because of how long it takes to break down and how specific the conditions must be for this to happen. For there to be a high-end product that meets safety standards, the process must be highly managed and the process must include a "rapid temperature rise," stimulating the "thermophilic microbial consumption of organic matter." This consumption is what produces safe, high-end compost of human waste.[23]

To properly ensure that this reaction is occurring, the organic matter must have proper and continuous access to biodegradable carbon and nitrogen, in addition to oxygen and water. This substance must then experience "forced aeration, periodic mixing and watering in order to prevent inhibition and premature cooling." The proper temperature for such compost is 55ºC (or 131ºF) for between 3 days and 3 weeks before it may be allowed to cool down. This extended, hot temperature is what kills pathogens. However, the World Health Organization recommends a slightly lower temperature of 50ºC (122ºF) for between 7-30 days before allowing it to cool and cure for 2-4 months.[24] In addition, moisture levels need to be moderated

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[20] U.S. Environmental Protection Agency, September 1999, https://www.epa.gov/sites/production/files/2015-06/documents/incinera.pdf.

[21] U.S. Environmental Protection Agency, "Water Efficiency Technology Fact Sheet."

[22] "Portable Vault Toilet Service Unit," U.S. Forest Service Technology and Development Program, Brenda Land, last modified July 2004, https://www.fs.fed.us/t-d/pubs/html/04231304/04231304.html.

[23] Geoffrey B. Hill, Susan A. Baldwin, and Björn Vinnerås. "Composting toilets a misnomer: Excessive ammonia from

to prevent anerobic conditions from forming or slowed microbial activity. This level needs to be between 40-60% water, which must be monitored frequently as well.[25]

The composting process is highly technical and requires constant monitoring to ensure that all pathogens have been killed and the compost rendered safe. Because this process is difficult, it is easy to skip steps or do it incorrectly, which results in unsafe compost. Hill, Baldwin, and Vinnerås cite seven studies that find that this occurs often, usually due to "poor design, overuse, insufficient maintenance, low temperatures, anaerobic conditions, and excessive urine."[26] Anaerobic conditions, which can develop when moisture level is not high enough, can sustain pathogens. Compost that does not meet correct standards can possibly transmit pathogens, cause the eutrophication of water systems, and have poison and kill plant life.[27]

The World Health Organization standards for fecal sludge that are not contained in a septic tank are that they are either taken care of by "transferring treatment technologies" such as composting or incineration, or allowed into a wet-pit leach field that does not have any possibility of contaminating the environment where it could reach humans.[28]

Policies in Other States

Massachusetts

Massachusetts' statutes require the state Department of Environmental Protection to develop an environmental code which includes rulemakings about sewage disposal.[29] The following are relevant regulations described by 301 Code of Massachusetts Regulations.[30] Composting toilets are allowed under narrow circumstances. Residential facilities are only permitted to install

any residual material must be buried onsite under six inches of soil, an approved offsite location, or removed by a licensed septage hauler.

In conjunction with a composting toilet, an alternative greywater system is allowed. All proposed sites for greywater disposal must be evaluated by Soil Evaluator and the Approving Authority on conditions of: deep observation hole testing, soil profile determination, percolation testing, landscape position, and hydrogeologic properties. If conditions are sufficient, and only greywater will be processed, a filter system approved by the Board of State Examiners of Plumbers and Gas Fitters and/or the Department may be used in place of a septic tank and in combination with a soil absorption system.[31] Additionally, the size of the soil absorption system in new construction may be redudpateraup teon]TJTf(((a)4 (c)4 bs)64 (lff1v0 (c)8 (o)2 (Tu

Maine also allows for primitive disposal systems equivalent to what the H.70 bill calls “low

Within just the past year (2020) there have been 110 sewage overflows due to wet weather in Vermont.[45] There were an additional 40 cases of overflow not caused by severe weather and 117 cases have been reported but not reviewed by the department of environmental conservation.

often use wells which are costly to build especially with environmental considerations such as soil quality and location.[54] The cost of traditional water systems will likely increase over time at a rate that is higher than inflation.[55] This is largely due to the costs of keeping up with sanitation practices that are vital in order to maintain safe drinking water. Urban areas tend to have cheaper access to water but those on or below the poverty line in rural areas tend to struggle in paying for water and plumbing services.[56]

Conclusion

Vermont homeowners most commonly receive their water piped from a municipality and dispose of both blackwater and greywater through a traditional septic tank. While certainly the most ubiquitously used water system, it occupies large areas, uses higher volumes of water, faces overflow, and can become expensive to construct. States that have made alternative wastewater systems legal have attempted to ensure the potential shortcomings are prevented. Both Massachusetts and Maine, examined in this report, approach this task differently. The proposed Vermont legislation, H.70, provides residents with alternative wastewater systems that may be better suited towards their needs but creates additional challenges in effective regulation.

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