Executive Summary

- Onsite wastewater treatment systems using conventional technology can provide effective treatment for wastewater when they are properly sited, designed, operated and maintained following current design standards. But there are limitations to their effectiveness in certain situations, depending on the water quality goals and priorities for specific locations and watersheds, and more advanced technologies are necessary to achieve water quality protection and restoration goals in some locations in New York.
- Older onsite systems that were constructed before current codes and design standards were implemented are often located on smaller lots, in soils that are not as suitable, are undersized, or have other limitations that reduce their effectiveness. Additionally, older systems that may have worked effectively for their initial uses, such as serving summer cottages, may not be working effectively more recently when homes have been converted for year-round use, or when soils that can adsorb phosphorus from wastewater has reached a saturation point after years of use.
- In most communities and watersheds in New York, it is the responsibility of the property owner to maintain onsite wastewater treatment systems, and there is often no ongoing, pro-active outreach, oversight or inspection program by government agencies to ensure that owners are maintaining their systems. The result is that onsite systems that are not performing adequately can go undetected for long periods of time.
- Communities in New York have a great deal of authority and latitude to implement locally-based education, outreach and other steps to encourage and even require maintenance of onsite wastewater systems. This is possible through basic home rule authority of local government under NY State law, and in some communities, it is also enabled through watershed rules and regulations that have been enacted by the NY State Department of Health for those communities. (For more information on home rule authority in New York and the state’s Municipal Home Rule Law, see Adopting Local Laws In New York State, a guidance document from the NY State Department of State. 1
- For addressing public health and water quality goals, a more sustainable approach over the longer term in some locations and situations may be development of small community collection and treatment systems that serve a number of homes or other buildings. For example, in hamlets or villages with buildings on smaller lots and older onsite systems installed before current codes were in place, it may be more cost-effective to plan a new community system targeted to serve the denser portion of the community. A variety of collection and treatment technologies are available and can be employed to achieve this goal in New York, and there are useful case studies where communities have implemented projects like this in recent years. In addition to water quality and public health, this approach can open up new community and economic development opportunities in locations where health codes have prohibited all new development due to failing onsite systems.

• The development of a watershed plan for protection and restoration of water quality, with a focus on managing onsite wastewater treatment systems, is one approach communities can use to begin addressing these issues. The development of a TMDL (total maximum daily load) plan, or a Nine Element plan, are among the strategies communities can use. This approach may open up possibilities for funding to support watershed planning and related education and outreach activities that can address onsite wastewater management priorities along with other issues.

Overview
Onsite wastewater treatment systems, or systems that serve a small group or cluster of homes, provide wastewater treatment for more than 20% of the homes in the U.S.\(^2\) The USEPA estimates that about 20% all onsite systems are failing to perform as designed at any given time. These failing systems present a significant risk to water quality and, in some cases, to public health. Addressing these issues is an important element of a comprehensive approach to watershed protection and restoration. This article is intended to provide an introduction to basic information about onsite systems and how they can be managed to protect and improve water quality in watersheds in NY State.

Introduction to laws and regulations relevant to OWTS
Most onsite wastewater treatment systems (OWTS) are regulated in NY State through Appendix 75-A of the NY State Department of Health Sanitary Code\(^3\) and most of them discharge to soils and groundwater (e.g., via a what’s commonly called a leach field for conventional systems generally called septic systems). This section of state law includes design standards for new OWTS that are required to be followed when new homes or other buildings with sanitary facilities are being designed and approved at the local level.\(^4\) In many counties in NY State, there’s a county health department that is responsible for administering these regulations. In some counties that don’t have their own health department, these responsibilities are handled by a regional office of the NY State Department of Health (one example of a county that is served by a regional office of NYS DOH near the mid-Hudson region is Sullivan County). The design standards for OWTS that have been promulgated by NYS DOH are now in a document known as the “Green book” (it was formerly known as the Red book). These standards have not been revised in many years (with the exception of a few fairly modest revisions that were finalized several years ago after a number of years of planning, solicitation of comments, etc.)

A separate section of law relevant for some OWTS, which is based on the Federal Clean Water Act, is New York’s State Pollution Discharge Elimination System regulations, known as SPDES. The Federal Clean Water Act includes a permitting system for discharges of municipal and industrial wastewaters, termed National Pollution Discharge Elimination System (NPDES), and after New York (and many other states) took on the primary role for administering these regulations, New York State’s regulatory framework was termed SPDES. The NY State Department of Environmental Conservation (NYS DEC) is the state agency responsible for administering the SPDES regulations and permits in most cases. Most SPDES permits are for discharges to streams or other surface water bodies, but some are for discharges to the soil and groundwater, and this is relevant for understanding some of the relevant regulations and how they are implemented.\(^5\)

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\(^2\) [https://www.epa.gov/septic/septic-systems-overview](https://www.epa.gov/septic/septic-systems-overview), accessed January 29 2018


\(^4\) Design standards are available at: [https://www.health.ny.gov/environmental/water/drinking/wastewater_treatment_systems/docs/design_handbook.pdf](https://www.health.ny.gov/environmental/water/drinking/wastewater_treatment_systems/docs/design_handbook.pdf)

\(^5\) NYSDEC SPDES permit program [http://www.dec.ny.gov/permits/6054.html](http://www.dec.ny.gov/permits/6054.html)
According to New York’s regulations for wastewater discharges to soil and groundwater, the relevant regulations for individual treatment systems and discharges, and the agency that administers the regulations, both depend on the volume of water the system is designed and permitted to discharge each day, as follows:

- Systems designed and permitted for discharge up to 1,000 gallons per day (GPD) of treated water are regulated solely by Appendix 75A in the NY State sanitary code;
- Systems for discharges between 1,000-10,000 GPD are regulated according to the state’s SPDES regulations, but for systems in this range, the NYS DOH has the responsibility for administering the review of proposed system designs and for approving permits for them, and as noted above, this is generally done by a county DOH office or a regional office of NYS DOH. This transfer of authority and responsibility for design review and permitting of systems was implemented through a memorandum of understanding between NYS DEC and NYS DOH in 1984. But if DOH wishes to have the DEC directly involved in review of a specific OWTS proposal and design, DEC will get involved and in some cases, DOH will give most or all of the review responsibility for a specific system to DEC. (A presentation developed by the NY State Dept. of State’s local government training program references this 1984 MOU and provides a lot of other relevant perspective – it’s available at https://www.cwicny.org/misc/onsite.pdf)
- Systems for discharges over 10,000 GPD are regulated by SPDES and NYS DEC retains the primary role for administering review of system designs and for permit approvals.

The three bullets above all refer only to systems that discharge to soil and groundwater. For wastewater treatment systems that discharge to streams or other surface water bodies in NY State, all discharges are regulated by the SPDES regulations and the NYS DEC is the agency that administers review of system designs and permits for systems of any size.6

Water quality and public health considerations

- The primary constituents of domestic wastewater that conventional onsite systems are potentially able to treat effectively include microbes, including bacteria and other species, some of which are human pathogens, and nutrients, including carbon, phosphorus and nitrogen. Phosphorus removal is achieved in conventional systems primarily through adsorption to soil particles. Nitrogen removal can be achieved depending on the presence of specific conditions that allow certain biogeochemical processes to occur, leading to denitrification and release of harmless nitrogen gas into the air. But conventional systems are generally considered to be not sufficient to achieve nitrogen removal in many situations. Newer scientific information regarding water quality priorities in freshwater bodies suggests that controlling nitrogen discharges is often a priority, and this is a relatively recent development that’s relevant for comprehensive approaches to watershed restoration in freshwater, upland watershed areas in New York.

• Water quality goals for onsite systems include protection of public health and protection of aquatic ecology, habitat and aesthetic values in streams and other waterbodies. Onsite systems can, in some cases, provide effective protection for public health even while they are not fully protective of these other values. Beyond protecting against acute health risks from bacteria and other pathogenic microbes, preventing nitrate concentrations above 10 parts per million is a key priority for public health where groundwater provides potable water supplies. Nitrogen removal capabilities in onsite systems may be a high priority where homes are dependent on groundwater for potable water supply and where homes are located at suburban densities, even when residential lots are as large as 1-2 acres.

Clustered, small community, or decentralized wastewater systems

In NY State, according to current regulations, it is challenging to use wastewater technologies and systems that provide treatment capacity to serve buildings located on separate tax parcels with one shared system that serves multiple parcels. The NYS DOH will not approve new systems that serve more than one tax parcel unless the system is owned by a municipality or certain other government entities, such as a public authority (for example, the Dutchess County Water and Wastewater Authority). This applies to all wastewater systems, whether they discharge to groundwater or surface water. Still, in many situations, there are important advantages if more than one parcel can be served by a single wastewater system. In fact, a lot of Federal and state policies and funding decisions over many years have been based on a belief that wastewater treatment is best accomplished at a community or even regional scale. This article is focused on OWTS and systems that serve smaller groups of properties and does not address details about the relative benefits and limitations of larger community wastewater systems, but several references are included at the end for more information about these issues.

Wastewater systems that serve a relatively small number of homes or other properties are often termed “clustered” systems. In some cases, these systems were designed and installed as part of the initial development plan for a group of homes, and in others they have been retrofitted years after homes were built, often when homes were originally built for seasonal use, such as small homes commonly built around lakes. Over time, especially in regions that have experienced significant development, it’s very common that these seasonal homes have been converted over time for year-round occupancy. Typically, upgrades to old onsite wastewater systems become a priority where older homes were built on small lots using wastewater designs that are now obsolete, such as simple cesspools, which do not provide effective treatment and protection of water quality in most cases. Where enough homes have substandard onsite systems and other factors are in place, some communities have installed new wastewater collection systems and a treatment plant of some kind to provide more effective treatment for protection of human health and the environment. (On a related note, in the Hudson Valley region in New York, and perhaps other areas in the state, where new wastewater treatment plants were designed and installed to serve a single subdivision, they are often called “package plants”.) The term “decentralized” is used to refer to both onsite systems serving a single building or property, and also to clustered systems, which are also called small community treatment systems.

The design, construction and operation of clustered or small community wastewater systems can take advantage of a variety of technologies for collection, treatment and dispersal (or discharge) of wastewater, some of which are particularly suitable for smaller systems and which can become less feasible to use as community wastewater systems become larger in scale. For example, small diameter pipe collection systems can enable installation of collection systems at lower cost, because they can be designed so they do not need to simply use gravity to allow wastewater to flow downhill to the
treatment plant, which larger collection systems always strive to do (though in flatter areas, it is common for large systems to use pump stations when collection pipes cannot flow by gravity alone). Small community treatment systems can use constructed wetlands, aerated lagoons, and other innovative designs that can have significant advantages as compared to more conventional treatment technologies, including reduced energy use. Spray irrigation is a fairly common approach for dispersing effluent following treatment in an aerated lagoon, and this has been permitted and used in NY State. (Drip irrigation systems are another option for dispersing treated effluent but this has not been used much in New York to date.) A key tradeoff involved in decisions about which treatment technology to use involves the availability of land — where more land is available, options like wetlands, lagoons and spray irrigation become feasible, and where it is not, mechanical treatment systems that need less space may be preferred. Golf courses, other open space or parks, tree farms, and other areas can be used for spray irrigation of effluent, so open space areas can serve multiple functions with the appropriate planning, design and operations measures. Mechanical treatment systems have the advantage of taking less space and, often, being more familiar to many design engineers, but they often tend to use more energy for operations.

Other regulations relevant to OWTS

In certain situations, regulations other than the ones outlined above can become relevant for issues related to siting and other aspects of onsite or small community wastewater systems. These are some relevant regulations, but this is not a comprehensive list and there may be others:

- The NY State law called Protection of Waters regulates activities in streams and in the regulated buffer area along streams, and where an OWTS is located closer to a stream or other waterbody, this state law administered by NYS DEC may be relevant in certain situations.
- The MS4 regulations for stormwater management require management of many kinds of pollutants, including effluent from onsite wastewater systems. In designated MS4 communities, if an onsite system is failing and causing a water quality violation, this is an issue the MS4 municipality must address to meet their responsibilities under these regulations, specifically as part of the illicit discharge detection and elimination program required for MS4s.
- Watershed rules and regulations (which are authorized by in the state’s sanitary code), where they have been enacted, can provide a specific legal mechanism enabling municipal inspection and enforcement to ensure effective operation and management of onsite wastewater systems.

Educational Resources:
Note: A number of the documents cited and linked in the article and footnotes above are relevant for basic information about onsite wastewater systems serving individual properties. Some of the resources listed below are more relevant for clustered, neighborhood-scale, or community wastewater system planning, while several are relevant for individual onsite system design, maintenance, etc.

*Establishing Private Water and Sewer Systems -- What Every Municipality and Planning Board Should Know*, an article by Bridget Barclay, available at:

Town Special Districts in New York: Background, Trends and Issues, a guidance document published by the NY State Comptroller in March 2007, with information on forming special districts and related issues, available at:

https://osc.state.ny.us/localgov/pubs/research/townspecialdistricts.pdf

Valuing Decentralized Wastewater Technologies: A Catalog of Benefits, Costs, and Economic Analysis Techniques, published by the Rocky Mountain Institute in 2004, which is a comprehensive evaluation of economic factors and other considerations regarding the relative benefits of decentralized wastewater management strategies. It is available at

http://www.10xe.org/Knowledge-Center/Library/W04-21_ValuingDecentralizedWastewater

Onsite Wastewater – this is a resource page at the U.S. Center for Disease Control and Prevention, with links to a number of documents and other websites with relevant information. (Note: One resource listed here, the National Small Flows Clearinghouse of the National Environmental Services Center, was a very comprehensive resource with hundreds of fact sheets, videos, and technical documents, but on Jan. 29 2018, a web search found that this site is apparently no longer working, and the CDC page below may be one of the better alternatives.)

https://www.cdc.gov/nceh/ehs/topics/wastewater.htm


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