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# SEPTAGE MANAGEMENT IN NORTH CAROLINA

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## SOIL SCIENCE NOTES

## Number 2

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Approximately fifty percent of the homes in North Carolina utilize septic tank - soil treatment systems to treat and dispose of domestic wastewater. The septic tank, one of the integral parts of the system, is designed to remove and treat solids. These solids are referred to as septage. When properly managed, the land application of septage is an environmentally sound alternative to the earlier days when septage was land filled or buried in pits.



**WHAT IS SEPTAGE?** Septage means solid waste that is a fluid mixture of untreated and partially treated sewage solids, liquids, and sludges from human or domestic origin which is removed from a wastewater system. The term septage includes the following:

- Domestic septage is either liquid or solid material removed from a septic tank, cesspool portable toilet, type III marine sanitation device or a similar treatment system that receives only human or household wastewater.
- Grease septage is material pumped from grease interceptors, separators, traps, or other appurtenances used for the purpose of removing cooking oils, fats, grease, and food debris from the waste flow generated from food handling, preparation, and cleanup. Restaurants should be encouraged to pump grease traps monthly to improve the efficiency of the grease traps and reduce the concentrations of grease and oils in the material land applied.
- Industrial or commercial septage is material pumped from septic tanks or other devices used in the collection, pretreatment, or treatment of any water-carried waste resulting from any process of industry, manufacture, trade, or business where the design disposal of the waste is subsurface. Domestic septage mixed with any industrial or commercial septage is considered industrial or commercial septage.

Material pumped from commercial facilities such as restaurants, grease traps, gas stations and shopping centers is considered industrial septage. Industrial septage requires special handling, treatment and disposal methods. If the material to be pumped is questionable, it should be sampled for chemical analysis prior to the tank being pumped.

**DISPOSAL PRACTICES:** Currently there are three acceptable methods of septage disposal.

1. Treatment at a wastewater treatment plant
2. Treatment at an independent septage treatment plant
3. Land Application

Each method has its advantages and disadvantages. Treatment at a wastewater treatment plant allows for the

centralization of waste treatment facilities. However, the facility must have the capability to store and treat the septage. Treatment at an independent septage treatment plant provides a regional solution to septage treatment but it has high capital, operational, maintenance costs. Land application is relatively simple and

economical.

**LAND APPLICATION:** Septage contains many nutrients essential for plant growth. Land applying the septage in accordance with federal and state regulations poses little risk to public health and the environment. Federal and state rules require that septage meet operational standards for pathogen and vector reduction. Pathogens are agents that can cause disease if not properly treated. Vectors are considered to be any organism that might transport a pathogen off-site. Examples are flies and rodents.

The pathogen reduction requirement on the receiver site in the United States Environmental Protection Agency (US-EPA) 503 regulation can be achieved through either defined management practices, requirements for soil incorporation, or through alkaline stabilization of the septage. The management practices are primarily restrictions on harvesting and requirements for restricting public access to the site

Certain crop restrictions are required by the federal and state regulations:

1. Food crops with harvested parts that touch the soil surface, but are totally above ground, cannot be harvested for 14 months after application. Examples include melons and cucumbers.
2. Root crops cannot be harvested for 20 months after application if the septage is not disked in and remains on the soil surface for 4 months or longer. Examples include carrots and turnips.
3. Root crops cannot be harvested for 38 months after application if the septage remains on the soil surface for less than 4 months.
4. No crop can be harvested for at least 30 days following application of septage.
5. Animals cannot be grazed on a septage receiver site for 30 days following land application.
6. Turf can not be harvested for one year following application of septage if the turf is to be placed on any sites with high potential for public exposure.

In addition, public access must be restricted for at least 30 days. These restrictions include fencing and posting of signs. Any remotely situated site is considered to have a restricted access by virtue of the location.

There are three vector attraction and reduction alternatives listed in the 503 regulation. One of the following of the vector attraction reduction requirements must be employed whenever septage is applied to land.

1. Septage can be injected into the soil surface at the time of application and no significant amount of septage can remain present on the soil surface one hour after application. The regulation does not define a significant amount of septage.
2. Septage must be incorporated into the surface soil within six hours of application.
3. The pH of septage must be elevated to and maintained at a pH of at least 12 for a minimum of 30 minutes without the addition of more alkaline material.

**L**IME STABILIZATION is the method of choice for treatment of septage to reduce pathogens and vectors prior to land application. The lime or alkaline stabilization process requires septage haulers to add sufficient lime ( $\text{Ca}(\text{OH})_2$ ) to the septage to achieve a pH of 12 for at least 30 minutes without the addition of more alkaline material. Typical agricultural limes, such as calcitic or dolomitic lime, are not suitable for raising the pH to 12.

The amount of hydrated lime needed to raise the pH to 12 will vary according to the water hardness in the area, the amounts of solids in the septage and other factors. Typically 100 pounds of hydrated lime will raise the pH of 1000 gallons of septage to 12 or greater for 30 minutes. The lime can be added at the septic tank, vacuumed or dumped into the pumper tank, or added to a holding tank or lagoon. The most reliable method for determining the amount of lime needed is to actually monitor the pH of the septage as lime is added. Inexpensive pH kits can be obtained for this monitoring.

**N**UTRIENT MANAGEMENT is required by the North Carolina Septage Management regulation. In short, nutrient management is pollution prevention achieved by developing a nutrient budget for the crop, applying nutrients at the proper time, applying only the amounts of nutrients necessary to produce a crop, and considering the environmental hazards of the site. The goal of nutrient management planning is to develop soil fertility programs consistent with realistic production goals which also minimize entry of nutrients by leaching or edge-of-field delivery into surface water or groundwater. Nutrient management planning includes managing all sources of plant nutrients such as soil reserves, commercial fertilizers, organic wastes, and crop residues. It entails the development of a management strategy that meets the needs of the farm as well as environmental groups and regulatory agencies. The basic process of writing a nutrient management plan for septage management is as follows:

1. Determine crop yield potential for each field, based on the known productivity of the soil, and yield-limiting factors.

2. Collect soil samples and have them analyzed by a laboratory using appropriate methodology and procedures.
3. Identify the total nutrient needs for the expected yield, using realistic yield expectations for nitrogen rates where applicable, and soil test results for other nutrients.
4. Include credit for nitrogen provided by a previous legume crop, or past manure/organic waste applications.
5. Recommend applications for fertilizers, manure or other waste to supply the needed nutrients for optimal crop production.
6. Use agricultural nutrient Best Management Practices to minimize potential nutrient loss from the land and to maximize plant utilization of the applied nutrients (NRCS nutrient management technical guide and Soil Facts, "Best Management Practices for Agricultural Nutrients", AG-439-20). Three best management practices that should be followed with regards to septage management are:

- a) septage should be land applied no earlier than thirty days before a crop is to be planted;
- b) crops receiving septage are to be harvested and removed from the field;
- c) cover crops are to be planted to stabilize the soil and reduce nutrient leaching during periods when a harvestable crop is not in the field.

**A**PPPLICATION RATES: The US-EPA has mandated that land application of septage be based on the nitrogen rate required to produce a realistic yield for the crop grown. The annual application rate yielded will be expressed as gallons per acre per year when using a crop nitrogen uptake expressed as pounds of nitrogen per acre per year. The equation below is used in the regulation to calculate the annual application rate for septage:

$$\text{gallons / acre / year} = \frac{\text{Crop Nitrogen Requirement (lb / ac / yr)}}{0.0026}$$

The coefficient 0.0026 is based on the average plant-available nitrogen content of 2.6 pounds of nitrogen per 1000 gallons of septage.

Below is an example calculation:

$$\text{gallons / acre / year} = \frac{110 \text{ lb / ac / yr}}{0.0026}$$

$$\text{Application rate} = 42,000 \text{ gallons/acre/year}$$

In addition to the requirements of the US-EPA 503 regulations, the North Carolina rules allow no more than 50,000 gallons/acre/year. In order to apply more than 50,000

gallons/acre/year the operator has to provide the Division of Solid Waste Management with evidence of adequate public notice and proof of successful completion of the Land Application of Residuals and Biosolids Course given by the Department of Environment, Health, and Natural Resources.

**STORAGE OF SEPTAGE:** North Carolina rules require an alternative plan for septage disposal should a site be temporarily unavailable for land application. If a waste treatment plant is unavailable storage detention facilities that have a minimum volume greater or equal to the average volume of septage pumped per week. The inclusion of storage facilities, such as above ground tanks and storage lagoons, greatly increases the flexibility of land application. Storage facilities may be used during the process of transferring septage to specialized application equipment, during periods when the soil is wet or frozen, or during planting or harvesting operations. Because open pits or unlined storage lagoons can be a major source of nuisance odors and groundwater contamination, enclosed holding tanks are recommended, although lined lagoons in isolated areas may be acceptable.

**BORDERS, BUFFERS & SETBACKS** are required to protect human health and the environment. When permitting a site, the Division of Solid Waste Management considers all the buffers required by state and federal law. These buffers include, but are not limited to, setbacks from:

- residences
- wells
- springs
- streams
- public road right of way
- food crops
- wetlands

The division also considers the feasibility of land applying septage to a small field. Such considerations include the turning radius of the application equipment and odd-shaped fields with tight corners. Septage disposal sites less than five acres in size, individual fields of a site less than two acres in size, and sites with complex soil patterns or unusual shapes will be permitted only if the applicant demonstrates to the Division of Solid Waste Management that the site can be properly managed for crop production and that septage can be evenly distributed over the site.

**RECORD KEEPING:** There are no formal reporting requirements listed in the US-EPA 503 regulation. The regulation does specify that records must be maintained by individuals who land apply septage. The following information must be recorded and retained by the septage applicator for five years following any application event:

1. Site location.
2. Number of acres involved in the land application program.
3. Date and time of each application event.
4. The nitrogen requirement of the crop grown on the land receiver site.
5. The gallons of septage applied in each application event, certification that the material is domestic septage only, and that pathogen reduction and vector attraction reduction requirements have been met.
6. A description of the pathogen reduction and vector attraction reduction methods.

**PERMITS:** There are three types of permits required for septage management firms in North Carolina. The first permit is for the firm that operates a septage pumping business, disposes of portable toilet waste or manages septage from properties which they own, lease or manage. Information required for the application of a septage management firm permit includes, but is not limited to, the owner's name, business name, and counties of operation.

The second permit is for the sites that will be utilized for the land application of the septage. Information required for the application of a site permit includes, but is not limited to, the location of the site, types of septage to be land applied, anticipated volume to be applied, aerial photograph of the site and background soil analysis.

The third permit required for the septage management firm is for the storage facility. Information required for the application of a storage facility permit includes, but is not limited to, the location of the facility, types of septage to be stored, description of the facility including size, number and types of structures to be used.

The owner of the septage pumping business is responsible for obtaining all permits to haul and land apply septage. To apply for a permit, contact the Department of Environment, Health and Natural Resources - Division of Solid Waste Management - Composting and Land Application Branch.

**CONCLUSION:** When properly managed, the land application of septage is a safe and environmentally sound practice that provides nutrients required for plant growth. It is an essential part of the treatment of human wastes and is an excellent alternative to earlier days when septage was land filled or buried in pits.