

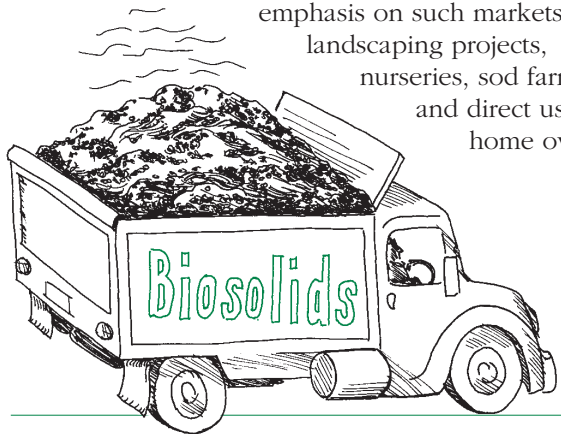
## Doing What Comes Naturally

Every day millions of gallons of wastewater containing human and household wastes pass through sewer lines to municipal treatment facilities. During treatment, solid, semi-solid, and liquid residues, or sludges, are removed from the wastewater. These sludges are composed of water, organic matter, nutrients, such as nitrogen, phosphorus, calcium, and magnesium, and micronutrients, such as zinc and iron. Over the past several years, the quality of municipal sludges has improved considerably, due in part to the enforcement of federal, state, and local regulations and in part to pretreatment standards that indirect dischargers, such as industries, must comply with before they can send their wastewater to public facilities for final treatment.

Historically, sewage sludge has been considered a waste and has been dumped in municipal and commercial landfills or the ocean—such practices were easy and cheap. But times have changed and so, too, have our attitudes regarding sludge management. We have come to recognize that, like animal wastes, wastewater residuals are a part of the natural cycle of life. They have nutrient and soil-enhancing properties that make them a practical choice for a variety of beneficial uses.

Sludges that have been processed and treated so that they can be used beneficially are called biosolids. In general, biosolids are processed and treated to suit their ultimate application. Traditionally, liquid or dewatered biosolids have been applied successfully to agricultural lands, forests, or reclaimed lands. More

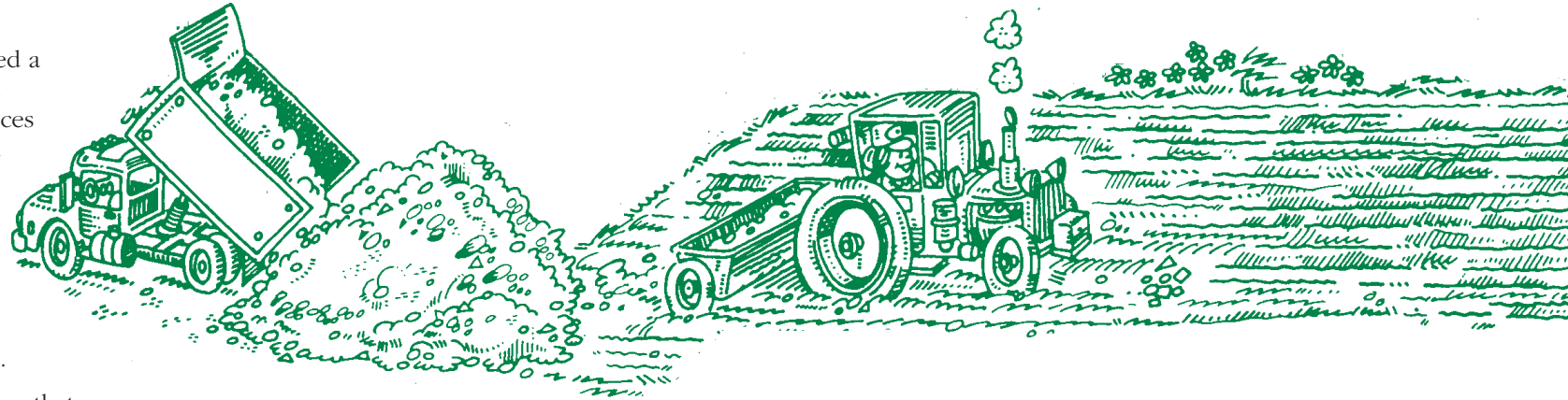
recently, there has been greater emphasis on such markets as landscaping projects, nurseries, sod farms, and direct use by home owners.



## Land Application

The notion of nourishing the land with human and animal wastes is not new. For thousands of years farmers have recognized the value of human manure as a fertilizer. In fact, sewage sludge has been applied to land in the United States and Europe for over 40 years. Today, over half of the sewage sludge generated in the U.S. is land applied.

Land Application refers to the application of biosolids to land to either condition the soil or to fertilize crops or other vegetation grown in the soil. Biosolids can be land applied by spraying or spreading the treated sludge onto the land surface or by incorporating or injecting the material into the soil.



Biosolids contain many of the same constituents as commercial fertilizers, including valuable organic matter, nitrogen, and phosphorus. While not a complete replacement for chemical fertilizers in terms of nutrient ratios, biosolids do some things that chemical fertilizers can't do. They're composed of organic matter that promotes necessary bacterial activity and improves the structure, texture, and water retention characteristics of the soil. These properties stimulate growth of vegetation, which helps reduce soil erosion and improve crop yields. Biosolids also provide trace metals and nutrients that commercial fertilizers do not have.

## 503 Standards

Biosolids that are to be applied to the land must meet pollutant limits set forth in EPA's Part 503 rule. Many of the 503 requirements are based on the results of an extensive multimedia risk assessment during which EPA addressed 25 pollutants using 14 exposure pathways. The risk assessment process resulted in the establishment of state-of-the-art risk-based standards for controlling the use or disposal of biosolids. In general, research results and operating experience over the past 25 years have greatly expanded EPA's understanding of the risks and benefits of using or disposing of biosolids.

Land application practices are also subject to operational standards to control disease-causing organisms, or pathogens, and to reduce vector (e.g., flies, birds) attraction. The 503s also include general requirements, management practices, and frequency of monitoring, recordkeeping, and reporting requirements. These requirements include specific provisions for both the biosolids preparer, or generator, and the person who applies the biosolids to the land.

## Practical Domains

Experience and science show that, as long as the process is managed carefully and wisely, land application of biosolids can be an effective, inexpensive, and "low tech" recycling option that benefits both generators and users. Considerations for land application sites may include depth to groundwater, distance to surface water, slope, soil characteristics, distance to drinking water supplies, and proximity to homes, schools, and other buildings. Agricultural lands, forests, reclaimed lands, and public works projects are the most practical domains for land application uses.

■ **Agricultural Lands** - Agricultural use accounts for approximately 77 percent of the biosolids that are land applied in the United States. This includes land that is used to grow both food crops and feed crops and pasture land. As with commercial fertilizers, farmers must follow best management practices when applying biosolids. The material must be applied at the correct "agronomic rate" for the plant being grown and must be monitored. Biosolids may need to be supplemented with other fertilizers to balance crop needs.

■ **Forests** - Biosolids are used in silviculture to increase forest productivity for certain tree species. The application of biosolids to forest land can shorten pulp wood and lumber production cycles, especially on marginally productive soils.

■ **Land Reclamation Sites** - Biosolids are used to help reclaim barren lands, such as mines, quarries, gravel pits, and construction sites. Biosolids provide nutrients and condition the soil so that vegetation can be established. Vegetation reduces soil erosion and helps make the land productive again.

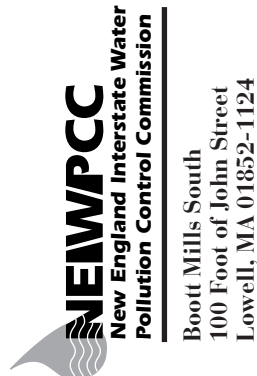
■ **Recreation and Other Uses** - Biosolids are applied to areas of land to condition the soil and enhance the growth of vegetation. Examples of such sites include parks, ball fields, golf courses, cemeteries, plant nurseries, and highway median strips.

**AGRONOMIC RATE = The rate at which nitrogen is applied to the soil to meet the needs of the crop being grown.**

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*Biosolids are a Natural Resource!*

# Land Application of Biosolids



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## A Residual of Worth

**S**ludge is an organic solid, semi-solid, or liquid by-product of the wastewater treatment process. Sludge characteristics vary depending on each treatment facility's wastestream and the processes that are used. Sludges that meet EPA standards for land application, which include reduction or elimination of pathogens and very low limits for heavy metals, are referred to as **Biosolids**.

Although there has been significant research on the beneficial use of biosolids, and history has demonstrated, in the U.S. and other regions of the world, that high quality biosolids can be beneficial soil additives and plant nutrients when applied properly, concerns still exist. These concerns relate primarily to the quality of the biosolid material and its impact on soil productivity, water resources, and adjacent land uses.

To ensure that sludges that are used as biosolids are treated and managed in a manner that protects both human health and the environment, Congress directed EPA to develop a comprehensive national Sewage Sludge Program aimed at reducing risks and maximizing the beneficial uses of sludge. In February of 1993, EPA issued its sewage sludge use or disposal regulation, 40 CFR Part 503, commonly referred to as the "503s." The 503s set minimum quality standards and dictate proper management practices for all sewage sludge that is used or disposed of through land application, surface disposal, and incineration. Many states have more stringent rules.

The Northeast States, NEIWPCC, and the EPA believe that, when managed and applied properly, biosolids can be valuable resources. With the phaseout of unlined landfills, the federal ban on ocean dumping, and growing public awareness of environmental issues, communities have begun to recognize that biosolids can be a resource and not a waste. Many communities have discovered viable, safe, and environmentally sound options for the beneficial use of their biosolids. Some communities have implemented a single beneficial use method, some employ a combination of different sludge use and/or disposal methods, others have entered into regional solutions or contracted with privately-owned facilities. In choosing an option, communities must consider cost, odor control, and siting issues.