

# Biosolids Fact Sheet

Oregon Association of Clean Water Agencies



## 1. What are biosolids?

Biosolids are the nutrient-rich organic by-product of domestic wastewater treatment. Biosolids are a beneficial resource. They contain essential plant nutrients and organic matter, and can be recycled and applied as a fertilizer and soil amendment, when properly treated and managed.

## 2. Why do we have biosolids?

Wastewater treatment creates clean water and residual solid material. The residual material is treated using one or more carefully regulated processes (biological, chemical or physical) to produce biosolids.

## 3. What is the difference between biosolids and sludge?

The term “sludge” describes the untreated solids removed in the domestic wastewater treatment process. Sewage sludge is treated to kill pathogens and stabilize organic matter to reduce offensive odors and its appeal to insects and rodents. The treated product is called biosolids once it meets federal and state standards allowing it to be beneficially used for land application.

## 4. What is in biosolids?

Biosolids contain nitrogen, phosphorus, other nutrients, and organic matter. Biosolids also may contain trace amounts of metals and organic compounds. These constituents originate from human waste, household plumbing systems, along with businesses and industries that discharge to the sewer system.

## 5. How are industries that discharge into the sewer system regulated?

Industries that create wastewater with higher levels of pollutants than domestic wastewater are required to remove pollution by pretreating their wastewater before discharging it to the public sewer system. Pretreatment and source control programs developed under the federal Clean Water Act have greatly improved the quality of biosolids since 1982 when the programs were started, as have bans on the manufacture and sale of toxic chemicals including PCBs and certain pesticides.

## 6. What risks do trace metals pose?

The U.S. Environmental Protection Agency (EPA) thoroughly studied the potential risks from trace metals in biosolids and set maximum levels in biosolids to ensure protection of public health and the environment. To date, studies indicate that

properly treated and managed biosolids can be land applied in an environmentally sound manner.

Many of the regulated metals in biosolids are beneficial in correct amounts, such as copper, molybdenum, and zinc which are micronutrients for plants. The presence of these micronutrients is one reason why biosolids can be more effective than mineral fertilizers at promoting plant growth.

## 7. What about organic compounds in biosolids?

Many chemicals used in society can be found in trace amounts in wastewater. The fact is, few chemicals of concern are found in biosolids. An EPA 2009 *Targeted National Sewage Sludge Survey*<sup>1</sup> investigated levels of several trace organic compounds in solids collected from 74 wastewater treatment plants nationally. The EPA study found some analytes were present in all samples, while others were present in none or only a few samples.

EPA will conduct a hazard and exposure assessment for these pollutants if sufficient data are available.

<sup>1</sup> Samples collected in 2006 & 2007 - see <http://www.epa.gov/waterscience/biosolids/insss-overview.html#background>

## 8. What about pharmaceuticals in biosolids?

Pharmaceuticals such as antibiotics and prescription drugs and personal care products (PPCPs), such as soaps, shampoos, detergents, and perfumes contain a wide variety of chemicals. The impact on the environment of the chemicals in pharmaceuticals and personal care products is the focus of considerable research. Although leading scientists see little threat to public health and the environment from PPCPs associated with biosolids, the EPA is currently developing better sampling and analytical procedures for PPCPs. Once improved sampling and analytical methods are in place, EPA plans to conduct exposure and hazard assessments for these pollutants which take into account toxicity data for humans and ecological receptors, solids pollutant concentrations, and the fate and transport of these chemical compounds.

The best way to reduce concentrations of pharmaceuticals in biosolids is to never flush unwanted drugs down the toilet, and to support effective drug take back programs. Purchase soaps and cleaners that are manufactured with the environment in mind -- such as those that are recognized by the EPA *Design for Environment Program* (Dfe)<sup>2</sup>.

## 9. How are biosolids used?

Across the United States, thousands of municipalities currently recycle their biosolids and apply them to land. Agricultural and non-agricultural sites benefit from the nutrients and soil conditioning value

of biosolids. The many successful uses of biosolids include: production of feed, horticultural, and biofuel crops; production of sod and maintenance of turf; improved forest productivity; and reclamation and revegetation of areas disturbed by mining and construction activities. Highly treated biosolids are also used as part of a topsoil mix for revegetation of landfill sites and landscaping uses.

Other biosolids management options include incineration and landfill disposal. Biosolids can also be processed to create glass aggregate used as a construction material and other products. All options have costs and risks that each municipality must consider.

## 10. What are the benefits of land application of biosolids?

Land application is a cost-effective and sustainable option for managing biosolids. The Environmental Quality Commission (EQC) encourages the land application of biosolids which are managed in a manner which protects the public health and maintains or improves environmental quality. The Oregon DEQ implements this policy across the state.

Biosolids enrich the soil with essential nutrients and organic matter. Plants need a complex mixture of nutrients, soil, air, and water to grow well. Biosolids contain a full range of plant-essential nutrients. Biosolids typically contain about 50 percent organic matter, which improves soil tilth, allows the soil to drain and breathe better, and to hold more water. This results in decreased water runoff and soil erosion, and increased water conservation. These attributes may help a farmer comply with agricultural conservation practices. Research plots

and demonstration sites have shown that the quality of crops grown on biosolids-amended soils is equal or superior to those grown with commercial fertilizers.

According to an Oregon Association of Clean Water Agencies (ACWA) June 2006 survey, approximately 98 percent of biosolids produced in the state of Oregon are beneficially recycled.

## 11. Why does the EPA consider biosolids safe for land application?

Decades of scientific research have demonstrated biosolids can be safely used on food crops. The National Academy of Sciences reviewed current practices, public health concerns and regulatory standards, and concluded that *"the use of these materials in the production of crops for human consumption when practiced in accordance with existing federal guidelines and regulations, presents negligible risk to the consumer, to crop production and to the environment."*<sup>3</sup> In addition, an epidemiological study of the health of farm families using biosolids showed that the use of biosolids was safe.

Research on the safety of biosolids is ongoing. The Clean Water Act requires EPA to review the biosolids regulations every two years to identify additional contaminants of concern that may warrant investigation. EPA conducted an exposure and hazard assessment for solids constituents detected in its *Targeted National Sewage Sludge Survey* released in 2009.

<sup>2</sup> See <http://www.epa.gov/dfe/index.htm>

<sup>3</sup> See <http://www.nap.edu/openbook.php?isbn=0309084865>





## 12. What are the greenhouse gas effects of biosolids land application?

Land application of biosolids provides two significant benefits that reduce greenhouse gas emissions. First, some of the organic matter (carbon) provided by biosolids is retained in the soil for long periods of time, removing it from the atmospheric carbon cycle. Second, biosolids can replace commercial fertilizers, saving the fuel needed to mine and manufacture commercial fertilizers from petroleum-based sources.

Another benefit is realized at wastewater treatment plants that use anaerobic digestion to stabilize their biosolids, common at many municipalities. The methane gas produced by the anaerobic digestion process is captured and often used as a heat source or to drive electrical generators. These practices can replace the use of fossil fuels and electricity used to treat the wastewater.

## 13. What is the difference between Class A and Class B biosolids?

EPA and DEQ recognize two classes of biosolids that are distinguished by their pathogen reduction levels.

To be considered Class A biosolids, pathogens must be reduced to extremely low levels. Class A biosolids products can be used on residential lawns and gardens, parks and golf courses, and other places where unrestricted public contact is likely.

Class B biosolids are processed to substantially reduce pathogen content prior to land application.

Because pathogen reduction is less complete for Class B biosolids, additional management practices, such as temporary limits on public access along with short-term grazing and crop harvest restrictions, are required at field application sites. Site-specific DEQ site authorizations are also required for Class B biosolids use.

Some customers prefer Class B biosolids for a particular use. For example, farmers may prefer Class B biosolids over composted Class A biosolids because it contains more plant-available nitrogen.

In 2006, Oregon wastewater treatment facilities produced predominantly Class B biosolids (91% of total biosolids production). Only 4% of biosolids were treated to meet the Class A standard.

## 14. How are biosolids regulated in Oregon?

The land application of biosolids, biosolids-derived products and domestic septage is regulated under the DEQ regulations found in Oregon Administrative Rules Chapter 340, Division 50. The state rules incorporate most of the federal biosolids regulations (40 CFR Part 503), including requirements that reduce pathogens, stabilize organic matter, and limit trace elements including arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc.

In Oregon, monitoring is also required for several macronutrients, including potassium, nitrogen, and phosphorus.

The Oregon DEQ is responsible for permitting land application sites

for Class B biosolids in Oregon to protect public health and the environment.

For each site where biosolids will be applied, DEQ issues a site authorization to the wastewater treatment facility that prescribes appropriate management practices for the site, which account for:

- Site characteristics and soil conditions
- Protection of ground and surface water and wells
- Crop rotations or vegetation
- Biosolids chemical properties
- Type of biosolids (liquid, semi-solid, or solid)
- Method of biosolids application

Among other things, the site authorization establishes conditions on:

- Allowable biosolids application rate and season of application
- Public access restrictions
- Required waiting periods between biosolids application and crop harvest or grazing
- Required buffers near homes, highways, and other public areas

## 15. What are Best Management Practices for biosolids recycling?

Best Management Practices for the land application of biosolids include the use of agronomic loading rates, restrictions on access to the site, planting and grazing restrictions, setbacks for surface and groundwater protection, and proper timing of biosolids application.

## 16. What are biosolids agronomic rates?

The agronomic loading rate is based on a crop's ability to use nitrogen and considers the plant-available nitrogen content of the biosolids and other nitrogen sources at the site. Biosolids application at agronomic rates supplies adequate nitrogen to maximize crop growth while protecting water quality.

## 17. Does the land application of biosolids pollute surface water or groundwater?

Properly managed biosolids products do not pollute surface water or groundwater. Biosolids recycling programs follow best management practices to ensure water quality is protected. In fact, documented improvements in surrounding water quality have been found in numerous biosolids application projects due to enriched soils and vigorous growth of vegetation that reduce soil erosion and stabilize contaminants that had previously contributed to stream and groundwater pollution. Biosolids are not allowed to runoff into surface water, including rivers, streams, irrigation ditches, or ponds and biosolids application rates and site management practices are designed to prevent the leaching of nutrients to groundwater.



## 18. Are there pathogens in biosolids?

Yes. Pathogens can be found in biosolids. However, the wastewater and biosolids treatment processes significantly reduce pathogen levels. Pathogen reduction in combination with site management practices allow for the safe recycling of biosolids through land application.

## 19. What are the concerns of windblown pathogens or bioaerosols?

Concerns about biological aerosols associated with the land application of biosolids and the incidence of illness within neighboring residences have received public attention. A

national study conducted by the University of Arizona on the health implications of bioaerosols from biosolids land application activities found no documented problems.<sup>4</sup>

## 20. How does biosolids recycling fit into Oregon land use law?

Oregon law allows the application of biosolids to Exclusive Farm Use (EFU) zoned land provided that application rates and site management practices ensure continued agricultural, horticultural, or silvicultural production and do not reduce the productivity of the land. See ORS 215.213 and 215.283.

<sup>4</sup> *Journal of Applied Microbiology*, 2005, 99, p. 310-322

## For Further Information

Oregon Department of Environmental Quality:

<http://www.deq.state.or.us/wq/biosolids/biosolids.htm>

United States Environmental Protection Agency:

<http://www.epa.gov/owm/mtb/biosolids/index.htm>

Oregon State University: <http://cropandsoil.oregonstate.edu>

Washington State University: <http://www.puyallup.wsu.edu/soilmgmt/Biosolids.htm>

University of Washington: <http://faculty.washington.edu/slb>

Northwest Biosolids Management Association: <http://www.nwbiosolids.org>

National Biosolids Partnership: <http://www.biosolids.org>

North East Biosolids and Residuals Association: <http://www.nebiosolids.org>

University of Arizona, College of Agriculture and Life Sciences:

<http://cals.arizona.edu/pubs/consumer/az1426.pdf>

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[www.oracwa.org](http://www.oracwa.org)

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