Introduction

Closing the recycling loop means turning waste materials into useful products. We close the recycling loop in our gardens and landscapes when we use compost made from yard debris and food waste, and organic fertilizers made from fish or poultry waste, or biosolids products. Most recycled organic waste materials are composted, dried, heated, pelletized, or otherwise treated to make them safe and convenient for use as soil amendments.

Biosolids Production

Biosolids are a recyclable organic material produced in municipal wastewater treatment plants. Biosolids are made from wastewater solids—the organic and mineral matter recovered during wastewater treatment. The wastewater solids are digested (broken down by microorganisms) to reduce odors, pollutants, and pathogens (that is, microorganisms that cause disease). Excess water is removed to create a product that can be handled as a solid. Additional heat treatment of the biosolids reduces pathogens to background levels, creating a product suitable for gardens and landscapes.

Biosolids must meet quality standards that are regulated through the Federal Clean Water Act. Class A biosolids meet the strictest pathogen standards, based on federal treatment and monitoring requirements. Only Class A biosolids are available for home garden and landscape use. Not all wastewater treatment plants produce biosolids for public use, so its availability varies depending on your location.

Biosolids Uses

Research shows that biosolids build soil organic matter, improve soil tilth, and benefit crops under a wide range of conditions by providing nitrogen, phosphorus, and organic matter. (See publications listed in the Further Reading section for biosolids research findings). Biosolids products are a locally produced and inexpensive source of plant nutrients and organic matter. Using biosolids products is one way to close the recycling loop, thus benefiting your community and the environment (Figure 1).

Although biosolids products provide the same benefits as organic fertilizers and soil amendments, biosolids are not organically certified; therefore, gardeners following certified practices should not use biosolids.

Class A is the highest standard of pathogen removal for biosolids. To meet Class A requirements, biosolids must be treated by a process that reduces pathogens to low levels (such as high-temperature composting, heat-drying, or high-temperature digestion). The process must be monitored to show that it meets required treatment times and temperatures, and the biosolids must be tested and shown to meet standards for pathogen levels. Besides meeting Class A standards, biosolids for home and garden use must also meet the strictest standards for trace element pollutant levels. Biosolids currently produced in the Northwest have low levels of trace elements and meet these standards.

This fact sheet is part of the WSU Extension Home Garden Series.
Biosolids Types

There are three main types of biosolids for use in the garden or landscape, and each of these types has different properties and different uses. The three types are heat-dried products, composts, and Class A blends. All three materials have been processed with heat to destroy pathogens.

Heat-dried biosolids

Heat-dried biosolids are the most nutrient-rich form of biosolids available to home gardeners (Figure 2). These biosolids are rapidly dried by intense heat, at temperatures ranging from 300 degrees to more than 1000 degrees Fahrenheit, depending on the type of equipment used. Heat-drying biosolids kills pathogens while retaining most of the nutrients, producing pellets that are similar to those contained in organic fertilizers. Because they have not been diluted with other materials, heat-dried biosolids contain a high concentration of nutrients. Nitrogen (N) content typically ranges from 4% to 7%, with similar levels of phosphorus (P) (measured as P$_2$O$_5$). Nitrogen availability in the first season after application is about 40%, which is similar to the percentage provided by poultry manure. A 50-lb bag of heat-dried biosolids with 6% total N provides enough available N to fertilize 400 to 600 square feet of garden at a rate of 2 lb to 3 lb of N per 1000 square feet. The same amount of biosolids will cover 1200 square feet of lawn at a single application rate of 1 lb N per 1000 square feet.

Heat-dried biosolids from different sources vary in physical properties. Some of these biosolids are uniform pellets (Figure 3), while others are more variable in size and may be dusty, making them less pleasant to handle. Heat-dried biosolids may produce odors when they become wet from rainfall or irrigation water. If you plan to fertilize a large garden or lawn area with heat-dried biosolids, test a smaller section first to see if odor could become a problem.

Biosolids compost

Composting kills pathogens in biosolids by exposing the pathogens to high temperatures (greater than 131°F). Diluting biosolids with carbon-rich materials reduces the concentration of plant nutrients, and composting reduces the availability of these nutrients to plants. Biosolids composts typically contain 1.5% to 2% total nitrogen, with about 5% to 10% of that nitrogen available to plants during the first year. Thus, composted biosolids products have much lower nitrogen availability than heat-dried products. The main benefit of these composted products is as a soil amendment to build organic matter and improve soil physical properties. Use biosolids compost as you would use other types of compost (Figure 5). If you are establishing a new raised bed or a garden in soil with little organic matter, apply from 1 inch to 3 inches of biosolids compost.
and mix it into the soil. Use smaller amounts (1/2 inch to 1 inch) in the following years.

**Biosolids blends**

A few wastewater treatment plants produce Class A biosolids by using high-temperature digestion at 131°F or higher. Undiluted biosolids are sticky and clump readily, so they are not convenient to use in gardens. Blending these biosolids with other materials reduces clumping, making them easier to use. Blending materials include sand, sawdust, and bark. Blended products include lawn and garden amendments (Figure 6), potting and raised bed mixes (Figure 7), and manufactured topsoils. Biosolids blends typically contain less than 1.5% nitrogen and phosphorus because they have been diluted by the woody and sandy components of the blends. Properties of different biosolids blends vary, depending on the composition and purpose of the blend. Refer to the instructions provided by the product manufacturer for guidance on uses and application rates for a specific blend. Tacoma, WA, and Vancouver, BC, are two Northwest cities that produce biosolids blends.

Biosolids blends initially have higher nitrogen availability compared to biosolids composts because the biosolids are fresh, so there is more rapid nutrient release. These products provide adequate nitrogen for garden crops in the first year after application. By the second year, however, nitrogen release from the biosolids is much slower, while the decomposing wood product actually ties up or immobilizes N, making it unavailable to plants. Consequently, gardeners using biosolids-wood blends usually need to supplement their gardens with nitrogen beginning in the second year after application of these blends. Use standard recommended rates provided in local or regional University Extension publications.

**Protecting health and the environment**

When working with biosolids, use the same precautions that you would use with any garden product. For example, wash your hands before handling, preparing, or consuming food. Any fertilizer or soil amendment can harm water quality if allowed to run off into surface water. Keep products off sidewalks, driveways, and gutters to reduce runoff to storm drains. Know the best use for your product and avoid over-application.


Biosolids are rich in phosphorus; consequently, repeated applications will eventually increase soil P to excessive...
levels. If your soil test shows excessive levels of P, reduce or stop using biosolids and other P-rich amendments, particularly if water can run from your lawn or garden into storm drains or ditches. Biosolids do not contain much potassium (K), so you may need to supplement with K if your soil test shows low K levels.

Some gardeners are concerned about wastewater contaminants in biosolids, such as trace metals, household chemicals, and pharmaceuticals. Biosolids produced today contain low levels of trace metals and the availability of the metals to plants is also low, resulting in negligible risk to garden crops. Biosolids composts and blends have even lower levels of trace metals, sometimes lower than the levels found in the background soil. Biosolids contain low levels of some household chemicals and pharmaceuticals; however, these substances are either bound tightly to the soil or are broken down by soil and composting organisms. The likelihood of exposure to these household chemicals and pharmaceuticals is much greater with household use than through contact with garden crops or soils.

**Obtaining biosolids for your garden or landscape**

Where available, most Class A biosolids products can be obtained in bulk through local wastewater treatment plants. Some products are sold bagged or in bulk at garden or landscape supply stores. Most biosolids producers will have instructional guides that describe their product and its proper uses. Check with your local wastewater treatment plant to find out if they produce a Class A product and, if so, what kind it is and how it can be obtained.

**Further Reading**

**Biosolids**


**Organic soil amendments**


**Research on biosolids and soil quality**


**Soil testing**


Use pesticides with care. Apply them only to plants, animals, or sites as listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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