

# Water Quality

**Focus Area**  
Nutrients &  
Bacterial  
Waste



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## Best Management Practices for Biosolids Land Application

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Biosolids is domestic wastewater sludge that meets standards for use as a fertilizer or soil conditioner. These standards include monitoring requirements, metal limitations, pathogen reduction, vector requirements and best management practices.

Applying biosolids to land uses the available nitrogen, phosphorus and potash as fertilizer for growing crops. It is an environmentally sound practice sanctioned by the U.S. Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources (DNR). Reusing biosolids on crops, pastures and timberland reduces water pollution. It eliminates the environmental risks and costs associated with sludge disposal options, benefiting all Missourians.

### Background

EPA regulations, under Title 40 Code of Federal Regulations Part 503 (40 CFR 503), establish the minimum national standards for the use and disposal of domestic sludge. These standards include limitations for the land application of biosolids.

DNR incorporated the EPA standards into the state requirements under the Missouri Clean Water Law and regulations. The state rules include additional requirements that are not covered in the EPA standards. Complying with state regulations automatically meets the EPA sludge standards.

### Pollutant standards for land application

Testing for metal, pathogens and other pollutants is required to determine the representative quality of the biosolids. Treat biosolids to reduce pathogens and

vectors before application. The concentration of metal and other pollutants in the biosolids determines the acceptability for land application and the appropriate loading rates to protect crops, soils and the environment. Refer to the MU publication [WQ 425, Biosolids Standards for Metals and Other Trace Substances](#).

### Best management practices

Biosolids that meet the standards for metal, pathogens, vectors and other pollutants are safe to apply when following the best management practices.

Best management practices, or “good farming practices,” include agronomic load rates, buffer zones, depth to groundwater, wetlands protection, harvest and grazing deferrals, threatened and endangered species protection, field slope limitations, restrictions for frozen or saturated soils, requirements for public-use sites, soil conservation practices and other site restrictions.

The following list of practices is based on the regulations and standard permit conditions:

#### 1. No discharge

Biosolids must not discharge from the application site, except during catastrophic or chronic precipitation exceeding the 1-in-10 year rainfall level.

#### 2. Public contact sites and public-use or distribution of biosolids

- Class A biosolids applied to public-use sites, distributed for general public use or used on vegetable crops, root crops or home gardens must comply with 40 CFR 503 Subpart B.

- A biosolids management plan or engineering report for Class A biosolids used on public sites must

be approved by the DNR before use or distribution.

- Do not apply Class B biosolids to public contact areas, residential lawns or turf farms unless the biosolids are incorporated. Restrict public access for 12 months. You must gain approval from the permitting authority.

### 3. Crop restrictions

Do not apply Class B biosolids to root crops, home gardens or vegetable crops whose edible parts will come in contact with applied biosolids, unless the crops are not used for direct human consumption.

### 4. Harvest and grazing restrictions

Do not apply biosolids to land within 30 days of harvest or grazing by cattle. Applicators are also subject to requirements of the Missouri Department of Agriculture State Milk Board concerning grazing restrictions of lactating dairy cattle.

### 5. Threatened or endangered species

Applying biosolids must not adversely affect a threatened or endangered species or its designated critical habitat. This is in accordance with section 4 of the Endangered Species Act.

### 6. Nitrogen limitations

Do not apply more than the agronomic rate of nitrogen needed.

- The applicator must document the Plant Available Nitrogen (PAN) loadings, available nitrogen in the soil and crop removals, unless the following conditions are met:

a) Nitrogen content of the biosolids does not exceed 50,000 mg/kg of total nitrogen on a dry weight basis; and

b) Biosolids application rate is less than two dry tons per acre per year.

- Report nitrogen compounds as nitrogen in the PAN calculations. Calculate PAN as follows:

$(\text{Nitrate} + \text{nitrite nitrogen}) + (\text{organic nitrogen} \times 0.2) + (\text{ammonia nitrogen} \times \text{volatilization factor})$

The volatilization factors are 0.7 for surface application and 1 for subsurface injection.

- You may use alternate PAN calculations if documented by site-specific data and prior approval is obtained from the DNR.

- If you use the University soil test laboratory, the soil test report will provide the net nitrogen to apply for a specific crop and yield goal. If you use a private soil test laboratory, the available nitrogen in the soil must be determined and subtracted from the nitrogen application requirements.

### 7. Buffer zones

Do not apply biosolids within:

- 300 feet of a water supply well, sinkhole, lake,

pond, water supply reservoir or water supply intake in a stream;

- 300 feet of a losing stream, no-discharge stream, stream stretches designated for whole body contact recreation, wild and scenic rivers, Ozark National Scenic Riverways or outstanding state resource waters as listed in the Water Quality Standards, 10 CSR 20-7.031;

- 150 feet of dwellings;

- 100 feet of wetlands or permanent flowing streams;

- 50 feet of a property line or other waters of the state, including intermittent flowing streams.

### 8. Slope limitations for application sites

- On slopes of 0 to 6 percent, there is no rate limitation

- On 7 to 12 percent slopes, you may apply biosolids when soil conservation practices are used to meet minimum erosion (T) levels in accordance with U.S. Soil Conservation service recommendations.

- For slopes of 12 percent or more, apply biosolids only when the site is maintained in grass vegetation with at least 80 percent ground cover. Do not apply more than two dry tons per acre per year.

### 9. Stormwater runoff

- Do not place biosolids in a location where it is reasonably certain that pollutants will be transported into waters of the state during stormwater runoff.

- Subsurface inject the biosolids, incorporate after application, use soil conservation practices, adhere to slope restrictions, create buffer areas and follow other approved methods, as necessary.

- Soil conservation practices for application must be approved by the U.S. Soil Conservation Service or the University of Missouri Extension service.

### 10. Frozen, snow-covered or saturated soil conditions

Do not apply biosolids when the ground is frozen, snow covered or when the soil is saturated, unless site restrictions or other controls are provided to prevent pollutants from being discharged during snowmelt or storm water runoff. If land application is necessary during inclement weather, use sites which meet the following:

- A maximum field slope of 6 percent and a minimum 300 feet grass buffer between the application site and waters of the state.

- A maximum field slope of 2 percent and 100 feet grass buffer between the application site and waters of the state.

- Other best management practices approved by the DNR.

## **11. Biosolids storage**

- Provide adequate sludge and biosolids storage as needed to match the application windows for crop planting, harvesting and inclement weather conditions. Operate storage basins so there is no discharge to waters of the state.

- Recommended biosolids storage for grassland sites ranges from 60 to 120 days as follows: 60 days south of Highway 60; 75 days between Highway 60 and Highway 50; 90 days between Highway 50 and Highway 36; and 120 days north of Highway 36.

- Storage should be increased for tilled cropland application sites depending on the crop rotations and ratio of tilled land to grassland. Recommended storage is 180 to 365 days if all sites are tilled cropland.

- Any storage area located off-site of the sludge or biosolids generating facility must have a separate individual permit for the storage site, except for temporary stockpiles.

- Use temporary stockpiles for solid or semi-solid materials (no free liquids) only. Limit the stockpile to two weeks per year at any one application field.

Locate stockpiles at least 300 feet from drainage ways or they must have runoff collection berms at least 6 inches high around the pile.

## **12. Application rates**

Evenly spread the biosolids over the entire application site. Do not dump the material in batches or spread a pile using a blade, disc or similar equipment.

## **13. Application equipment**

Properly operate and maintain application equipment. Visually check the equipment each day

during operation. Apply biosolids during daylight hours only, unless approval is obtained from the permitting authority.

## **14. Soil pH limitations**

Do not apply biosolids to sites with a soil pH less than 6.0 or greater than 7.5 (based on the salt solution test, which is preferred) or less than 6.5 or greater than 8.0 (based on the water solution test).

Application of biosolids to higher pH soils may be considered on a case-by-case basis. Submit a site-specific permit application and supporting document, addressing crop and groundwater protection, to DNR. Tracking of aluminum loading rates will be required. See Table 4 in MU publication WQ 425.

## **15. Soil phosphorus limitations**

Do not apply biosolids to soils that contain more than 800 pounds of available phosphorus, based on the Bray P-1 test, unless approval is obtained from the permitting authority DNR.

## **16. Soil depth**

Do not apply biosolids to sites that have less than 5 feet of soil above bedrock or a groundwater aquifer, unless authorized in a site-specific permit for the application site.

## **17. Recordkeeping**

Sludge applicators must keep detailed records for at least five years on each location and amounts of biosolids applied.

Landowners are not required to keep records. However, it is highly recommended that biosolids application records be incorporated into your total nutrient management plan.



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