



MINNESOTA

BIOSOLIDS MANAGEMENT 2018 - STATE SUMMARY

This summary, a dashboard of state statistics, & further data are at www.biosolidsdata.org

In Minnesota...

- *Minnesota's urban capital region operates modern, advanced sewage sludge incinerators with extensive heat recovery and electricity generation, managing the majority (62%) of the state's wastewater solids.*
- *Biosolids use in agriculture is common in Minnesota, and many exemplary biosolids management programs land apply mostly liquid biosolids on abundant farm acreage in this highly agricultural state.*
- *Anaerobic digestion and energy generation from biogas are common in the management of MN biosolids.*

Biosolids Management in Minnesota

Minnesota is a largely rural state, with over 26,000,000 acres, 51% of its total area, in agricultural use (as of 2012, USDA). This makes land application of biosolids as soil amendment an easy and economical option for many wastewater treatment facilities. In 2018, 736 operating wastewater treatment plants (WRRFs) in MN generated an estimated 161,272 dry U.S. tons of biosolids. Of that total, 44,318 dry U.S. tons went to beneficial use, mostly bulk land applied as Class B (or in a few cases, as Class A) biosolids.

Most land-applied biosolids in MN are applied in liquid form, without dewatering. The proximity of abundant farmland makes transporting liquid cost effective. Most land-applied biosolids are handled by WRRF staff, perhaps in conjunction with a contracted land applier. One challenge for WRRFs handling liquid biosolids is storage. Many facilities can only land apply in narrow time windows between snowy winter and the growing season: in the spring, after snow melts and roads dry out enough to accommodate heavy loads; in the fall, after the harvest. Some facilities can land apply on snow covered or frozen ground, provided they meet additional vector attraction reduction and slope requirements.¹ WRRFs such as St. Cloud and Moorhead rely on large underground biosolids storage tanks and massive deployments of tanker trucks and spreaders for a couple of weeks each spring and fall. A few WRRFs also land apply in

¹ From state coordinator: For clarification between dewatered and liquid: Some facilities that can meet vector attraction without having to inject or incorporate within 6 hours can potentially land apply on frozen or snow covered ground if they meet the additional requirement of fields with slopes that are less than 2% for both dewatered and bulk liquid biosolids. For bulk liquid biosolids, land application is restricted to 15,000 gallons per acre hydraulic loading rate and is not allowed within 600 feet from a downgradient surface, as listed in MN R 7041.1200, Management Practices and Limitations, Subpart 3, Item B.

neighboring Wisconsin. Approximately 25% of Minnesota's biosolids are managed by private contractors.

The exception to the state-wide trend in land application is the seven-county metropolitan area of Minneapolis-St. Paul. The metro area is home to roughly 56% of MN's population. The Metropolitan Council ("Met Council") Environmental Services (MCES) operates the capital region's nine WRRFs. The Metro Plant in St. Paul is the largest WRRF in Minnesota; it processes its solids in three sewage sludge incinerators (SSIs); a fourth incinerator is in design in 2021 and is expected to be operational by the end of 2024. The MCES SSIs are some of the most technologically advanced SSIs in the country, with extensive heat recovered for electricity generation and facility heating. Some of MCES's WRRFs deal with their own biosolids, others send them to the Metro Plant for processing and incineration. The Met Council website (see references below) provides descriptions of each WRRF, including, for the most part, where their solids go for treatment, disposal, or end use. In 2018, the majority of biosolids in the metro area and state-wide in MN (62%) were incinerated. Of the state's three incineration facilities, two are in the metro area: Seneca and the Metro Plant; the third is the newest, in Buffalo (added since 2004).

In 2018, seven landfills in MN received biosolids, accounting for a small percentage of MN's total. Two WRRFs in MN sent biosolids to two out-of-state landfills. Some of the biosolids sent to landfill are used as daily cover, but those amounts are not tracked. When biosolids go to landfill, they must meet Class B pathogen reduction standards, and most landfills require additional testing or treatment (e.g. TCLP and paint filter tests).

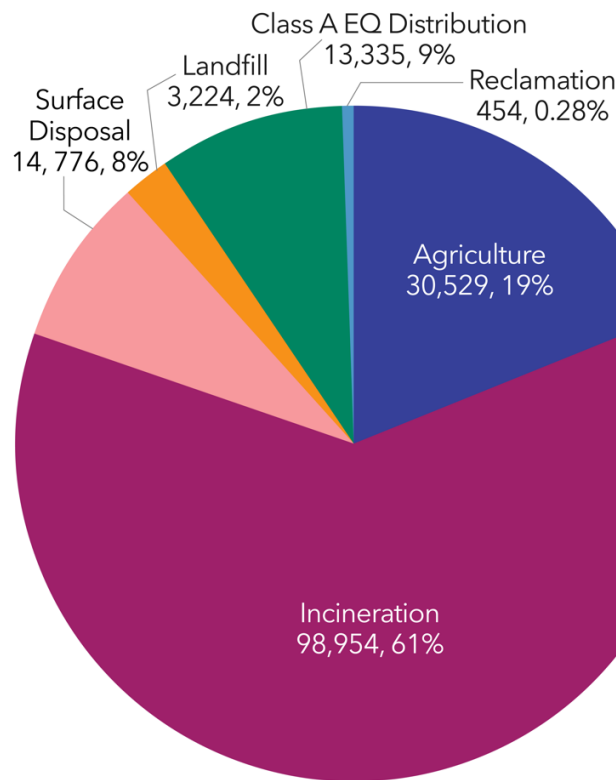
Eight facilities in MN produce Class A EQ biosolids. All of it is distributed in bulk, largely managed by the WRRF/generator, sent to land application, and not closely tracked. No biosolids composting currently happens in the state, since land application is a cost-effective and efficient beneficial use. The Blue Lake facility, operated by MCES, produces a pelletized Class A EQ biosolids fertilizer that is land applied in bulk, and some other WRRFs around the state are in the process of installing systems to produce higher quality biosolids (more details below).

MPCA has fairly good data on treatment processes employed by different WRRFs, collected through annual reporting by all major and minor biosolids generators (WRRFs and separate preparers). As with most states, there's a variety of biosolids treatment and storage systems in operation, spanning generations of available technologies.

Minnesota has two permitted mobile treatment systems (one Bioset alkaline treatment process, one Fenton Dryer) capable of producing a Class A EQ product, but they have not yet been used. They're owned by Fergus Power Pump, a frequent contractor for pond decommissions, pump-outs, and dewatering solids. In 2018, three WTPs in MN reported sending solids for further treatment to West Central Wisconsin Biosolids Facility. A couple of facilities use bio bags.

There are 18 reed beds in use in MN (though in 2018, only seven facilities reported quantities of solids sent to reed beds). Of those 18, 14 have non-native phragmites (a family of reeds often used in artificial reed beds for phytoremediation), one has native phragmites, one has a mix of native phragmites and cattails, and two operate as drying beds. MPCA is working with the facilities that use non-native phragmites to switch to native phragmites or a different solids management option, as required by recent regulatory changes from the Departments of Agriculture and Natural Resources. These changes were driven by new research from the University of Minnesota that concluded that non-native phragmites spread not only by propagating plant parts such as stems and roots, but also by seed – something not previously understood. A research center at the UMN is embarking on a project to identify species of native phragmites that are effective in dewatering (<https://www.maisrc.umn.edu/native-phragmites>), hoping this research will benefit wastewater treatment systems.²

Minnesota Biosolids Use & Disposal 2018
 (dry US tons, %)
 Total: 161,300



² From state coordinator: There is a lot that has gone into this and it's hard to explain in brief. The regulation is changing somewhat, but even with the regulation as it is currently, the non-native phragmites should not be allowed to spread. For more information, the best resource is the U of M research as that is what drove MPCA, U of M, Dept. of Ag. and MnDNR to work together with the wastewater facilities to start moving forward with management and eventually moving away from using non-native phragmites.

Agency/Department Oversight

Biosolids in Minnesota are regulated by the Minnesota Pollution Control Agency (MPCA), which is active in controlling, encouraging, and monitoring biosolids land application. The state requires annual reporting on biosolids from all major and minor WRRFs/generators, and any ponds, lagoons, or reed beds that are cleaned out or decommissioned. The biosolids program is governed under Minnesota Rules Chapter 7041 (1997). In 2018, 3539 acres were newly permitted for biosolids land application, and 123 new site approvals were issued. Three facilities in Minnesota are certified by the National Biosolids Partnership's Environmental Management System/Biosolids Management Program.

The MPCA website describes biosolids management in MN in the following way:

The MPCA encourages the beneficial reuse of biosolids in a manner that protects human health and the environment. The treatment of domestic wastewater can generate biosolids. The treatment of these solids produces a nutrient-rich organic material that farmers can use. Various wastewater treatment processes stabilize and disinfect the solids, destroying harmful bacteria and reducing odors. The result is a humus-like organic matter, dry powder, pellets, slurry, or liquid that bear little resemblance to the untreated solids from which they were derived. Biosolid recycling reduces both the amount of waste going to landfills and incinerators and the total use of petroleum-based chemical fertilizers.

Biosolids that will be applied to land must meet strict regulations and quality standards. State and federal rules govern the use and disposal of biosolids, set limits for contaminants such as metals, and require pathogen and vector attraction reduction, site and crop harvesting restrictions, and record keeping and reporting.

Local governments in MN are allowed to adopt more restrictive ordinances on biosolids, with the exception of the seven county metropolitan area (Minneapolis-St. Paul). As of 2018, ten municipalities and two counties in Minnesota had more restrictive ordinances on biosolids use/disposal than the state.

State Regulations and Permitting

The MPCA regulates biosolids through specific NPDES permits that require annual reporting. Additionally, the state requires site approvals and land application permits for Class A or Class B land application. If a facility generates a Class A EQ product, they can market the product as fertilizer with few restrictions, provided it meets additional fertilizer regulations from the Dept. of Agriculture. Any EQ biosolids entering MN from out of state must have an approved management plan. WRRFs/biosolids generators hold legal liability for biosolids end use.

MN's requirements for vector attraction reduction, pathogen reduction, and pollutant limits are the same as the U.S. EPA Part 503 regulations. MN does require management practices beyond Part 503. Additional state requirements include:

- Setback requirements for surface water, tile inlets, sinkholes, wetlands, wells, and residences. There are also slope restrictions.
- Additional monitoring at Class B land application sites, with soil tests for texture, organic matter content, pH, extractable P & K and soluble salts.
- Facilities and contractors are required to have a Type IV land application certified operator per MN Rules Chapter 7048. Certification of these operators is administered by the state.

PCB testing is required for solids removed from ponds that were built before 1984; otherwise testing requirements match Part 503.

Minnesota allows for the application of Class B biosolids from more than one generator on the same site in one crop year, but only every few years does it actually happen. There are only two WRRFs that do this; they share approximately three land application sites.

Nitrogen is the basis for the agronomic loading rate for land application. Minnesota does not require formal nutrient management plans. To control phosphorus (P) in soils where biosolids is applied, Minnesota uses the Bray-1 soil test. If a soil tests over 200 ppm for P, the land applier must consult USDA Natural Resource Conservation Service (NRCS) to determine what special erosion and phosphorus control measures are required.

Since 2007, the only rule change affecting MN's biosolids program was a shift in the training requirements for Type IV waste disposal facility operator licensure, as outlined in MN Rules Chapter 7048.

Pressures on Biosolids Management and Land Application

Pressures on biosolids in MN as of 2018 include...

1. AGRICULTURAL ISSUES - declining farmland due to less agriculture or due to development, sprawl, seasonal restrictions, or competition with manures, etc.
2. MANAGEMENT ISSUES - hauling distances
3. AGRICULTURAL ISSUES - soil compaction, difficulty with timing, stockpiling, etc.
4. PUBLIC INVOLVEMENT- concerns of neighbors, environmental groups, and others
5. MANAGEMENT ISSUES - securing long-term use options

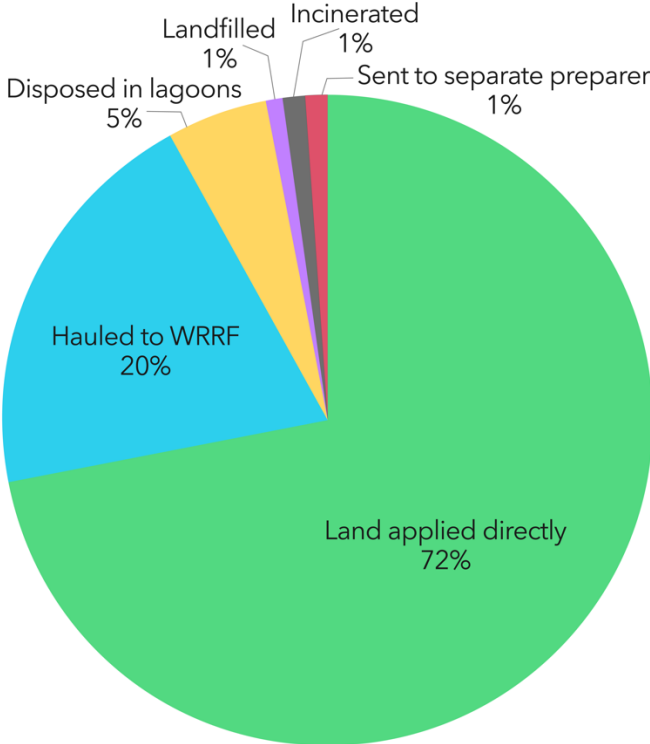
Declining farmland in Minnesota is partly due to many farmers reaching retirement, and selling farmland for development or other uses, rather than keeping it in active agricultural use. Part of a nationwide trend, fewer farms in MN are staying "in the family." There has also been an increase in the planting of crops for human consumption in the state, cutting down on the farmland that's potentially available for biosolids application.

Since 2004, Minnesota has seen a decrease in quantities of biosolids for beneficial use. Some of that could be explained by the increase in anaerobic digestion, which produces a smaller volume of final product than other treatment processes. More extreme weather events have also led to less frequent dry soil conditions needed to land apply biosolids, amplifying the challenge of biosolids storage.³

Septage Management

The majority of MN’s septage is quick-treated using lime or another stabilizer to meet Part 503 requirements, and directly land-applied. An estimated 541 septage haulers operate in Minnesota; 52 WRRFs and 10 separate preparers receive and treat septage in the state.

Minnesota Septage Management 2018
(% estimated)



³ From state coordinator: I would love to do more with soil health and trying to couple soil health with land application. We have had NRCS talk at some of our training sessions regarding soil health and have done some demonstrations. If my time was not constrained with other emerging issues, I would love to find facilities to work with to do some pilot projects with NRCS and the local SWCDs, incorporating as many principles of soil health as we can while still maintaining compliance with biosolids regulations.

Table 1. Minnesota Septage Management

Septage haulers based in the state	541
Separate preparers (not WRRFs) taking septage in the state	10
WRRFs required to take septage?	No
WRRFs accepting septage in the state	52
Septage received in 2018 (gallons) - reported septage from septic tanks, chemical toilets, etc	No data
Other outside wastes accepted at WRRFs, type & gallons...	No data
Is FOG considered a significant issue? Is it regulated / how?	Yes; not regulated by state; yes.*
Is there a proactive program to collect FOG?	
Can septage be land applied?	Yes
Most recent septage regulations update	Follows Part 503
FTEs at state agency for septage	2

*MN Technical Assistance Program has projects and initiatives, including reducing discharges of hard to treat wastes such as FOG. <http://www.mntap.umn.edu/>

Major WRRFs, Separate Preparers, and Notable Projects

There are several notable biosolids programs in MN, which provides significant state support for biosolids infrastructure upgrades. The programs listed below are trying to address some of the greatest challenges that face biosolids - nutrient management, sheer volume generated, limitations on beneficial use, public messaging - both nationwide and in Minnesota specifically.

- The Empire Wastewater Treatment Plant, Farmington, MN, is one of nine managed and operated by the Met Council. Biosolids from the plant are spread on nearby fields, some of which are owned by MCES. The Empire plant and some of its land application sites are located on 400 acres along the Vermillion River, consisting of undeveloped “natural” land, cropland, and the WRRF site. In the early 2000s, a local environmental group, at MCES’s request, initiated projects to restore some wildlife habitat and stabilize streambanks.
- Western Lake Superior Sanitation District (WLSSD) in Duluth is the second-largest WRRF in MN. Its biosolids program has operated since the early 2000s. Solids are processed on-site in anaerobic digesters, producing a Class B product marketed as “Field Green” fertilizer that’s in high demand for local land application. WLSSD staff apply the biosolids on farm fields (mostly hay, but some cash crops) and old taconite mine sites. WLSSD is dual permitted for land application in Minnesota and Wisconsin, and the entire

biosolids/Field Green program is staffed internally. WLSSD has an informative website that includes a video about Field Green's production process and agricultural benefits. According to WLSSD, a study by Minnesota Extension demonstrated increased protein content in hay grown on biosolids-fertilized fields, and increased hay production resulting in economic benefits for farmers.

- St. Cloud's Nutrient, Energy and Water (NEW) Recovery Facility services St. Cloud and surrounding communities. In recent years, the city has shifted its focus and messaging from "wastewater treatment" to "resource recovery," in line with a broader trend in biosolids and biofuel production and nutrient management. The facility also receives high-strength waste, which is fed into the anaerobic digesters. The energy produced from anaerobic digestion biogas is used by two biofuel generators. Along with onsite solar, the facility produced 82% of its own electricity in 2018. In early 2018, the facility was producing a Class B liquid biosolids (3% solids) for local land application. That same year, two new projects were commissioned at the facility: a reactor to produce Ostar phosphorus fertilizer, and a Lystek reactor. The Lystek solids system began operations in 2018, and produces pumpable, liquid biosolids that is Class A and 15% solids through thermal hydrolysis of centrifuged Class B biosolids. St. Cloud's website provides plentiful information on the city's biosolids management program, which is currently platinum certified by the National Biosolids Partnership.
- Rochester's Water Reclamation Plant has a robust in-house biosolids program that uses anaerobic digestion and applies liquid biosolids (5.8% solids) to local agricultural land at no cost to farmers. Methane gas produced during digestion is cleaned and used to power engine generators and boilers, depending on the electricity or heat needs of the season. The City of Rochester is currently considering upgrades to the WRP that would, among other things, increase capacity for anaerobic digestion and solids storage, decrease total solids generated by installing gravity belt thickeners, allow for high-strength waste processing, and expand nutrient recovery.
- The City of Moorhead's Wastewater Treatment Facility (WWTF) uses anaerobic digestion to produce a liquid biosolids product for application on 400-800 acres annually of nearby farmland. Digester gas goes through a boiler to heat the digesters, and excess gas heats facility buildings or is flared. Starting in 2020, Moorhead is undertaking improvement projects to its wastewater treatment facilities, including the installation of a new digester cover to allow for more efficient recovery of methane gas to heat the plant. Moorhead's biosolids management program is currently gold certified by the National Biosolids Partnership.
- The City of Marshall's WWTF treats both domestic and industrial sewage, including waste from an ice cream factory, a turkey processing plant, and a corn mill. Using an Autothermal Thermophilic Aerobic Digester (ATAD), solids from the plant are treated to Class A quality and go to liquid land application for a fee to farmers of \$75/acre.

Marshall recently finished installing new biosolids storage tanks to hold biosolids during cold months when land application is not an option.

- Mankato’s biosolids management program has been platinum certified by the National Biosolids Partnership since 2010. The city’s Water Resource Recovery Facility (WRRF) uses anaerobic digestion and contracts to land apply Class B biosolids free to farmers after the fall harvest. Mankato plans to upgrade its digesters in 2021 in order to increase tank capacity, decrease water content, and enhance energy recovery.
- The Blue Lake WRRF in Shakopee, managed and operated by MCES, produces a Class A heat-dried, pelletized product that is land applied in bulk to local farm fields through a public-private partnership with New England Fertilizer Company (NEFCO). The solids processing facility was completed in 2012, and is partially powered by energy recovered from anaerobic digestion (and partially by a newer solar array). NEFCO operates the facility, employing what its website describes as “an innovative staffing partnership” with MCES.

References

The state biosolids coordinator and other state biosolids experts provided most of the information in this summary report. Additional information was obtained from:

MPCA:

<https://www.pca.state.mn.us/water/biosolids>

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Metropolitan Council, Minneapolis/St. Paul, MN:

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<https://metro council.org/Wastewater-Water/Projects/Metro-Plant-Solids-Management/How-It-Works.aspx>

New England Fertilizer Company:

<http://www.nefcobiosolids.com/view-our-projects/st-paul-shalopee-mn/>

Western Lake Superior Sanitation District, Duluth, MN:

<https://wlssd.com/services/biosolids/>

St. Cloud, MN:

<https://www.ci.stcloud.mn.us/DocumentCenter/View/18490/2018-Digester-Newsletter-FINAL>

<https://www.ci.stcloud.mn.us/331/Wastewater-Services>

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<https://www.thermalprocess.com/media/case-study-marshall.cfm>

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<http://cswea.org/multisite/minnesota/biosolids/>

Duluth News Tribune:

<https://www.duluthnewstribune.com/news/4066846-debate-over-biosolids-reignites>

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USDA Economic Research Service:

<https://www.ers.usda.gov/data-products/major-land-uses/major-land-uses/#Summary%20tables>

River Falls Municipal Utilities, WI:

<https://www.rfmu.org/614/West-Central-Wisconsin-Biosolids-Facilit>