

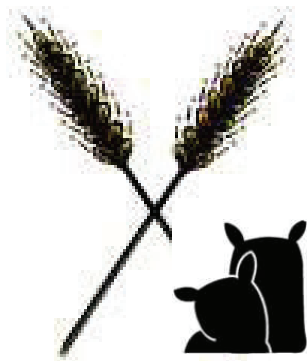


Minnesota Pollution Control Agency

pocket
guide
for
land
application
of

Biosolids

*For use by
biosolids operators &
applicators to
prepare for field work &
while
in the field*



a
guide
for
Minnesota

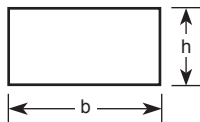
This Pocket Guide belongs to:

Name

Phone

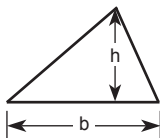
Handy Formulas & Conversions

- **Area of a Rectangle or Parallelogram**



$$\text{Area (ft}^2\text{)} = b \times h \text{ (ft)}$$

- **Area of any Triangle**



$$\text{Area (ft}^2\text{)} = \frac{b \times h \text{ (ft)}}{2}$$

To convert area to acres: $\text{Area (ft}^2\text{)} \div 43,560 \text{ ft}^2/\text{acre}$

Volume

- **Gallons to Dry Tons** *(as a decimal)*

$$\text{Dry Tons} = \text{Gallons} \times \% \text{ Total Solids} \div 240$$

- **Dry Tons to Gallons** *(as a decimal)*

$$\text{Gallons} = \text{Dry Tons} \div \% \text{ Total Solids} \times 240$$

How to use the Pocket Guide

This Pocket Guide accompanies the MPCA's manual, Land Application of Biosolids, and was developed with MPCA-certified land application Type IV operators. Using a permanent marker, operators can record analyses, calculations done at the office, and information about operations. The permanent marker can be removed with rubbing alcohol and used again.

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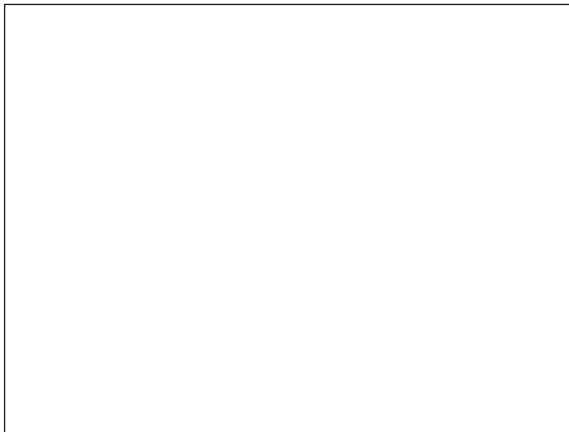
Checklist to be used before application

Crop Year

- Pathogen Reduction met?
- Vector Attraction Reduction met?
- Representative sample taken & results reviewed?
- Metals below ceiling concentrations?
- Sites approved by MPCA/approval letters reviewed?
 - Soil tests up to date (within last 3 years)?
 - Soil tests checked for limits for pH, salts & P?
- Discussed plans with farmer:
 - Fertilizer plans?
 - Crop plans?
 - Realistic yield goals?
- MANA rates figured out?
 - Calculated application rates to be \leq MANA rate?
 - Speeds, RPMs, etc?
- Application equipment calibrated?
 - Truck volume and performance?
- Field staked?

Site layout

For sketches, diagrams or other information.



Calculated drive speed for specific application rates for various conditions

Rate (gal/acre)	Speed	Other information for driver

Field Calibration of Equipment

- Apply one vehicle load of biosolids at known volume (for liquid) or weight (for dewatered).
- Measure the coverage of this application in square feet.
- Divide the coverage (sq. ft.) by 43,560 sq. ft./acre to get the fraction of an acre covered per load.
- Take the volume or weight of one load and divide by the fraction of an acre covered to get or check vehicle application rates in gal/acre or wet tons/acre.

Surface application

Injection

Biosolids Quality – Nutrients & Trace Elements

Crop Year
<input type="text"/>

4

Nutrient	Our Values
% TKN	
% NH ₃ -N	
% Phosphorus	
% Potassium	
% TS	
% VS	

For your convenience...

One dry ton = _____ gal. or _____ wet tons
Available N/dry ton = _____ pounds
Phosphorus/dry ton = _____ pounds (about 50% available)
Potassium/dry ton = _____ pounds
Commercial price of N this year = \$ _____ /lb
Value of biosolids N/ton = \$ _____
Other information:

Trace Element	Our Values (mg/kg)¹	Ceiling concentration (mg/kg)¹	“Clean Biosolids” Monthly Average Concentration (mg/kg)¹	Cumulative Loading Rate (lbs/acre)
Arsenic		75	41	37
Cadmium		85	39	35
Copper*		4300	1500	1339
Lead		840	300	268
Mercury		57	17	15
Molybdenum*		75	none	none
Nickel		420	420	375
Selenium*		100	100	89
Zinc*		7500	2800	2500
Other:				

* = Essential plant nutrients

¹Dry weight basis

Nitrogen recommendations for corn production *when soil nitrate test is not used*

Crop grown last year	Organic Matter Level*	Expected Yield (bu/acre)					
		< 100	100-124	125-149	150-174	175-199	200+
N to Apply (lbs/acre)							
alfalfa (≥ 4 plants/ft ²)	low	0	0	0	30	50	70
	med and high	0	0	0	0	30	50
alfalfa (2-3 plants/ft ²)	low	0	30	60	90	110	130
	med and high	0	0	30	60	80	100
soybeans, small grains,** alfalfa (≤ 1 plant/ft ²)	low	60	90	120	150	170	190
	med and high	30	60	90	120	140	160
edible beans, field peas	low	70	100	130	160	180	200
	med and high	50	80	110	140	160	180
Group 1 crops	low	25	55	85	115	135	155
	med and high	0	25	55	85	105	125
Group 2 crops	low	100	130	160	190	210	230
	med and high	70	100	130	160	180	200

*** Organic Matter Level: Low = less than 3.0%
Med & high = 3.0% or more**

The well-drained soils of southeastern Minnesota receive the N recommendations listed for soils with a medium and high organic matter level. All irrigated soils are included in the low organic matter category.

** Use these recommendations if any small grain stubble in southeastern Minnesota counties was tilled after harvest; if there was no tillage, use recommendations for crops in Group 1. Use recommendations for crops in Group 2 if corn follows small grain in the remainder of the state.

Group 1 Crops

alsike clover	grass-legume pasture
birdsfoot trefoil	fallow
grass/legume hay	red clover

Group 2 Crops

barley	grass pasture	sugarbeets
buckwheat	oats	sunflowers
canola	potatoes	sweet corn
corn	rye	vegetables
grass hay	sorghum-sudan	wheat

Nitrogen credits for some forage legumes if corn is planted two years later

Legume Crop	Second year nitrogen credit (lb/acre)
Harvested alfalfa	75
≥ 4 plants/ft ²	
2-3 plants/ft ²	50
≤ 1 plant/ft ²	0
Red clover	35

MANA Rates for Hay & Legumes

Crop	MANA Rates
Soybeans	Realistic yield goal X 3.5 = #N/acre
Cover crop	50# N/acre
Grass hay	75# N/acre Max. OR 30# N/acre X yield (tons measured)
Alfalfa	200# N/acre Max. OR
Clover	100# N/acre Max. } 50# N/acre X yield (tons measured)
Clover/grass mix	100# N/acre Max.
Alfalfa/grass mix	100# N/acre Max.

The **Realistic Yield Goal** is the most recent five-year average of crop yields, excluding the worst year, or the most recent three- to five-year average yield increased by ten percent. If the crop has never been grown or records are not available, the county NRCS, county extension agent or crop consultants can recommend a realistic yield goal based on soil productivity and level of management.

Minimum Duration Between Application and Harvest for Grazing & Public Access for Class B Biosolids Applied to Land

Criteria	If surface applied or incorporated	If injected
Food crops of which the harvested part(s) may touch the soil/sludge mixture (melons, squash, tomatoes, etc.)	14 mos.	14 mos.
Food crops of which the harvested part(s) grow in the soil (potatoes, carrots, etc.)	20 or 38 mos. ¹	38 mos.
Feed, other food crops (field corn, sweet corn, hay, etc.) or fiber crop	30 days	30 days
Grazing of animals	30 days	30 days
Public access to the land:	1 year	1 year
	30 days	30 days
	High potential ²	
	Low potential ³	

¹The 20-month duration between application and harvest applies when the biosolids that are surface-applied stay on the soil surface for 4 months or longer before incorporation into the soil. The 38-month duration is in effect when the biosolids remain on the soil surface for less than 4 months before incorporation.

²This includes, but is not limited to, public contact sites and reclamation sites located in populated areas (for example, city construction sites, turf farms, and plant nurseries).

³Land the public uses infrequently which includes, but is not limited to, agricultural land, forest land, and reclamation sites in unpopulated areas.

Setbacks & Management Practices

for site characteristics and good crop growth to protect public health, surface water and ground water

For Agricultural Sites			
Criteria	If surface applied	If incorporated	If injected
Allowable slopes	0 - 6%	0 - 12%	0 - 12 %
Depth to bedrock	3 ft.	3 ft.	3 ft.
Depth to seasonal high water table or drain tile	3 ft.	3 ft.	3 ft.
Distance to wells: Private supply Public supply Irrigation	200 ft. 1000 ft. 50 ft.	200 ft. 1000 ft. 25 ft.	200 ft. 1000 ft. 25 ft.
Distance to residences¹	200 ft.	200 ft.	100 ft.
Distance to residential development¹	600 ft.	600 ft.	300 ft.
Distance to public contact site⁴	600 ft.	600 ft.	300 ft.
Distances to down gradient² lakes, rivers, streams, Types 3, 4, & 5 wetlands, intermittent streams³, or tile inlets connected to these surface waters, and sinkholes			
Slope 0 - 6%	200 ft.	50 ft.	50 ft.
Slope > 6 - 12%	Not allowed	100 ft.	100 ft.
Distances to grassed waterways⁴			
Slope 0 - 6%	100 ft.	33 ft.	33 ft.
Slope 6 -12%	Not allowed	33 ft.	33 ft.

¹*Separation distances may be reduced with written permission from all persons responsible for residential developments and places of recreation and all persons inhabiting within the otherwise protected distance.*

²*If down gradient surface water does not receive runoff from a bermed site, separation distances can be reduced to 33 feet.*

³*Intermittent stream means a drainage channel with definable banks that provides for runoff flow to a perennial stream, lake or wetland during snowmelt or rainfall.*

⁴*Separation distances are from the centerline of grassed waterways. For grassed waterways that are wider than these separation distances, biosolids can be applied up to the edge of the grass. Grassed waterways are natural or constructed, typically broad and shallow, and seeded with grass to help prevent erosion.*

When applying on frozen or snow-covered ground:

- Biosolids can be applied on frozen or snow-covered land only if the slope of the land is between 0 and 2%.
- Applying liquid biosolids is restricted to a maximum rate of 15,00 gallons per acre.
- The separation distance to surface water features in the table to the left increases to 600 feet for liquid biosolids.

Public access: Control public access to agricultural application sites for 30 days after applying biosolids. The MPCA considers private farmland inaccessible to the general public because of the Minnesota Trespass Law. However, if public access to the site cannot be easily controlled, signs or fences may be necessary.

Application rates: The application rate of biosolids is based on the nitrogen needs of the crop to be grown on the site. All other forms of nitrogen fertilizers that may be applied to the same crop must be considered when determining the biosolids application rate. This ensures that excess nitrogen, which could impact our water resources, is not applied.



Annual Report is due

December 31

of each year.

Crop Year

Checklist to be used After Application (includes Records & Reporting)

- Provide farmer with:
 - Information sheet on nutrients and site restrictions keep copy in file
 - Information on area actually covered
- All** certification statements signed, including the one that is not on annual report?
- Complete annual report. Information and data in records to demonstrate compliance with what is stated on annual report for:
 - Pathogen reduction
 - Vector attraction reduction
 - Daily hauling logs (amount applied each day and location)
 - Soil test data
 - Analytical lab sheets
 - Vehicle calibration
 - Location of stockpile areas (long-term storage)
 - Amount of biosolids applied cumulatively
 - Cumulative metal loadings (if not EQ biosolids)
- Copy report. File one copy & send one to MPCA.

Emergency Spill Numbers

MPCA	1-800-657-3864
Minnesota Duty Officer (24 hr.):	
Non-metro	1-800-422-0798
Metro	651-649-5451
Other numbers:	

Be prepared to answer the following questions when contacting the Minnesota Duty Officer:

- Your name and phone number
- Phone number of contact person
- Exact location and time of spill
- Identity of substance spilled
- Estimated amount of substance released
- Was the substance released to air, land or water?
- Potential for off-site movement?
- What was your response?
- Was (is) medical attention needed?

Spill Notes

To whom did you speak?
Date & time:
Decisions made:
Other notes:

Contact

Sheryl Bock, MPCA-Brainerd
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