

Manure application planning for feedlots with less than 300 animal units

All feedlots in Minnesota are required to land apply manure in an agronomic manner and comply with state rules and regulations governing land application of manure to protect water quality. This document will assist feedlot owners with less than 300 animal units (AU) plan and keep record of manure applications in accordance with state rules and regulations.

The Minnesota Pollution Control Agency's (MPCA's) Nutrient Management Tool is an online tool that is available to assist with manure management planning and record keeping.

(A link to this tool is available here: <https://www.pca.state.mn.us/land-application-of-manure>)

Manure nutrient testing

Manure testing is required for facilities of 100 AU or more but is recommended for all sites.

- Manure testing is required annually for three years and can then be reduced to once every four years.
 - Additional sampling is required anytime there may be changes in expected manure nutrient content.

Nitrogen rate limits

Nitrogen (N) application rates for crops should be consistent with the appropriate University of Minnesota (U of M) recommendations. Table 1 below identifies the maximum amount of N recommended by the U of M.

The max N application values in this table may not be the best nitrogen recommendation for every case. To obtain specific nitrogen recommendations, please refer to the applicable U of M and MPCA publication(s).

Table 1. Maximum Nitrogen Application Rates

(Adapted from: <https://extension.umn.edu/manure-management/manure-application-rates> - January 2026)

Crop to be grown	Yield	Previous Crop	Max N Application Rate (lbs/acre)
Corn or corn silage	Any	Corn or corn silage	195
Corn or corn silage	Any	Soybeans	150
Corn or corn silage	Any	Peas or edible beans	175
Corn or corn silage (irrigated)	Any	Corn or corn silage	235 (max 180 from fall applied manure)
Corn or corn silage (irrigated)	Any	Soybeans	205 (max 180 from fall applied manure)
Wheat	60 - 80 bu	Corn	110 - 150
Wheat	60 - 80 bu	Soybeans	90 - 130
Oats	81 - 100 bu	Corn	70
Oats	81 - 100 bu	Soybeans	30
Sweet corn	8 - 9 tons	Corn	120
Sweet corn	8 - 9 tons	Soybeans	90
Edible beans	2400 - 2900 lbs	Corn or Soybeans	70 - 90
Alfalfa ^a	5 ton	Any	255
Grass hay/Pasture ^a	2 ton	Any	54

^a N is not needed; but N from manure will be utilized when applied.

Nitrogen rates for corn grown one or two years after alfalfa

When alfalfa is grown one or two years prior to the current corn crop, the N recommendation includes consideration of a number of factors when selecting the appropriate amount of N to apply. Given the complexity of the recommendations, the MPCA expects N rate decisions to comply with the recommendations as given but should not exceed the values in Table 2 below.

Table 2. Nitrogen rates for corn following alfalfa

Alfalfa age	First-year corn following alfalfa		Second-year corn following alfalfa	
	Dryland	Irrigated	Dryland	Irrigated
1 year	40 - 80 lbs N/acre	140 - 170 lbs N/acre	80 - 120 lbs N/acre	140 - 170 lbs N/acre
2 years or more	0 - 40 lbs N/acre	70 - 150 lbs N/acre	0 - 80 lbs N/acre	70 - 150 lbs N/acre

Reducing potential nitrogen loss

Some fields can achieve highly productive and profitable yields by applying N at rates below the maximum U or M recommendations.

- For corn grown on non-irrigated loamy fine sands with less than 3% organic matter, the recommended N application is 100 lbs N per acre for corn following corn or 70 lbs N per acre for corn following soybeans.

The following practices are recommended to help limit loss/leaching of fall applied N:

- Use of cover crops – especially when manure is applied early in the fall.
- Delaying manure application until soil temperatures have reached 50°F.
- Limit manure application to no more than 180 lbs of N on coarse-textured soils.
 - Sidedress additional N during the growing season (as needed, not to exceed values listed in Table 1).

Accounting for ALL nitrogen sources

The total N applied from all sources must be equal to or less than the maximum N recommendation. The following N credits must be subtracted from the N recommendation.

N from starter, other commercial fertilizer, or herbicide/pesticide carriers

Table 3. How to calculate N supplied by common commercial fertilizers

Fertilizer	Product applied	Conversion factor	N supplied
UAN (28% N)	gal/acre	X 2.98 =	lbs/acre
UAN (32% N)	gal/acre	X 3.54 =	lbs/acre
Liquid 10-34-0	gal/acre	X 1.17 =	lbs/acre
Urea	lbs/acre	X 0.46 =	lbs/acre
Anhydrous ammonia	lbs/acre	X 0.82 =	lbs/acre
<i>Example: (liquid 10-34-0)</i>	5 gal/acre	X 1.17 =	5.9 lbs/acre

N from manure applied last year

$$\frac{\text{Application rate last year (tons or gal/acre)}}{1,000} \times \frac{\text{Availability factor (0.25 (0.15 for swine))}}{\text{Liquid only}} \times \text{N Test last year} = \text{N available this year (lbs/acre)}$$

N from irrigation water

$$\text{NO}_3\text{-N test (ppm)} \times \frac{0.228}{\text{Conversion factor}} \times \text{Depth of water (acre-inches)} = \text{N available (lbs/acre)}$$

Calculating manure or fertilizer application rates

Important: Do **NOT** use 1st year nutrient availability estimated by the manure testing lab.

How much manure to apply to provide a specific amount of N

Step 1 - Find the amount of N you need from manure after accounting for N from other sources:

$$\frac{\text{Desired amount of N (see pg 1 or 2)}}{\text{Fertilizer N including starter (see pg 2)}} - \frac{\text{N from manure applied last year (see pg 2)}}{\text{N from irrigation water (see pg 2)}} = \text{N to be supplied by manure (lbs/acre) Transfer \# to next line}$$

Step 2 - Find the manure application rate (or use quick reference charts on pages 4-7):

$$\frac{\text{N to be supplied by manure (from step 1)}}{\text{N Availability factor (\# from Table 4 / 100)}} \div \frac{\text{N Test (estimates on pg 11)}}{\text{Liquid only}} \times 1,000 = \text{Application rate (tons or gal/acre)}$$

How much commercial fertilizer to apply after a manure application

Step 1 - Find N supplied by manure applied this year:

$$\frac{\text{Application rate (tons or gal/acre)}}{\text{Liquid only}} \times 1,000 \times \frac{\text{N Availability factor (\# from Table 4 / 100)}}{\text{N Test}} = \text{N from manure this year (lbs/acre) Transfer \# to next line}$$

Step 2 - Find the amount of commercial fertilizer to apply after accounting for N from other sources:

$$\frac{\text{Desired amount of N (see pg 1 or 2)}}{\text{N from manure applied this year (from step 1)}} - \frac{\text{N from manure applied last year (see pg 2)}}{\text{N from irrigation water (see pg 2)}} = \text{N to be supplied by commercial fertilizer (lbs/acre)}$$

Nitrogen availability for different application methods

Table 4. Percent of total nitrogen available per year by animal species and method of application


Animal type	Broadcast			Injection	
	Incorporation after 4 days (no incorporation)	Incorporation 12 - 96 hrs	Incorporation within 12 hrs (includes cover discs)	Knife (includes coulters)	Sweep
Year 1					
Beef	25	45	60	50	60
Dairy	20	40	55	50	55
Swine	35	55	75	70	80
Poultry	45	55	70	70	70
Year 2					
Beef	25	25	25	25	25
Dairy	25	25	25	25	25
Swine	15	15	15	15	15
Poultry	25	25	25	25	25

Manure application rate quick reference charts

You can determine your manure application rate using the charts below and on pages 5 and 6.

Example: Solid beef manure applied to continuous corn


- Application method: Incorporate after 4 days
- Manure N test: 10 lbs/ton
- Total N for corn on corn: 185 lbs N
 - N from last year's manure: 60 lbs N [24 x .25 x 10]
 - 125 lbs Urea spring applied: 57.5 lbs N
 - 5-gal 10-34-0 starter: 6 lbs N
- Manure N desired: 61.5 or about 60 lbs N
- Application Rate: 24 ton/acre (using table to the right)



N Test	Incorporation after 4 days (no incorporation)				
	Desired Available N (lbs/acre)				
	60	80	100	120	150
6	40.0	100.0	120.0	123.5	130.0
8	30.0	75.0	90.0	92.5	97.5
10	24.0	60.0	72.0	74.0	78.0
12	20.0	50.0	60.0	61.5	65.0
14	17.0	43.0	51.5	53.0	55.5


To find application rates for different N tests or desired available N refer to the calculations provided on page 3.

Table 5. Poultry litter broadcast application rate (ton/acre)



N Test	Incorporation after 4 days (no incorporation)					Incorporation 12 - 96 hours				Incorporation within 12 hours (includes cover discs)			
	Desired Available N (lbs/acre)					Desired Available N (lbs/acre)				Desired Available N (lbs/acre)			
	80	120	150	180	195	120	150	180	195	120	150	180	195
35	5.0	7.5	9.5	11.5	12.5	6.0	8.0	9.5	10.0	4.5	5.5	7.0	7.5
40	4.5	6.5	8.5	10.0	11.0	5.5	7.0	8.0	9.0	4.0	5.0	6.0	6.5
45	4.0	6.0	7.5	9.0	9.5	5.0	6.0	7.5	8.0	3.5	4.5	5.5	6.0
50	3.5	5.5	6.5	8.0	8.5	4.5	5.5	6.5	7.0	3.0	4.0	5.0	5.0
55	3.0	5.0	6.0	7.5	8.0	4.0	5.0	6.0	6.5	3.0	3.5	4.5	4.5
60	3.0	4.5	5.5	6.5	7.0	3.5	4.5	5.5	6.0	2.5	3.5	4.0	4.5
65	2.5	4.0	5.0	6.0	6.5	3.5	4.0	5.0	5.5	2.5	3.0	3.5	4.0

Table 6. Beef broadcast manure application rate (ton/acre)



N Test	Incorporation after 4 days (no incorporation)					Incorporation 12 - 96 hours				Incorporation within 12 hours (includes cover discs)			
	Desired Available N (lbs/acre)					Desired Available N (lbs/acre)				Desired Available N (lbs/acre)			
	60	80	100	120	150	80	120	150	195	80	120	150	195
6	40.0	53.5	66.5	80.0	100.0	29.5	44.5	55.5	72.0	22.0	33.5	41.5	54.0
8	30.0	40.0	50.0	60.0	75.0	22.0	33.5	41.5	54.0	16.5	25.0	31.5	40.5
10	24.0	32.0	40.0	48.0	60.0	18.0	26.5	33.5	43.5	13.5	20.0	25.0	32.5
12	20.0	26.5	33.5	40.0	50.0	15.0	22.0	28.0	36.0	11.0	16.5	21.0	27.0
14	17.0	23.0	28.5	34.5	43.0	12.5	19.0	24.0	31.0	9.5	14.5	18.0	23.0
16	15.0	20.0	25.0	30.0	37.5	11.0	16.5	21.0	27.0	8.5	12.5	15.5	20.5
18	13.5	18.0	22.0	26.5	33.5	10.0	15.0	18.5	24.0	7.5	11.0	14.0	18.0
20	12.0	16.0	20.0	24.0	30.0	9.0	13.5	16.5	21.5	6.5	10.0	12.5	16.5
22	11.0	14.5	18.0	22.0	27.5	8.0	12.0	15.0	19.5	6.0	9.0	11.5	15.0
24	10.0	13.5	16.5	20.0	25.0	7.5	11.0	14.0	18.0	5.5	8.5	10.5	13.5

Table 7. Dairy broadcast manure application rate (ton/acre)

Multiply rates by 1,000 for liquid application rates in gal/acre


 N Test	Incorporation after 4 days (no incorporation)					Incorporation 12 - 96 hours				Incorporation within 12 hours (includes cover discs)			
	Desired Available N (lbs/acre)					Desired Available N (lbs/acre)				Desired Available N (lbs/acre)			
	60	80	100	120	150	80	120	150	195	80	120	150	195
6	50.0	66.5	83.5	100.0	125.0	33.5	50.0	62.5	81.5	24.0	36.5	45.5	59.0
8	37.5	50.0	62.5	75.0	94.0	25.0	37.5	47.0	61.0	18.0	27.5	34.0	44.5
10	30.0	40.0	50.0	60.0	75.0	20.0	30.0	37.5	49.0	14.5	22.0	27.5	35.5
12	25.0	33.5	41.5	50.0	62.5	16.5	25.0	31.5	40.5	12.0	18.0	22.5	29.5
14	21.5	28.5	35.5	43.0	53.5	14.5	21.5	27.0	35.0	10.5	15.5	19.5	25.5
16	19.0	25.0	31.5	37.5	47.0	12.5	19.0	23.5	30.5	9.0	13.5	17.0	22.0
18	16.5	22.0	28.0	33.5	41.5	11.0	16.5	21.0	27.0	8.0	12.0	15.0	19.5
20	15.0	20.0	25.0	30.0	37.5	10.0	15.0	19.0	24.5	7.5	11.0	13.5	17.5
22	13.5	18.0	22.5	27.5	34.0	9.0	13.5	17.0	22.0	6.5	10.0	12.5	16.0
24	12.5	16.5	21.0	25.0	31.5	8.5	12.5	15.5	20.5	6.0	9.0	11.5	15.0
26	11.5	15.5	19.0	23.0	29.0	7.5	11.5	14.5	19.0	5.5	8.5	10.5	13.5
28	10.5	14.5	18.0	21.5	27.0	7.0	10.5	13.5	17.5	5.0	8.0	9.5	12.5
30	10.0	13.5	16.5	20.0	25.0	6.5	10.0	12.5	16.5	5.0	7.5	9.0	12.0

Table 8. Dairy injected manure application rate (gal/acre)


 N Test	Knife Injection or Coulter Injection					Sweep Injection				
	Desired Available N (lbs/acre)					Desired Available N (lbs/acre)				
	80	120	150	180	195	80	120	150	180	195
8	20,000	30,000	37,500	45,000	49,000	18,000	27,500	34,000	41,000	44,500
10	16,000	24,000	30,000	36,000	39,000	14,500	22,000	27,500	32,500	35,500
12	13,500	20,000	25,000	30,000	32,500	12,000	18,000	22,500	27,500	29,500
14	11,500	17,000	21,500	25,500	28,000	10,500	15,500	19,500	23,500	25,500
16	10,000	15,000	19,000	22,500	24,500	9,000	13,500	17,000	20,500	22,000
18	9,000	13,500	16,500	20,000	21,500	8,000	12,000	15,000	18,000	19,500
20	8,000	12,000	15,000	18,000	19,500	7,500	11,000	13,500	16,500	17,500
22	7,500	11,000	13,500	16,500	17,500	6,500	10,000	12,500	15,000	16,000
24	6,500	10,000	12,500	15,000	16,500	6,000	9,000	11,500	13,500	15,000
26	6,000	9,000	11,500	14,000	15,000	5,500	8,500	10,500	12,500	13,500
28	5,500	8,500	10,500	13,000	14,000	5,000	8,000	9,500	11,500	12,500
30	5,500	8,000	10,000	12,000	13,000	5,000	7,500	9,000	11,000	12,000
32	5,000	7,500	9,500	11,500	12,000	4,500	7,000	8,500	10,000	11,000
34	4,500	7,000	9,000	10,500	11,500	4,500	6,500	8,000	9,500	10,500

Table 9. Swine broadcast manure application rate (ton/acre)

Multiply rates by 1,000 for liquid application rates in gal/acre



 N Test	Incorporation after 4 days (no incorporation)					Incorporation 12 - 96 hrs				Incorporation within 12 hrs (includes cover discs)			
	Desired Available N (lbs/acre)					Desired Available N (lbs/acre)				Desired Available N (lbs/acre)			
	60	80	100	120	150	120	150	180	195	120	150	180	195
15	11.5	15.0	19.0	23.0	28.5	14.5	18.0	22.0	23.5	10.5	13.5	16.0	17.5
20	8.5	11.5	14.5	17.0	21.5	11.0	13.5	16.5	17.5	8.0	10.0	12.0	13.0
25	7.0	9.0	11.5	13.5	17.0	8.5	11.0	13.0	14.0	6.5	8.0	9.5	10.5
30	5.5	7.5	9.5	11.5	14.5	7.5	9.0	11.0	12.0	5.5	6.5	8.0	8.5
35	5.0	6.5	8.0	10.0	12.0	6.0	8.0	9.5	10.0	4.5	5.5	7.0	7.5
40	4.5	5.5	7.0	8.5	10.5	5.5	7.0	8.0	9.0	4.0	5.0	6.0	6.5
45	4.0	5.0	6.5	7.5	9.5	5.0	6.0	7.5	8.0	3.5	4.5	5.5	6.0
50	3.5	4.5	5.5	7.0	8.5	4.5	5.5	6.5	7.0	3.0	4.0	5.0	5.0
55	3.0	4.0	5.0	6.0	8.0	4.0	5.0	6.0	6.5	3.0	3.5	4.5	4.5
60	3.0	4.0	5.0	5.5	7.0	3.5	4.5	5.5	6.0	2.5	3.5	4.0	4.5
65	2.5	3.5	4.5	5.5	6.5	3.5	4.0	5.0	5.5	2.5	3.0	3.5	4.0
70	2.5	3.5	4.0	5.0	6.0	3.0	4.0	4.5	5.0	2.5	3.0	3.5	3.5
75	2.5	3.0	4.0	4.5	5.5	3.0	3.5	4.5	4.5	2.0	2.5	3.0	3.5
80	2.0	3.0	3.5	4.5	5.5	2.5	3.5	4.0	4.5	2.0	2.5	3.0	3.5

Table 10. Swine injected manure application rate (gal/acre)

 N Test	Knife Injection or Coulter Injection					Sweep Injection				
	Desired Available N (lbs/acre)					Desired Available N (lbs/acre)				
	80	120	150	180	195	80	120	150	180	195
15	7,500	11,500	14,500	17,000	18,500	6,500	10,000	12,500	15,000	16,500
20	5,500	8,500	10,500	13,000	14,000	5,000	7,500	9,500	11,500	12,000
25	4,500	7,000	8,500	10,500	11,000	4,000	6,000	7,500	9,000	10,000
30	4,000	5,500	7,000	8,500	9,500	3,500	5,000	6,500	7,500	8,000
35	3,500	5,000	6,000	7,500	8,000	3,000	4,500	5,500	6,500	7,000
40	3,000	4,500	5,500	6,500	7,000	2,500	4,000	4,500	5,500	6,000
45	2,500	4,000	5,000	5,500	6,000	2,000	3,500	4,000	5,000	5,500
50	2,500	3,500	4,500	5,000	5,500	2,000	3,000	4,000	4,500	5,000
55	2,000	3,000	4,000	4,500	5,000	2,000	2,500	3,500	4,000	4,500
60	2,000	3,000	3,500	4,500	4,500	1,500	2,500	3,000	4,000	4,000
65	2,000	2,500	3,500	4,000	4,500	1,500	2,500	3,000	3,500	4,000
70	1,500	2,500	3,000	3,500	4,000	1,500	2,000	2,500	3,000	3,500
75	1,500	2,500	3,000	3,500	3,500	1,500	2,000	2,500	3,000	3,500
80	1,500	2,000	2,500	3,000	3,500	1,500	2,000	2,500	3,000	3,000

Manure application records

Use the form(s) below to keep records of your manure application activities for each crop year.

Note: Additional records are required for short-term stockpiling.

Cropping year: September 1, _____ to August 31, _____ Cropland manager's name: _____

Name of facility where manure generated: _____ Registration number: _____

Licensed commercial animal waste technician name (if used): _____ License no.: _____

Manure analysis results (In the spaces provided, enter the most recent analysis alone or as part of a running average – *entries must represent manure applied.*)

Manure source 1: _____ Date last analyzed: _____ Manure source 2: _____ Date last analyzed: _____

N: _____ P₂O₅: _____ K₂O: _____ Units: lb/ton lb/1,000 gal. N: _____ P₂O₅: _____ K₂O: _____ Units: lb/ton lb/1000 gal.

Manure source 3: _____ Date last analyzed: _____ Manure source 4: _____ Date last analyzed: _____

N: _____ P₂O₅: _____ K₂O: _____ Units: lb/ton lb/1,000 gal. N: _____ P₂O₅: _____ K₂O: _____ Units: lb/ton lb/1000 gal.

Field information		Crop information		Manure application information				Nitrogen (lb N/ac)			
Field ID	Acres used	Crop grown to utilize the nutrients applied	Crop most recently harvested	Manure source (1-4 from above)	Dates of application	Application rate per acre	Method of application and incorporation Knife injection Sweep injection Surface <12 hr Incorp Surface <4 day Incorp Surface 4+ day Incorp	Fertilizer N (including starter) N1	Carry-over N last year's manure N2	Manure N applied this year N3	Total available N (N1+N2+N3) SUM
Example	40	Corn	Soybeans	1	Nov – Feb 2024	25 ton	Surface 4+ day Incorp	121	0	60	181

Land application setbacks from waters

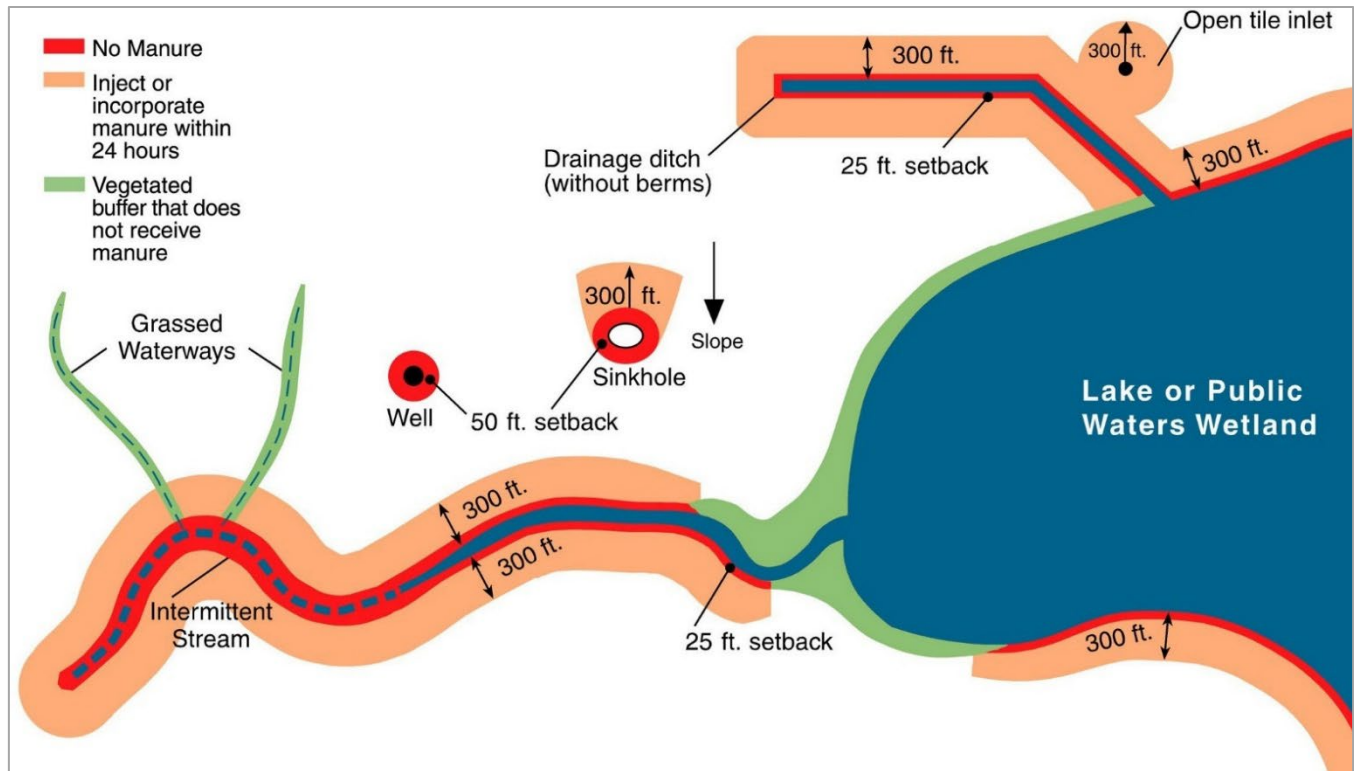


Figure 1. Setbacks to water features when manure is applied.

Short-Term manure stockpile requirements

Table 11. Location restrictions for short-term manure stockpiles by sensitive feature

Sensitive feature	Location Restriction
Waters of the State, tile intakes, road ditches, sinkholes, non-farmed wetlands, and rock outcrops	Setback of 300 ft of flow distance and at least 50 ft horizontal distance
Private well	Setback of 100 ft (200 ft for vulnerable wells)
Public water supply well	Setback of 1,000 ft
Drain tile with less than 3 ft of soil cover	Setback of 100 ft
Shoreland or floodplain	Stockpiling is prohibited
Sand/Gravel pits, quarries, exposed bedrock	Stockpiling is prohibited
Seasonal water table within 2 ft of the surface	Stockpiling is prohibited
Land where soil texture to a depth of five feet is entirely coarser than a sandy-loam	Stockpiling is prohibited
Land with greater than a 6% slope	Stockpiling is prohibited
Land with greater than 2 % slope	Stockpiling is prohibited (Unless clean water diversions and erosion control measures used)

Other short-term stockpile restrictions

- Each stockpile must not exceed agronomic needs of the crops on the field (up to 320 acres)
- Stockpile must be removed within one year (otherwise considered a permanent stockpile)
- Must have vegetated cover or crop for at least one full growing season prior to re-use of the site
 - Unless stockpiled for less than 10 consecutive days and no more than 6 times per year; or
 - Unless located within an open lot with less than 100 animal units.

Minimum soil phosphorus requirements

When soil test phosphorus levels exceed 21 parts per million (ppm) using the Bray P1 test (Bray) or 16 ppm using the Olsen test (Olsen), the rate and frequency of manure applications must not allow soil test phosphorus build-up over a six-year period when manure is applied within 300 feet of:

- Lakes
- Rivers
- Streams
- Intermittent streams
- Protected wetlands
- Unbermed drainage ditches

Exception: Not required when a 100 ft non-manured vegetative buffer exists along lakes and streams, or 50 ft elsewhere.

Do my practices build soil phosphorus levels over a six-year period?

Below is an example of how to determine if you are building soil phosphorus levels over a six-year period.

- **Rotation:** Corn and soybean (200 bushel (bu) average for corn and 55 bu average for soybean)
 - 200 bu Corn = 68 lbs phosphorus (P₂O₅) removed per year $[200 \times 0.34 \text{ (from Table 12)} = 68]$
 - 55 bu Soybeans = 45 lbs P₂O₅ removed per year $[55 \times 0.82 \text{ (from Table 12)} = 45]$
- **Manure application:** Beef manure (7 lbs P₂O₅/ton) is applied to the corn crop at 25 ton/acre
 - 25 ton/acre x 7 lbs P₂O₅/ton x 0.8 (P₂O₅ availability factor) = 140 lbs P₂O₅
- **Other P sources:** Five gallons of 10-34-0 starter fertilizer is applied to corn providing 20 lbs P₂O₅

P balance:

Total P₂O₅ applied over 6 years: 480 lbs P₂O₅ $[140 \text{ (manure P)} + 20 \text{ (starter P)}] \times 3 \text{ (corn crops)}$
 - Total P₂O₅ removed over 6 years: - 339 lbs P₂O₅ $68 \text{ (corn P removal)} \times 3 + 45 \text{ (soybean P removal)} \times 3$

Balance: 141 lbs P₂O₅ (Surplus) *Soil P₂O₅ levels will build*

Potential adjustment: Removing one year of manure application would prevent buildup

Table 12. Phosphorus removal by various crops

Crop	P ₂ O ₅ Removal	
Alfalfa	10.8	lbs/ton
Corn (grain)	0.34	lbs/bu
Corn silage	3.8	lbs/ton
Grass hay or pasture	8.9	lbs/ton
Grass/legume	11.2	lbs/ton
Oats (grain)	0.25	lbs/bu
Oats (grain & straw)	0.32	lbs/bu

Crop	P ₂ O ₅ Removal	
Potatoes	0.14	lbs/cwt
Rye (grain)	0.44	lbs/bu
Rye (grain & straw)	0.59	lbs/bu
Soybeans	0.82	lbs/bu
Sweet corn	11	lbs/ton
Wheat (grain)	0.53	lbs/bu
Wheat (grain & straw)	0.64	lbs/bu

Spill response

- Tend to any injuries
- Contain the spill by creating berms and plugging culverts and tile inlets that manure could enter
- Contact the Minnesota Duty Officer (**1-800-422-0798**)
- Contact the County Feedlot Officer or MPCA
- Recover pooled manure and solids; get a pump truck if necessary
- Scrape large accumulations; leave vegetation if possible
- If spilled on the road, recover what is possible and scrape/sweep the remainder off the road
- Work areas of bare soils and re-seed

Duty Officer (1-800-422-0798)

Info to provide:

- the location, date, and time of spill
- what was spilled
- approximate amount spilled
- which local officials have been notified (sheriff, fire dept., etc.)
- any surface water(s) impacted
- what has happened or is happening
- a call back number

Manure sampling and spreader calibration

Tips for taking manure samples

- When possible, take many small samples and mix in a clean five-gallon bucket.
- Sample different locations and/or depths to ensure a representative sample.
 - If sampling a stockpile avoid sampling the outer 1.5 feet

Manure spreader calibration

Step 1

- **Solid manure:** Weigh the spreader both empty and full. Subtract the empty weight from the full weight to determine the tons of manure per load.
- **Liquid manure:** Determine 1,000's of gallons per load (multiply tank volume by 90%).

Step 2

- Calculate acres covered by one load - multiply the distance traveled by the width of the spread.
Example: 800 ft traveled x 20 ft spread = 16,000 sq ft = 0.37 acres per load
Solid: 6 tons per load / 0.37 acres covered per load = 16 tons/acre
Liquid: 4,000 gal per load / 0.37 acres covered per load = 10,800 gal/acre

For more information

- Solid manure sampling: <https://youtu.be/Cu2iPIJ5zBE>
- Calibrating a solid manure spreader: <https://youtu.be/I0JHLO80B4E>

Estimated nutrient content of liquid and solid manure

When possible, actual manure test results should be used in place of these estimates.

Table 13. Estimated nutrient content of manure by animal type.

Animal type	Liquid manure (lbs/1000 gal)			Solid manure (lbs/ton)		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Beef						
Feeder cattle/Slaughter steer	29	18	26	11	7	11
Cow	20	16	24	7	4	7
Calf	27	18	24	9	4	8
Dairy						
Mature cow (milked or dry)	31	15	19	10	3	6
Heifer	32	14	28	10	3	7
Calf	27	14	24	10	3	5
Swine						
Nursery	25	19	22	13	8	4
Wean-Finish	42 (57)	34 (46)	24 (34)	14 (14)	6 (6)	4 (4)
Grow-Finish	58 (75)	44 (54)	40 (40)	16 (22)	9 (22)	5 (17)
Farrowing	15	12	11	14	6	4
Gestation	25	25	24	9	7	5
Poultry						
Layers	57	52	33	34	51	26
Broilers	63	40	29	46	53	36
Turkeys	56	39	31	40	50	30

Useful resources developed by the MPCA

The MPCA feedlot program homepage: <https://www.pca.state.mn.us/feedlots>

Come here to find MPCA regional feedlot staff contacts or county feedlot officer contacts.

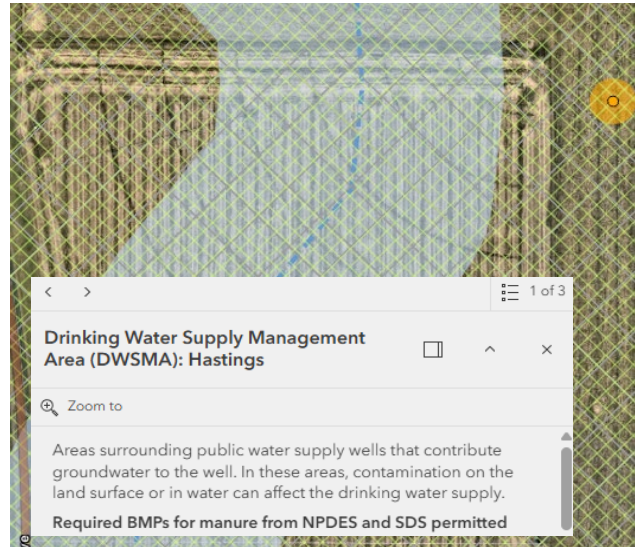
The MPCA land application of manure webpage: <https://www.pca.state.mn.us/land-application-of-manure>

Come here to find information about land application of manure including the following:

- **Interactive Nutrient Management Planning Map:** <https://arcg.is/1aT1DX1>
Zoom to your field and see sensitive areas within or near the field. An example is below.

TIP: Clicking on the sensitive feature will display the setback/management requirements.

In areas where multiple sensitive features overlap click the arrows at the top left of the pop-up box to see more info about all sensitive areas.



- **Manure nitrogen rates for corn production**
Learn more about how U of M nitrogen recommendations are used with manure.

TIP: Do an internet search for “wq-f8-18” to quickly find a direct link to the fact sheet.

- **Manure management for corn on irrigated sandy soils**
Learn more about manure nitrogen requirements for irrigated corn on sandy soils.

TIP: Do an internet search for “wq-f8-52” to quickly find a direct link to the fact sheet.

- **Applying manure in sensitive areas:** <https://tinyurl.com/tc5edjh5>
Learn more about the requirements for manure application near water features, wells, sinkholes, and other areas more susceptible to potential impacts.

TIP: The interactive nutrient management planning map (listed above) contains similar content.

- **Manure application record 100 – 299 Animal Units (AU)**
(highlighted in the screen shot)
Obtain more copies of the recordkeeping form for future crop years.

TIP: Do an internet search for “wq-f6-03” to quickly find a direct link to the form.

Recordkeeping

These forms are not required when using the online Nutrient Management Tool.

- [Land application records for 300 or more animal units \(wq-f6-23a\)](#)
 - [Instructions: Land application records for 300 or more animal units \(wq-f6-23b\)](#)
- [Records when manure ownership is transferred - 300 or more animal units \(wq-f6-43\)](#)
 - [Record-keeping form instructions - Transferred ownership of manure \(wq-f6-42\)](#)
- [Form: Manure application record - 100-299 AU \(wq-f6-03\)](#)
 - [Instructions: Manure application record - 100-299 AU \(wq-f6-04\)](#)

Other resources

U of M extension “manure team” homepage: <https://manure.umn.edu>

All things manure related including nitrogen recommendations specific to manure.

TIP: Scroll down on the webpage to find land application information under the land application heading.

Click on the “+” sign next to “Application basics” for land application of manure information.

MDA runoff risk advisory forecast: <https://tinyurl.com/bdfwc4m2>

A tool to help farmers and commercial applicators determine the best time to apply manure by avoiding precipitation, snow melt, or other conditions that may cause recently applied manure to leave the field.

U of M crop nutrient recommendations: <https://tinyurl.com/mww45spv>

Find crop-specific nutrient needs for Minnesota, including guidelines for nitrogen, phosphate, potash and other fertilizers, as well as strategies for ensuring your crops get the nutrients they need.