Chapter ATCP 50

APPENDIX D

NUTRIENT MANAGEMENT
(Acre)
Code 590
Natural Resources Conservation Service
Conservation Practice Standard

Definition

Managing the amount, form, placement, and timing of applications of plant nutrients.

Scope

This standard establishes the minimum acceptable requirements for ***a plan that addresses*** the application of plant nutrients associated with organic wastes (manure and organic byproducts), commercial fertilizer, legume crops, and crop residues.

Purposes

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

- Supply plant nutrients for crop production.
- Minimize entry of nutrients to surface water.
- Minimize entry of nutrients to groundwater.

Conditions Where Practice Applies

On lands where plant nutrients are applied.

Criteria

Because this is the first conservation practice standard designed to use the new NRCS planning procedure, a short explanation of the application of criteria based on identified purpose is provided.

In order to address the purpose of supplying nutrients for crop production, Criteria I must be applied.

It would be extremely rare in Wisconsin to find a field with an identified concern of nutrients applied for production where there would not also be a concern for the entry of nutrients to either surface or groundwater. Criteria I would only be used alone where Total Resource Planning did not identify a surface or groundwater concern. Food Security Act and Farmland Preservation Plans are not Total Resource Plans.

In order to address the purpose of minimizing the entry of nutrients to surface water, Criteria I and III must be applied.

The criteria for minimizing the entry of nutrients to surface water will be applied to the majority of the fields in Wisconsin.

In order to address the purpose of minimizing entry of nutrients into groundwater, Criteria I and II must be applied.

The criteria for minimizing the entry of nutrients to groundwater will be applied in areas with groundwater concerns, ie, Lower Wisconsin River Valley, Central Sands, Atrazine Prohibition Areas, etc.

This practice would be used to treat these identified resource concerns:

Soil Resource
  Soil Contaminants:
    Excess Animal Wastes and Other Organics
    Excess Fertilizer
Water Resource
  Quality:
    Nutrients and Organics in Groundwater
    Nutrients and Organics in Surface Water
Plant Resource
  Management:
    Nutrient Management

Note: Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your local NRCS office or the Wisconsin Land and Water Conservation Association office, Madison, WI at (608) 833−1833.

I. Minimum Criteria to Provide Nutrients for Crop Production and to Minimize Entry of Nutrients to Surface Water and Groundwater

A. General Cases:

1. Soils shall be tested a minimum of once every four years.

2. Develop field by field nutrient budget for all major nutrients consistent with UWEX Publication "A−2809". Conservation Planning Tech Note WI−1 spells out the minimum requirements for a Nutrient Management Plan.

3. Available nitrogen, including nitrogen from legumes, manure, sludge, organic byproducts, and commercial sources, shall not exceed nonlegume crop needs, except that, available nitrogen may exceed crop needs by up to 20% if legumes, manures and organic byproducts are the only sources of nitrogen.

4. Commercial fertilizer shall not be applied to frozen or snow covered ground except for grass pastures on slopes of six percent or less north of Wisconsin Highway 29 and on winter grains throughout the state.

B. Manure and organic byproducts applied to crops for harvest.

1. Organic byproducts other than manure or septage shall be analyzed for nutrients. Other analyses may be required as prescribed by state, federal, or local regulations. These materials shall be spread as prescribed by federal, state, or local regulations (see Wis. Department of Natural Resources Code, NR214 (industrial wastes), NR204 (municipal sludges), NR113 (septage)). Required documentation shall be maintained by the applicator. These materials may require injection or incorporation within specified time periods.

2. Surface spread liquid manures and organic byproducts shall not run off the intended site during application. Application must be stopped if ponding or runoff begins.

C. Manure and organic byproducts applied on land where vegetation is not harvested. This does not include non−farmed wetlands.

1. Liquid materials shall be injected across slopes that are 3% or greater or be surface spread.

2. Application rates shall not exceed 75 lb available P2O5/acre (32.8 lb P/acre) total for a 5−year period unless incorporated.

3. Application of manure shall occur between July 15 and freeze−up to minimize damage to wildlife habitat.

II. Additional Criteria to Minimize Entry of Nutrients to Groundwater

A. Manure shall contain a nitrification inhibitor if it is injected in the fall on sands, and loamy sands when the soil temperature is above 50 degrees F.

B. Commercial nitrogen fertilizer for spring seeded crops shall not be fall applied on sands and loamy sands.

C. Manure and organic byproducts shall not be applied to the following areas unless injected or incorporated within 72 hours:

1. Within 200 feet upgradient of sinkholes, creviced bedrock at the surface, or other direct conduits to the groundwater, such as gravel pits and wells.

2. In other locally identified areas documented as having a high potential to pollute groundwater resources.

D. Commercial Nitrogen application rates shall not exceed recommendations based on crop need.

III. Additional Criteria to Minimize Entry of Nutrients to Surface Water

A. Manure shall not be applied at rates exceeding 75 lb available P2O5/acre/ year (32 lb P/acre) unless these materials are incorporated within 72 hours after application, in which case, the nitrogen content of the manure becomes the restricting nutrient. Applications of manure cannot be at a level which delivers more nitrogen than the crop needs. The nutrient content of manure shall be determined through a laboratory analysis or from SCS Conservation Planning Technical Note 1.

B. The soil loss tolerance will not be exceeded on soils receiving manure and organic byproducts.

C. Manure and organic byproducts shall not be spread in established waterways, non–farmed wetlands, terrace channels or other areas where runoff concentration occurs.

D. Manure and organic byproducts shall not be applied to the following areas unless injected or incorporated within 72 hours:

1. within the 10–year floodplain or within 200 feet of streams, rivers, or lakes, whichever is greater,

2. within 200 feet upgradient of sinkholes, creviced bedrock at the surface, or other direct conduits to the groundwater, such as gravel pits and wells.

E. Manure and organic byproducts shall not be applied on frozen or snow covered ground in the following areas:

1. areas identified in III(D) (above),

2. slopes of greater than 9%, except for manure on slopes up to 12% with well grassed waterways, that are either contour stripcropped with alternate strips in sod, or contour farmed with all the residue from a corn crop taken for grain remaining on the surface.

3. other locally identified areas documented as having a high potential to pollute surface water resources.

F. Manure and organic byproducts may be applied on frozen or snow covered ground on locally identified areas documented as having a low potential to pollute surface water.

G. Commercial phosphorus application rates shall not exceed recommendations based on crop need.

H. Additional guidance for reducing entry of nutrients into surface water may be found in Conservation Planning Technical Note 1.

PLANNING CONSIDERATIONS

1. Manure should not be winter spread on sites that are likely to deliver nutrient runoff to surface waters and/or groundwater. See Conservation Planning Technical Note 1 for guidelines concerning areas with high pollution hazard for surface runoff.

2. Manure should be stored in properly located and constructed facilities during periods when land application is not suitable. (See UWEX Publication A–3466 for more information.)

3. Manure applications to no–till cropping systems should be injected to avoid nutrient runoff and maximize nutrient availability. Surface applications should be avoided.

4. Vegetative filter strips, along with other erosion control practices, should be maintained adjacent to surface water, wetlands, sinkholes, and rock outcrops in order to reduce the amount of sediment and nutrients which actually reach surface water and/or groundwater.

5. Evaluate federal, state, and local water quality standards and designated use limitations, such as city, county, and township zoning ordinances.

PLANS AND SPECIFICATIONS

Plans and specifications will be prepared for a specific site based on this standard, and planning instructions provided in Conservation Planning Technical Note 1.

1. Nutrients shall be applied consistent with federal, state, and local regulations.

2. Industrial wastes and byproducts are regulated under NR214, Wisconsin Administrative Code. They must be spread in accordance with a Wisconsin Pollution Discharge Elimination System (WPDES) Permit as obtained from the Wisconsin Department of Natural Resources (WDNR).

OPERATION, SAFETY AND MAINTENANCE

1. Minimize operator exposure to potentially toxic gases associated with manure, organic wastes and chemical fertilizers, particularly in enclosed areas. Wear protective clothing appropriate to the material being handled.

2 .Protect commercial fertilizer from the weather, and agricultural waste storage facilities from accidental leakage or spillage. See Chapter Ag 162 of Wisconsin Administrative rules and County Waste Storage Facilities Ordinances concerning regulations on siting, design, operation and maintenance of these facilities.

3. When cleaning equipment after nutrient application, remove and save fertilizers or wastes in an appropriate manner. If system is flushed, use rinse water in the following batch of nutrient mixture, where possible, or dispose of according to state and local regulations. Always avoid cleaning equipment near high runoff areas, ponds, lakes, streams, and other water bodies. Extreme care must be exercised to avoid contaminating wells.

4. Application equipment must be calibrated to achieve the desired application rate.

Working Tools –

1. SCS Conservation Planning Technical Note 1

2. University of Wisconsin–Extension (UWEX) Publication "A–2809, Soil Test Recommendations for Field, Vegetable, and Fruit Crops", Rev. 1991.

3. University of Wisconsin–Extension (UWEX) Publication "A–3512, Wisconsin's Preplant Soil Profile Nitrate Test".

4. University of Wisconsin–Extension (UWEX) – Wisconsin Department of Agriculture, Trade, and Consumer Protection (UWEX–DATCP) Publication "A–3466, Nutrient and Pesticide Best Management Practices for Wisconsin Farms", June 1989.

5. University of Wisconsin−Extension (UWEX) Publication "A−2100, Sampling Soils for Testing".

6. University of Wisconsin−Extension (UWEX) Publication "A−3517, Using Legumes as a Nitrogen Source", May 1991, with revised 1992 Forage Legume Nitrogen Credit Table.

7. University of Wisconsin−Extension (UWEX) Publication "A−3537, Nitrogen Credits for Manure Applications", May 1991.

8. University of Wisconsin−Extension (UWEX) Publication "A−3557, Nutrient Management: Practices for Wisconsin Corn Production", May 1992.

9. University of Wisconsin−Extension (UWEX) Publication "A−3568, A Step−by−Step Guide to Nutrient Management", May 1992.

10. University of Wisconsin−Extension (UWEX) Publication "Wisconsin Irrigation Scheduling Program".

11. University of Wisconsin−Extension (UWEX) Publication "WISP: Managing Irrigation for Corn Production", March 1991.

12. Wisconsin Department of Natural Resources Codes NR214, (Land Treatment of Industrial Liquid Wastes, By−product Solids and Sludges); NR204 (Municipal Sludge Management) and NR113 (Septage).

13. WISPer Model, The Wisconsin Integrative Soil Program Ver. 2.0 for Economic Recommendations, University of Wisconsin−Extension.

NRCS, WI
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Wisconsin Technical Note − Conservation Planning WI−1

October 21, 1993

Subject: **Nutrient Management**

Nutrient management planning is an important yet oftentimes cumbersome process. This Technical Note has been developed in order to provide guidance for nutrient management planning, specifically:

Conservation Planning Technical Note 1.

Part 1.1 Minimum requirements for a nutrient management plan

Part 1.2 Items to consider in nutrient management planning that may provide additional benefit over and above the criteria in the nutrient management standard

Part 1.3 A procedure for estimating nutrient credits available from manure

Part 1.4 A sample procedure for identifying areas that pose a pollution hazard to water quality from winter spread manure.

Part 1.5 Example water budgets

Technical Note − Conservation Planning − WI−1, Part 1.1

Minimum requirements for a nutrient management plan

A nutrient management plan shall be developed according to the following criteria and steps:

A. Assemble the following background information for the plan

1. Aerial photographs of the farm containing

a. Boundaries and identification numbers for all crops fields, pastures, and waste spreading sites.

b. Identification of fields or portions of fields with waste spreading restrictions.

2. A soil survey map and other appropriate maps will be used to identify:

a. Soils for sampling and making nutrient recommendations.

b. Drainage features and other environmentally sensitive areas including waterways, springs, creviced bedrock, streams, lakes, sinkholes, quarries, tile outlets and wells.

c. Percent land slope.

d. The map may also be used to identify environmentally vulnerable soils including those less than 20 inches to bedrock, having permeabilities greater than 6.0 inches/hour or having water tables shallower than 1.0 foot (unless drained) as given in Section II−G of the Field Office Technical Guide (FOTG).

3. As a minimum, the amount of nutrients from all sources shall be identified including (legumes), manure, other organic byproducts, and commercial fertilizers.

4. A crop history identifying the previous season's crops and future cropping plans, including crop type and rotation shall be recorded. UWEX Soil Analysis Laboratory has developed a "Soil Information Sheet" to record and utilize this information as part of a soil test program.

B. The producer or land manager is responsible for developing and maintaining a current nutrient budget on a field by field basis. Soil test reports from UWEX soil analysis laboratories (including ASS approved labs) provides an existing method of developing a budget.

Technical Note – Conservation Planning – WI−1, Part 1.2

Items of benefit for nutrient management planning

The items listed in Part 1.2 of the technical note should be considered in nutrient management planning. These items may provide additional water quality benefit over and above the criteria in the Nutrient Management Standard.

The rate, timing and placement of nutrients are important considerations that may affect water quality.

I. The following considerations look at timing of nutrient applications in order to reduce the impacts on water quality.

A. Nutrients should be applied as near to the time of crop use as possible.

B. Minimize nutrient applications on frozen or snow−covered ground.

C. Seasonal water budgets can be used to identify potential leaching and runoff events and to select management options to control these losses. Example water budges are in Part 1.5 of this Technical Note.

D. Manure and other organic byproducts should not be applied on sandy or loamy sand soil in the fall when soil temperatures are greater than 50 degrees F unless a cover crop is present to use the nitrogen.

II. The following considerations look at managing the rate of nutrients applied and the placement of nutrients in order to reduce the impact on water quality.

A. Use soil test levels to prioritize manure application sites. Apply manure to the least environmentally sensitive areas first. Criteria to consider include: soil permeability, infiltration capacity, slope, erodibility, accessibility, present crop, potential fate of runoff and presence of conservation practices.

B. Manure injection or incorporation within 72 hours minimizes nitrogen volatilization losses.

C. When concerned with the rate and placement of nitrogen, consider these things.

1. Risk of nitrogen movement to ground water is greatest for highly permeable soils, shallow soils over permeable bedrock, and soils with a high water table. A map of groundwater contamination susceptibility in Wisconsin is found in UWEX−DATCP publication "A−3466" between p. 66 and 67.

2. Nitrogen losses to the atmosphere from denitrification are greatest on poorly drained soils.

3. Unused or residual nitrate may be leached from the soil and pollute groundwater. In years of normal fertilizer application and unexpected low yields, excess nutrients, including nitrate, may accumulate in the soil. Soil profile nitrate tests can be used to measure carryover nitrogen and adjust nitrogen applications (see UWEX publication "A−3512"). Additional options for reducing the amount of nitrogen subject to leaching include:

a. Growing a winter cover crop to use carryover nitrogen.

b. Growing legume crops (when managed without supplemental N inputs) to "scavenge" N remaining in the profile.

c. Growing high N demanding crops such as corn and forage grasses.

4. Nitrification inhibitors used with ammonium or ammonium−forming N fertilizers can improve N efficiency and limit loss of fertilizer N on soils where the potential for nitrate loss through leaching or denitrification is high (see page 29 of the UWEX publication "A3466" for more information).

D. When concerned with the rate and place of phosphorus, consider these things.

1. Appropriate management practices for phosphorus on individual farms will vary with specific cropping, topographical, environmental and economic conditions. See UWEX publication A−3466 and A−3557 for more information.

2. Soil test values are primarily interpreted for crop response and economic return.

3. Consider reducing or eliminating applications of P sources, including manure and other organic byproducts, if soil test levels exceed 75 ppm P (150 lbs P/acre).

4. Where soil test P levels are 75 to 150 ppm (very high to excessively high) the following practices are recommended:

a. Use runoff and erosion control practices such as residue management, conservation tillage, and contour farming.

b. Rotate to P−demanding crops such as alfalfa.

c. Limit starter P applications on row crops to 20 lbs P205/acre.

d. Where possible, apply manure on fields with lower P tests.

5. Where soil test levels exceed 150 ppm P, these additional practices are recommended:

a. To the extent possible, eliminate all non−starter P applications.

b. Consider using additional runoff and erosion control practices such as buffer (filter) strips.

6. Where soil test P exceeds 150 ppm on all land available for manure or other waste material applications, apply to the least environmentally sensitive areas first at rates needed to supply the crop N requirements or the anticipated crop removal of P and/or K. Criteria to prioritize application sites may include soil permeability and infiltration capacity, slope, erodibility, soil test P level, potential fate of runoff, presence of conservation practices, and field accessibility.

III. Other Considerations

A. Phosphorus losses are greatest on eroding sites with high runoff.

B. Use appropriate pH management to keep soil pH in the proper range for optimum crop production. Soil pH affects the availability of almost all of the essential elements (see UWEX Publication "A−2809").

C. Barnyards, feedlots, and manure storage facilities should be thoroughly cleaned prior to abandonment. High N demanding crops such as alfalfa or corn should be planted at the site to use soil nitrate.

D. Good soil tilth should be maintained. good soil tilth encourages infiltration and reduces runoff. this is especially important when the objective is to protect surface water but may not be desirable if the objective is protection of groundwater.

1. Organic matter additions promote good soil tilth.
2. Equipment travel on saturated soils should be avoided to reduce soil compaction and rutting.

E. Practices such as crop rotation promote efficient nutrient use.

Technical Note – Conservation Planning – WI−1, Part 1.3

Determining manure nutrient credits

Proper crediting of manure nutrients can lower commercial fertilizer needs and reduce the potential for surface and ground water pollution. Manures contain the major plant nutrients (N, P and K) and other essential nutrients. Only a portion of the nutrients from a field spread manure are available in the first year. The rest become available over time as the nutrients are released from the organic fraction. Calculating the fertilizer value of manure involves three steps:

STEP 1: Determine Available−Nutrient Content

STEP 2: Determine Manure Application Rates.

STEP 3: Calculate the Manure Nutrient Credit

STEP 1: Determine Available−Nutrient Content

Because the nutrient content of manure varies so much, it is recommended that a representative (well−agitated) sample be sent to a laboratory to determine its fertilizer value.

Where manure is tested:

Multiply the total nutrient content by the appropriate percent available nutrients from Table 2. See Equation 1.

Equation 1. Calculating Available Nutrient Content

Total Nutrient Content X Manure Nutrient Availability = Available Nutrient Content

Express Total Nutrient Content as pounds per ton if working with solid manure or pounds per 1,000 gallons if working with liquid manure.

Express Table 2 percentage as a decimal and use that as the Manure Nutrient Availability term in Equation 1.

Where manure is not tested:

Use Tables 3 and/or 4 to estimate the available nutrient content of various solid and liquid manures after one application or consecutive annual applications.

STEP 2: Determine Available−Nutrient Content

Identify the fields that have received or will receive manure.

Then, determine how much manure per acre has been applied or will be applied to each field. UWEX Publication A3381, "Determining Manure Application Rates", contains more information.

STEP 3: Calculate the Manure Nutrient Credit

After you know the manure's available nutrient content and the application rate to a particular field, you can calculate the manure nutrient credit from Equation 2.

Multiply the Manure Application Rate from STEP 2 by the Available Nutrient Content from STEP 1.

Maintain proper units for this calculation by using the appropriate conversion terms in Table 5.

Equation 2. Manure Nutrient Credit Calculation

Available Nutrient Content X Manure Application Rate = Manure Nutrient Credit

MANURE CREDITING EXAMPLES

Example 1: Producer Smith surface applied 20 ton/acre of fresh solid dairy manure to corn ground last fall without testing the manure. Estimate the amount of N, P205, and K20 available to the next corn crop from manure.

Step 1: Use Table 3 to estimate available nutrients from surface spread solid dairy manure as 3−3−8/ton.

Step 2: Use Equation 2 to calculate the manure nutrient credit from a 20 ton/acre application rate.

(3−3−8/ton)(20 ton/acre) = 60 lb N/acre, 60 lb P205/acre, 160 lb K20/acre

Table 1. Rule of Thumb Average Nutrient and Dry Matter Content from Various Solid and Liquid Manures +

Species/mgt	%Dry Matter	N	P205	K20
		———	lb/ton	———
Dairy, solid, fresh*	12.7	10	5	10
Beef, solid, fresh*	11.6	14	9	11
Swine, solid, fresh*	9.2	10	6	9
Poultry, solid, fresh*	25.2	25	25	12
			——— lb/1,000 gal———	
Dairy, liquid*	8.5	28	14	28
Veal calf, liquid**	1.5	12	12	25
Beef, liquid*	7.7	39	25	31
Swine, liquid, finishing unit***	7.6	55	27	34
Swine , liquid farrow−nursery***	3.8	30	10	10
Poultry, liquid*	16.8	69	69	33

* Adapted from Table 1, UWEX Publication A3411, "Manure Nutrient Credit Worksheet", 1987.

** Adapted from Table 10−7, Midwest Plan Service Publication 18, "Livestock Waste Facilities Handbook", Rev. 1985, with 50% dilution water added. NOTE: Rainfall and flush water, may contribute significantly more water than 50%.

*** Adapted from Table 3, Iowa State University Extension Service Publication Pm−1164, Animal Manure: A Source of Crop Nutrients", 1984.

\+ Sample analysis will give a better estimate for subject farm.

Table 2. Estimated First−Year Nutrient Availability (%)* from Various Manures

Species	N	P205	K20
Dairy, surface applied**	30%	55%	75%
Dairy, incorporated**	35%	55%	75%
Veal calf, surface applied***	40%	55%	75%
Veal calf, incorporated***	50%	55%	75%
Beef, surface applied**	25%	55%	75%
Beef, incorporated**	30%	55%	75%
Swine, surface applied**	40%	55%	75%
Swine, incorporated**	50%	55%	75%
Poultry, surface applied**	50%	55%	75%
Poultry, incorporated**	60%	55%	75%

* If manure has been applied to the same field at similar rates for 2 consecutive years, increase the nutrient values in the table an additional 10 percentage points. If manure has been applied to the same field at similar rates for three or more consecutive years, increase the nutrient values in the table an additional 15 percentage points. (See example 2, step 1)

** Modified from Table 3, UWEX Publication A3411, "Manure Nutrient Credit Worksheet", 1987.

*** Modified from Table 10−7, Midwest Plan Service Publication 18, Livestock Waste Facilities Handbook", Rev. 1985.

Example 2: Producer Jones surface spread and incorporated 8,000 gal/acre of fall−applied stored liquid dairy manure on a 20 acre corn field for two consecutive years. A manure analysis from a private lab showed a total nutrient value of 32−15−36/l,000 gal. Next spring he will plant corn and apply l00 lb/acre of 9−23−30 starter fertilizer. A UWEX Soil test recommended 160 lb N/acre, 60 lb P205/acre, and 120 lb K20/acre. Calculate the amount of nutrients in the manure and starter fertilizer, and how much additional nutrients must be supplied from other sources.

Step 1: Table 2 shows the percent available nutrients in dairy manure as 35% N, 55% P205, and 75% K20 for. first year nutrient availability. However, since similar manure rates have been applied for two consecutive years, increase these values an additional ten percentage points for each nutrient to 45% for N, 65% for P205, and 85% for K20. See the first footnote in Table 2.

Step 2: Use Equation 1 to calculate the available nutrient content.

(32−15−36)/1,000 gal. X (0.45−0.65−0.85) = 14.4 lb N/l,000 gal.,
9.8 lb P205/1,000 gal.
30.6 lb K20/1,000 gal.

Step 3: Use Equation 2 to calculate the manure nutrient credit from an 8,000 gallon rate.

(14.4 lb N/1,000 gal.) X 8,000 gal/acre = 115 lb N/acre
(9.8 lb P205/1,000 gal.) X 8,000 gal/acre = 78 lb P205/acre
(30.6 lb K20/1,1000 gal.) X 8,000 gal/acre = 245 lb K20/acre

Now, subtract the manure and starter P205 and K20 credits from the soil test recommendations to determine if additional nutrients are required. Round the resulting positive numbers to the nearest 10 lb/acre.

(160 – 115) lb N/acre = 45 lb N/acre or 50 lb N/acre
(60 – 78 – 23) lb P205/acre = −41 lb P205/acre (excess P)
(120 – 245 – 30) lb K20/acre = −155 lb K20/acre (excess K)

The total amount of additional N needed is: 50 lb N/acre X 20 acres = 1000 lb N

If Phosphorus or Potassium are a water quality concern, this producer may want to reduce the amount of manure being applied to these acres.

Table 3. Rule−of−thumb Estimates of Available Nutrients from Solid Manure by Species and Management Systems for up to Three or More Consecutive Years of Application*

Species/mgt. System	Dry Matter	Total Available Nutrients		
		N	P205	K20
	%		lb./ton	
	One Year of Application			
Dairy, surface applied	12.7	3	3	8
Dairy, incorporated	12.7	4	3	8
Beef, surface applied	11.6	4	5	8
Beef, incorporated	11.6	4	5	8
Swine, surface applied	9.2	4	3	7
Swine, incorporated	9.2	5	3	7
Poultry, surface applied	25.2	13	14	9
Poultry, incorporated	25.2	15	14	9
	Two Consecutive Years of Application			
Dairy, surface applied	12.7	4	3	9
Dairy, incorporated	12.7	5	3	9
Beef, surface applied	11.6	5	6	9
Beef, incorporated	11.6	6	6	9
Swine, surface applied	9.2	5	4	8
Swine, incorporated	9.2	6	4	8
Poultry, surface applied	25.2	15	16	10
Poultry, incorporated	25.2	18	16	10
	Three or More Consecutive Years of Application			
Dairy, surface applied	12.7	5	4	9
Dairy, incorporated	12.7	5	4	9
Beef, surface applied	11.6	6	6	10
Beef, incorporated	11.6	6	6	10
Swine, surface applied	9.2	6	4	8
Swine, incorporated	9.2	7	4	8
Poultry, surface applied	25.2	16	18	11
Poultry, incorporated	25.2	19	18’	11

* Based on values given in Tables 1 and 2, calculated using Equation 1. Figures are rounded to the nearest whole pound.

Table 4. Rule−of−thumb Estimates of Available Nutrients from Liquid Manure by Species and Management Systems for up to Three or More Consecutive Years of Application*

Species/mgt. System	Dry Matter	Total Available Nutrients		
		N	P205	K20
	%	−−−−−−−− lb./1000 gal. −−−−−−−−		
	One Year of Application			
Dairy, surface applied	8.5	8	8	21
Dairy, incorporated	8.5	10	8	21
Veal calf, surf. appl.	3.0	12	14	38
Veal calf, incorp.	3.0	14	14	38
Beef, surface applied	7.7	10	14	23
Beef, incorporated	7.7	12	14	23
Swine, f.u.**, surf. appl.	7.6	22	15	26
Swine, f.u.**, incorp.	7.6	28	15	26
Swine, f.n.***, surf. appl.	3.8	12	6	8
Swine, f.n.***, incorp.	3.8	15	6	8
Poultry, surface applied	16.8	35	38	25
Poultry, incorporated	16.8	41	38	25
Two Consecutive Years of Application				
Dairy, surface applied	8.5	11	9	24
Dairy, incorporated	8.5	13	9	24
Veal calf, sur. appl.	3.0	14	16	43
Veal calf, incorp.	3.0	17	16	43
Beef, surface applied	7.7	14	16	26
Beef, incorporated	7.7	16	16	26
Swine, f.u.**, surf. appl.	7.6	28	15	29
Swine, f.u.**, incorp.	7.6	33	15	29
Swine, f.n.***, surf. appl.	3.8	15	7	9
Swine, f.n.***, incorp.	3.8	15	7	9
Poultry, surface applied	16.8	42	45	28
Poultry, incorporated	16.8	48	45	28
	Three or More Consecutive Years of Application			
Dairy, surface applied	8.5	13	10	25
Dairy, incorporated	8.5	14	10	25
Veal calf, surf. appl.	3.0	16	17	46
Veal calf, incorp.	3.0	18	17	46
Beef, surface applied	7.7	16	17	28
Beef, incorporated	7.7	18	17	28
Swine, f.u.**, surf. appl.	7.6	30	19	31
Swine, f.u.**, incorp.	7.6	36	19	31
Swine, f.n.***, surf. appl.	3.8	17	8	9
Swine, f.n.***, incorp.	3.8	20	8	9
Poultry, surface applied	16.8	45	48	30
Poultry, incorporated	16.8	52	48	30

* Based on values given in Tables 1 and 2, calculated using Equation 1. Figures are rounded to the nearest whole pound.

** finishing unit

*** farrow−nursery

Technical Note – Conservation Planning – WI−1, Part 1.4

Guidelines for identifying areas that represent a surface water pollution hazard from winter spread manure and other organic by products.

DIRECTIONS:

A. On a copy of the aerial photo, identify:

perennial streams, lakes, and natural wetlands – "Discharge Points" – Other channels –Cropland field boundaries

B. For fields not within 900 ft. of waterbodies or discharge points, identify distances (either 50, 100, or 150 ft.) from identified channels by using section II. of the table.

C. For fields within 900 ft. of waterbodies or discharge points:

1. Determine the cropping system (crops, rotation, tillage, contouring, etc.) for each field.
2. Based on slope, flow type and surface conditions, determine the area of high hazard by selecting a distance from section I. of the table.

Note: If the minimum distance cannot be achieved within the boundaries of the selected slope, flow type and surface condition, prorate the distance by estimating a representative slope, flow type and surface condition.

DEFINITIONS:

A. Discharge Point = In addition to mapped waterbodies, discharge points include: impoundments, natural wetlands, intermittent streams, drainage ditches, grassed waterways or other channels having a drainage area as indicated in the following table. For the purposes of establishing hazard areas this definition expands the standard definition of waterbodies to include a broader drainage network active during peak runoff events.

B. OH = Means that part of a crop rotation in which small grains as a companion crop or hay is grown.

C. Other Channels = Channels that can be identified on aerial photos, soil maps or field observation (eg. waterways, gullies, etc.) that have drainage areas less than those specified for Discharge Points.

D. Overland Flow = The assumed mode of runoff flow in the absence of well established rills and channels.

E. Shallow Concentrated Flow = The assumed mode of runoff flow commonly occurring with long slopes, characterized by well established rills but devoid of open channels.

F. Winter Spread Manure = The practice of spreading manure during that time of the year (winter and portions of fall and spring) when incorporation is not practical and the potential for runoff is greatest.

1 gallon = 8.3 pounds
1 ton = 2,000 pounds
1,000 gal. = 4.17 tons
1 bushel = 77.5 Pounds (liquid)
1 bushel = 1.25 cubic feet (liquid)
1 cu.ft. = 62 pounds (liquid dairy)
1 cu.ft. = 60 pounds (liquid beef & swine)
1 cu.ft. = 60 pounds (fresh, solid poultry)
1 cu.ft. = 62 pounds (semi−solid dairy)
1 cu.ft. = 55 pounds (semi−solid beef & swine)**
1 cu.ft. = 45 pounds (solid dairy)
1 cu.ft. = 7.5 gallons
1 acre−inch = 27,225 gallons

* When sizing manure spreaders, use manure unit conversions based on cubic feet, rather than bushel, measurements. ** UWEX estimates

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Water Budgets

Water budgets in Appendix A are based on CREAMS computer model runs. CREAMS (Chemical, Runoff, and Erosion from Agricultural Management Systems) is a mathematical model developed to evaluate non−point source pollution from field−sized areas.

Rainfall records for the following locations were used:

Rice Lake, Wisconsin for Spencer silt loam; Lancaster, Wisconsin for Tama silt loam; Plainfield, Wisconsin for Plainfield loamy sand.

The watershed size used was 12 acres. The average field slope was 5.5% and the overland flow slope length was 2001.

The representative water budgets show rainfall, runoff, evapotranspiration and percolation below the root zone.

BACKGROUND:

The table values for areas of high pollution hazard are derived from the Velocities For Upland Method of Estimating Time = of Concentration (NRCS National Engineering Handbook Sec. 4, Fig 15−2) using a delivery time of five minutes.

Guidelines for areas of high pollution hazard to surface runoff from winter spread manure.