

NUTRIENT MANAGEMENT

(Acre)
Code 590

Natural Resources Conservation Service
Conservation Practice Standard

I. Definition

Managing the amount, source, placement, form, and timing of the application of nutrients and soil amendments.

II. Purposes

This standard establishes the acceptable criteria and documentation requirements for a plan that addresses the application and *budgeting*¹ of nutrients for plant production. All nutrient sources, including soil reserves, commercial fertilizer, manure, organic byproducts, legume crops, and crop residues shall be accounted for and properly utilized. These criteria are intended to minimize nutrient entry into surface water, groundwater, and atmospheric resources while maintaining and improving the physical, chemical, and biological condition of the soil.

III. Conditions Where Practice Applies

This standard applies to all *fields* where plant nutrient sources and soil amendments are applied during the course of a *rotation*.

IV. Federal, State, and Local Laws

Users of this standard are responsible for compliance with applicable federal, state, and local laws, rules, or regulations governing nutrient management systems. This standard does not contain the text of federal, state, or local laws. Implementation of this standard may not eliminate nutrient losses that could result in a violation of law.

V. Criteria

This section establishes requirements for planning, design parameters, acceptable management processes, and performance requirements for nutrient management plan development and implementation. Nutrient management plans shall be prepared according to all of Criteria A., B., C., D., and E.

All of the information contained in this section is required. Wisconsin Conservation Planning Technical Note WI-1 is the companion document to this standard and includes criteria that are required where referenced within this section.

A. Criteria for Surface and Groundwater Resources

1. Nutrient Criteria for All Sites

- a. Develop and implement an annual field-specific nutrient application plan. Account for the source, rate, timing, form, and method of application for all *major nutrients* consistent with this standard and soil fertility recommendations found in University of Wisconsin-Extension (UWEX) Publication A2809, "Soil Test Recommendations for Field, Vegetable and Fruit Crops," unless use of one the following options are appropriate:
 - For crops not listed in A2809, use other appropriate Land Grant University recommendations.
 - For nutrient application decisions based on plant tissue analysis, the sampling and testing of plants and the resulting nutrient recommendations shall be done in accordance with University of Wisconsin recommendations. See V.A.1.1.

Annual plan updates shall document the crops, tillage, nutrient application rates, and methods actually implemented.

- b. The plan shall be based on yield goals that are attainable under average growing conditions and established

¹ Words in the standard that are shown in italics are described in X. Definitions. The words are italicized the first time they are used in the text.

- using soil productivity, local climate information, multi-year *documented yields*, and/or local research on yields for similar soils and crop management systems. Yield goals should not be higher than 15% above the previous 3-5 year average.
- c. Soils shall be tested a minimum of once every four years by a DATCP-certified laboratory for pH, phosphorus (P), potassium (K), and organic matter. A laboratory list is provided in Appendix 2 of the Wisconsin Conservation Planning Technical Note WI-1. Soil sampling shall be consistent with UWEX Publication A2100, "Sampling Soils for Testing." For perennial fruit crops, use of soil test recommendations from UWEX Publication A-2809 is only required as the basis for fertilizer applications prior to establishment of new plantings. Subsequent nutrient recommendations should be based on plant tissue analysis results. See V.A.1.l.
 - d. Annual P and K nutrient recommendations may be combined into a single application that does not exceed the total nutrient recommendation for the rotation. This combined annual application is not allowed on frozen or snow covered soil. Commercial P fertilizers shall not be applied to soils with P tests in the non-responsive range for the crop being grown with the exception of not more than 20 pounds per acre P₂O₅ as starter for corn or recommended rates of starter P₂O₅ for potatoes and other vegetable crops as identified in UWEX Publication A3422, "Commercial Vegetable Production in Wisconsin." All the P and K starter fertilizer shall be credited against crop needs. When grouping fields for nutrient application purposes, N, P, and K application rates shall match individual field recommendations as closely as possible.
 - e. Where practical, adjust soil pH to the specific range of the crop(s) grown to optimize nutrient utilization.
 - f. Available nitrogen from all sources shall not exceed the annual N requirement of non-legume crops consistent with UWEX Publication A2809, or the annual N uptake by legume crops. Because of variability in N mineralization and manure applications, it is acceptable for available N to be up to 20% more than the recommended N rate when legumes, manures, and organic byproducts are used to meet the entire N requirement of the crop to be grown.

Starter N fertilizers are to be credited against crop needs as follows: all N beyond 20 pounds per acres for corn and 40 pounds per acre for potatoes.
 - g. First year available N in manure applied to fields prior to legume crop establishment shall not exceed the first year's annual N removal by legumes and companion crop. See Wisconsin Conservation Planning Technical Note WI-1, Part II B.4.
 - h. First and second-year legume credits shall be applied as identified in UWEX Publication A2809, Table 25, or through soil nitrate testing as identified in UWEX Publication A3624, "Soil Nitrate Tests for Wisconsin Cropping Systems."
 - i. Estimates of first-year available nutrient credits for manure shall be established in accordance with one of the following methods:
 - (1) A manure analysis from a laboratory participating in the Manure Analysis Proficiency (MAP) testing program and interpreted according to Part III, Table 3 of the Wisconsin Conservation Planning Technical Note WI-1, or
 - (2) Estimates of first-year available nutrients from manure. See Part III, Table 4 of the Wisconsin Conservation Planning Technical Note WI-1.
- Note:** It is strongly recommended that second-year nutrient credits, especially for areas receiving consecutive manure applications, be

- included in the nutrient management plan using values in Part III, Table 4 of Wisconsin Conservation Planning Technical Note WI-1 or soil nitrate testing.
- j. Organic byproducts other than manure (i.e., industrial wastes, municipal sludge, and septage) applied to fields shall be analyzed for nutrient content and applied in accordance with applicable regulations including restrictions on heavy metal content and land application rates.
 - k. Manures, organic byproducts, and fertilizers shall not run off the field site during or immediately after application. If ponding, runoff, or drainage to subsurface tiles of the applied materials occurs, implement the following activities as appropriate:
 - (1) Stop application.
 - (2) Take corrective action to prevent offsite movement.
 - (3) Modify the application (rate, method, depth of injection, timing) to eliminate runoff or drainage to subsurface tiles.
 - (4) Notify the Wisconsin Department of Natural Resources (WDNR) in the event that a spill or accidental release of any material or substance when required by the Agricultural Spill Law (s.289.11, Wis. Stats.) or the terms of a WPDES permit. Refer to the Wisconsin Conservation Planning Technical Note WI-1, Part IV, for contact information and "Agricultural Spills and How to Handle Them," Pub-RR-687-2002, August 2002.
 - l. Where nutrient application decisions are based on plant tissue analysis, the sampling and testing of plants and the resulting nutrient recommendations shall be done in accordance with University of Wisconsin recommendations in the references section of this standard. Nutrient recommendations for cranberries may be based on plant analysis as defined by appropriate publications in the references section of this standard.
 - m. Where *gleaning/pasturing* occurs, verify through computations that the nutrients deposited as manure within a field, do not exceed the N and P requirements of this standard.
2. Nutrient Application Prohibitions
- a. Nutrients shall not be spread on the following features.
 - (1) Surface water, established *concentrated flow channels*, or non-harvested *permanent vegetative buffers*.
 - (2) A non-farmed wetland, sinkhole, nonmetallic mine, or well.
 - (3) The area within 50 feet of a potable drinking water well shall not receive mechanical applications of manure.
 - (4) Areas contributing runoff within 200 feet upslope of *direct conduits to groundwater* such as a well, sinkhole, fractured bedrock at the surface, *tile inlet*, or nonmetallic mine unless the nutrients are *effectively incorporated* within 72 hours.
 - (5) Land where vegetation is not removed mechanically or by grazing, except to provide nutrients for establishment and maintenance, unless necessary in an emergency situation.
 - (6) Fields exceeding *tolerable soil loss (T)*. Erosion controls shall be implemented so that tolerable soil loss (T) over the crop rotation will not be exceeded on fields that receive nutrients.
 - b. When frozen or snow-covered soils prevent effective incorporation at the time of application and the nutrient application is allowed, implement the following:
 - (1) Do not apply nutrients within the *Surface Water Quality Management Area (SWQMA)*

- except for manure deposited through winter gleaning/pasturing of plant residue.
- (2) Do not apply nutrients to locally identified areas delineated in a *conservation plan* as contributing nutrients to direct conduits to groundwater or surface water as a result of runoff.
- (3) Do not exceed the P removal of the following growing season's crop when applying manure. Liquid manure applications are limited to 7,000 gallons per acre. The balance of the crop nutrient requirement may be applied the following spring or summer. Winter applications shall be conducted according to Section VII.B.
- (4) Do not apply nutrients on slopes greater than 9%, except for manure on slopes up to 12% where cropland is contoured or contour strip cropped.
- (5) Do not apply N and P in the form of commercial fertilizer. An exception is allowed for grass pastures and on winter grains that do not fall within a prohibition area defined by V.A.2.
3. Nutrient Application Restrictions
- a. When unincorporated liquid manure applications (less than 12% solids) occur on non-frozen soils within a SWQMA, use Table 1 to determine maximum acceptable rates. No applications are allowed on *saturated soils*.
- Sequential applications may be made to meet the desired nutrient additions consistent with this standard. Prior to subsequent applications soils shall be evaluated using Table 1 or wait a minimum of 7 days.

Table 1

Surface Texture Class ¹	Max Application Rate <i>gal/acre</i>		Allowable Soil Moisture Description for Applications
	< 30%*	≥ 30%*	
Fine	3000	5000	Easily ribbons out between fingers, has a slick feel.
Medium	5000	7500	Forms a ball, is very pliable, slicks readily with clay.
Coarse	7000	10000	Forms a weak ball, breaks easily.

¹ Fine – clay, silty clay, silty clay loam, clay loam

Medium – sandy clay, sandy clay loam, loam, silt loam, silt

Coarse – loamy sand, sandy loam, sand. This category also includes peat and muck based on their infiltration capacity.

* Crop residue or vegetative cover on the soil surface after manure application.

- b. For all nutrient applications on non-frozen soil within a SWQMA use one or more of the following practices as appropriate to address water quality concerns for the site:
 - (1) Install/maintain permanent vegetative buffers (harvesting is allowed unless restricted by other laws or programs). Refer to NRCS Field Office Technical Guide (FOTG), Section IV, Standard 393, Filter Strip, or ATCP 48 for land in drainage districts.
 - (2) Maintain greater than 30% crop residue or vegetative cover on the soil surface after nutrient application.
 - (3) Incorporate nutrients within 72 hours leaving adequate residue to meet tolerable soil losses.
 - (4) Establish cover crops promptly following application.
2. When manure is applied in late summer or fall to meet the fertility needs of next year's crop and soil temperatures are greater than 50°F, apply one of the following options:
 - a. Use a nitrification inhibitor with liquid manure and limit N rate to 120 pounds available N per acre.
 - b. Delay applications until after September 15 and limit available N rate to 90 pounds per acre.
 - c. Apply to fields with perennial crops or fall-seeded crops. N application shall not exceed 120 pounds available N per acre or the crop N requirement, whichever is less.
3. When manure is applied in the fall and soil temperatures are 50°F or less, limit available N from manure application to 120 pounds per acre or the crop N requirement, whichever is less.

Note: The restrictions in B. 2. and 3. do not apply to spring manure applications prior to planting. The balance of the crop N requirements may be applied the following spring or summer.

4. Where P enrichment of groundwater is identified as a conservation planning concern, implement practices to reduce delivery of P to groundwater.

B. Criteria to Minimize Entry of Nutrients to Groundwater

To minimize N leaching to groundwater on *high permeability soils*, or soils with less than 20 inches to bedrock, or soils with less than 12 inches to *apparent water table*, or within 1000 feet of a municipal well, apply the following applicable management practices:

Note: A list of soils with a high potential for N leaching to groundwater is provided in Appendix 1 of the Wisconsin Conservation Planning Technical Note WI-1.

1. Where sources of N are applied:
 - a. No fall commercial N applications except for establishment of fall-seeded crops. Commercial N application rates, where allowed, shall not exceed 30 pounds of available N per acre.
 - b. On irrigated fields, including irrigated manure, apply one of the following management strategies:
 - (1) A split or delayed N application to apply a majority of crop N requirement after crop establishment.
 - (2) Utilize a nitrification inhibitor with ammonium forms of N.

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

1. Where manure, organic byproducts, or fertilizers are applied:
 - a. Avoid building soil test P values when possible beyond the non-responsive soil test range for the most demanding crop in the rotation. For most agronomic crops in Wisconsin, the non-responsive soil test range is 30 to 50 parts per million (ppm) Bray P-1 soil test.
 - b. Establish perennial vegetative cover in all areas of concentrated flow resulting in reoccurring gullies.
2. Develop a P management strategy when manure or organic by-products are applied during the crop rotation to minimize surface

water quality impacts. Use either the *Phosphorus Index (PI)* in section a., or Soil Test Phosphorus Management Strategy found in section b. The single strategy chosen, either a. or b., shall be applied uniformly to all fields within a farm or tract.

Note: First year available N in manure applied to fields prior to legume crop establishment shall not exceed the first year's annual N removal by legumes and companion crop. See Wisconsin Conservation Planning Technical Note WI-1, Part II B.4. Available N applied cannot exceed the N need or legume crop N removal of the next crop to be grown.

- a. PI Strategy – The planned average PI values for up to an 8-year rotation in each field shall be 6 or lower. P applications on fields with an average PI greater than 6 may be made only if additional P is needed according to UWEX soil fertility recommendations. Strategies for reducing the PI, algorithms, and software for calculating the Wisconsin PI can be found at <http://wpindex.soils.wisc.edu/>.
- b. Soil Test Phosphorus Strategy - Management strategies based on soil test phosphorus may be used. Operations using this strategy shall have a conservation plan addressing all soil erosion consistent with the current crops and management or use the erosion assessment tools included with the Phosphorus Index model. In crop fields where ephemeral erosion is an identified problem, a minimum of one of the following runoff-reducing practices shall be implemented:
 - Install/maintain contour strips and/or contour buffer strips. Refer to NRCS FOTG, Section IV, Standard 585, Strip Cropping, and/or Standard 332, Contour Buffer Strip.
 - Install/maintain filter strips (NRCS FOTG, Section IV, Standard 393, Filter Strip) along surface waters and concentrated flow channels that empty into surface waters that are within or adjoin areas where manure will be applied.

- Maintain greater than 30% crop residue or vegetative cover on the soil surface after planting.
- Establish fall cover crops.

Available phosphorus applications from all sources shall be based on the following soil test P values (Bray P-1).

- (1) Less than 50 ppm soil test P: nutrient application rates allowed up to the N needs of the following crop or the N removal for the following legume crop.
- (2) 50-100 ppm soil test P: P application shall not exceed the total crop P removal for crops to be grown over a maximum rotation length of 8 years.
- (3) Greater than 100 ppm soil test P: eliminate P applications, if possible, unless required by the highest P demanding crop in the rotation. If applications are necessary, applications shall be 25% less than the cumulative annual crop removal over a maximum rotation length of 8 years.
- (4) For land with potatoes in the rotation, total P applications shall not exceed crop removal over a maximum rotation length of 8 years if soil tests are in the optimum, high, or excessively high range for potatoes.

D. Additional Criteria to Minimize N and Particulate Air Emissions

Where air quality is identified in a conservation plan as a resource concern, apply a management strategy that minimizes nutrient volatilization and particulate losses while maintaining tolerable soil erosion levels for wind and water.

E. Additional Criteria to Protect the Physical, Chemical, and Biological Condition of the Soil

1. Nutrients shall be applied in such a manner as not to permanently degrade the soil's structure, chemical properties, or biological condition.

2. To the extent practical, nutrients shall not be applied to flooded or saturated soil when the potential for soil compaction and/or the creation of ruts is high.

VI. Considerations

The following are optional management considerations and are not required practices.

- A. Promote seeding and stabilization of concentrated flow channels, installation and maintenance of vegetative filter strips, riparian buffers and other buffer strips adjacent to surface water and wetlands in conjunction with other conservation practices in order to reduce the amounts of sediment and nutrients that reach surface water and/or groundwater.
- B. Corn nitrogen recommendations in A2809 can be adjusted for the effects of current corn and nitrogen fertilizer prices using the N rate calculator available at <http://www.uwex.edu/ces/crops/NComparison.htm>. Additional management practices that can be utilized to improve N use efficiency can be found in the Wisconsin Conservation Planning Technical Note WI-1, Part II.
- C. Apply nutrients not specifically addressed by this standard (i.e., secondary and micro nutrients) based on recommendations found in UWEX Publication A2809.

Since specific environmental concerns have not been identified for potassium (K), K additions in manure or bio-solids will be determined by rate limits for the N or P in those materials. Commercial fertilizer K applications equal to crop removal will avoid building soil test K levels. K may be applied equal to crop removal at any soil test K level. Dairy producers should monitor K levels in forages and take additional steps to reduce soil K levels if consumption of forage with high K levels becomes an animal health problem.
- D. To minimize N leaching on medium and fine-textured soils, avoid fall commercial N applications for crops to be seeded the following spring. When commercial N is applied in the fall, use ammonium forms of N and delay N application until soil temperatures drop below 50°F. Use of a nitrification inhibitor with fall-applied N is recommended.
- E. Irrigated fields should use irrigation scheduling strategies with the intent of minimizing leaching

losses and improving water use efficiency and not exceeding intake/infiltration capacity of the soil.

- F. Consider the use of animal feeding strategies based on published nutrition research findings (National Research Council, etc.) to reduce excess P in rations when manure applications are made to cropland.
- G. Consider delaying surface applications of manure or other organic byproducts if precipitation capable of producing runoff is forecast within 24 hours of the time of planned application.
- H. Consider modifications to the crop rotation to provide crop fields for the application of manure during the summer crop growing season.
- I. Manure top-dressed on existing forages should not exceed the nutrient equivalent of 35 pounds N – 25 pounds P₂O₅ – 80 pounds K₂O (first year availability per acre) or no more than 10 tons of solid manure per acre per harvest. Additional management considerations can be found in “Applying Manure to Alfalfa,” North Central Regional Research Report 346.
- J. For fields directly adjacent to, or with areas of concentrated or channelized flow that drain directly to, Outstanding, Exceptional or nutrient impaired surface waters, avoid raising soil test P levels to the maximum extent practicable. In addition, implement conservation practices that reduce delivery of nutrients to these waters. For operations using the P-Index in high environmental risk areas, the P-Index values should be reduced to the maximum extent practicable by applying additional conservation practices.
- K. Where residual nitrate carryover is probable, the preplant soil nitrate test is recommended to adjust N application rates.

VII. Plans and Specifications

- A. The minimum requirements for a nutrient management plan are specified in the previous sections of this standard and expanded in Part I of the Wisconsin Conservation Planning Technical Note WI-1. Include in a nutrient management plan:
 - a soil map and aerial photograph of the site;

- current and planned crops and crop yields; realistic yield goals;
 - results of soil, plant, manure, or organic byproduct sample analysis;
 - recommended nutrient application rates;
 - documentation of actual nutrient applications including the rate, form, timing, and method. Revise the plan to reflect any changes in crops, yields, tillage, management, and soil or manure analyses;
 - the location of sensitive areas and the resulting nutrient application restrictions;
 - guidance for implementation, maintaining records;
 - each field's tolerable and actual soil losses;
 - soil test P-ppm; P balance, or P Index level where applicable;
 - other management activities required by regulation, program requirements, or producer goals;
 - a narrative to explain other implementation clarifications.
- B. Winter Spreading Plan – The plan shall identify those areas of fields that meet the restrictions for frozen or snow-covered ground identified in this standard. If necessary, land application of manure on frozen and snow-covered ground shall occur on those fields accessible at the time of application that represent the lowest risk of runoff and deliverability to areas of concentrated and channelized flow and surface waters. Low-risk fields shall be identified using either the P-Index or an approved conservation plan. In general, fields most suitable for land application during frozen and snow-covered ground conditions include those fields:
- with low slope,
 - with low erosion,
 - with high levels of surface roughness,
 - with the greatest distance to surface waters and areas of concentrated flow,
 - with no drainage to Outstanding/ Exceptional/nutrient impaired water bodies,
 - with low delivery potential during active snowmelt.

Refer to section VIII.E for storage/infield stacking of manure during periods of active snowmelt.

- C. Persons who review or approve plans for nutrient management shall be certified through any

certification program acceptable to the NRCS (NRCS General Manual, Title 180, Part 409.9, NRCS TechReg) or other appropriate agencies within the state.

- D. Industrial wastes and byproducts and municipal sludge are regulated by the Wisconsin Department of Natural Resources (WDNR). They must be spread in accordance with a Wisconsin Pollution Discharge Elimination System (WPDES) permit as obtained from the WDNR.
- E. Plans for nutrient management shall be developed in accordance with policy requirements of the NRCS General Manual Title 450 Part 401.03 and Title 190, Part 402, the contents of this standard, the procedures contained in the National Planning Procedures Handbook, and NRCS National Agronomy Manual, Section 503.
- F. Plans for Nutrient Management that are elements of a more comprehensive conservation plan shall recognize other requirements of the conservation plan and be compatible with the other requirements. A Comprehensive Nutrient Management Plan (CNMP) is a conservation system unique to animal feeding operations (AFO). The CNMP will be developed to address the environmental risks identified during the resource inventory of an AFO. A CNMP will require use of all the applicable criteria in this technical standard along with the additional criteria located in NRCS National Planning Procedures Handbook, Subpart B, Part 600.54.

VIII. Operation and Maintenance

- A. Document the actual nutrient application including the rate, form, timing, and method of the application. Revise the plan to reflect any changes in crops, tillage or management, soils, and manure tests.
- B. Evaluate the need to modify field operations to reduce the risk of large nutrient losses during a single runoff event based on current field conditions or forecasted weather events.
- C. 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.

- D. Protect commercial fertilizer from the weather, and agricultural waste storage facilities from accidental leakage or spillage. See Wisconsin administrative rules and county or local ordinances concerning regulations on siting, design, operation, and maintenance of these facilities.
- E. During periods when land application is not suitable, manure shall be stored in a manure storage facility designed in accordance with the criteria contained in NRCS FOTG Standard 313, Waste Storage Facility. Temporary management of manure shall be in accordance with the criteria for temporary unconfined stacks of manure contained in Table 7 of Standard 313.
- F. When cleaning equipment after nutrient application, remove and save fertilizers or wastes in an appropriate manner. If the application equipment system is flushed, use the 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 potable drinking water wells.
- G. The application equipment shall be calibrated to achieve the desired application rate.

IX. References

Cranberry Tissue Testing for Producing Beds in North America (1995) Davenport et al., Oregon State Univ. Ext. Serv. Pub. CM8610.

Mineral Nutrition for Fruit Crops, Roper, Univ. of Wisconsin Dept. of Horticulture Pub.

National Research Council (NRC) Nutrient Requirements of Dairy Cattle, National Academy Press, 7th Revised Edition, 2001.

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USDA, NRCS, General Manual, Title 180, Part 409 Conservation Planning Policy, Wisconsin Supplement 409.9, Minimum Criteria to Achieve an NRCS Certified Conservation Planner Designation.

USDA, NRCS, General Manual, Title 190, Part 402, Nutrient Management.

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USDA, NRCS, National Planning Procedures Handbook, Amendment 4, March 2003.

USDA, NRCS, National Handbook of Conservation Practices, Subpart B, Part 600.54, Element Criteria for CNMP Development.

USDA, NRCS, Wisconsin Conservation Planning Technical Note WI-1, Companion Document to NRCS FOTG Standard 590, Nutrient Management.

USDA, NRCS, Wisconsin Field Office Technical Guide (FOTG), Section I, Erosion Prediction, Maps.

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University of Wisconsin-Extension (UWEX) Publication A3392, Guidelines for Applying Manure to Cropland and Pasture in Wisconsin, August, 1995.

University of Wisconsin-Extension (UWEX) Publication A3422, Commercial Vegetable Production in Wisconsin, 2005.

University of Wisconsin-Extension (UWEX) Publication A3512, Wisconsin's Preplant Soil Profile Nitrate Test, 1990.

University of Wisconsin-Extension (UWEX) Publication A3517, Using Legumes as a Nitrogen Source, September 1997.

University of Wisconsin Extension (UWEX) Publication A3557, Nutrient Management: Practices for Wisconsin Corn Production, September 1994.

University of Wisconsin-Extension (UWEX) Publication A3568, A Step-by-Step Guide to Nutrient Management, May 1992.

University of Wisconsin-Extension (UWEX) Publication A3624, Soil Nitrate Tests for Wisconsin Cropping Systems, 1994.

University of Wisconsin-Extension (UWEX) Publication A3634, Nitrogen Management on Sandy Soils, 1995.

University of Wisconsin-Extension (UWEX), Nitrogen Source and \$ Rate of Return Calculator, Rankin, <http://www.uwex.edu/ces/crops/NComparison.htm>

University of Wisconsin-Extension (UWEX), NPM Program, Know How Much You Haul!, ipcm.wisc.edu.

University of Wisconsin-Extension (UWEX) Publication A3769, Recommended Methods of Manure Analysis, 2003.

University of Wisconsin Soil and Forage Analysis Lab Sampling for plant analysis: <http://uwlab.dyndns.org/marshfield/> (Click on Lab procedures and then plant analysis).

Wisconsin Administrative Code, Department of Agriculture, Trade and Consumer Protection, Chapter 48, Drainage Districts.

Wisconsin Phosphorus Index: <http://wpindex.soils.wisc.edu/>.

X. Definitions

Apparent Water Table (V.B) - Continuous saturated zone in the soil to a depth of at least 6 feet without an unsaturated zone below it.

Budgeting (II) - Document present and prior year's crop, estimated nutrient removal by these crops and known nutrient credits. When nutrients are applied for future crop needs in the rotation, implement a tracking process to allow adjustment of subsequent nutrient applications so that the total amount of nutrients applied to the farm or tract complies with this standard and is documented in the plan. Required as a component for all nutrient management plans (VII.A.; Wisconsin Conservation Planning Technical Note WI-1 Part 1 B.d. (1), (2); C.6.).

Concentrated Flow Channel (V.A.2.a.(1)) - A natural channel or constructed channel that has been shaped or graded to required dimensions and established in perennial vegetation for the stable conveyance of runoff. This definition may include non-vegetated channels caused by ephemeral erosion. These channels include

perennial and intermittent streams, drainage ditches, and drainage ends identified on the NRCS soil survey and not already classified as SWQMAs.

Concentrated flow channels are also identifiable as contiguous up-gradient deflections of contour lines on the USGS 1:24,000 scale topographic map. The path of flow to surface water or direct conduits to groundwater must be documented. For construction, refer to NRCS FOTG Standard 412, Grassed Waterway, for more information.

Conservation Plan (V.A.2.b.(2)) - A plan developed and field verified by a conservation planner to document crop management and the conservation practices used to control sheet and rill erosion to tolerable levels (T) and to provide treatment of ephemeral soil erosion. A conservation plan must be signed by the land operator and approved by the county land conservation committee or their representative. A conservation plan will be needed for designating winter spreading restrictions other than those specifically listed in this standard, and when implementing the soil test P management strategy where the soil erosion assessment is not calculated with the Wisconsin Phosphorus Index model. A conservation planner must develop conservation plans using the minimum criteria found in the USDA, NRCS National Planning Procedures Handbook and the Wisconsin Field Office Technical Guide and be qualified by one of the following:

1. Meeting the minimum criteria in the NRCS General Manual, Title 180, Part 409.9(c), NRCS Certified Conservation Planner Designation.
2. Meeting criteria established by the county land conservation committee.
3. Meeting the NRCS TechReg Certified Conservation Planner Option 1, 2, 3.

Direct Conduits to Groundwater (V.A.2.a.(4)) - Wells, sinkholes, swallets (a sinkhole or rock hole that intercepts a stream, diverting all or a portion of it to the groundwater), fractured bedrock at the surface, mine shafts, non-metallic mines, tile inlets discharging to groundwater quarries, or depressional groundwater recharge areas over shallow fractured bedrock. For the purpose of nutrient management planning, these features will be identified on the NRCS soil survey and/or USGS 1:24,000 scale topographic map, or otherwise determined through on-site evaluation and documented in a conservation plan.

Documented yields (V.A.1.b.) - Crop production yield-records documented by field for at least two consecutive years that are used to determine phosphorus and potassium fertility recommendations. Yield record documentation may include measurements of harvested crop weight, volume, or the use of calibrated yield-monitors.

Effectively Incorporated (V.A.2.a.(4)) - Means the mixing with the topsoil or residue or subsurface placement of nutrients with topsoil by such means as injector, disc, sweep, mold-board plow, chisel plow, or other tillage/infiltration methods. Nutrients will not run off the field or drain to subsurface tiles during application.

Fields (III) - A group or single nutrient management unit with the following conditions: similar soil type, similar cropping history, same place in rotation (i.e., second year corn fields, established alfalfa), similar nutrient requirements, and close proximity. Examples include: alternate strips in a contour strip system, pasture, variable rate nutrient application management units, and other management units where grouping facilitates implementation of the nutrient management plan.

Gleaning / Pasturing (V.A.1.m.) - An area of land where animals graze or otherwise seek feed in a manner that maintains the vegetative cover over all the area and where the vegetative cover is the primary food source for the animals. Livestock shall be managed to avoid the routine concentration of animals within the same area of the field. Manure deposited near a well by grazing of livestock does not require incorporation.

High Permeability Soils (V.B) - Equivalent to drained hydrologic group A that meet both of the following criteria:

1. Permeability = 6 inches/hour or more in all parts of the upper 20 inches and
2. Permeability = 0.6 inches/hour or more in all parts of the upper 40 inches.

Use the lowest permeability listed for each layer when evaluating a soil. For a multi-component map unit (complex), evaluate each component separately. If the high permeability components meet the criteria and cannot be separated, the entire map unit should be considered as high permeability.

Major Nutrients (V.A.1.a) - Nitrogen (N), phosphorus (P), and potassium (K).

Note (V.A.1.i.) - Any section labeled as a 'note' is to be considered a recommendation rather than a requirement.

The note is included in the criteria section to ensure subject continuity.

Permanent Vegetative Buffer (V.A.2.a.(1)) - A strip or area of perennial herbaceous vegetation situated between cropland, grazing land, or disturbed land (including forest land) and environmentally sensitive areas (as defined in NRCS Technical Standard 393, Filter Strip).

Phosphorus Index (PI) (V.C.2) - The Wisconsin Phosphorus Index (PI) is an assessment of the potential for a given field to deliver P to surface water. The PI assessment takes into account factors that contribute to P losses in runoff from a field and subsequent transport to a water body, including:

- Soil erosion as calculated using the current approved NRCS soil erosion prediction technology located in Section I of the NRCS FOTG.
- Estimated annual field rainfall and snowmelt runoff volume.
- Soil P concentrations as measured by routine soil test P (Bray P-1).
- Rate and management of P applications in the form of fertilizer, manure, or other organic material.
- Characteristics of the runoff flow pathway from the field to surface water.

The algorithms and software for calculating the Wisconsin PI can be found at <http://wpindex.soils.wisc.edu/>.

Rotation (III) - The sequence of crops to be grown for up to an 8-year period as specified by the conservation plan or as part of the soil erosion assessment calculated with the Wisconsin Phosphorus Index model.

Saturated Soils (V.A.3.a) - Soils where all pore spaces are occupied by water and where any additional inputs of water or liquid wastes cannot infiltrate into the soil.

Surface Water Quality Management Areas (SWQMA) (V.A.2.b.(1)) - For the purposes of nutrient management planning, Surface Water Quality Management Areas are defined as follows:

1. The area within 1,000 feet from the ordinary high-water mark of navigable waters that consist of a lake, pond or flowage, except that, for a navigable water that is a glacial pothole lake, "surface water quality management area" means the area within

1,000 feet from the high-water mark of the lake.

2. The area within 300 feet from the ordinary high-water mark of navigable waters that consists of a river or stream that is defined as:
 - Perennial streams (continuous flow) identified on the NRCS soil survey and/or USGS 1:24,000 scale topographic map as solid lines,
 - Otherwise determined through an onsite evaluation and documented in an approved conservation plan.

Areas within the SWQMA that do not drain to the water body are excluded from this definition.

Tile Inlet (V.A.2.a.(4)) - The interception of surface runoff within a concentrated flow channel or field depression, by a constructed device designed to direct runoff into an underground tile for conveyance to surface or groundwater.

Tolerable Soil Loss (T) - For sheet and rill erosion (V.A.2.a.(6)) - T-value means the maximum rate of soil erosion established for each soil type that will permit crop productivity to be sustained economically and indefinitely. Erosion calculations shall be based on current approved erosion prediction technology found in NRCS FOTG Section I or the soil loss assessment calculated using the Phosphorous Index Model. Tolerable soil erosion rates shall be determined using the RUSLE2 Related Attributes Report located in Section 2, e-FOTG, Soil Report.