

NM1: INTRODUCTION TO NUTRIENT MANAGEMENT PLANNING

Nutrient management planning is a strategy for obtaining the maximum economic return from both on- and off-farm fertilizer resources in a manner that optimizes soil conservation and protects the quality of nearby water resources.

▶ What is a nutrient management plan?

- ▷ A NM plan is a strategy for obtaining the maximum economic return from both on- and off-farm fertilizer resources in a manner that promotes soil conservation and protects the quality of nearby water resources.
- ▷ A successful plan has agronomic, economic, and environmental benefits.
- ▷ The overall goal of a NM plan is to balance nutrient applications with crop needs and to minimize losses to the environment.
- ▷ Writing and following an nutrient management plan often increases a farm's profitability by improving soil fertility and cropping practices.
- ▷ Writing and following a nutrient management plan can potentially reduce the loss of nutrients to both surface and groundwater through improved understanding of a farm's management practices, underlying soil attributes and potential sensitive areas. Phosphorus movement from the landscape can impair surface water quality. Nitrogen can leach from the soil and impair groundwater quality.
- ▷ A nutrient management plan is most often used to document regulatory compliance. Additional uses include farm record keeping and public relations.
- ▷ A nutrient management plan can also serve as communication tool for farm managers, farm employees, commercial fertilizer applicators, custom manure haulers or other custom farm operators.

▶ Who needs a nutrient management plan?

- ▷ If a Wisconsin farm is required to have a NM plan, that plan must be compliant with the USDA Natural Resource Conservation Service (NRCS) Nutrient Management Standard (Code 590).
- ▷ Farms required to have a 590 compliant nutrient management plan include those: 1) Farms offered cost-share payments for government agricultural programs that include a NM plan as a condition of the agreement. 2) Farms participating in the Farmland Preservation Program/Working

SnapPlus CONNECTION



What is SnapPlus?

SnapPlus is Wisconsin's nutrient management planning software. The program helps farmers make the best use of their on-farm nutrients, as well as make informed and justified commercial fertilizer purchases. By calculating potential soil and phosphorus runoff losses on a field-by-field basis while assisting in the economic planning of manure and fertilizer applications, SnapPlus provides Wisconsin farmers with a tool for protecting soil and water quality

What is SnapPlus? VIDEO

All of the SnapPlus How-To Videos are available on our [YouTube channel](#) or on the [SnapPlus website](#).

OPTIONAL TOPICS

Who can write a NM plan?

A qualified nutrient management planner can prepare and sign off on a nutrient management plan. Qualified planners include:

Certified crop advisors (CCA)

Certified professional agronomists (CPAg)

Certified professional soil scientists (CPSS)

Farmers who successfully complete a DATCP-approved training course

Is there cost share to assist with nutrient management?

Yes! Incentives include funding for practices such as soil sampling, planting a cover crop, or purchasing equipment to improve nutrient stewardship. Check with your local

by the USDA-NRCS. Two of the most popular are the Environmental Quality Improvement Program (EQIP) and the Conservation Security Program (CSP).

- ▷ The Wisconsin Department of Natural Resources (WDNR) administers numerous programs with NM compliance requirements. These include:
 - 1) Wisconsin Pollution Discharge Elimination System (WPDES) Permits required for livestock operations that have over 1,000 animal units. (An animal unit = 1,000 lbs of animal. 1 cow = 1.4 au). WPDES permits include a NM plan.
 - 2) Notice of Discharge (NOD) which is a complaint-driven system where the DNR inspects farms based on a reported complaint. DNR and local LCD work with operations to correct the problem and provide funding to construct the necessary pollution prevention system. A NM plan is strongly suggested.
 - 3) 303(d) Listed Waters identifies water bodies in the state that do not meet water quality standards due to point, nonpoint (runoff), and other sources of pollution. The list prioritizes locations for water quality improvement actions. Total Maximum Daily Loads (TMDLs) for the main contaminant to a given 303(d) water body are set by the WDNR. Implementation strategies (and potential regulations) for meeting TMDLs are developed by WDNR and local units of government. In agricultural watersheds with 303(d) waters, nutrients (phosphorus and nitrogen) and sediment are often the main TMDLs.
- ▷ Local ordinances such as county manure storage, feedlot, and/or livestock siting ordinances often require a NM plan.

ADDITIONAL RESOURCES

- **NRCS Conservation Practice Standard: Nutrient Management Code 590** PUBLICATION
- **NRCS Conservation Practice Standard: Technical Note Nutrient Management** PUBLICATION
- **ATCP50 Farm Conservation Standards** PUBLICATION
- **Department of Agriculture, Trade and Consumer Protection Nutrient Management** WEBSITE



Lands Initiative Program. 3) Farms required to possess a Wisconsin Pollutant Discharge Elimination System (WPDES) permit (NR 243) due to the size of their livestock operation (often referred to as CAFOs).

4) Farms regulated under a local ordinance for manure storage or livestock siting 5) Farms issued a Notice of Discharge (NR 243) for causing significant discharge (manure).

- ▷ All Wisconsin farms — regardless if they have livestock or not — should write and follow a nutrient management plan because it just makes good sense!

Wisconsin County Land & Water office or NRCS office annually to see what incentives are available.

What is a CAFO?

A Concentrated Animal Feeding Operation (CAFO) is defined as any animal feeding operation with 1000 animal units or more. To calculate animal units.

<https://dnr.wi.gov/files/PDF/forms/3400/3400-025A.pdf>

ADDITIONAL RESOURCES

- **Benefits of a NMP** PUBLICATION
- **Nutrient Management Plans Working on Wisconsin Farms: Real Farms, Real Results** PUBLICATION



NM2: NUTRIENT MANAGEMENT PLAN BASICS

A nutrient management plan is dynamic tool that can be used to assess the status of nutrients in your fields and optimize future nutrient applications.

▶ NM plan components

- ▷ A nutrient management plan has five basic components: 1) Soil test results, 2) On-farm nutrient resources inventory and nutrient crediting of those resources, 3) Cropping plan, 4) On-farm conservation practices inventory, 5) Nutrient application plan.
- ▷ A NM plan is a dynamic tool that can be used to assess current soil fertility practices and develop future farm goals.
- ▷ A NM plan can be a very effective record-keeping tool.
- ▷ NM plans require annual updating.

▶ Mechanics of a nutrient management plan

- ▷ Soil test results provide the base nutrient recommendations for each field.
- ▷ All on-farm nutrient resources – manure, legumes in the crop rotation, biosolids and other organic amendments, residual soil nitrate – must be included since they all contain nutrients and need to be accounted for or “credited.”
- ▷ The plan must be written for the entire crop rotation.
- ▷ Areas of the farm with nutrient/manure spreading restrictions (see section of the 590 NM standard for more information) must be identified.
- ▷ The farm conservation plan must be updated so that all field receiving nutrients are at tolerable soil loss (T) limits.
- ▷ The nutrient application plan includes all manure, biosolids, lime and fertilizer applications.
- ▷ Most NM plans should include a plan narrative that explains issues such as deviations from the 590 standard, soil fertility or liming alerts, and/or manure application restrictions.

SnapPlus CONNECTION



Making plan writing easier

SnapPlus is a powerful tool that allows you to use soil test data from your fields to calculate the fertilizer amounts needed based on crop needs and your management decisions using University of Wisconsin data. Additionally, users can keep track of manure and nutrient applications to make their farms more efficient.

All of the SnapPlus How-To Videos are available on our [YouTube channel](#) or on the [SnapPlus website](#).

OPTIONAL TOPICS

How often do I need to soil test?

Most soils should be sampled every 3-4 years with the exception of sandy soils which should be sampled every 2 years. Details on how and when to soil sample will be discussed in module **S6 Soil Sampling and Procedures**.

Is a NM plan a one-time thing?

No, a nutrient management plan needs to be annually updated to reflect any cropping changes from what was planned and to determine the economically optimum rate for nitrogen fertilizer applications based on price changes for fertilizer and/or crops. Since plans are written for a multi-year crop rotation, it is highly probable that things will change and evolve over the life of the plan.

What are nutrient credits?

Nutrient credits are the fertilizer replacement value of non-commercial nutrient resources like manure, biosolids, or legumes. Nutrients from these sources become available over time as the organic materials decompose.

For manure, nutrient amounts can be estimated by

ADDITIONAL RESOURCES

- [What is a Farm Nutrient Management Plan?](#) PUBLICATION
- [Wisconsin Nutrient Management Basics](#) PUBLICATION
- [Credit What You Spread Card \(UWEX Publication A3580\)](#) PUBLICATION

- **Credit Legume Nitrogen and Reap the Profits Card** (UWEX Publication A3591) PUBLICATION
- **Department of Agriculture, Trade and Consumer Protection website's Nutrient Management** WEBSITE

referencing the “book” values with the type and amount of manure applied or by having manure tested to determine the actual value. Manure testing is often recommended for liquid manure and manure that is stored for a long period of time or if manure is concentrated.

For biosolids or other soil amendments, the nutrient amounts must be pre-determined by the source or the nutrient content of the material must be assessed by a lab.

For legumes (grown during the previous season), nutrient credits are determined by the legume type, stand density, and previous harvest management.

How do conservation practices affect nutrient management?

Using conservation-focused cropping strategies (i.e., reducing or eliminating tillage, growing cover crops, planting diverse crop rotations, and/or utilizing rotational grazing) can potentially reduce soil erosion, leaching, runoff losses of nutrients, and/or increase soil organic matter.

It is estimated that 1 ton of eroded soil may contain 2 pounds of nitrogen, 9 pounds of phosphorus, 31 pounds of potassium, along with varying amounts of calcium, magnesium, sulfur, micronutrients, and soil organic matter. Keeping soil in place not only reduces nutrient loss and potential fertilizer needs, but also protects the future productivity of the soil while reducing the risk of nutrients entering surface and groundwater bodies.

Soil organic matter is important to nutrient cycling and retention. Soil organic matter contains nutrients that can become available to plants. It also has a negative charge (CEC) that helps protect certain nutrients from loss from the soil system by leaching or runoff. Using conservation-focused cropping strategies may build soil organic matter content over time, thereby improving nutrient use efficiency and/or reducing supplemental nutrient needs.





NM3: THE USDA-NRCS 590 NUTRIENT MANAGEMENT STANDARD

Understanding the basic components of the 590 standard is important and will help guide the nutrient management planning process.

▶ What is the USDA-NRCS 590 Nutrient Management Standard?

- ▷ The 590 nutrient management (NM) standard is the criteria that all NM plans required of agricultural/government programs must meet. It is a national United States Dept. of Agriculture (USDA) - Natural Resources Conservation Service (NRCS) standard that is modified by each state. The 590 NM standard regulates the amount of nutrients – from any source that can be applied to cropland. In addition, it contains nutrient application limitations based on land characteristics such as slope, soil type, distance to water, frozen and snow-covered ground.
- ▷ Nutrient application rates contained in the 590 NM standard are based on University of Wisconsin research recommendations. These recommendations can be found in UW-Extension publication A2809 *Nutrient Application Guidelines for Field, Vegetable, and Fruit Crops in Wisconsin*.
- ▷ Components of the 590 NM standard deal with: 1) requirements for all fields, 2) requirements for the protection of groundwater, and 3) requirements for the protection of surface water.

▶ Key requirements and prohibitions

- ▷ A NM plan must be an annual plan that includes all fields on a farm that will receive any nutrients. The plan must indicate that adequate acreage exists to utilize the manure (or other organic by-products) nutrients generated on a given farm. A winter-spreading plan is also required, if applicable. Without going into great detail, the key requirements and prohibitions contained in the 590 NM standard are as follows:
- ▷ Farm fields must be soil tested at least every four years. Soil samples must be sent to a Wisconsin-certified (WDATCP) lab.
- ▷ Individual field nutrient budgets consistent with UW recommendations must be developed. Nutrient from non-commercial fertilizer sources (manure, legumes, soil nitrate, etc.) must be accounted (credited).
- ▷ Follow the nutrient application prohibitions included in the 590 NM standard. These prohibitions include: no

SnapPlus CONNECTION



SnapPlus and the USDA-NRCS 590 Standard
SnapPlus makes recommendations based on 590 standard and also provides different options and standards for WPDES permitted farms (CAFOs).

All of the SnapPlus How-To Videos are available on our **YouTube channel** or on the **SnapPlus website**.

OPTIONAL TOPICS

Do I have to have a NM plan for pastures?

A nutrient management plan must be made for a pasture if any of the following conditions apply:

- 1) Mechanical applications of nutrients are used
- 2) The average stocking rate is greater than or equal to 1 animal unit/acre
- 3) There is a herd present in the winter (not a feedlot)

For more information on NM planning for pastures see:

<https://datcp.wi.gov/Documents/NutrientMngmtOnPastures.pdf>

How can I check my plan for compliance?

A checklist was developed to let you review your plan and ensure it follows the guidelines for your operation.

The checklist can be found here:

<https://uwmadison.app.box.com/s/f62y7gt9qtgxmzwpuj02qouuhyvdz8na>

What is a SWQMA?

This acronym stands for Surface Water Quality Management Area. From line (66) "Surface water quality management areas" or "SWQMA" means all of the

nutrient runoff during application, no applications to fields exceeding “T”, no applications to areas of concentrated flow (waterways), saturated soils, areas adjacent to well, etc.

- ▷ Additional prohibitions deal with frozen or snow-covered fields and include: setbacks from lakes (1,000 ft) and streams (300 ft) – areas referred to as SWQMAs (surface water quality management areas), manure application rate limits, field slope restrictions, and liquid manure applications over fields with shallow bedrock or a history of well contamination from manure.
- ▷ Nutrient applications to non-frozen SWQMAs are allowed provided soil conservation practices are in place with additional restrictions for unincorporated liquid manure.
- ▷ The 590 NM standard contains groundwater protection criteria that is focused on nitrogen management on sandy soils and shallow soils. Restrictions include: no commercial fertilizer N applications in the fall, N fertilizer source (use ammonium fertilizer that has been treated with a nitrification inhibitor or use slow release forms of N) and timing (sidedress or split application) recommendations, manure application rate and timing limitations.
- ▷ Practices for surface water protection include: avoiding the build-up of soil P levels to excessively high ranges, soil erosion control, and limiting manure application rates to fields based on either soil test P thresholds or phosphorus index model rankings.

▶ NM programs and regulations

- ▷ The USDA 590 NM standard is a key component of many state, federal, and local programs dealing with agriculture and environmental protection.
- ▷ Consult with your local county Land & Water Conservation Department, zoning office, and NRCS office for information specific to where you farm.
- ▷ Probably the biggest program prompting state farmers to develop NM plans is Wisconsin’s Farmland Preservation Program – which was recently renamed to the Working Lands Initiative. This program, which attempts to preserve farmland through tax credit incentives, was expanded many years ago to include NM planning. This program is administered by the Wis. Dept. of Ag, Trade & Consumer Protection (WDATCP) and is implemented locally by county Land Conservation Departments.
- ▷ Additionally, the WDATCP offers cost-share incentive payment to producers for the preparation of NM plans. The program and funding are administered by county Land Conservation Departments. When state or federal funds are used for cost-sharing manure storage facilities or barnyard runoff control systems, a NM plan must also be prepared.
- ▷ Federal programs with a NM component are administered

following:

- (a) The area within 1,000 feet from the ordinary high water mark of navigable waters that consist of a lake, pond or flowage.
- (b) The area within 1,000 feet from the high water mark of navigable waters that consist of a glacial pothole lake.
- (c) The area within 300 feet from the ordinary high water mark of navigable waters that consist of a river or stream or other non-lake navigable waters.
- (d) The area within 300 feet of conduits to navigable waters.

What is “T”?

Soil loss tolerance (T) is the maximum amount of soil loss in tons per acre per year, that can be tolerated and still permit a high level of crop productivity to be sustained economically and indefinitely. T values range from 1 to 5 tons per acre per year.

The USDA (1956) defined the following top ten influencing factors of tolerable soil loss for a particular soil; the rate of soil formation from parent material; the rate of topsoil formation from subsoil; reduction of crop yield by erosion; soil depth; changes in soil properties favorable for plant growth caused by erosion; loss of plant nutrients by erosion; the likelihood of rill and gully formation; sediment deposition problems within a field; sediment delivery from the erosion site; the availability of feasible, economic, culturally and socially acceptable, as well as sustainable soil conservation practices.

S1: SOILS OVERVIEW

Soil properties, such as soil texture and organic matter, change over time and space due to natural soil processes and agronomic management. SnapPlus identifies some of these differences using USDA-NRCS soil maps and information.

▶ What is soil?

- ▷ Soil is a dynamic natural body composed of minerals, organic matter, air, and water that acts on and is acted upon by living organisms in a thin layer covering the earth's surface.

▶ Inherent vs. dynamic properties

- ▷ Some soil properties, such as soil texture and mineral composition, are considered **inherent**, meaning they are the result of natural soil formation properties and change little over time. In contrast, **dynamic** soil properties, such as soil water, temperature, biological activity, pH and soil nutrient levels, change over the short-term and over short distances. Dynamic soil properties are influenced by agricultural management.
- ▷ Agricultural management of soils, including soil testing and nutrient applications, must take inherent and dynamic soil properties into account to optimize crop nutrient uptake and reduce nutrient losses to the environment.

▶ Soil composition

- ▷ Soil texture only includes the mineral fraction of soil. Soil textures is defined by particle size (sand, silt and clay) and each size fraction has a different impact on soil properties, function, and nutrient management.
- ▷ The USDA identifies 12 soil textures based upon the percentage of sand, silt, and clay in a soil. The textural classifications are represented on a soil textural triangle. Soil nutrient recommendations are often differentiated by soil texture.
- ▷ Soil organic matter contributes to soil fertility, nutrient cycling, microbial communities, and soil water dynamics. Soil organic matter gains and losses are impacted by tillage, organic additions, and crop rotations.

▶ Soil formation

- ▷ Soil properties can vary dramatically throughout a region, as well as a single field, due to natural soil forming factors and agricultural management.

SnapPlus CONNECTION



SnapMaps

Soil maps are created for each field using Snap Maps. These maps contain field-specific soil information, including dominate and critical soil series, based on USDA-NRCS information.

[Getting Started with SnapMaps](#) VIDEO

[Navigating SnapMaps' Tools](#) Video

[Drawing Field Boundaries](#) VIDEO

All of the SnapPlus How-To Videos are available on our [YouTube channel](#) or on the [SnapPlus website](#).

OPTIONAL TOPICS

What is the Web Soil Survey?

Web Soil Survey is a free website hosted by the USDA-Natural Resources Conservation Service where the public can access soils information for almost all locations in the United States. Users can determine the soils mapped within identified field, as well as the associated soil descriptions, soil property, and soil interpretation data for each soil map unit.

<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

How to do soil texture by feel?

Soil texture can be estimated by wetting and ribboning a soil sample. Soil texturing by feel takes practice:

<https://www.youtube.com/watch?v=l0yaBxj767s>

- ▷ The five soil forming factors — climate, soil organisms, topography, parent material and time — influence soil horizonation, texture, organic matter content, and natural nutrient supply capacity, which in turn influences soil productivity, nutrient recommendations, and management options to reduce potential erosion and nutrient losses.
- ▷ Soil formation, landscape position, and groundwater hydrology influence a soil's drainage class and potential soil productivity and management. A soil's drainage class can influence nutrient cycling and potential nutrient loss to ground and surface waters.

▶ Soil classification and map units

- ▷ The USDA-NRCS has mapped most soils in the US. Soil series are the lowest and most homogeneous class in the soil classification system and meet clearly defined soil properties and specifications. However, soils are mapped as soil map units, which often include a dominant soil series and multiple minor components (series), miscellaneous areas, or both that do not dramatically impact the soil's management.
- ▷ Farmers can identify the soil map units within their fields through USDA soil maps, their agronomists, or the Web Soil Survey.
- ▷ SnapPlus uses the predominant, as well as the most limiting (critical) soil series within a field. The predominant soil series is used to determine nutrient management recommendations for the field. The critical soil series is the most erosion-prone soil that comprises at least 10% of the field and is used in soil erosion and P Index calculations.

How many named soils are there in Wisconsin?

There are more than 730 (734 as of Nov. 2012) named soils in Wisconsin. Each one is unique based upon the presence of various horizons, colors, structures, and textures.

What is soil drainage class?

A soil's drainage class indicates the frequency and duration of saturation (soil pores completely filled with water) during soil formation. Tile drainage or irrigation do not typically influence a soil's mapped drainage class. Better drained soils have a greater depth to saturation and therefore, plant roots will typically grow deeper into the soil as compared to more poorly drained soils.

ADDITIONAL RESOURCES

- [Management of Wisconsin Soils \(UWEX A3588\)](#) PUBLICATION
- [Long Term Conventional and No-Tillage Systems Compared](#) VIDEO
- [Soil Aggregation and Water Infiltration](#) VIDEO
- [Soil Organic Matter Accumulation and Oxidation](#) VIDEO
- [Soil Erosion, Soil and Water Management](#) VIDEO
- [Soil Quality, Water Use, Precision Ag, Soil and Water Management](#) VIDEO
- [Basic Soil Properties, Soil and Water Management](#) VIDEO
- [Tools For Measuring Soil Compaction](#) VIDEO
- [Residue and Compaction, Soil And Water Management](#) VIDEO
- [Using A Penetrometer to Detect Soil Compaction](#) VIDEO
- [USDA Web Soil Survey](#) WEBSITE

