NATURAL RESOURCES CONSERVATION SERVICE

NEW JERSEY

CONSERVATION PRACTICE STANDARD

NUTRIENT MANAGEMENT

(Ac.)

CODE 590

DEFINITION

Managing the amount (rate), source, placement (method of application), and timing of plant nutrients and soil amendments.

PURPOSE

- To budget, supply, and conserve nutrients for plant production.
- To minimize agricultural nonpoint source pollution of surface and groundwater resources.
- To properly utilize manure or organic by-products as a plant nutrient source.
- To protect air quality by reducing odors, nitrogen emissions (ammonia, oxides of nitrogen), and the formation of atmospheric particulates.
- To maintain or improve the physical, chemical, and biological condition of soil.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where plant nutrients and soil amendments are applied. This standard does not apply to one-time nutrient applications to establish perennial crops.

CRITERIA

General Criteria Applicable to All Purposes

A nutrient budget for nitrogen, phosphorus, and potassium must be developed that considers all potential sources of nutrients including, but not limited to, green manures, legumes, crop residues, compost, animal manure, organic by-products, biosolids, waste water, organic matter, soil biological activity, commercial fertilizer, and irrigation water.

Enhanced efficiency fertilizers, used in the State must be defined by the Association of American Plant Food Control Officials (AAPFCO) and be accepted for use by the State fertilizer control official, or similar authority, with responsibility for verification of product guarantees, ingredients (by AAPFCO definition) and label claims.

For nutrient risk assessment policy and procedures see Title 190, General Manual (GM), Part 402, Nutrient Management, and Title 190, National Instruction (NI), Part 302, Nutrient Management Policy Implementation.

To avoid salt damage, the rate and placement of applied nitrogen and potassium in starter fertilizer must be consistent with Rutgers Cooperative Extension guidelines, or industry practice recognized by Rutgers Cooperative Extension.

The NRCS-approved nutrient risk assessment for nitrogen (NJ Nutrient Leaching Risk- Appendix 1) must be completed unless the State NRCS, with the concurrence of NJ Department of Environmental Protection (NJDEP) Div. of Water Quality has determined specific conditions where nitrogen leaching is not a risk to water quality, including drinking water.

The NRCS-approved nutrient risk assessment for phosphorus (NJ Phosphorus Index- Appendix 2) must be completed when phosphorus application rate exceeds Rutgers Cooperative Extension fertility rate guidelines for the planned crop(s), or

- the planned area is within a phosphorus-impaired watershed (contributes to 303d-listed water bodies), or
- the NRCS and NJDEP have not determined specific conditions where the risk of phosphorus loss is low.
- manure or other organic wastes are being applied.

A phosphorus risk assessment will not be required when NRCS, with concurrence of NJDEP, has determined specific conditions where the risk of phosphorus loss is low. These fields must have a documented agronomic need for phosphorus; based on soil test phosphorus (STP) and Rutgers Cooperative Extension nutrient recommendations.

On organic operations, the nutrient sources and management must be consistent with the USDA's National Organic Program.

Areas contained within minimum application setbacks (e.g., sinkholes, wellheads, gullies, ditches, or surface inlets) must receive nutrients consistent with the setback restrictions.

Applications of irrigation water must minimize the risk of nutrient loss to surface and groundwater.

Soil pH must be maintained in a range that enhances an adequate level for crop nutrient availability and utilization. Refer to Rutgers Cooperative Extension documentation for guidance.

Soil, Manure, and Tissue Sampling and Laboratory Analyses (Testing).

Nutrient planning must be based on current soil, manure, and (where used as supplemental information) tissue test results developed in accordance with Rutgers Cooperative Extension guidance, or industry practice, if recognized by the university.

Current soil tests are those that are no older than 3 years, but may be taken on an interval recommended by Rutgers Cooperative Extension. The area represented by a soil test must be that acreage recommended by the Rutgers Cooperative Extension.

Where a conservation management unit (CMU) is used as the basis for a sampling unit, all acreage in the CMU must have similar soil type, cropping history, and management practice treatment.

The soil and tissue tests must include analyses pertinent to monitoring or amending the annual nutrient budget, e.g., pH, soil organic matter, phosphorus, potassium, or other nutrients and test for nitrogen where applicable. Follow Rutgers Cooperative Extension guidelines regarding required analyses.

Soil test analyses must be performed by laboratories successfully meeting the requirements and performance standards of the North American Proficiency Testing Program-Performance Assessment Program (NAPT-PAP) under the auspices of the Soil Science Society of America (SSSA) and NRCS, or other NRCS-approved program that considers laboratory performance and proficiency to assure accuracy of soil test results. Alternate proficiency testing programs must have solid stakeholder (e.g., water quality control entity, NRCS State staff, growers, and others) support and be regional in scope.

Nutrient values of manure, organic by-products and biosolids must be determined prior to land application. Laboratory analysis is preferred; however, current Rutgers Cooperative Extension or research derived values are acceptable.

Manure analyses must include, at minimum, total nitrogen (N), ammonium N, total phosphorus (P) or P_2O_5, total potassium (K) or K_2O, and percent solids, or follow Rutgers Cooperative Extension guidance regarding required analyses.

Manure, organic by-products, and biosolids samples must be collected and analyzed at least annually, or more frequently if needed to account for operational changes (feed management, animal type, manure handling strategy, etc.) impacting manure nutrient concentrations. If no operational changes occur, less frequent manure testing is allowable where operations can document a stable level of nutrient concentrations for the preceding three consecutive years.

Samples must be collected, prepared, stored, and shipped, following Rutgers Cooperative Extension guidance or industry practice.

When planning for new or modified livestock operations, acceptable "book values" recognized by the NRCS (e.g., NRCS Agricultural Waste Management Field Handbook) and Rutgers Cooperative Extension, or analyses from similar operations in the geographical area, may be used if they accurately estimate nutrient output from the proposed operation.

Manure testing analyses must be performed by laboratories successfully meeting the requirements and performance standards of the Manure Testing Laboratory Certification program (MTLCP), or other NRCS- approved program that considers laboratory performance and proficiency to assure accurate manure test results.

Nutrient Application Rates.

Planned nutrient application rates for nitrogen, phosphorus, and potassium should not exceed Rutgers Cooperative Extension guidelines or industry practice when recognized by the university.

At a minimum, determination of rate must be based on crop/cropping sequence, current soil test results,

realistic yield goals, and NRCS- approved nutrient risk assessments (Appendix 1 and 2).

Realistic yield goals must be established based on historical yield data, soil productivity information, climatic conditions, nutrient test results, level of management, and local research results considering comparable production conditions.

Estimates of yield response must consider factors such as poor soil quality, drainage, pH, salinity, etc., prior to assuming that nitrogen and/or phosphorus are deficient.

For new crops or varieties, industry- demonstrated yield, and nutrient utilization information may be used until Rutgers Cooperative Extension information is available.

Lower-than-recommended nutrient application rates are permissible if the grower's objectives are met.

Applications of biosolids, starter fertilizers, or pop-up fertilizers must be accounted for in the nutrient budget.

Nutrient Sources.

Nutrient sources utilized must be compatible with the application timing, tillage and planting system, soil properties, crop, crop rotation, soil organic content, and local climate to minimize risk to the environment.

Nutrient Application Timing and Placement.

Timing and placement of all nutrients must correspond as closely as practical with plant nutrient uptake (utilization by crops), and consider nutrient source, cropping system limitations, soil properties, weather conditions, drainage system, soil biology, and nutrient risk assessment results.

Nutrients must not be surface-applied if offsite losses are likely. This may preclude spreading on:

- frozen and/or snow-covered soils, and
- when the top 2 inches of soil are saturated from rainfall or snow melt.

Exceptions for the above criteria can be made for surface-applied manure when specified conditions are met and/or adequate conservation measures are installed to prevent the offsite delivery of nutrients. The adequate treatment level and specified conditions for winter applications of manure must be defined by NRCS in concurrence with the NJDEP. At a minimum, the following criteria shall be used for application areas with a risk of offsite runoff:

- Phosphorus Index of Medium or less;
- 50% or more living vegetative or crop residue surface cover;
- minimum 100' setback from surface waters;
- spreading rate not to exceed nutrient uptake of the following crop.

Additional Criteria to Minimize Agricultural Nonpoint Source Pollution of Surface and Groundwater

Planners must use the current NRCS-approved nitrogen (Leaching Index), phosphorus (Phosphorus Index), and soil erosion (Rusle2) risk assessment tools to assess potential for nutrient and soil loss. Identified resource concerns must be addressed to meet current planning criteria (quality criteria). Fields with erosion rates greater than 'T' shall be evaluated on site for any mitigation actions necessary to reduce risk. Technical criteria for risk assessments can be found in NI-190-302.

When there is a high risk of transport of nutrients, conservation practices must be coordinated to avoid, control, or trap manure and nutrients before they can leave the field by surface or subsurface drainage (e.g., tile). The number of applications and the application rates must also be considered to limit the transport of nutrients to tile.

Nutrients must be applied with the right placement, in the right amount, at the right time, and from the right source to minimize nutrient losses to surface and groundwater. The following nutrient use efficiency strategies or technologies must be considered:

- slow and controlled release fertilizers
- nitrification and urease inhibitors
- enhanced efficiency fertilizers
- incorporation or injection
- timing and number of applications
- soil nitrate and organic N testing
- coordinate nutrient applications with optimum crop nutrient uptake
- Corn Stalk Nitrate Test (CSNT), Pre-Sidedress Nitrate Test (PSNT), and Pre-Plant Soil Nitrate Test (PPSN)
- tissue testing, chlorophyll meters, and spectral analysis technologies
- other Rutgers Cooperative Extension recommended technologies that improve nutrient use efficiency and minimize surface or groundwater resource concerns.

Additional Criteria Applicable to Properly Utilize Manure or Organic By-Products as a Plant Nutrient Source

When manures are applied, and soil salinity is a concern, salt concentrations must be monitored to prevent potential crop damage and/or reduced soil quality.

The total single application of liquid manure:

- must not exceed the soil's infiltration or water holding capacity
- be based on crop rooting depth
- must be adjusted to avoid runoff or loss to subsurface tile drains.

Crop production activities and nutrient use efficiency technologies must be coordinated to take advantage of mineralized plant-available nitrogen to minimize the potential for nitrogen losses due to denitrification or ammonia volatilization.

Nitrogen and phosphorus application rates must be planned based on risk assessment results as determined by NRCS-approved nitrogen and phosphorus risk assessment tools.

For fields receiving manure, where phosphorus risk assessment results equate to LOW risk, additional phosphorus and potassium can be applied at rates greater than crop requirement not to exceed the nitrogen requirement for the succeeding crop. For fields receiving manure, where phosphorus risk assessment results equate to MODERATE risk, additional phosphorus and potassium may be applied at a phosphorus crop requirement rate for the planned crops in the rotation. When phosphorus risk assessment results equate to HIGH risk, additional phosphorus and potassium may be applied at phosphorus crop removal rates if the following requirements are met:

- a soil phosphorus drawdown strategy has been implemented, and
- a site assessment for nutrients and soil loss has been conducted to determine if mitigation practices are required to protect water quality.
- any deviation from these high risk requirements must have the approval of the Chief of the NRCS.

Manure or organic by-products may be applied on legumes at rates equal to the estimated removal of nitrogen in harvested plant biomass, not to exceed land grant university recommendations.

Manure may be applied at a rate equal to the recommended phosphorus application, or estimated phosphorus removal in harvested plant biomass for the crop rotation, or multiple years in the crop sequence at one time. When such applications are made, the application rate must not exceed the acceptable phosphorus risk assessment criteria, must not exceed the recommended nitrogen application rate during the year of application or harvest cycle, and no additional phosphorus must be applied in the current year and any additional years for which the single application of phosphorus is supplying nutrients.

Drawdown of soil phosphorus can be accomplished through a crop rotation that includes high phosphorus uptake species coupled with reduction of annual phosphorus application to a maximum of 20 lb/ac P_2O_5.

Additional Criteria to Protect Air Quality by Reducing Odors, Nitrogen Emissions and the Formation of Atmospheric Particulates

To address air quality concerns caused by odor, nitrogen, sulfur, and/or particulate emissions; the source, timing, amount, and placement of nutrients must be adjusted to minimize the negative impact of these emissions on the environment and human health. One or more of the following may be used:

- slow or controlled release fertilizers
- nitrification inhibitors
- urease inhibitors
- nutrient enhancement technologies
- incorporation
- injection
- stabilized nitrogen fertilizers
- residue and tillage management
- no-till or strip-till
- other technologies that minimize the impact of these emissions

Do not apply poultry litter, manure, or organic by-products of similar dryness/density when there is a high probability that wind will blow the material offsite.

Additional Criteria to Improve or Maintain the

Physical, Chemical, and Biological Condition of the Soil to Enhance Soil Quality for Crop Production and Environmental Protection

Time the application of nutrients to avoid periods when field activities will result in soil compaction.

In areas where salinity is a concern, select nutrient sources that minimize the buildup of soil salts.

CONSIDERATIONS

Elevated soil test phosphorus levels are detrimental to soil biota. Soil test phosphorus levels should not exceed State-approved soil test thresholds established to protect the environment.

Use no-till/strip-till in combination with cover crops to sequester nutrients, increase soil organic matter, increase aggregate stability, reduce compaction, improve infiltration, and enhance soil biological activity to improve nutrient use efficiency.

Use nutrient management strategies such as cover crops, crop rotations, and crop rotations with perennials to improve nutrient cycling and reduce energy inputs.

Use variable-rate nitrogen application based on expected crop yields, soil variability, soil nitrate or organic N supply levels, or chlorophyll concentration.

Use variable-rate nitrogen, phosphorus, and potassium application rates based on site-specific variability in crop yield, soil characteristics, soil test values, and other soil productivity factors.

Develop site-specific yield maps using a yield monitoring system. Use the data to further diagnose low- and high- yield areas, or zones, and make the necessary management changes. See Title 190, Agronomy Technical Note (TN) 190.AGR.3, Precision Nutrient Management Planning.

Use manure management conservation practices to manage manure nutrients to limit losses prior to nutrient utilization.

Apply manure at a rate that will result in an "improving" Soil Conditioning Index (SCI) without exceeding acceptable risk of nitrogen or phosphorus loss.

Use legume crops and cover crops to provide nitrogen through biological fixation and nutrient recycling.

Modify animal feed diets to reduce the nutrient content of manure following guidance contained in Conservation Practice Standard (CPS) Code 592, Feed Management.

Soil test information should be no older than 1 year when developing new plans.

Excessive levels of some nutrients can cause induced deficiencies of other nutrients, e.g., high soil test phosphorus levels can result in zinc deficiency in corn.

Use soil tests, plant tissue analyses, and field observations to check for secondary plant nutrient deficiencies or toxicity that may impact plant growth or availability of the primary nutrients.

Use the adaptive nutrient management learning process to improve nutrient use efficiency on farms as outlined in the NRCS' National Nutrient Policy in GM 190, Part 402, Nutrient Management.

Potassium should not be applied in situations where an excess (greater than soil test potassium recommendation) causes nutrient imbalances in crops or forages.

Workers should be protected from and avoid unnecessary contact with plant nutrient sources. Extra caution must be taken when handling anhydrous ammonia or when dealing with organic wastes stored in unventilated enclosures.

Material generated from cleaning nutrient application equipment should be utilized in an environmentally safe manner. Excess material should be collected and stored or field applied in an appropriate manner.

Nutrient containers should be recycled in compliance with State and local guidelines or regulations.

Considerations to Minimize Agricultural Nonpoint Source Pollution of Surface and Groundwater.

Use conservation practices that slow runoff, reduce erosion, and increase infiltration, e.g., filter strip, contour farming, or contour buffer strips. These practices can also reduce the loss of nitrates or soluble phosphorus.

Use application methods and timing strategies that reduce the risk of nutrient transport by ground and surface waters, such as:

- split applications of nitrogen to deliver nutrients during periods of maximum crop utilization,
- banded applications of nitrogen and/or phosphorus to improve nutrient availability,

- drainage water management to reduce nutrient discharge through drainage systems, and
- incorporation of surface-applied manures or organic by-products if precipitation capable of producing runoff or erosion is forecast within the time of planned application.

Use the agricultural chemical storage facility conservation practice to protect air, soil, and water quality.

Use bioreactors and multistage drainage strategies when approved by the Rutgers Cooperative Extension.

Considerations to Protect Air Quality by Reducing Nitrogen and/or Particulate Emissions to the Atmosphere.

Avoid applying manure and other by-products upwind of inhabited areas.

Use high-efficiency irrigation technologies (e.g., reduced-pressure drop nozzles for center pivots) to reduce the potential for nutrient losses.

PLANS AND SPECIFICATIONS

The following components must be included in the nutrient management plan:

- aerial site photograph(s)/imagery or site map(s), and a soil survey map of the site,
- soil information including: soil type surface texture, pH, drainage class, permeability, available water capacity, depth to water table, restrictive features, and flooding and/or ponding frequency,
- location of designated sensitive areas and the associated nutrient application restrictions and setbacks,
- for manure applications, location of nearby residences, or other locations where humans may be present on a regular basis, and any identified meteorological (e.g., prevailing winds at different times of the year), or topographical influences that may affect the transport of odors to those locations,
- results of approved risk assessment tools for nitrogen, phosphorus, and erosion losses,
- documentation establishing that the application site presents low risk for phosphorus transport to local water when phosphorus is applied in excess of crop requirement.
- current and/or planned plant production sequence or crop rotation,
- soil, water, compost, manure, organic by-product, and plant tissue sample analyses applicable to the plan,
- when soil phosphorus levels are increasing, include a discussion of the risk associated with phosphorus accumulation and a proposed phosphorus draw-down strategy,
- realistic yield goals for the crops,
- complete nutrient budget for nitrogen, phosphorus, and potassium for the plant production sequence or crop rotation,
- listing and quantification of all nutrient sources and form,
- all enhanced efficiency fertilizer products that are planned for use,
- in accordance with the nitrogen and phosphorus risk assessment tool(s), specify the recommended nutrient application source, timing, amount (except for precision/variable rate applications specify method used to determine rate), and placement of plant nutrients for each field or management unit, and
- guidance for implementation, operation and maintenance, and recordkeeping.

In addition, the following components must be included in a precision/variable rate nutrient management plan:

- Document the geo-referenced field boundary and data collected that was processed and analyzed as a GIS layer or layers to generate nutrient or soil amendment recommendations.
- Document the nutrient recommendation guidance and recommendation equations used to convert the GIS base data layer or layers to a nutrient source material recommendation GIS layer or layers.
- Document if a variable rate nutrient or soil amendment application was made.
- Provide application documenting source, timing, method, and rate of all applications that resulted from use of the precision agriculture process for nutrient or soil amendment applications.
- Maintain the electronic records of the GIS data layers and nutrient applications for at least 5 years.

If increases in soil phosphorus levels are expected (i.e., when N-based rates are used), the nutrient management plan must document:

- the soil phosphorus levels at which it is desirable to convert to phosphorus based planning,
- the potential plan for soil test phosphorus drawdown from the production and harvesting of crops, and
- management activities or techniques used to reduce the potential for phosphorus transport and loss,
- for AFOs, a quantification of manure produced in excess of crop nutrient requirements, and
- a long-term strategy and proposed implementation timeline for reducing soil P to levels that protect water quality,

OPERATION AND MAINTENANCE

Conduct periodic plan reviews to determine if adjustments or modifications to the plan are needed. At a minimum, plans must be reviewed and revised, as needed with each soil test cycle, changes in manure volume or analysis, crops, or crop management.

Fields receiving animal manures and/or biosolids must be monitored for the accumulation of heavy metals and phosphorus in accordance with land-grant university guidance and State law.

Significant changes in animal numbers, management, and feed management will necessitate additional manure analyses to establish a revised average nutrient content.

Calibrate application equipment to ensure accurate distribution of material at planned rates.

Document the nutrient application rate. When the applied rate differs from the planned rate, provide appropriate documentation for the change.

Records must be maintained for at least 5 years to document plan implementation and maintenance. As applicable, records include:

- soil, plant tissue, water, manure, and organic by-product analyses resulting in recommendations for nutrient application,
- quantities, analyses and sources of nutrients applied,
- dates, and method(s) of nutrient applications, source of nutrients, and rates of application,
- weather conditions and soil moisture at the time of application; lapsed time to manure incorporation; rainfall or irrigation event,
- crops planted, planting and harvest dates, yields, nutrient analyses of harvested biomass, and crop residues removed,
- dates of plan review, name of reviewer, and recommended changes resulting from the review, and
- all enhanced efficiency fertilizer products used.

Additional records for precision/variable rate sites must include:

- maps identifying the variable application source, timing, amount, and placement of all plant nutrients applied, and
- GPS-based yield maps for crops where yields can be digitally collected.

REFERENCES

Association of American Plant Food Control Officials (AAPFCO). 2011. AAPFCO Official Publication no. 64. AAPFCO Inc., Little Rock, AR.

Follett, R.F. 2001. Nitrogen transformation and transport processes. *In* Nitrogen in the environment; sources, problems, and solutions, (eds.) R.F. Follett and J. Hatfield, pp. 17-44. Elsevier Science Publishers. The Netherlands. 520 pp.

Schepers, J.S., and W.R. Ruan, (eds.) 2008. Nitrogen in agricultural systems. Agron. Monogr. no. 49, American Society of Agronomy (ASA), Crop Science Society of America (CSSA), Soil Science Society of America (SSSA). Madison, WI.

Sims, J.T. (ed.) 2005. Phosphorus: Agriculture and the environment. Agron. Monogr. no. 46. ASA, CSSA, and SSSA, Madison, WI.

Stevenson, F.J. (ed.) 1982. Nitrogen in agricultural soils. Agron. Series 22. ASA, CSSA, and SSSA, Madison, WI.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2010. Agronomy Technical Note, (TN) 190-AGR-3, Precision Nutrient Management Planning. Washington, DC.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2011. Title 190, General Manual, (GM), Part 402, Nutrient Management. Washington, DC.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2011, Title 190, National Instruction (NI), Part 302, Nutrient Management Policy Implementation. Washington, DC.

APPENDIX 1.

NEW JERSEY NUTRIENT LEACHING RISK

The Leaching Risk should be determined for nitrogen application on farms adjacent to sampled wells with documented ground water nitrate levels of 10 mg/liter or higher, according to the NRCS-available current map information from the New Jersey Department of Environmental Protection.

The LI does not account for irrigation. If irrigation is applied only to supply plant needs, there will be little additional loss below the rootzone. The additional loss would be relative to the precipitation events after the soil profile is saturated or nearly saturated due to irrigation.

Procedure:

1. Run RUSLE2 and determine Leaching Index (LI) for field.
2. Use Table 1, Leaching Potential (LP), to evaluate the site further, comparing application method with soil texture.
3. Use Table 2 to combine the LI with the LP to determine the overall Nutrient Leaching Risk for the field.

General guidelines:

An overall Table 2 risk of L is **not likely** to contribute soluble nutrients below the rootzone under normal management. Site conditions and practices do not pose a leaching risk.

An overall risk of M **may** contribute soluble nutrients below the rootzone under normal management. Site conditions combined with practices pose a medium risk.

*A Nutrient Leaching Risk of H is **likely** to contribute soluble nutrients below the rootzone under normal management. Site conditions combined with practices pose a high leaching risk. Soluble nutrient applications should be practiced with extreme limitations.*

Where Medium to High Nutrient Leaching Risks are encountered, producers shall employ management practices to reduce risk. In addition to applying only the recommended amounts of N via incorporation at or near planting, other practices such as splitting application of lower N rates during plant growth is useful. The same concept applies to permanent grass pasture/hayland where manure or fertilizer applications should be applied in small multiple applications (normally after each cutting or grazing) during active plant growth. For other guidance, see the Criteria and Considerations sections of this Standard.

Note: It is important to recognize the limitations of this Index. It is intended as a planning tool, and not a regulatory method.

Table 1.

Nitrogen Leaching Potential (LP) by Soil and Application Method

Application Timing	Soil Texture		
	Coarse	Medium	Fine
Fall Applied	H	M-L	L
Spring, preplant	H-M	M-L	L
Sidedress or split app.	M-L	L	L

H – High probability for leaching loss

M – Medium potential for leaching loss

L – Low potential for leaching loss

Soil Texture:

Coarse: sand, loamy sand, sandy loam

Medium: silt, silt loam, loam

Fine: silty clay loam, silty clay, clay, clay loam, sandy clay loam, sandy clay

Table 2.

Nutrient Leaching Risk

	LI 2	LI 2-10	LI >10
LP L	L	L	M
LP M-L	L	M	H
LP H-M	M	H	H

APPENDIX 2.

NEW JERSEY PHOSPHOROUS INDEX

The New Jersey Phosphorous Index is included in Standard 590 in accordance with the NRCS Nutrient Management Policy 190-GM, Part 402. Use of the P Index is required by Policy when developing Resource Management Systems for operations that are located in hydrologic units (HUC-14 digit) having a designation of phosphorous impaired waters; P application rates exceed Rutgers Cooperative Extension fertility rate guidelines for the planned crop(s), and/**or** organic wastes are being land applied. The organic wastes may be generated by the operation or imported from outside the operation.

The P Index is a method to evaluate the relative risk of surface water impacts from the phosphorous contained in land applied organic wastes. The Index operates on a field specific basis.

It is important to remember that the Phosphorous Index is a general assessment tool that has limitations, and should be viewed as such. This tool is intended to help in selection of management alternatives that can reduce the probability of phosphorous impacting water resources. Any attempt to use this tool as a regulatory method is beyond the scope and purpose.

The P Index includes two separate methodologies: one for typical crop production systems and one for systems utilizing raised beds and plastic mulch. The reason for this is the unique runoff characteristics of the latter. The P Index for a raised bed-plastic mulch crop system is completely independent from the P Index for Typical Crop Production Systems and stands alone.

Within each methodology, a series of site characteristics critical to potential P loss are listed down the left column, with weighting factors in parentheses. The relative risk factors for each are listed across the top with multipliers in parentheses. The score for each site characteristic is obtained by multiplying the weight factor by the risk factor.

Examples:

If a field edge is 75 feet from surface water (Site Characteristic C.) its score for that particular aspect would be 1.5 x Medium (5) = 7.5.

If a field soil test P is high (Site characteristic D.) the score for that particular aspect would be 1.5 x High (10) = 15.

If the soil erosion rate (RUSLE2) for the field is 5 tons/ac/yr,(Site Characteristic A) the score for that particular aspect would be 1.5 x Low (3) = 4.5.

All 5 Site Characteristics would be evaluated this way. The scores for each Site Characteristic are then added and compared to the Phosphorous Index Designation to see where the total falls. This enables the planner to have a measure of guidance in deciding when a nutrient management plan should be nitrogen or phosphorous based.

NEW JERSEY PHOSPHOROUS INDEX FOR TYPICAL CROP PRODUCTION SYSTEMS

*** See Soil Runoff Class Designation, following page**

Site Characteristic	None (0)	Low (3)	Medium (5)	High (10)	Very High(20)	Score
A. Soil Erosion (1.5)	< 1 ton/ac/yr	1 - 5 tons/ac/yr	6 – 10 tons/ac/yr	11 – 15 tons/ac/yr	>15 tons/ac/yr	
B. Soil Runoff Class* (1.0)	Negligible	Very low or low	Medium	High	Very High	
C. Distance of P application edge from surface water (1.5)	> 250 ft	100 - 250 ft	50 - 99 ft	20 - 49 ft	< 20 ft	
D. Soil Test P Rutgers values (1.5)	Very Low *(Below optimum)*	Low *(Below optimum)*	Medium *(Below optimum)*	High *(Optimum)*	Very High[1] *(Above optimum)*	
E. P Application Method: Both organic and inorganic sources (1.0)	None applied	Placed with planter deeper than 2 inches; *or* injected deeper than 2 inches; *or* applied and incorporated less than 7 days before planting crop	Applied and incorporated 7 days - 3 months before planting crop; or surf. applied to hayland during the growing season	Applied and incorporated > 3 months before planting crop; or surf. applied < 3 months before planting crop; or surf. applied to hayland outside of the growing season; or surf. applied to good pasture (70% or more living cover)	Surface applied to overgrazed pasture with less than 30% living cover; or surface applied without incorp. > 3 months before planting crop	

Total Score:

[1] Where soil test lab results indicate P levels in the very high range where no additional P is recommended for crop growth purposes, P may still be applied in the organic(manure/compost) form in accordance with the recommendations of this Index without known environmental problems. However, there may be nutrient-plant-animal interaction consequences thus suggesting avoiding additional P applications in both fertilizer and manure sources.

Soil Runoff Class Designation: for use in P Index, Site Characteristic B.

Slope %	EFM Ch. 2 Curve Number < 50	EFM Ch. 2 Curve Number 51-60	EFM Ch. 2 Curve Number 61-70	EFM Ch. 2 Curve Number 71-80	EFM Ch. 2 Curve Number >80
< 1	Negligible	Negligible	Negligible	Negligible	Very Low
1 - 2	Negligible	Negligible	Very Low	Very Low	Low
3 - 5	Negligible	Negligible	Low	Low	Medium
6 - 8	Very Low	Very Low	Medium	Medium	High
9 - 16	Very Low	Low	Medium	High	Very High
> 16	Low	Medium	High	Very High	Very High

2. STAND ALONE P INDEX FOR SYSTEMS USING PLASTIC MULCH ON RAISED BEDS:

Site Characteristic	None (0)	Low (3)	Medium (5)	High (10)	Very High (20)	Score
A. Use of plastic mulch on raised beds. Beds running up and down slope unless noted as contoured. (3.0)	Uses *contoured* beds on well drained soils with slopes <2%	Uses beds on well drained soils with slopes < 2% or, beds are *contoured* on any soils with slopes 2 - 5%	Uses beds on well drained soils with slopes 2 - 5% or, beds are *contoured* on any soils with slopes 6 -10%	Uses beds on moderately to poorly drained soils with slopes 2– 5%, or beds are *contoured* on any soils with slopes >10%	Uses beds on any soils with slopes > 5%	
B. Distance of P application edge from water (2.0)	> 250 ft	100 - 250 ft	50 - 99 ft	25 - 49 ft	< 25 ft	
C. Soil Test P Rutgers values (1.5)	Very Low *(Below optimum)*	Low *(Below optimum)*	Medium *(Below optimum)*	High *(Optimum)*	Very High *(Above optimum)*	

Total Score:

Phosphorus Index Designation:

< 30 *Low Potential for P loss.* **LOW** potential for P movement from this site given current management practices and site characteristics. There is a low probability of an adverse impact to surface waters from P losses from this site. Nitrogen-based nutrient management planning is satisfactory for this site. Soil P levels and P loss potential may increase in the future due to N-based nutrient management.

30 – 50 *Medium Potential for P loss.* **MEDIUM** potential for P movement from this site given current management practices and site characteristics. Phosphorous applications should not exceed P amount to be removed by the crop. Practices should be implemented to reduce P losses by surface runoff, subsurface flow, and erosion.

51 – 100 High Potential for P loss. **HIGH** potential for P movement from this site given current management practices and site characteristics. Phosphorus-based nutrient management planning should be used for this site. Phosphorus applications should be limited to crop removal of P. All practical management practices for reducing P losses by surface runoff, subsurface flow, or erosion should be implemented. A soil test phosphorus drawdown strategy shall be established in the first crop year following determination of a HIGH P Index designation.

> 100 *Very High Potential for P loss.* **VERY HIGH** potential for P movement from this site given current management practices and site characteristics. **No additional phosphorus** shall be applied to this site. Active remediation and drawdown techniques shall be implemented to reduce the loss potential from this site.