NUTRIENT MANAGEMENT TRAINING AND CERTIFICATION REGULATIONS

4VAC5-15-10. Definitions.

The words and terms used in this chapter shall have the following meanings unless the context clearly indicates otherwise.

"Application rate" or "nutrient rate" means the quantity of major nutrients, nitrogen as N, phosphorus as P_2O_5, and potassium as K_2O on a per acre basis to supply crop or plant nutrient needs, and to achieve realistic expected crop yields.

"Banding" or "sideband" means the placement of fertilizer approximately two inches to the side and two inches below the seed.

"Best management practice" means a conservation or pollution control practice that manages soil, nutrient losses, or other potential pollutant sources to minimize pollution of water resources, such as split applications of nitrogen, or use of cereal grain cover crops to trap available nitrogen and reduce soil erosion.

"Biosolids" means a sewage sludge that has received an established treatment for required pathogen control and is treated or managed to reduce vector attraction to a satisfactory level and contains acceptable levels of pollutants, such that it is acceptable for use for land application,

marketing, or distribution in accordance with 12VAC5-585-10 et seq., Biosolids Use Regulations of the Board of Health.

"Broadcast" means the uniform application of a material over a field.

"Calibration" means the systematic determination of the operational parameters, such as speed and quantity delivered, of application equipment.

“Cereal crop” or “small grain” means barley, rye, triticale, or wheat.

"Certified nutrient management planner" or "nutrient management planner" or "planner" means ~~the person or persons who prepare nutrient management plans under these regulations~~ a person who holds a current Virginia nutrient management certificate of competence.

"Cool season grass" means grass species of temperate zone origin which exhibit the greatest rates of dry matter production in the day/night temperature range of 60°/ 50°F to 80°/ 70°F ~~and includes fescues, bluegrasses, and ryegrasses~~. Examples of cool season grasses include fescue, bluegrass, and ryegrass.

"Commonwealth" means the Commonwealth of Virginia.

“Composted organic nutrient source” means the relatively stable, humus-like product resulting from the controlled aerobic, thermophilic biological decomposition of organic material that bears little physical resemblance to the raw materials from which it originated and having a final carbon to nitrogen ration of 25:1 or greater.

"Cover crop" means a crop including, but not limited to, cereal grains, which is planted following the harvest of the preceding crop for the purpose of:

1. Seasonal protection of soil, or

2. Assimilation of residual soil nitrogen left from a previous crop or from continued mineralization of nitrogen.

"Crop" means cultivated plants or agricultural produce such as grain, silage, forages, oilseeds, vegetables, fruit, nursery stock, or turfgrass.

"Cropland" means land used for the production of grain, oilseeds, silage, industrial crops, and any other category of crop not defined as specialty crop, hay, or pasture.

"Crop nutrient needs" means the primary nutrient requirements of a crop determined as pounds of nitrogen as N, phosphorus as P_2O_5, and potassium as K_2O required for production of an expected crop yield based upon soil analysis results as specified in Virginia Nutrient

Management Standards and Criteria, revised 2005 or Virginia Commercial Vegetable Production Recommendations for 2004.

"Crop nutrient removal" means the amount of nutrients per acre expected to be taken up by a plant and removed from the site in the harvested portion at the expected yield level, generally expressed as tons per acre or bushels per acre, at rates specified in Virginia Nutrient Management Standards and Criteria, revised 2005.

"Crop rotation" means a method of maintaining and renewing the fertility of a soil by the successive planting of different crops on the same land.

"Department" means the Department of Conservation and Recreation.

"Double crop" means the production and harvesting of two crops in succession within a consecutive 12-month growing season.

"Dry manure" or "semisolid manure" means manure containing less than 85.5% moisture.

"Environmentally sensitive site" means any field which is particularly susceptible to nutrient loss to groundwater or surface water since it contains, or drains to areas which contain, sinkholes; or

where at least 33% of the area in a specific field contains one or any combination of the following features:

1. Soils with ~~a leaching index above 10~~ high potential for leaching based on soil texture or excessive drainage;

~~2. Sinkholes;~~

~~3.~~ 2. Shallow soils less than 41 inches deep likely to be located over fractured or limestone bedrock;

~~4.~~ 3. Subsurface tile drains;

4. Soil with high potential for subsurface lateral flow based on soil texture and poor drainage;

5. Floodplains as identified by soils prone to frequent flooding in county soil surveys; or

6. Lands with slopes greater than 15%.

"Expected crop yield" means a realistic crop yield for a given farm field determined by using yield records or soil productivity information.

"Fertilizer" means any organic or inorganic material of natural or synthetic origin that is added to a soil to supply certain nutrients essential to plant growth.

"Field" means a unit of contiguous nonwooded land generally used for crop production that is separated by permanent boundaries, such as fences, permanent waterways, woodlands, croplines

not subject to change because of farming practices, and other similar features or as determined by the United States Department of Agriculture Farm Service Agency.

"Field identification number" means a number used by a farmer (or the United States Department of Agriculture Farm Service Agency) to distinguish or identify the location of a field on a farm.

"Groundwater" means any water beneath the land surface in a water saturated layer of soil or rock.

"Grid soil sampling" means a process whereby farm fields or other areas are subdivided into smaller areas or squares for the purpose of obtaining more detailed soil analysis results.

"Hay" means a grass, legume, or other plants, such as clover or alfalfa, which is cut and dried for feed, bedding, or mulch.

"Hydrologic soil group" means a classification of soils into one of four groups, A, B, C, or D, according to their hydrologic properties, ranging from low runoff potential (high infiltration potential) in group A to high runoff potential (low infiltration potential) in group D.

"Incorporation" means the process whereby materials are mixed into soils and not exposed on the soil surface, such as would be achieved by disking one time to a depth of six inches.

"Industrial waste" means liquid or other waste resulting from any process of industry, manufacture, trade or business, or from the development of any natural resources.

"Irrigation" means the application of water to land to assist in crop growth.

"Irrigation scheduling" means the time and amount of irrigation water to be applied to an area for optimum crop growth and to minimize leaching and runoff.

"Leaching" means the movement of soluble material, such as nitrate, in solution through the soil profile by means of percolation.

"Legume" means a plant capable of fixing nitrogen from the atmosphere such as peas, beans, peanuts, clovers, and alfalfas.

"Legume nitrogen credit" means the amount of nitrogen a legume is expected to supply to a succeeding crop.

"Liming" means the application of materials containing the carbonates, oxides, or hydroxides of calcium or magnesium in a condition and in a quantity suitable for neutralizing soil acidity.

"Liquid manure" means manure containing at least 85.5% moisture or which can be applied through subsurface injection or surface application with liquid application equipment.

"Livestock" means domesticated animals such as cattle, chickens, turkeys, hogs, and horses raised for home use or for profit.

"Manure" or "animal waste" means animal fecal and urinary excretions and waste by products which may include spilled feed, bedding litter, soil, lactase, process wastewater, and runoff water from animal confinement areas.

"Mehlich I" means a specific soil analysis procedure developed by North Carolina State University to determine extractable levels of certain nutrients in soils.

"Micronutrient" means a nutrient necessary only in extremely small amounts for plant growth.

"Mineralization" means the process when plant unavailable organic forms of nutrients are converted to a plant available inorganic state as a result of soil microbial decomposition.

“No-till” means the soil is left undisturbed from the time of harvest or the chemical killing of the preceding crop or cover crop until and including the time of planting of the current crop except

for strips up to 1/3 of the row width that are disturbed by coulters or disk openers during the planting operation.

"NRCS" means the United States Department of Agriculture, Natural Resource Conservation Service, formerly the Soil Conservation Service (SCS).

"Nutrient" means an element or compound essential as raw materials for plant growth and development such as carbon, nitrogen, and phosphorus.

"Nutrient content" means the percentage of any primary nutrients such as nitrogen as N, phosphorus as P_2O_5, and potassium as K_2O contained in any type or source of plant nutrients.

"Nutrient management plan" or "plan" means a plan prepared by a Virginia certified nutrient management planner to manage the amount, placement, timing, and application of manure, fertilizer, biosolids, or other materials containing plant nutrients in order to reduce ~~pollution~~ nutrient loss to the environment and to produce crops.

"Nutrient Management Training and Certification Fund" means the fund established by § 10.1-104.2 of the Code of Virginia to support the department's Nutrient Management Training and Certification Program.

"Organic nutrient source" or "organic source" means manure, biosolids, sludge, industrial waste, green manure, compost, or other plant or animal residues which contain plant nutrients.

"Organic residuals" means nutrients released over time from manure, biosolids, industrial wastes, legumes, or other organic sources of nutrients.

"Pasture" means land which supports the grazing of animals for forages.

"Person" means an individual, corporation, partnership, association, a governmental body and its subordinate units, a municipal corporation or any other legal entity.

“Phosphorus index” means the Virginia Phosphorus Index Version 1.3 Technical Guide, Revised March 2005.

"Plant available nutrients" means the portion of nutrients contained in nutrient sources which is expected to be available for potential use by plants during the growing season or the crop rotation.

"Pre-sidedress nitrogen test ~~(PSNT)~~" or “PSNT” means a procedure used to ~~help~~ determine soil ~~nitrogen level~~ nitrate-nitrogen levels during a crop growing season.

"Primary nutrients" means nitrogen as N, phosphorus as P_2O_5, and potassium as K_2O.

"Residual nutrients" means the level of nitrogen, phosphorus, and potassium remaining or available in the soil from previously applied nutrient sources, or unharvested plants or plant parts, or baseline nutrient levels in the soil.

"Runoff" means that part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface water which can carry pollutants from the land.

“RUSLE2” means the USDA – NRCS Revised Universal Soil Loss Equation Version 2 software package.

"Secondary nutrient" means calcium, magnesium, or sulfur.

"Sewage sludge" or "sludge" means any solid, semisolid, or liquid residues which contain materials removed from municipal or domestic wastewater during treatment including primary and secondary residues. Other residuals or solid wastes consisting of materials collected and removed by sewage treatment, septage, and portable toilet wastes are also included in this definition. Liquid sludge contains less than 15% dry residue by weight or can be applied through subsurface injection or surface application with liquid application equipment. Dewatered sludge contains 15% or more dry residue by weight.

"Shall" means a mandatory requirement.

"Should" means a recommendation.

"Slope" means the degree of deviation of a surface from horizontal, measured as a percentage, as a numerical ratio, or in degrees.

"Sidedress" means the placement of fertilizer beside or between the rows of a crop after crop emergence.

"Sinkhole" means a depression in the earth's surface caused by dissolving of underlying limestone, salt, or gypsum having drainage patterns through underground channels.

"Slowly available nitrogen" means nitrogen sources that have restricted availability involving compounds which dissolve slowly, materials that must be microbially decomposed, or soluble compounds coated with substances highly impermeable to water such as urea formaldehyde based water insoluble nitrogen, sulfur coated urea, and natural organics.

"Soil erosion" or "erosion" or “soil loss” means the wearing away of the land surface by water, wind, or waves.

"Soil management group" means a grouping of soils based on their similarity in profile characteristics which affect crop production and require specific soil and crop management practices.

~~"Soil nitrate leaching index" means the potential for a given soil to be subject to nitrate leaching below the root zone.~~

"Soil pH level" means the negative logarithm of the hydrogen-ion activity of a soil which measures the relative acidity or alkalinity of the soil. The pH level affects the availability and plant utilization of nutrients.

"Soil productivity group" means a grouping of soils based upon expected yield levels for a given crop type.

"Soil series" means a classification of a specific soil type by name based on the chemical and physical properties of the soil.

"Soil survey" means a published or unpublished document developed by a governmental entity which includes detailed descriptions and classifications of soils, mapping of various soil series, and the interpretation of soils according to their adaptability for various crops and trees.

"Specialty crop" means vegetables, tree crops, perennial vine crops, ornamentals, horticultural crops, and other similar crops.

"Split application" means utilizing a sequence of two or more nutrient applications, separated by approximately three weeks or more, to a single crop in order to improve nutrient uptake efficiency.

"Surface water" means all water whose surface is exposed to the atmosphere.

“Tilled” means soil is disturbed between the time of harvest of the preceding crop through the time of planting of the current crop in that greater than 1/3 of the row width is disturbed by tillage implements such as moldboard plows, chisel plows, subsoilers, disks, field cultivators, roto-tillers, coulters or disk openers.

"Tillering" is the formation of lateral shoots from the auxillary buds of small grains and grasses.

"Tissue test" means an analysis of crop tissue for the percentage of nitrogen at key growth stages, and used as an intensive nutrient management technique with small grain crops.

"Topdress" means broadcast applications of fertilizer on crops such as small grains or forage after crop emergence has occurred.

“Trap crop” means a timely planted cereal crop for the purposes of capturing residual soil nitrogen and nitrogen that is released during the decomposition of manure or biosolids in order to manage limited manure or sewage sludge storage availability.

"Turfgrass" means selected grass species planted or sodded and managed for such uses as home lawns, golf courses, office parks and rights-of-way.

"Volatilization" means a process by which nitrogen is lost to the atmosphere as ammonia gas.

"Warm season grass" means a grass species of tropical origin that exhibits the highest rate of dry matter production in the day/night temperature range of 90°/79°F at a minimum to a maximum of 97°/88°F. ~~Warm~~ Examples of warm season grasses include zoysia and bermuda grasses.

"Water insoluble nitrogen" or "WIN" means a urea formaldehyde based slowly available nitrogen listed on fertilizer bags and reported as a percentage.

"Watershed" means a drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

"Watershed code" means the letter and number used by the department to identify a watershed or hydrologic unit area.

"Zadoks' growth stage" means the numerical scale ranging from 0-93 which assigns values to small grain growth stages, e.g. Growth Stage 30 is just prior to the stem elongation phase in wheat growth.

4VAC5-15-40. Eligibility requirements.

A. Certification may be obtained by satisfying all of the following requirements for certification:

1. Satisfactorily completing and submitting to the department an application in the form required by the department, including a statement of any felony convictions. Such application shall be submitted to the department at least 30 days before the approved examination date set by the department. The application shall request information relating to the person's education, work experience, knowledge of nutrient management, and willingness to abide by the requirements of these regulations;

2. Supplying proof of meeting one of the following:

a. A copy of a college transcript indicating completion of a college degree with a major in an agriculturally related area with coursework in the area of nutrient management such as soils, soil fertility, and plant science, and one year of practical experience related to nutrient management planning or implementation of nutrient management concepts and principles acceptable to the department, or

b. A combination of education to include nutrient management related educational courses or training and a minimum of three years of practical experience related to nutrient management planning or implementation of nutrient management concepts and principles acceptable to the department;

3. Obtaining a passing score on each of the ~~essential components~~ parts of the nutrient management certification examination administered by the department; and

4. Submitting a $100 certification fee by check or money order to the department.

B. Certificates shall be valid for two years and will expire on the last day of the expiration month. Certified nutrient management planners or applicants shall notify the department of any change in mailing address within 30 days of such change in address.

C. Individuals certified as nutrient management consultants by the State of Maryland or certified as nutrient management specialists by the Commonwealth of Pennsylvania will be eligible for

certification in Virginia by complying with all requirements of these regulations except for subdivision A 2 of this section. These individuals may also substitute, for the requirements in 4VAC5-15-60 C, the attainment of a passing score on a Virginia specific examination component which shall include at a minimum the elements listed in 4VAC5-15-60 C 9 and C 10. The department, upon review, may accept or approve nutrient management certification programs of other states as satisfying partial requirements for certification.

4VAC5-15-60. Examination.

A. The department shall administer nutrient management certification examinations at least once per year. The examinations shall require a demonstration of the ability to prepare a nutrient management plan. The department may limit the number of applicants taking the examination based upon available examination space.

B. Applicants for certification shall achieve a passing score on each of the ~~essential components~~ parts of the nutrient management certification examination to become eligible for certification.

C. The examinations for persons involved in agricultural nutrient management shall address the elements listed below. To address nutrient management on urban land uses, specialty specific examinations may be added to or substituted by the department for the elements below.

1. General understanding of overall nutrient management concepts such as nutrient cycling on farms, the purpose of nutrient management planning, economic aspects of nutrient use, and components of a nutrient management plan;

2. Basic soil science concepts such as soil physical and chemical properties including texture, structure, organic matter, and horizon development, and how such characteristics influence crop productivity and adaptation, water runoff, and infiltration;

3. Environmental management concepts such as the water cycle, nutrient loss mechanisms, environmental effects of nutrients in waters including Chesapeake Bay, identification of high risk sites relating to nutrient use and appropriate nutrient management practices to reduce nutrient losses;

4. Nutrient sampling, testing, and analysis such as basic sampling procedures, relationship of soil test level with the likelihood of crop response, soil nitrate testing, manure and biosolids sampling and interpretation, and determining nitrogen supplied by legumes;

5. Basic soil fertility concepts such as relationship of soil pH to nutrient availability and toxicity, essential elements for crop growth, limiting factors to crop production, cation exchange capacity and related concepts, nutrient cycles, and forms of nutrients in soils;

6. Fertilizer management concepts such as types of fertilizers, nutrient analysis of common materials and grades, basic calculations and blending, calibration of equipment, and application methods;

7. Manure management concepts such as nutrient content and volume produced, determination of plant available nutrients, selecting sites for manure application, proper timing and placement, coordination of fertilizers with manure, application methods and calibration;

8. Biosolids management concepts such as determination of plant available nutrients, nutrient content, forms of nutrients, types of sludges, coordination with fertilizer applications, and application methods;

9. Nutrient management training and certification regulatory requirements, and requirements of other nutrient management related laws, regulations, and incentive programs; and

10. Development of multiple components of nutrient management plans and completion of calculations comparable to development of nutrient management plans such as, but not limited to, determination of specific soil types in fields, determination of specific nutrient requirements based on soil productivity and soil analysis results, evaluation of field limitations based on environmental hazards or concerns, timing of nitrogen applications, phosphorus nutrient

management planning methods and assessment techniques, and interpretation of manure analysis results.

D. An individual who is unable to take an examination at the scheduled time shall notify the department at least five days prior to the date and time of the examination; such individual will be rescheduled for the next examination. The department may consider accepting notice of less than five days due to individual hardship situations on a case-by-case basis. Failure to notify the department may require the individual to submit a new application and payment of fees in accordance with 4VAC5-15-40.

E. The department shall establish acceptable passing scores for the examinations based on the department's determination of the level of examination performance required to show minimal acceptable competence.

F. All applicants shall be notified of results in writing within 60 days of the completion of the examinations.

4VAC5-15-80. Certificate renewal.

The department will not renew a certificate if a proceeding to deny certification under 4VAC5-15-110 has begun, or if the department has found that the applicant violated any requirements of

this chapter. A certificate is issued for two years and may be renewed on or before the expiration of a certificate by complying with all of the following requirements:

1. Submittal of a renewal application on the form the department requires;

2. Payment of a $100 renewal fee to the department;

3. Submittal of proof of satisfactory completion of at least four hours of continuing education pre-approved by the department within the past two years. Requests for pre-approval of continuing education courses must be received at least 60 days prior to the expected course date or dates and must include a detailed syllabus indicating time to be spent on each topic area covered. Continuing education hours must be in subject matter consistent with 4VAC5-15-60 C. Department personnel may attend continuing education sessions to verify that the requirements are met. Proof of attendance must be verified by the course provider. The department may accept continuing education units obtained in Delaware, Maryland and Pennsylvania if such continuing education units are specifically for the purpose of recertification in the state nutrient management certification program; and

4. Completion of at least one nutrient management plan or completion of four hours of continuing education pre-approved by the department within the past two years in addition to the requirements of subdivision 3 of this section.

5. Persons certified prior to the effective date of this regulation shall attend a department approved training course in phosphorus nutrient management planning methods and assessment techniques prior to certificate renewal. The training course hours may be applied toward other continuing education requirements of this subsection.

4VAC5-15-100. Recordkeeping and reporting requirements.

A. Certified nutrient management planner reporting requirements. A person who holds a certificate under these regulations shall keep records and file with the department by September 30 of each year an annual activity report on a form supplied by the department covering the previous year (July 1 through June 30). The annual activity report shall contain the following information:

1. Name and certificate number of the certified nutrient management planner;

2. Any change of mailing address during the previous year;

3. Number of nutrient management plans completed;

4. Acreage covered by plans and planned acreage by county and state watershed codes specified by plan categories of new or revised;

5. Breakdown of planned acreage by cropland, hay, pasture, and specialty crops by county and watershed code specified by plan categories of new or revised; and

6. Other information indicating number of practices facilitated by the planner such as manure testing and use of the PSNT.

B. Certified nutrient management planner recordkeeping requirements. The department may periodically inspect nutrient management plans prepared by certified persons and required records for the purpose of review for compliance with 4VAC5-15-140 and 4VAC5-15-150. A certified nutrient management planner shall maintain the following plan records for a period of not less than three years from the date the plan was prepared:

1. A complete copy of each nutrient management plan prepared and shall make such plans available for inspection by department personnel upon request within ~~two weeks~~ one week of receiving such request;

2. Records for each plan with all of the following information if the information is not already contained in the plan:

a. Representative soil analysis results for fields, or field grids if grid soil sampling is used, dated not more than three years prior to the date the nutrient management plan was completed to include information on soil fertility levels for phosphorus and potassium, and pH level;

b. Copies of soil survey maps or a soil survey book containing maps for each field unless a soil survey has not been published for the county;

c. Yield records for each field to include calculations used to determine the planning yield if upward adjustments to soil productivity based yields were made to more than 20% of the fields covered by the plan;

d. Type and number of livestock, if any, as well as a description of the livestock to include average weight;

e. Calculations or records indicating annual quantity of manure produced or expected to be produced; and

f. Organic nutrient source analysis, if applicable, to include information on percentage of moisture, total nitrogen or total Kjeldahl nitrogen, ammonium nitrogen, total phosphorus, and total potassium.

3. A summary listing of all plans prepared to include landowner or operator's name and the date the plan was prepared or revised.

4VAC5-15-110. Compliance with regulations and disciplinary action.

If the department finds that a certified person or an applicant for certification violated any requirements of this chapter, including the circumstances listed below, the department may deny, suspend or revoke certification, following the informal fact-finding procedures of the Virginia Administrative Process Act (§9-6.14:1 et seq. of the Code of Virginia).

1. Providing misleading, false, or fraudulent information in applying for a certificate;

2. Providing the department with any misleading, false, or fraudulent report;

3. Offering or preparing a nutrient management plan claimed to be prepared by a person certified as a nutrient management planner in Virginia as provided by these regulations without a certificate;

4. Offering ~~or~~ , preparing, modifying, or revising a nutrient management plan that does not comply with the requirements of these regulations;

5. Failing to promptly provide any report or to allow the department access to inspect any records required to be kept by these regulations;

6. Failing to provide the department with a copy of a nutrient management plan within two weeks following the modification of any plan required by regulations promulgated under §32.1-164.5 for sewage sludge, §62.1-44.17:1 for animal waste, §62.1-44.17:1.1 for poultry waste; or

~~6.~~ 7. Conviction of a felony related in any way to the responsibilities of a certified nutrient management planner.

~~**4VAC5-15-130. Duties of other state agencies.**~~

~~The provisions of this chapter shall not limit the powers and duties of other state agencies.~~

4VAC5-15-140. Nutrient management plan content.

A. A certified nutrient management planner shall prepare nutrient management plans which contain the information in subsections B through G of this section. For nutrient management plans covering nonagricultural, specialty land uses, for example residential lawns, office parks, and golf courses, the department may specify additional plan elements which are critical to the management of nutrients for a particular activity, and may eliminate requirements not pertinent to nonagricultural land uses.

B. Plan identification. Each plan shall be identified by a single cover sheet indicating:

1. Farmer/operator name and address;

2. Name, ~~and~~ certificate number, and signature of the certified nutrient management planner that prepared the plan;

3. County and watershed code of land under the nutrient management plan;

4. Total acreage under the plan with double cropped acreage accounted for only once;

5. Acreage of cropland, hay, pasture, and specialty crops included in the plan for the first year of the plan;

6. Date the plan was prepared or revised; and

7. Type and approximate number of livestock, if applicable.

C. Map or aerial photograph.

1. Each plan shall contain a map or aerial photograph to identify:

a. The farm location and boundaries;

b. Individual field boundaries where nutrients will be applied; ~~and~~

c. Field numbers and acreages where nutrients will be applied;

d. Environmentally sensitive sites as defined in 4VAC-5-15-10;

e. Setback areas for non-application for manure and biosolids as specified in 4VAC5-15-150. A. 5. e;

f. Location of manure, biosolids, or waste storage if any; and

g. Intermittent or perennial streams and buffers (if the phosphorus index is used to determine phosphorus application rates).

2. The map or aerial photograph shall be legible, with the features in subdivision 1 of this subsection recognizable. A farm sketch or soil survey map may be used when a map or aerial photograph is not available, if the features described in subdivision 1 of this subsection are recognizable.

D. Summary of nutrient management plan recommendations. Each plan shall contain one or more summary sheets that list the following information for each field:

1. Name of the farmer/operator;

2. Field identification numbers to include the United States Department of Agriculture Farm Service Agency tract and field numbers;

3. Field acreages;

4. Expected crops or crop rotations;

5. Crop nutrient needs per acre based on soil analysis results and soil productivity;

6. Legume nitrogen credits per acre;

7. Available nutrients in soil from previous crop and mineralization of organic residuals;

8. Recommended organic nutrient source application rates in tons per acre or 1,000 gallons per acre; plant available nitrogen as N, phosphorus as P_2O_5, and potassium as K_2O per acre; and spreading schedule to include approximate months of application;

9. Expected days for incorporation of organic nutrient sources into the soil if organic nutrient sources will be used;

10. Commercial fertilizer rates and timing of applications, including split applications of nitrogen and the possible use of soil nitrogen test results on a field before sidedressing with nitrogen; and

11. Numerical phosphorus and potassium soil analysis results expressed as ppm P and K , pounds per acre P and K or pounds per acre P_2O_5 and K_2O for all fields in the plan.

E. Individual fields may be grouped together if similar soil productivity levels, soil fertility levels, and environmentally sensitive site features exist pertaining to subsection D of this section.

F. Each plan shall also contain the following information in summary or narrative form:

1. Identification and management of environmentally sensitive sites;

2. Quantities of manure produced on the farm, available manure storage capacity, and manure analysis;

3. Total manure used as crop nutrients, if any, including manure from both on farm and off farm sources based on plan recommendations and total land requirements for manure utilization;

4. Quantity of unused manure, if applicable, and recommendations on appropriate use options;

5. Liming recommendations if soil pH is below the optimal range;

6. Recommendations or fact sheets to ensure efficient application of fertilizers and organic nutrient sources and other best management practices to reduce the potential for the degradation of surface and groundwater quality, which may include but are not limited to:

a. Equipment calibration;

b. Application timing and method;

c. Crop rotation and agronomic practices;

d. Soil nitrate testing; and

e. Cover crop management;

7. Information on maintaining and updating a nutrient management plan. General comments about plan maintenance shall include:

a. The length of time the plan is effective~~, not to exceed five years from the date the plan is developed~~ consistent with 4VAC5-15-150 D. 1.; and

b. Identification of circumstances or changes in the farm operation such as an increase in animal numbers that would require the plan to be updated prior to the time specified in this subdivision.

8. Expected crop yields for each field for the planned crop rotation;

9. The following information for all fields where the phosphorus applications are based on the phosphorus index:

a. Functioning riparian buffer widths and distances to surface waters in feet;

b. Presence of any contour planting at a maximum of 1% row grade, strip cropping, conservation tillage with greater than 30% residue, or terraces;

c. Percentage of required ground cover on pastures stated as <50% cover, 50-75% cover, or >75% cover; and

d. Crop tillage type for each crop stated as either no-till or tilled for all cropland; and

e. If expected soil erosion for the phosphorus index was developed using RUSLE2, a copy of the RUSLE2 Profile Erosion Calculation Record computerized print-out indicating: (i) crop(s) for each year in the crop rotation specified by calendar year to match those identified in the nutrient management plan, (ii) all mechanical field operations, and (iii) edge of field soil loss for each field.

~~9.~~ 10. Other notes as needed pertaining to nutrient application, tillage, and other special conditions.

G. The nutrient management planner ~~should~~ shall incorporate additional plan requirements ~~as appropriate~~ if required by other specific legislative, regulatory or incentive programs which apply to a specific operator.

4VAC5-15-150. Required nutrient management plan procedures.

A. Nutrient application.

1. A certified nutrient management planner shall include, in each plan, nutrient application practices for each field in the plan. The nutrient application rates shall be calculated for nitrogen (N), phosphate (P_2O_5), and potash (K_2O). Individual field recommendations shall be made after considering nutrients contained in fertilizers, manure, biosolids, industrial wastes, legumes in the crop rotation, crop residues, residual nutrients, and all other sources of nutrients. Individual fields may be grouped together if similar soil productivity levels, soil fertility levels, and environmentally sensitive site features exist.

2. Nutrient application rates.

a. Determination of crop nutrient needs shall be consistent with tables and procedures contained in Virginia Nutrient Management Standards and Criteria, Revised ~~November 1995~~, 2005 and the Commercial Vegetable Production Recommendations, ~~1995~~ 2004 (Virginia Cooperative Extension Publication 456-420), and shall be based on soil test results for P_2O_5 and K_2O.

b. Nitrogen applications rates in nutrient management plans shall not exceed crop nutrient needs in subdivision 2 a of this subsection ~~and phosphorus application rates should be managed to reduce adverse water quality impacts. Whenever possible, phosphorus applications from organic nutrient sources should not exceed crop needs based on a soil test over the duration of the crop rotation. If this is not possible, preference should be given to routing phosphorus in organic~~

~~nutrient sources to fields having the lowest phosphorus soil analysis, fields to be rotated into crops such as alfalfa hay, or fields with predominately A and B slopes as identified in a soil survey~~.

~~c. The development and implementation of a comprehensive soil conservation plan or practices that meet the criteria for a conservation system contained in the United States Department of Agriculture NRCS Field Office Technical Guide shall be recommended by a nutrient management planner on sites designated as highly erodible land (HEL) by the NRCS where a soil analysis indicates a very high phosphorus level (55 parts per million or above using Mehlich I extraction procedures or other methods correlated to Mehlich I) and phosphorus applications from organic sources will exceed crop uptake. If such sites are established pastures, the certified nutrient management planner shall recommend that pasture grasses or legumes be maintained at no less than a three-inch height in order to reduce runoff potential~~.

c. Phosphorus application rates shall be managed to minimize adverse water quality impacts consistent with procedures (1) through (4) of this subsection.

(1) Phosphorus applications from inorganic nutrient sources shall not exceed crop nutrient needs over the crop rotation based on a soil test.

(2) Phosphorus applications shall not be included in nutrient management plans for soils exceeding specified phosphorus saturation levels as listed in Virginia Nutrient Management Standards and Criteria, Revised 2005 regardless of the outcome of other procedures specified in this subsection. The specified phosphorus saturation levels pertain to the following plan development dates: (i) 65% for plans developed after 12/31/2005 through 12/31/2010; and (ii) 50% for plans developed after 12/31/2010.

(3) Whenever possible, phosphorus applications from organic nutrient sources should not exceed crop needs based on a soil test over the duration of the crop rotation. If this is not possible, maximum phosphorus application rates and phosphorus control practices contained in nutrient management plans shall be consistent with the phosphorus management provisions contained in Virginia Nutrient Management Standards and Criteria, Revised 2005.

(4) A single phosphorus application may be recommended to address multiple crops in the crop rotation identified within the timeframe covered by the nutrient management plan consistent with 4VAC5-15-150 D. 1 if the single application does not exceed the sum of the appropriate application rates for individual crops as determined by subdivisions (1) through (3) of this subsection.

d. Recommended application rates for ~~potassium,~~ secondary nutrients~~,~~ and micronutrients ~~should~~ shall be at agronomically or economically justifiable levels for expected crop production.

Potassium applications sufficient to meet crop nutrient needs shall be included in nutrient management plans for all fields consistent with recommendations contained in Virginia Nutrient Management Standards and Criteria, Revised 2005.

~~e. Expected crop yield shall be determined from past crop yields or soil productivity on a given field. The farmer's past experience with crop yields in specific fields may be used to make reasonable adjustments to expected crop yields in lieu of verifiable yield records provided the upward adjustments impact no more than 20% of the fields on a particular farm. The calculation of expected crop yield shall:~~

~~(1) Be an average of the three highest yielding years taken from the last five years the particular crop was grown in the specific field or~~

~~(2) Be based on and consistent with soil productivity information contained in Virginia Nutrient Management Standards and Criteria, Revised November 1995.~~

e. Expected crop yield shall be determined from any of the following methods on a given field:
(1) Soil productivity group expected crop yields based on and consistent with soil productivity information contained in Virginia Nutrient Management Standards and Criteria, Revised 2005;
(2) The farmer's past experience with crop yields in specific fields may be used to make reasonable adjustments to expected crop yields in e.(1) of this subsection in lieu of verifiable

yield records provided the upward adjustments impact no more than 20% of the fields on a particular farm and the expected crop yields do no exceed the soil productivity group rating of any soil series that directly adjoins the soils contained in the specific field as indicated in the soil survey; or

(3) Verifiable past crop yields are utilized to determined expected crop yield. The calculation of expected crop yield shall be an average of the three highest yielding years taken from the last five years the particular crop was grown in the specific field

f. Representative soil analysis results for fields shall be determined by using standard soil sampling and analysis methods according ~~to Agronomy Monograph #9, American Society of Agronomy~~ Methods of Soil Analysis, Part 3, Chemical Methods, 1996 utilizing the Mehlich I extraction procedure for phosphorus or other methods and laboratories approved by the department and correlated to Mehlich I and utilizing correlation procedures contained in Virginia Nutrient Management Standards and Criteria, Revised ~~November 1995~~ 2005. Soil analysis results shall be dated no more than three years prior to the beginning date of the nutrient management plan. A single composite soil sample should represent an area up to approximately 20 acres. Fields such as those common to strip cropping may be combined when soils, previous cropping history, and soil fertility are similar. Representative soil ~~samples~~ sample cores shall be obtained from the soil surface to a depth of ~~two to~~ four inches (0 – 4") for fields which ~~are not tilled~~ have not been tilled within the past three years, and from the soil surface to a depth of six

~~to eight~~ inches (0-6") for fields which are tilled or have been tilled within the past three years. Soil sampling of fields based on grids of subfield areas may be utilized.

g. For existing operations, the most recent organic nutrient source analysis results or an average of past nutrient analysis results ~~should~~ for the specific operation within the last three year period shall be used to determine the nutrient content of organic nutrient sources. Manure analyses shall include percent moisture, total nitrogen or total Kjeldahl nitrogen, ammonium nitrogen, total phosphorus, and total potassium determined using laboratory methods consistent with Recommended Methods of Manure Analysis, publication A3769, University of Wisconsin, 2003 or other methods approved by the department. For plans on new animal waste facilities, average ~~values~~ analyses published in Virginia Nutrient Management Standards and Criteria, Revised ~~November 1995~~ 2005, should be utilized unless proposed manure storage and treatment conditions warrant the use of alternative data. Plant available nutrient content shall be determined using the mineralization rates and availability coefficients found in Virginia Nutrient Management Standards and Criteria, Revised ~~November 1995~~ 2005, for different forms and sources of organic nutrients. Mineralization of organic nutrients from previous applications shall be accounted for in the plan.

h. The expected nitrogen contributions from legumes shall be credited when determining nutrient application rates at levels ~~which substantially conform to those~~ listed in Virginia Nutrient Management Standards and Criteria, Revised ~~November 1995~~ 2005.

3. Soil pH influences nutrient availability and crop nutrient utilization and should be adjusted to the level suited for the crop. Nutrient management plans shall contain lime recommendations to adjust soil pH to a level within the appropriate agronomic range for the existing crop or crop(s) to be grown. Recommendations shall address lime application if soil pH is below the optimal range. Nutrient management planners shall not recommend the application of lime, lime amended materials, or nutrient sources that are expected to raise the soil pH to a level that exceeds the appropriate agronomic range for the growing crop or crop(s) to be grown based on recommendations contained in Virginia Nutrient Management Standards and Criteria, Revised 2005.

4. Nutrient application timing.

~~a. Timing recommendations for nutrient applications shall be as close to plant nutrient uptake periods as reasonably possible. To reduce the potential for nutrient leaching or runoff, a certified nutrient management planner shall recommend planting an agronomically feasible crop within 30 days of the planned nutrient application if no actively growing crop is in place. For organic nutrient sources, planned applications may be recommended between December 21 and March 16, if necessary, if a crop will be planted during the normal spring planting season and sites have low surface runoff potential due to slope or crop residue or if management practices such as injection are recommended to reduce the potential for surface runoff of organic nutrient sources.~~

~~A certified nutrient management planner shall utilize procedures contained in Virginia Nutrient Management Standards and Criteria, Revised November 1995, to assist in determining the timing of nutrient applications.~~

a. Timing recommendations for nutrient sources containing nitrogen shall be as close to plant nutrient uptake periods as reasonably possible. A certified nutrient management planner shall utilize procedures contained in Virginia Nutrient Management Standards and Criteria, Revised 2005, to determine the timing of nutrient applications. To reduce the potential for nutrient leaching or runoff, a certified nutrient management planner shall recommend applications of nitrogen containing materials only to sites where an actively growing crop is in place at the time of application or where a timely planted crop will be established within 30 days of the planned nutrient application, except as specified in subsections b or c. If such nutrient applications are made to fall seeded crops such as small grain, the crop planted shall be capable of germination and significant growth before the onset of winter so the crop is able to take up the available applied nitrogen.

b. If necessary, organic nutrient source applications may be within 60 days of planting a spring seeded crop to sites that: (i) are not environmentally sensitive sites as identified in 4VAC5-15-10 or Virginia Nutrient Management Standards and Criteria, Revised 2005, and (ii) have at least 60 percent uniform ground cover from an existing actively growing crop such as a small grain trap

crop or fescue with exposed plant height of three inches or more. Such nutrient applications shall not exceed application rates of the spring seeded crop.

c. Composted organic nutrient sources having a final carbon to nitrogen ratio of 25:1 or greater are exempt from requirements a. and b. of this subsection if analyzed for carbon to nitrogen ratio at the conclusion of the composting process and results are obtained prior to land application. If composted organic nutrient sources are applied greater than 30 days prior to crop planting on sites with less than 60% crop residue cover, the plan shall require chisel plowing or ridge tilling within 48 hours of application of the composted organic nutrient source. If ridge tilling or chisel plowing is utilized, the equipment should be operated predominately along the contour so that uniform parallel ridges are created that will improve soil roughness and reduce runoff potential until any finishing tillage operations are performed close to the time of crop planting. The planner shall recommend soil nitrate testing to determine nitrogen application rates during the growing season following the application of composted organic nutrient sources.

~~b.~~ d. The nutrient management planner shall recommend split application of inorganic nitrogen fertilizers as starter or broadcast and sidedressing or top dressing in row crops and small grains consistent with procedures contained in Virginia Nutrient Management Standards and Criteria, Revised ~~November 1995~~ 2005, on environmentally sensitive sites as identified in 4VAC5-15-10. Split applications of inorganic nitrogen fertilizers and irrigation scheduling shall be recommended for crops to receive irrigation. The use of a pre-sidedress nitrogen test (PSNT) can

help to determine ~~additional~~ nitrogen needs during the growing period. In lieu of split applications, the planner may recommend the application of the total nitrogen requirement for spring planted row crops within one week prior to planting if at least 50 % of the plant available nitrogen requirement of the crop is supplied with slowly available nitrogen sources.

~~c.~~ e. Nutrient applications on frozen or snow covered ~~grounds should be avoided~~ ground shall not be recommended in nutrient management plans. If an emergency situation such as storage system freeze-up necessitates the application of organic nutrient sources, ~~select fields which have~~ the planner may advise the producer to apply no more than 40 pounds of plant available nitrogen per acre and deduct the applied nitrogen from other planned applications for the current or next crop if the field has: (i) slopes of less than ~~5.0% which are either planted in cover crops or have significant crop residue present~~ 6 %; (ii) 60 % uniform ground cover from an existing actively growing crop such as a small grain trap crop or fescue with exposed plant height of three inches or more; (iii) a minimum of a 200 foot vegetated or adequate crop residue buffer between the application area and all surface water courses and; (iv) soils characterized by USDA as “well drained.”

5. Application method for nutrients.

a. The application of nitrogen containing materials shall be managed to minimize runoff, leaching and volatilization losses.

b. Applications of liquid manures or sludges utilizing irrigation shall not be recommended to be applied at hydraulic rates above those contained in Virginia Nutrient Management Standards and Criteria, Revised ~~November 1995~~ 2005.

c. Plans shall not recommend liquid manure or sludge application rates utilizing nonirrigation liquid spreading equipment which exceed 14,000 gallons per acre (approximately one-half (0.5) inch) per application. The amount of liquid manure or sludge application in plans will not exceed the hydraulic loading capacity of the soil at the time of each application. If a subsequent pass across a field is necessary to achieve the desired application rate, the plan will allow for sufficient drying time.

d. Where possible, the planner should recommend that biosolids, industrial wastes, and manures be incorporated or injected in the crop root zone in order to reduce losses of nitrogen to the atmosphere and to increase the plant available nitrogen to phosphorus ratio of these nutrient sources relative to crop nutrient needs. Lime stabilized biosolids should not be injected due to the creation of a localized band of high soil pH unless subsequent practices are utilized, such as disking, in order to adequately mix the soil.

e. The planner shall recommend ~~buffer zones~~ setbacks around wells, springs, surface waters, sinkholes, and rock outcrops where manure, ~~or~~ biosolids, or industrial waste should not be

applied. Such ~~buffer zones~~ setbacks recommended shall be consistent with criteria contained in Virginia Nutrient Management Standards and Criteria, Revised ~~November 1995~~ 2005 unless alternative setbacks or buffers are specified in regulations or permits pertaining to the site. For sites impacted by other regulations or permits, the planner shall include the setbacks and buffers specified in regulations promulgated under § 32.1-164.5 for sewage sludge, § 62.1-44.17:1 for animal waste, § 62.1-44.17:1.1 for poultry waste, § 10.1-2100 et. seq. for sites in Chesapeake Bay Preservation areas, and permits for industrial waste land application. The land area within setback and buffer areas shall be deducted from field acreage to determine usable field acreage for nutrient application in nutrient management plans.

B. Manure production and utilization.

1. The planner shall estimate the annual manure quantity produced on each farm utilizing tables and forms contained in Virginia Nutrient Management Standards and Criteria, Revised ~~November 1995~~ 2005, or from actual farm records of manure pumped or hauled during a representative 12-month period.

2. The nutrient management plan shall state the total amount of manure produced and the amount that can be used on the farm, utilizing the information and methods provided in the Virginia Nutrient Management Standards and Criteria, Revised ~~November 1995~~ 2005. The plan shall

discuss any excess manure and shall provide recommendations concerning options for the proper use of such excess manure.

C. Plans shall identify and address the protection from nutrient pollution of environmentally sensitive sites.

D. Plan maintenance and revisions.

1. A site-specific nutrient management plan developed in accordance with all requirements of these regulations, including specified crops or crop rotations, shall provide information on soil fertility and seasonal application of required nutrients for one to five years of crop production. Plans developed for a period of time greater than three years and up to five years ~~should generally~~ shall be limited to sites in permanent pasture or continuous hay ~~rotations~~.

2. The plan shall ~~indicate~~ state a need for immediate modification if ~~cropping systems, rotations, fields,~~ (i) animal numbers are to increase above the level specified in the plan, (ii) animal ~~type~~ types including intended market weights ~~, or management~~ are to be changed, ~~added or removed~~ (iii) additional imported manure, biosolids, or industrial waste that was not identified in the existing plan is to be applied to fields under the control of the operator, or (iv) ~~. The planner shall state in the plan that such plan will be invalid if~~ available land area for the utilization of manure decreases below the level necessary to utilize manure in the plan~~, or if changes in animal~~

~~numbers or type affect land area necessary to utilize manure~~. The plan shall also state a need for modification if cropping systems, rotations, or fields are changed and phosphorus will be applied at levels greater than crop nutrient needs based on soil analysis as determined from procedures in Virginia Nutrient Management Standards and Criteria, Revised 2005.

3. Adjustments to manure production and application should be made if there are increases in animal numbers or changes in how animal waste is stored or applied, or when there are changes in nutrient content of manure resulting from changing feed ~~ration~~ rations, animal types, or new sampling and analysis for nutrient content and application rate calculations.

4. Soil analysis shall be recommended for each field at least once every three years to determine the soil fertility and pH, and to update the nutrient management plan.

5. Manure analysis shall be recommended before field application until a baseline nutrient content is established for the specific manure type on the corresponding farm operation. After a baseline nutrient content is established, a manure analysis shall be recommended at least once every three years for dry or semisolid manures, and at least once every year for liquid manures.

6. Modified top dressing or sidedressing application rates of nitrogen may be recommended if a pre-sidedress nitrogen test (PSNT) administered during the growing season indicates different levels of nitrogen than planning time calculations if the use of the PSNT and interpretation of the

test results are consistent with Virginia Nutrient Management Standards and Criteria, Revised 2005.

DOCUMENTS INCORPORATED BY REFERENCE

Virginia Nutrient Management Standards and Criteria, Department of Conservation and Recreation, Division of Soil and Water Conservation, Revised ~~November 1995~~ 2005.

Virginia Commercial Vegetable Production Recommendations for ~~1995~~ 2004, Virginia Cooperative Extension Service, Publication No. 456-420.

Electronic Field Office Technical Guide, ~~Soil Conservation Services~~ Natural Resources Conservation Service, United States Department of Agriculture.

~~Methods of Soil Analysis, Part 1, Physical and Mineralogical Methods, Second Edition, 1986, American Society of Agronomy.~~

~~Methods of Soil Analysis, Part 2, Chemical and Microbiological Properties, Second Edition, 1982, American Society of Agronomy.~~

Methods of Soil Analysis, Part 3, Chemical Methods, 1996, Soil Science Society of America / American Society of Agronomy.

Recommended Methods of Manure Analysis, publication A3769, University of Wisconsin, 2003

Virginia Phosphorus Index Version 1.3 Technical Guide, Revised March 2005, Virginia Tech.

Commonwealth of Virginia

Virginia Nutrient Management Standards and Criteria Revised 2005

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Table of Contents

Instructions for the Use of the Virginia Nutrient Management Standards and Criteria, Revised 2005

❑ When developing nutrient recommendations, first determine the soil map units (soil series) within field boundaries from the soil survey maps of the subject farm. Using this information, the soil productivity group is determined from Table 1-1 for each crop to be grown.

❑ Using the Virginia Agronomic Land Use Evaluation System (VALUES), Table 1-2, the expected yield of a crop for any one field may be determined in one of two ways. If any single soil productivity group comprises 67% or more of a field, this is considered a predominant soil group, and it may be used to establish the expected yield for the entire field. The other method is to use a weighted average of all soil productivity groups to determine the expected yield and nutrient recommendations. If several map units make up a field representing multiple productivity groups, none of which account for 67% or more of the field, then the weighted average method to determine the expected crop yield shall be used.

❑ When using the weighted average method, determine expected crop yield for each soil map unit from Table 1-2, and determine the weighted average yield for the field by summing the fractional yields for each soil map unit. After the weighted average expected yield is calculated and any yield reductions are considered, the soil productivity group of the field is determined by finding the expected crop yield in Table 1-2 which is closest to the weighted average yield.

❑ To establish an expected yield for a soil series complex use a weighted average formula with percentages of 60%-40% for complexes with two named soils and 50%-30%-20% for complexes with three named soils. For example for a Frederick-Christian-with included soils, calculate the expected yield as the sum of 60% of the expected yield based on VALUES for the Frederick and 40% of the expected yield based on VALUES for the Christian.

❑ Once the expected yield for a crop is determined, a yield reduction will need to be applied if certain conditions exist within the soil profile such as eroded topsoil, slope, coarse fragments and rock outcrops. These conditions are explained with the associated yield reductions in Table 1-3.

❑ If producer records are utilized to establish expected crop yields, average the three highest yields achieved over the last five crop years the particular crop was grown in the field, (i.e. exclude the two lowest crop yields before calculating the average). The corresponding soil productivity group for the field is found by finding the expected crop yield in Table 1-2 that is closest to the above determined yield.

❑ A field shall be considered an environmentally sensitive site, where any part of the field drains into a sinkhole or if at least 33% of the area of the field contains one or a combination of the following features:

1. Soils with high potential for leaching based on soil texture or excessive drainage (Table 1-4);
2. Shallow soils less that 41 inches deep likely to be located over fractures or limestone bedrock (Table 1-4);
3. Subsurface tile drains;

4. Soil with high potential for subsurface lateral flow based on soil texture and poor drainage able 1-4);
5. Floodplains as identified by soils prone to frequent flooding in county soil surveys;
6. Lands with slopes greater than 15%.

Fields containing envrionmentally sensitive sites may be subdivided into separate fields, if the areas can be managed individually and the operator agrees to manage each area as written in the plan.

❑ The results of soil testing labs approved by the Department must be correlated to Virginia Tech Mehlich I using Table 2-1, and the conversion procedures in Sections II.A., II.B., and II.C. Only the Virginia Tech soil test scale and the conversion of other approved labs to the Virginia Tech soil test scale can be used to develop phosphorus and potassium recommendations when developing Virginia nutrient management plans.

❑ Nitrogen fertilizer recommendations are developed by identifying the soil productivity group for the crop to be grown in Table 1-1, and selecting a recommended application rate from the various crops listed in Section V. Phosphorus and potassium recommendations are determined based on the soil test results for the field by the accompanying table listed with each crop in Section V.

❑ Use the Virginia Tech soil test rating (such as M+) to determine Phosphorus and Potassium recommendations from Section V. If the soil test level is L, M, or H use the midpoint of the recommended nutrient application range. If the soil test level is L-, M-, or H- use the highest value of the recommended nutrient application range. If the soil test level is L+, M+, or H+ use the lowest value of the recommended nutrient application range.

❑ When using soil productivity groupings to determine expected yields, if a soil is listed in Table 1-1 as not suited (NS) for a particular crop, the farmer should be advised that the particular crop is not recommended to be grown on the soil. If the crop will still be grown in that soil type, use the lowest productivity group rating for that crop to determine the expected yield (i.e, if alfalfa will be grown on a soil listed as NS, then the planner would use productivity group III to determine nutrient application rates.

Section I. Agronomic and Environmental Management of Soils and Other Site Features

Table 1-1
Soil Productivity Groupings for Various Cropping Categories

Soil Series	Soil Mgt Group	Corn	Grain Sorghum	Small Grain	Soybeans	Alfalfa	Tall Grass, Clover, Hay, Pasture
Abell	G	IIa	IIa	I	II	II	I
Abell variant	G	IIa	IIa	I	II	II	I
Ackwater	K	IIb	IIb	I	II	III	I
Acredale (drained)	C	Ib	Ib	II	Ib	NS*	I
Acredale (undrained)	OO	V	V	V	V	NS*	NS*
Aden (drained)	C	Ib	Ib	II	Ib	NS*	I
Aden (undrained)	OO	V	V	V	V	NS*	NS*
Airmont	BB	IVb	IVb	III	IV	NS*	III
Alaga	II	V	V	III	V	NS*	NS*
Alamance	FF	IVb	IVb	III	IV	NS*	III
Alanthus	D	Ib	Ib	I	Ib	I	I
Albano	KK	V	V	V	V	NS*	IV
Albemarle	JJ	V	V	IV	V	NS*	IV
Alderflats	NN	V	V	V	V	NS*	NS*
Aldino	W	IVa	IVa	IV	III	NS*	IV
Aldio	Y	IVa	IVa	III	III	NS*	III
Allegheny	L	IIb	IIb	I	II	III	II
Alluvial Land, wet	MM	V	V	V	V	NS*	IV
Alonemill	A	Ia	Ia	I	Ia	I	I
Alonemill, Fluvaquentic	I	IIa	IIa	I	II	NS*	I
Alonzville	L	IIb	IIb	I	II	III	II
Altavista	B	Ia	Ia	I	Ia	II	I
Altavista, variant	B	Ia	Ia	I	Ia	II	I
Alticrest	E	IIa	IIa	I	II	NS*	II
Angie	AA	IVa	IVa	II	III	NS*	IV
Angie variant	AA	IVa	IVa	II	III	NS*	IV
Appling	V	IVa	IVa	II	III	III	III
Appling gritty	V	IVa	IVa	II	III	III	III
Appomattox	O	IIb	IIb	I	II	II	II
Arapahoe	EE	IVb	IVb	III	IV	NS*	NS*
Arcola	U	IIIb	IIIb	II	II	III	II
Ardilla	W	IVa	IVa	IV	III	NS*	IV
Argent	PP	V	V	V	V	NS*	NS*
Arkaqua	I	IIa	IIa	I	II	NS*	I
Ashburn	BB	IVb	IVb	III	IV	NS*	III
Ashe	JJ	V	V	IV	V	NS*	IV
Ashlar	FF	IVb	IVb	III	IV	NS*	III
Assateague	QQ	V	V	V	V	NS*	NS*

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Athol	M	IIb	IIb	I	II	I	II
Atkins	NN	V	V	V	V	NS*	NS*
Atlee	Q	IIIa	IIIa	II	II	NS*	III
Augusta (drained)	P	IIb	IIb	II	II	NS*	III
Augusta (undrained)	Z	IVa	IVa	IV	III	NS*	NS*
Augusta variant(drained)	P	IIb	IIb	II	II	NS*	III
Augusta variant(undrained)	Z	IVa	IVa	IV	III	NS*	NS*
Aura	T	IIIb	IIIb	II	II	NS*	III
Austinville	O	IIb	IIb	I	II	II	II
Axis	PP	V	V	V	V	NS*	NS*
Aycock	R	IIIa	IIIa	II	II	III	II
Ayersville	FF	IVb	IVb	III	IV	NS*	III
Backbay	PP	V	V	V	V	NS*	NS*
Badin	X	IVa	IVa	II	III	III	II
Baile	HH	IVb	IVb	III	IV	NS*	IV
Bailegap	GG	IVb	IVb	IV	IV	NS*	III
Balsam	GG	IVb	IVb	IV	IV	NS*	III
Bama	R	IIIa	IIIa	II	II	III	II
Banister	K	IIb	IIb	I	II	III	I
Barclay	E	IIa	IIa	I	II	NS*	II
Bateau	I	IIa	IIa	I	II	NS*	I
Bayboro (drained)	C	Ib	Ib	II	Ib	NS*	I
Bayboro (undrained)	OO	V	V	V	V	NS*	NS*
Beckham	O	IIb	IIb	I	II	II	II
Bedington	FF	IVb	IVb	III	IV	NS*	III
Beech	L	IIb	IIb	I	II	III	II
Beech Grove	JJ	V	V	IV	V	NS*	IV
Belhaven	PP	V	V	V	V	NS*	NS*
Belspur	H	IIa	IIa	III	II	NS*	IV
Beltsville	BB	IVb	IVb	III	IV	NS*	III
Belvoir	BB	IVb	IVb	III	IV	NS*	III
Benthole	CC	IVb	IVb	II	IV	NS*	III
Bentley	R	IIIa	IIIa	II	II	III	II
Berks	JJ	V	V	IV	V	NS*	IV
Berks variant	JJ	V	V	IV	V	NS*	IV
Bermudian	A	Ia	Ia	I	Ia	I	I
Bertie	J	IIb	IIb	I	II	NS*	I
Bertie, variant	J	IIb	IIb	I	II	NS*	I
Bethera (drained)	C	Ib	Ib	II	Ib	NS*	I

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Bethera (undrained)	OO	V	V	V	V	NS*	NS*
Bethesda	JJ	V	V	IV	V	NS*	IV
Bethlehem	V	IVa	IVa	II	III	III	III
Bibb	EE	IVb	IVb	III	IV	NS*	NS*
Biltmore	II	V	V	III	V	NS*	NS*
Birdsboro	L	IIb	IIb	I	II	III	II
Blackthorn	GG	IVb	IVb	IV	IV	NS*	III
Bladen (drained)	C	Ib	Ib	II	Ib	NS*	I
Bladen (undrained)	OO	V	V	V	V	NS*	NS
Blago	HH	IVb	IVb	III	IV	NS*	IV
Blairton	FF	IVb	IVb	III	IV	NS*	III
Bland	Y	IVa	IVa	III	III	NS*	III
Bleakhill	J	IIb	IIb	I	II	NS*	I
Blocktown	JJ	V	V	IV	V	NS*	IV
Bloodyhorse	JJ	V	V	IV	V	NS*	IV
Bluemont	JJ	V	V	IV	V	NS*	IV
Bohicket	PP	V	V	V	V	NS*	NS*
Bojac (ES VA Beach, Ches.)	T	IIIb	IIIb	II	II	NS*	III
Bojac (Mainland, excluding VA Beach & Ches.)	DD	IVb	IVb	II	IV	NS*	III
Bolling	J	IIb	IIb	I	II	NS*	I
Bolling variant	J	IIb	IIb	I	II	NS*	I
Bolton	M	IIb	IIb	I	II	I	II
Bonneau	DD	IVb	IVb	II	IV	NS*	III
Bookwood	U	IIIb	IIIb	II	II	III	II
Botetourt	G	IIa	IIa	I	II	II	I
Bourne	BB	IVb	IVb	III	IV	NS*	III
Bourne variant	BB	IVb	IVb	III	IV	NS*	III
Bowmansville	I	IIa	IIa	I	II	NS*	I
Braddock	O	IIb	IIb	I	II	II	II
Brandywine	FF	IVb	IVb	III	IV	NS*	III
Brecknock	U	IIIb	IIIb	II	II	III	II
Bremo	JJ	V	V	IV	V	NS*	IV
Brentsville	FF	IVb	IVb	III	IV	NS*	III
Brevard	B	Ia	Ia	I	Ia	II	I
Brickhaven	Y	IVa	IVa	III	III	NS*	III
Brinkerton	LL	V	V	V	V	NS*	IV
Brinklow	FF	IVb	IVb	III	IV	NS*	III
Broadway	A	Ia	Ia	I	Ia	I	I
Brockroad	V	IVa	IVa	II	III	III	III
Brownsville	JJ	V	V	IV	V	NS*	IV
Brownwood	JJ	V	V	IV	V	NS*	IV

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Brumbaugh	L	IIb	IIb	I	II	III	II
Brushy	JJ	V	V	IV	V	NS*	IV
Buchanan	BB	IVb	IVb	III	IV	NS*	III
Buckanan cobbly	JJ	V	V	IV	V	NS*	IV
Buckhall	V	IVa	IVa	II	III	III	III
Buckingham	JJ	V	V	IV	V	NS*	IV
Bucks	U	IIIb	IIIb	II	II	III	II
Buckton	A	Ia	Ia	I	Ia	I	I
Buffstat	V	IVa	IVa	II	III	III	III
Bugley	JJ	V	V	IV	V	NS*	IV
Buncombe	II	V	V	III	V	NS*	NS*
Burketown	BB	IVb	IVb	III	IV	NS*	III
Burrowsville	BB	IVb	IVb	III	IV	NS*	III
Burton	FF	IVb	IVb	III	IV	NS*	III
Buzzrock	JJ	V	V	IV	V	NS*	IV
Cahaba	R	IIIa	IIIa	II	II	III	II
Calverton	BB	IVb	IVb	III	IV	NS*	III
Calvin	JJ	V	V	IV	V	NS*	IV
Calvin cobbly	JJ	V	V	IV	V	NS*	IV
Camocca	PP	V	V	V	V	NS*	NS*
Caneyville	Y	IVa	IVa	III	III	NS*	III
Cape Fear (drained)	C	Ib	Ib	II	Ib	NS*	I
Cape Fear (undrained)	OO	V	V	V	V	NS*	NS*
Captina	BB	IVb	IVb	III	IV	NS*	III
Carbo	Y	IVa	IVa	III	III	NS*	III
Carbonton	Y	IVa	IVa	III	III	NS*	III
Cardiff	FF	IVb	IVb	III	IV	NS*	III
Cardova	JJ	V	V	IV	V	NS*	IV
Caroline	AA	IVa	IVa	II	III	NS*	IV
Cartecay	I	IIa	IIa	I	II	NS*	I
Carteret	PP	V	V	V	V	NS*	NS*
Cataska	JJ	V	V	IV	V	NS*	IV
Catharpin	X	IVa	IVa	II	III	III	II
Catlett	JJ	V	V	IV	V	NS*	IV
Catlett variant	JJ	V	V	IV	V	NS*	IV
Catoctin	JJ	V	V	IV	V	NS*	IV
Catoctin variant	JJ	V	V	IV	V	NS*	IV
Catpoint	II	V	V	III	V	NS*	NS*
Caverns	I	IIa	IIa	I	II	NS*	I
Cecil	X	IVa	IVa	II	III	III	II
Cedarcreek	GG	IVb	IVb	IV	IV	NS*	III
Chagrin	A	Ia	Ia	I	Ia	I	I
Chagrin variant	A	Ia	Ia	I	Ia	I	I
Chandler	FF	IVb	IVb	III	IV	NS*	III

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Chapanoke (drained)	C	Ib	Ib	II	Ib	NS*	I
Chapanoke (undrained)	OO	V	V	V	V	NS*	NS*
Charity	N	IIb	IIb	I	II	II	II
Chastain	LL	V	V	V	V	NS*	IV
Chatuge (drained)	C	Ib	Ib	II	Ib	NS*	I
Chatuge (undrained)	OO	V	V	V	V	NS*	NS*
Chavies	U	IIIb	IIIb	II	II	III	II
Chavies variant	U	IIIb	IIIb	II	II	III	II
Chenneby	I	IIa	IIa	I	II	NS*	I
Chesapeake	B	Ia	Ia	I	Ia	II	I
Chester	D	Ib	Ib	I	Ib	I	I
Chester Loam	D	Ib	Ib	I	Ib	I	I
Chesterfield	V	IVa	IVa	II	III	III	III
Chestnut	GG	IVb	IVb	IV	IV	NS*	III
Chewacla	I	IIa	IIa	I	II	NS*	I
Chickahominy	LL	V	V	V	V	NS*	IV
Chilhowie	JJ	V	V	IV	V	NS*	IV
Chincoteague	PP	V	V	V	V	NS*	NS*
Chipley	EE	IVb	IVb	III	IV	NS*	NS*
Chiswell	JJ	V	V	IV	V	NS*	IV
Christian	AA	IVa	IVa	II	III	NS*	IV
Christiana	AA	IVa	IVa	II	III	NS*	IV
Cid	KK	V	V	V	V	NS*	IV
Clairborne	M	IIb	IIb	I	II	I	II
Clairborne	U	IIIb	IIIb	II	II	III	II
Clapham	BB	IVb	IVb	III	IV	NS*	III
Clarksburg	W	IVa	IVa	IV	III	NS*	IV
Clarksville	GG	IVb	IVb	IV	IV	NS*	III
Clearbrook	JJ	V	V	IV	V	NS*	IV
Cliffield	JJ	V	V	IV	V	NS*	IV
Clifford	X	IVa	IVa	II	III	III	II
Clifton	L	IIb	IIb	I	II	III	II
Clover	V	IVa	IVa	II	III	III	III
Cloverlick	JJ	V	V	IV	V	NS*	IV
Clubcaf	LL	V	V	V	V	NS*	IV
Clymer	U	IIIb	IIIb	II	II	III	II
Codorus	A	Ia	Ia	I	Ia	I	I
Codorus	A	Ia	Ia	I	Ia	I	I
Codorus stony	A	Ia	Ia	I	Ia	I	I
Codorus variant	A	Ia	Ia	I	Ia	I	I
Colescreek	L	IIb	IIb	I	II	III	II
Colfax	BB	IVb	IVb	III	IV	NS*	III
Colfax variant	BB	IVb	IVb	III	IV	NS*	III
Colleen	KK	V	V	V	V	NS*	IV

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Colvard	II	V	V	III	V	NS*	NS*
Colvard fine	II	V	V	III	V	NS*	NS*
Colvard stony	II	V	V	III	V	NS*	NS*
Combs	A	Ia	Ia	I	Ia	I	I
Comus	A	Ia	Ia	I	Ia	I	I
Comus	A	Ia	Ia	I	Ia	I	I
Conetoe	DD	IVb	IVb	II	IV	NS*	III
Congaree	A	Ia	Ia	I	Ia	I	I
Coosaw	DD	IVb	IVb	II	IV	IV-V	III
Corolla	EE	IVb	IVb	III	IV	NS*	NS*
Corydon	JJ	V	V	IV	V	NS*	IV
Cotaco	G	IIa	IIa	I	II	II	I
Cotaco cobbly	G	IIa	IIa	I	II	II	I
Cotaco variant	G	IIa	IIa	I	II	II	I
Cottonbend	L	IIb	IIb	I	II	III	II
Coursey	G	IIa	IIa	I	II	II	I
Cowee	N	IIb	IIb	I	II	II	II
Coxville	LL	V	V	V	V	NS*	IV
Craggey	JJ	V	V	IV	V	NS*	IV
Craigsville	CC	IVb	IVb	II	IV	NS*	III
Craven	HH	IVb	IVb	III	IV	NS*	IV
Creedmoor	KK	V	V	V	V	NS*	IV
Creedmoor variant	KK	V	V	V	V	NS*	IV
Croton	LL	V	V	V	V	NS*	IV
Cullasaja	FF	IVb	IVb	III	IV	NS*	III
Cullen	N	IIb	IIb	I	II	II	II
Culleoka	U	IIIb	IIIb	II	II	III	II
Culpeper	X	IVa	IVa	II	III	III	II
Culpeper variant	X	IVa	IVa	II	III	III	II
Daleville (drained)	C	Ib	Ib	II	Ib	NS*	I
Daleville (undrained)	OO	V	V	V	V	NS*	NS*
Dan River	G	IIa	IIa	I	II	II	I
Dandridge	JJ	V	V	IV	V	NS*	IV
Danripple	L	IIb	IIb	I	II	III	II
Davidson	N	IIb	IIb	I	II	II	II
Dawhoo	PP	V	V	V	V	NS*	NS*
Dawhoo	PP	V	V	V	V	NS*	NS*
Dawhoo variant	PP	V	V	V	V	NS*	NS*
Decatur	M	IIb	IIb	I	II	I	II
Dekalb	FF	IVb	IVb	III	IV	NS*	III
Dekalb variant	FF	IVb	IVb	III	IV	NS*	III
Delanco	B	Ia	Ia	I	Ia	II	I
Delila	HH	IVb	IVb	III	IV	NS*	IV
Dellwood	CC	IVb	IVb	II	IV	NS*	III

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Deloss (drained)	C	Ib	Ib	II	Ib	NS*	I
Deloss (undrained)	OO	V	V	V	V	NS*	NS*
Derroc	CC	IVb	IVb	II	IV	NS*	III
Devotion	FF	IVb	IVb	III	IV	NS*	III
Diana Mills	V	IVa	IVa	II	III	III	III
Dillard	G	IIa	IIa	I	II	II	I
Dogue	K	IIb	IIb	I	II	III	I
Dogue variant	K	IIb	IIb	I	II	III	I
Dorovan	PP	V	V	V	V	NS*	NS*
Dothan	Q	IIIa	IIIa	II	II	NS*	III
Downer	DD	IIb	IIb	II	IV	NS*	III
Dragston	E	IIa	IIa	I	II	NS*	II
Drall	FF	IVb	IVb	III	IV	NS*	III
Drapermill	U	IIIb	IIIb	II	II	III	II
Drapermill	U	IIIb	IIIb	II	II	III	II
Drypond	JJ	V	V	IV	V	NS*	IV
Duckston	QQ	V	V	V	V	NS*	NS*
Duffield	G	IIa	IIa	I	II	II	I
Dulles	Y	IVa	IVa	III	III	NS*	III
Dumfries	T	IIIb	IIIb	II	II	NS*	III
Dunbar (drained)	P	IIb	IIb	II	II	NS*	III
Dunbar (undrained)	Z	IVa	IVa	IV	III	NS*	NS*
Dunning (drained)	H	IIa	IIa	III	II	NS*	IV
Dunning (undrained)	NN	V	V	V	V	NS*	NS*
Duplin	K	IIb	IIb	I	II	III	I
Durham	CC	IVb	IVb	II	IV	NS*	III
Dyke	O	IIb	IIb	I	II	II	II
Easthamlet	KK	V	V	V	V	NS*	IV
Ebbing	G	IIa	IIa	I	II	II	I
Edgehill	CC	IVb	IVb	II	IV	NS*	III
Edgehill variant	CC	IVb	IVb	II	IV	NS*	III
Edgemont	U	IIIb	IIIb	II	II	III	II
Edneytown	L	IIb	IIb	I	II	III	II
Edneyville	T	IIIb	IIIb	II	II	NS*	III
Edom	M	IIb	IIb	I	II	I	II
Elbert	LL	V	V	V	V	NS*	IV
Elbert variant	LL	V	V	V	V	NS*	IV
Elioak	X	IVa	IVa	II	III	III	II
Elk	A	Ia	Ia	I	Ia	I	I
Elkton (drained)	C	Ib	Ib	II	Ib	NS*	I
Elkton (undrained)	OO	V	V	V	V	NS*	NS*

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Elliber	M	IIb	IIb	I	II	I	II
Elsinboro	L	IIb	IIb	I	II	III	II
Emory	G	IIa	IIa	I	II	II	I
Emporia	R	IIIa	IIIa	II	II	III	II
Endcav	Y	IVa	IVa	III	III	NS*	III
Enon	Y	IVa	IVa	III	III	NS*	III
Enott	Y	IVa	IVa	III	III	NS*	III
Ernest	W	IVa	IVa	IV	III	NS*	IV
Escatawba	L	IIb	IIb	I	II	III	II
Eubanks	N	IIb	IIb	I	II	II	II
Eulonia	K	IIb	IIb	I	II	III	I
Eunola	T	IIIb	IIIb	II	II	NS*	III
Evansham	LL	V	V	V	V	NS*	IV
Evard	L	IIb	IIb	I	II	III	II
Evesboro	II	V	V	III	V	NS*	NS*
Exum	J	IIb	IIb	I	II	NS*	I
Faceville	R	IIIa	IIIa	II	II	III	II
Fairfax	D	Ib	Ib	I	Ib	I	I
Fairpoint	JJ	V	V	IV	V	NS*	IV
Fairview	X	IVa	IVa	II	III	III	II
Fairystone	X	IVa	IVa	II	III	III	II
Fallsington	E	IIa	IIa	I	II	NS*	II
Fauquier	N	IIb	IIb	I	II	II	II
Fauquier, deep phase	N	IIb	IIb	I	II	II	II
Faywood	U	IIIb	IIIb	II	II	III	II
Featherstone	PP	V	V	V	V	NS*	NS*
Fedscreek	GG	IVb	IVb	IV	IV	NS*	III
Feedstone	G	IIa	IIa	I	II	II	I
Fisherman	QQ	V	V	V	V	NS*	NS*
Fiveblock	JJ	V	V	IV	V	NS*	IV
Flatwoods	M	IIb	IIb	I	II	I	II
Fletcher	U	IIIb	IIIb	II	II	III	II
Flume	R	IIIa	IIIa	II	II	III	II
Fluvanna	Y	IVa	IVa	III	III	NS*	III
Forestdale	LL	V	V	V	V	NS*	IV
Fork (drained)	P	IIb	IIb	II	II	NS*	III
Fork (undrained)	Z	IVa	IVa	IV	III	NS*	NS*
Fork variant (drained)	P	IIb	IIb	II	II	NS*	III
Fork variant (undrained)	Z	IVa	IVa	IV	III	NS*	NS*
Frankstown	U	IIIb	IIIb	II	II	III	II
Frederick	M	IIb	IIb	I	II	I	II
Frederick/Lodi	M	IIb	IIb	I	II	I	II
Freemanville	Q	IIIa	IIIa	II	II	NS*	III
French	A	Ia	Ia	I	Ia	I	I

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Fripp	QQ	V	V	V	V	NS*	NS*
Funkstown	A	Ia	Ia	I	Ia	I	I
Gaila	FF	IVb	IVb	III	IV	NS*	III
Gainesboro	FF	IVb	IVb	III	IV	NS*	III
Galestown	II	V	V	III	V	NS*	NS*
Galtsmill	II	V	V	III	V	NS*	NS*
Georgeville	X	IVa	IVa	II	III	III	II
Germanna	L	IIb	IIb	I	II	III	II
Gertie	OO	V	V	V	V	NS*	NS*
Gilpin	U	IIIb	IIIb	II	II	III	II
Gilpin variant	U	IIIb	IIIb	II	II	III	II
Gladehill	A	Ia	Ia	I	Ia	I	I
Glenelg(BRH)	N	IIb	IIb	I	II	II	II
Glenelg(NV)	U	IIIb	IIIb	II	II	III	II
Glenville	W	IVa	IVa	IV	III	NS*	IV
Glynwood	GG	IVb	IVb	IV	IV	NS*	III
Glynwood Variant	GG	IVb	IVb	IV	IV	NS*	III
Goblintown	V	IVa	IVa	II	III	III	III
Goldsboro	J	IIb	IIb	I	II	NS*	I
Goldston	JJ	V	V	IV	V	NS*	IV
Goldvein	BB	IVb	IVb	III	IV	NS*	III
Goldvein gritty	BB	IVb	IVb	III	IV	NS*	III
Goresville	N	IIb	IIb	I	II	II	II
Granville	R	IIIa	IIIa	II	II	III	II
Grassland	L	IIb	IIb	I	II	III	II
Greendale	A	Ia	Ia	I	Ia	I	I
Greenlee	CC	IVb	IVb	II	IV	NS*	III
Grigsby	A	Ia	Ia	I	Ia	I	I
Grimsley	GG	IVb	IVb	IV	IV	NS*	III
Gritney	T	IIIb	IIIb	II	II	NS*	III
Groseclose	M	IIb	IIb	I	II	I	II
Grover	X	IVa	IVa	II	III	III	II
Guernsey	M	IIb	IIb	I	II	I	II
Gullion	B	Ia	Ia	I	Ia	II	I
Gundy	V	IVa	IVa	II	III	III	III
Gunstock	V	IVa	IVa	II	III	III	III
Guyen	Z	IVa	IVa	IV	III	NS*	NS*
Gwinnett variant	X	IVa	IVa	II	III	III	II
Hagerstown	M	IIb	IIb	I	II	I	II
Halewood	U	IIIb	IIIb	II	II	III	II
Halifax	KK	V	V	V	V	NS*	IV
Hanceville	V	IVa	IVa	II	III	III	III
Happyland	U	IIIb	IIIb	II	II	III	II
Hartleton	FF	IVb	IVb	III	IV	NS*	III
Hartsells	CC	IVb	IVb	II	IV	NS*	III

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Hatboro	HH	IVb	IVb	III	IV	NS*	IV
Hawksbill	CC	IVb	IVb	II	IV	NS*	III
Hawksbill cobbly	CC	IVb	IVb	II	IV	NS*	III
Hayesville	X	IVa	IVa	II	III	III	II
Haymarket	KK	V	V	V	V	NS*	IV
Hayter	L	IIb	IIb	I	II	III	II
Haywood	JJ	V	V	IV	V	NS*	IV
Hazel	JJ	V	V	IV	V	NS*	IV
Hazel	JJ	V	V	IV	V	NS*	NS*
Hazel channery	JJ	V	V	IV	V	NS*	IV
Hazel Run	U	IIIb	IIIb	II	II	III	II
Hazleton	JJ	V	V	IV	V	NS*	IV
Helena	KK	V	V	V	V	NS*	IV
Helena taxadjunct	KK	V	V	V	V	NS*	IV
Herndon	V	IVa	IVa	II	III	III	III
Hibler	L	IIb	IIb	I	II	III	II
Hickoryknob	N	IIb	IIb	I	II	II	II
Highsplint	CC	IVb	IVb	II	IV	NS*	III
Hiwassee	O	IIb	IIb	I	II	II	II
Hiwassee variant	O	IIb	IIb	I	II	II	II
Hoadley	BB	IVb	IVb	III	IV	NS*	III
Hobucken	PP	V	V	V	V	NS*	NS*
Holly	NN	V	V	V	V	NS*	NS*
Hollywood	LL	V	V	V	V	NS*	IV
Hublersburg	M	IIb	IIb	I	II	I	II
Huntington	A	Ia	Ia	I	Ia	I	I
Hyde (drained)	C	Ib	Ib	II	Ib	NS*	I
Hyde (undrained)	OO	V	V	V	V	NS*	NS*
Ingledove	A	Ia	Ia	I	Ia	I	I
Iotla	A	Ia	Ia	I	Ia	I	I
Iredell	KK	V	V	V	V	NS*	IV
Iredell variant	KK	V	V	V	V	NS*	IV
Irongate	DD	IVb	IVb	II	IV	NS*	III
Itman	JJ	V	V	IV	V	NS*	IV
Iuka	F	IIa	IIa	I	II	III	II
Izagora	J	IIb	IIb	I	II	NS*	I
Jackland	KK	V	V	V	V	NS*	IV
Jedburg	Z	IVa	IVa	IV	III	NS*	NS*
Jefferson	U	IIIb	IIIb	II	II	III	II
Jefferson variant	U	IIIb	IIIb	II	II	III	II
Johns (drained)	C	Ib	Ib	II	Ib	NS*	I
Johns (undrained)	OO	V	V	V	V	NS*	NS*

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Johns variant (drained)	C	Ib	Ib	II	Ib	NS*	I
Johns variant (undrained)	OO	V	V	V	V	NS*	NS*
Johnston	PP	V	V	V	V	NS*	NS*
Junaluska	U	IIIb	IIIb	II	II	III	II
Kalmia	S	IIIa	IIIa	II	II	NS*	III
Kaymine	JJ	V	V	IV	V	NS*	IV
Keener	O	IIb	IIb	I	II	II	II
Kelly	KK	V	V	V	V	NS*	IV
Kempsville	S	IIIa	IIIa	II	II	NS*	III
Kenansville	DD	IVb	IVb	II	IV	NS*	III
Kenansville variant	DD	IVb	IVb	II	IV	NS*	III
Keyport	K	IIb	IIb	I	II	III	I
Kinkora (drained)	C	Ib	Ib	II	Ib	NS*	I
Kinkora (undrained)	OO	V	V	V	V	NS*	NS*
Kinston (drained)	C	Ib	Ib	II	Ib	NS*	I
Kinston (undrained)	OO	V	V	V	V	NS*	NS*
Klej	EE	IVb	IVb	III	IV	NS*	NS*
Klinesville	JJ	V	V	IV	V	NS*	IV
Konnarock	JJ	V	V	IV	V	NS*	IV
Lackstown	K	IIb	IIb	I	II	III	I
Laidig	W	IVa	IVa	IV	III	NS*	IV
Laidig cobbly	W	IVa	IVa	IV	III	NS*	IV
Lakehurst	EE	IVb	IVb	III	IV	NS*	NS*
Lakeland	II	V	V	III	V	NS*	NS
Lakin	II	V	V	III	V	NS*	NS
Landisburg	W	IVa	IVa	IV	III	NS*	IV
Lanexa	PP	V	V	V	V	NS*	NS*
Lansdale	FF	IVb	IVb	III	IV	NS*	III
Laroque	FF	IVb	IVb	III	IV	NS*	III
Lawnes	PP	V	V	V	V	NS*	NS*
Leadvale	BB	IVb	IVb	III	IV	NS*	III
Leaf (drained)	C	Ib	Ib	II	Ib	NS*	I
Leaf (undrained)	OO	V	V	V	V	NS*	NS*
Leaksville	KK	V	V	V	V	NS*	IV
Leatherwood	OO	V	V	V	V	NS*	NS*
Leck Kill	U	IIIb	IIIb	II	II	III	II
Leedsville	L	IIb	IIb	I	II	III	II
Leetonia	II	V	V	III	V	NS*	NS*
Legore	V	IVa	IVa	II	III	III	III
Lehew	JJ	V	V	IV	V	NS*	IV

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	Soil Mgt Group	Corn	Grain Sorghum	Small Grain	Soybeans	Alfalfa	Tall Grass, Clover, Hay, Pasture
Lenoir	LL	V	V	V	V	NS*	IV
Leon	II	V	V	III	V	NS*	NS*
Levy	PP	V	V	V	V	NS*	NS*
Lew	FF	IVb	IVb	III	IV	NS*	III
Lewisberry	II	V	V	III	V	NS*	NS*
Lewisburg	CC	IVb	IVb	II	IV	NS*	III
Library	KK	V	V	V	V	NS*	IV
Lickdale (drained)	H	IIa	IIa	III	II	NS*	IV
Lickdale (undrained)	NN	V	V	V	V	NS*	NS*
Lignum	LL	V	V	V	V	NS*	IV
Lily	FF	IVb	IVb	III	IV	NS*	III
Linden	F	IIa	IIa	I	II	III	II
Lindside	A	Ia	Ia	I	Ia	I	I
Littlejoe	V	IVa	IVa	II	III	III	III
Litz	JJ	V	V	IV	V	NS*	IV
Lloyd	N	IIb	IIb	I	II	II	II
Lloyd variant	N	IIb	IIb	I	II	II	II
Lobdell	A	Ia	Ia	I	Ia	I	I
Lodi	M	IIb	IIb	I	II	I	II
Lostcove	FF	IVb	IVb	III	IV	NS*	III
Louisa	JJ	V	V	IV	V	NS*	IV
Louisa variant	JJ	V	V	IV	V	NS*	IV
Louisburg	FF	IVb	IVb	III	IV	NS*	III
Lowell	M	IIb	IIb	I	II	I	II
Lucketts	Y	IVa	IVa	III	III	NS*	III
Lucy	DD	IVb	IVb	II	IV	NS*	III
Lumbee (drained)	C	Ib	Ib	II	Ib	NS*	I
Lumbee (undrained)	OO	V	V	V	V	NS*	NS*
Lumbee variant (drained)	C	Ib	Ib	II	Ib	NS*	I
Lumbee variant (undrained)	OO	V	V	V	V	NS*	NS*
Lunt	AA	IVa	IVa	II	III	NS*	IV
Lynchburg	E	IIa	IIa	I	II	NS*	II
Macove	CC	IVb	IVb	II	IV	NS*	III
Madison	X	IVa	IVa	II	III	III	II
Madsheep	JJ	V	V	IV	V	NS*	IV
Maggodee	A	Ia	Ia	I	Ia	I	I
Magotha	PP	V	V	V	V	NS*	NS*
Malbis	W	IVa	IVa	IV	III	NS*	IV
Manassas	D	Ib	Ib	I	Ib	I	I
Mandy	JJ	V	V	IV	V	NS*	IV
Manor	FF	IVb	IVb	III	IV	NS*	III
Mantachie	I	IIa	IIa	I	II	NS*	I

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Manteo	JJ	V	V	IV	V	NS*	IV
Marbie	W	IVa	IVa	IV	III	NS*	IV
Marbleyard	FF	IVb	IVb	III	IV	NS*	III
Margo	A	Ia	Ia	I	Ia	I	I
Markes	NN	V	V	V	V	NS*	NS*
Marlboro	R	IIIa	IIIa	II	II	III	II
Marr	T	IIIb	IIIb	II	II	NS*	III
Marrowbone	JJ	V	V	IV	V	NS*	NS*
Marumsco	K	IIb	IIb	I	II	III	I
Masada	L	IIb	IIb	I	II	III	II
Massanetta	B	Ia	Ia	I	Ia	II	I
Massanutten	JJ	V	V	IV	V	NS*	IV
Matapeake	R	IIIa	IIIa	II	II	III	II
Matewan	FF	IVb	IVb	III	IV	NS*	III
Matewan	FF	IVb	IVb	III	IV	NS*	III
Matneflat	CC	IVb	IVb	II	IV	NS*	III
Matneflat	CC	IVb	IVb	II	IV	NS*	III
Mattamuskeet	PP	V	V	V	V	NS*	NS*
Mattan	PP	V	V	V	V	NS*	NS*
Mattapeake	B	Ia	Ia	I	Ia	II	I
Mattapex	K	IIb	IIb	I	II	III	I
Mattaponi	R	IIIa	IIIa	II	II	III	II
Maurertown	NN	V	V	V	V	NS*	NS*
Maury	M	IIb	IIb	I	II	I	II
Mayodan	V	IVa	IVa	II	III	III	III
McCamy	FF	IVb	IVb	III	IV	NS*	III
McClung	M	IIb	IIb	I	II	I	II
McGary (drained)	P	IIb	IIb	II	II	NS*	III
McGary (undrained)	Z	IVa	IVa	IV	III	NS*	NS*
McLaurin	DD	IVb	IVb	II	IV	NS*	III
McQueen	B	Ia	Ia	I	Ia	II	I
Meadowfield	JJ	V	V	IV	V	NS*	IV
Meadows	JJ	V	V	IV	V	NS*	IV
Meadowville	G	IIa	IIa	I	II	II	I
Meadowville variant	G	IIa	IIa	I	II	II	I
Meckesville	W	IVa	IVa	IV	III	NS*	IV
Mecklenburg	V	IVa	IVa	II	III	III	III
Mecklenburg variant	V	IVa	IVa	II	III	III	III
Meggett (drained)	C	Ib	Ib	II	Ib	NS*	I
Meggett (undrained)	OO	V	V	V	V	NS*	NS*
Melfa	PP	V	V	V	V	NS*	NS*

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Melvin (drained)	H	IIa	IIa	III	II	NS*	IV
Melvin (undrained)	NN	V	V	V	V	NS*	NS*
Middleburg	G	IIa	IIa	I	II	II	I
Millrock	II	V	V	III	V	NS*	NS*
Mine Run	II	V	V	III	V	NS*	NS*
Minnieville	N	IIb	IIb	I	II	II	II
Mirerock	KK	V	V	V	V	NS*	IV
Misenheimer	JJ	V	V	IV	V	NS*	IV
Molena	II	V	V	III	V	NS*	NS*
Monacan	I	IIa	IIa	I	II	NS*	I
Mongle	H	IIa	IIa	III	II	NS*	IV
Monongahela	W	IVa	IVa	IV	III	NS*	IV
Montalto	N	IIb	IIb	I	II	II	II
Montonia	X	IVa	IVa	II	III	III	II
Montresso	D	Ib	Ib	I	Ib	I	I
Montross	Q	IIIa	IIIa	II	II	NS*	III
Moomaw	W	IVa	IVa	IV	III	NS*	IV
Morasonville	D	Ib	Ib	I	Ib	I	I
Morven	G	IIa	IIa	I	II	II	I
Mount Lucas	J	IIb	IIb	I	II	NS*	I
Mt. Rogers	GG	IVb	IVb	IV	IV	NS*	III
Muckalee	MM	V	V	V	V	NS*	IV
Munden	F	IIa	IIa	I	II	III	II
Murrill	L	IIb	IIb	I	II	III	II
Muskingum	JJ	V	V	IV	V	NS*	IV
Myatt (drained)	C	Ib	Ib	II	Ib	NS*	I
Myatt (undrained)	OO	V	V	V	V	NS*	NS*
Myatt variant (drained)	C	Ib	Ib	II	Ib	NS*	I
Myatt variant (undrained)	OO	V	V	V	V	NS*	NS*
Myersville	D	Ib	Ib	I	Ib	I	I
Nahunta	E	IIa	IIa	I	II	NS*	II
Nanford	V	IVa	IVa	II	III	III	III
Nansemond	F	IIa	IIa	I	II	III	II
Nason	V	IVa	IVa	II	III	III	III
Nawney	PP	V	V	V	V	NS*	NS*
Neabsco	BB	IVb	IVb	III	IV	NS*	III
Needmore	FF	IVb	IVb	III	IV	NS*	III
Nestoria	JJ	V	V	IV	V	NS*	IV
Nevarc	HH	IVb	IVb	III	IV	NS*	IV
Newark (drained)	H	IIa	IIa	III	II	NS*	IV
Newark (undrained)	NN	V	V	V	V	NS*	NS*

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Newark variant (drained)	H	IIa	IIa	III	II	NS*	IV
Newark variant (undrained)	NN	V	V	V	V	NS*	NS*
Newbern	JJ	V	V	IV	V	NS*	IV
Newflat	LL	V	V	V	V	NS*	IV
Newhan	QQ	V	V	V	V	NS*	NS*
Newmarc	B	Ia	Ia	I	Ia	II	I
Nicelytown	A	Ia	Ia	I	Ia	I	I
Nicholson	BB	IVb	IVb	III	IV	NS*	III
Nickwasi	JJ	V	V	IV	V	NS*	NS*
Nimmo	E	IIa	IIa	I	II	NS*	II
Nixa	BB	IVb	IVb	III	IV	NS*	III
Nolichucky	O	IIb	IIb	I	II	II	II
Nolin	A	Ia	Ia	I	Ia	I	I
Nollville	G	IIa	IIa	I	II	II	I
Nomberville	A	Ia	Ia	I	Ia	I	I
Norfolk	R	IIIa	IIIa	II	II	III	II
Oak Level	V	IVa	IVa	II	III	III	III
Oakhill	FF	IVb	IVb	III	IV	NS*	III
Oaklet	Y	IVa	IVa	III	III	NS*	III
Oatlands	FF	IVb	IVb	III	IV	NS*	III
Occoquan	DD	IVb	IVb	II	IV	NS*	III
Ochlockonee	II	V	V	III	V	NS*	NS*
Ochlockonee variant	II	V	V	III	V	NS*	NS*
Ocilla	F	IIa	IIa	I	II	III	II
Ogles	CC	IVb	IVb	II	IV	NS*	III
Okeetee	LL	V	V	V	V	NS*	IV
Opequon	JJ	V	V	IV	V	NS*	IV
Orange	KK	V	V	V	V	NS*	IV
Orange variant	KK	V	V	V	V	NS*	IV
Orangeburg	R	IIIa	IIIa	II	II	III	II
Orenda	KK	V	V	V	V	NS*	IV
Oriskany	CC	IVb	IVb	II	IV	NS*	III
Orrville (drained)	C	Ib	Ib	II	Ib	NS*	I
Orrville (undrained)	OO	V	V	V	V	NS*	NS*
Orrville variant (drained)	C	Ib	Ib	II	Ib	NS*	I
Orrville variant (undrained)	OO	V	V	V	V	NS*	NS*
Osier	E	IIa	IIa	I	II	NS*	II
Ostin	II	V	V	III	V	NS*	NS*
Othello (drained)	C	Ib	Ib	II	Ib	NS*	I

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Othello (undrained)	OO	V	V	V	V	NS*	NS*
Ott	JJ	V	V	IV	V	NS*	NS*
Pacolet	X	IVa	IVa	II	III	III	II
Pactolus	EE	IVb	IVb	III	IV	NS*	NS*
Paddyknob	JJ	V	V	IV	V	NS*	IV
Pagebrook	Y	IVa	IVa	III	III	NS*	III
Pamlico	PP	V	V	V	V	NS*	NS*
Pamunkey	B	Ia	Ia	I	Ia	II	I
Pamunkey variant	B	Ia	Ia	I	Ia	II	I
Panorama	U	IIIb	IIIb	II	II	III	II
Pantego (drained)	C	Ib	Ib	II	Ib	NS*	I
Pantego (undrained)	OO	V	V	V	V	NS*	NS*
Parker	GG	IVb	IVb	IV	IV	NS*	III
Partlow	HH	IVb	IVb	III	IV	NS*	IV
Pasquotank (drained)	C	Ib	Ib	II	Ib	NS*	I
Pasquotank (undrained)	OO	V	V	V	V	NS*	NS*
Peaks	JJ	V	V	IV	V	NS*	IV
Peawick	HH	IVb	IVb	III	IV	NS*	IV
Pecktonville	M	IIb	IIb	I	II	I	II
Penhook	X	IVa	IVa	II	III	III	II
Penn	FF	IVb	IVb	III	IV	NS*	III
Philo (drained)	H	IIa	IIa	III	II	NS*	IV
Philo (undrained)	NN	V	V	V	V	NS*	NS*
Philoment	D	Ib	Ib	I	Ib	I	I
Pigeonroost	N	IIb	IIb	I	II	II	II
Pilot Mountain	JJ	V	V	IV	V	NS*	IV
Pineola	L	IIb	IIb	I	II	III	II
Pineville	U	IIIb	IIIb	II	II	III	II
Pineywoods	NN	V	V	V	V	NS*	NS*
Pinkston	JJ	V	V	IV	V	NS*	IV
Pinoka	JJ	V	V	IV	V	NS*	IV
Pisgah	M	IIb	IIb	I	II	I	II
Plummer	EE	IVb	IVb	III	IV	NS*	NS*
Pocalla	DD	IVb	IVb	II	IV	NS*	III
Pocaty	PP	V	V	V	V	NS*	NS*
Pocomoke	E	IIa	IIa	I	II	NS*	II
Poindexter	FF	IVb	IVb	III	IV	NS*	III
Poindexter variant	FF	IVb	IVb	III	IV	NS*	III
Polawana	PP	V	V	V	V	NS*	NS*

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Pooler variant (drained)	C	Ib	Ib	II	Ib	NS*	I
Pooler variant (undrained)	OO	V	V	V	V	NS*	NS*
Pope	A	Ia	Ia	I	Ia	I	I
Poplimento	M	IIb	IIb	I	II	I	II
Porters	FF	IVb	IVb	III	IV	NS*	III
Portsmouth (drained)	C	Ib	Ib	II	Ib	NS*	I
Portsmouth (undrained)	OO	V	V	V	V	NS*	NS*
Post	V	IVa	IVa	II	III	III	III
Pouncey	LL	V	V	V	V	NS*	IV
Poynor	GG	IVb	IVb	IV	IV	NS*	III
Psamments	II	V	V	III	V	NS*	NS*
Pungo	PP	V	V	V	V	NS*	NS*
Purcellville	D	Ib	Ib	I	Ib	I	I
Purdy (drained)	H	IIa	IIa	III	II	NS*	IV
Purdy (undrained)	NN	V	V	V	V	NS*	NS*
Quantico	R	IIIa	IIIa	II	II	III	II
Rabun	N	IIb	IIb	I	II	II	II
Rains (drained)	C	Ib	Ib	II	Ib	NS*	I
Rains (undrained)	OO	V	V	V	V	NS*	NS*
Ramsey	JJ	V	V	IV	V	NS*	IV
Rapidan	N	IIb	IIb	I	II	II	II
Rappahanock	PP	V	V	V	V	NS*	NS*
Raritan	W	IVa	IVa	IV	III	NS*	IV
Rasalo	Y	IVa	IVa	III	III	NS*	III
Rayne	U	IIIb	IIIb	II	II	III	II
Readington	W	IVa	IVa	IV	III	NS*	IV
Reaville	JJ	V	V	IV	V	NS*	IV
Redbrush	Y	IVa	IVa	III	III	NS*	III
Remlik	DD	IVb	IVb	II	IV	NS*	III
Rhodhiss	X	IVa	IVa	II	III	III	II
Rigley	CC	IVb	IVb	II	IV	NS*	III
Rion	X	IVa	IVa	II	III	III	II
Riverview	G	IIa	IIa	I	II	II	I
Rixeville	JJ	V	V	IV	V	NS*	NS*
Roanoke (drained)	H	IIa	IIa	III	II	NS*	IV
Roanoke (undrained)	NN	V	V	V	V	NS*	NS*
Robertsville	LL	V	V	V	V	NS*	IV
Rockbam	X	IVa	IVa	II	III	III	II
Rohrersville	BB	IVb	IVb	III	IV	NS*	III
Ross	A	Ia	Ia	I	Ia	I	I

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Rough	JJ	V	V	IV	V	NS*	IV
Rowland	A	Ia	Ia	I	Ia	I	I
Rumford	DD	IVb	IVb	II	IV	NS*	III
Rushtown	FF	IVb	IVb	III	IV	NS*	III
Ruston	S	IIIa	IIIa	II	II	NS*	III
Saffell	DD	IVb	IVb	II	IV	NS*	III
Santuc	G	IIa	IIa	I	II	II	I
Sassafras	T	IIIb	IIIb	II	II	NS*	III
Saunook	L	IIb	IIb	I	II	III	II
Sauratown	CC	IVb	IVb	II	IV	NS*	III
Savannah	BB	IVb	IVb	III	IV	NS*	III
Scatterville	BB	IVb	IVb	III	IV	NS*	III
Schaffenaker	II	V	V	III	V	NS*	NS*
Seabrook	EE	IVb	IVb	III	IV	NS*	NS*
Seagate	EE	IVb	IVb	III	IV	NS*	NS*
Sedgefield	KK	V	V	V	V	NS*	IV
Sekil	FF	IVb	IVb	III	IV	NS*	III
Seneca	G	IIa	IIa	I	II	II	I
Sequatchie	B	Ia	Ia	I	Ia	II	I
Sequoia	U	IIIb	IIIb	II	II	III	II
Sewell	JJ	V	V	IV	V	NS*	IV
Shelocta	L	IIb	IIb	I	II	III	II
Shelocta variant	L	IIb	IIb	I	II	III	II
Shenval	O	IIb	IIb	I	II	II	II
Sherando	CC	IVb	IVb	II	IV	NS*	III
Sheva	KK	V	V	V	V	NS*	IV
Shottower	O	IIb	IIb	I	II	II	II
Shouns	G	IIa	IIa	I	II	II	I
Sindion	B	Ia	Ia	I	Ia	II	I
Skeeterville	KK	V	V	V	V	NS*	IV
Slabtown	G	IIa	IIa	I	II	II	I
Slagle	K	IIb	IIb	I	II	III	I
Snicksville	D	Ib	Ib	I	Ib	I	I
Snowdog	BB	IVb	IVb	III	IV	NS*	III
Spears Mountain	V	IVa	IVa	II	III	III	III
Speedwell	A	Ia	Ia	I	Ia	I	I
Spessard	CC	IVb	IVb	II	IV	NS*	III
Spivey	FF	IVb	IVb	III	IV	NS*	III
Spotsylvania	V	IVa	IVa	II	III	III	III
Spray	JJ	V	V	IV	V	NS*	IV
Spriggs	JJ	V	V	IV	V	NS*	IV
Springwood	D	Ib	Ib	I	Ib	I	I
Stanton	LL	V	V	V	V	NS*	IV
Starr	G	IIa	IIa	I	II	II	I
Starr-Dyke	O	IIb	IIb	I	II	II	II

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Staser	A	Ia	Ia	I	Ia	I	I
State (ES)	T	IIIb	IIIb	II	II	NS*	III
State (Mainland)	B	Ia	Ia	I	Ia	II	I
Steinsburg	JJ	V	V	IV	V	NS*	IV
Stonecoal	JJ	V	V	IV	V	NS*	IV
Stoneville	X	IVa	IVa	II	III	III	II
Stott Knob	N	IIb	IIb	I	II	II	II
Stough	F	IIa	IIa	I	II	III	II
Straightstone	V	IVa	IVa	II	III	III	III
Strawfield	X	IVa	IVa	II	III	III	II
Stumptown	FF	IVb	IVb	III	IV	NS*	III
Suches	A	Ia	Ia	I	Ia	I	I
Sudley	D	Ib	Ib	I	Ib	I	I
Suffolk	T	IIIb	IIIb	II	II	NS*	III
Sugarhol	O	IIb	IIb	I	II	II	II
Sulfaquents	PP	V	V	V	V	NS*	NS*
Summers	GG	IVb	IVb	IV	IV	NS*	III
Susquehanna	KK	V	V	V	V	NS*	IV
Swamp	PP	V	V	V	V	NS*	NS*
Swampoodle	D	Ib	Ib	I	Ib	I	I
Sweetapple	FF	IVb	IVb	III	IV	NS*	III
Swimley	M	IIb	IIb	I	II	I	II
Sycoline	KK	V	V	V	V	NS*	IV
Sylco	JJ	V	V	IV	V	NS*	IV
Sylvatus	JJ	V	V	IV	V	NS*	IV
Talladega	JJ	V	V	IV	V	NS*	IV
Tallapoosa	JJ	V	V	IV	V	NS*	IV
Tallapoosa variant	JJ	V	V	IV	V	NS*	IV
Tanasee	JJ	V	V	IV	V	NS*	IV
Tankerville	N	IIb	IIb	I	II	II	II
Tankerville taxadjunct	N	IIb	IIb	I	II	II	II
Tarboro	II	V	V	III	V	NS*	NS*
Tarrus	X	IVa	IVa	II	III	III	II
Tate	O	IIb	IIb	I	II	II	II
Tate variant	O	IIb	IIb	I	II	II	II
Tatum	X	IVa	IVa	II	III	III	II
Terric Medisaprists	PP	V	V	V	V	NS*	NS*
Tetotum	K	IIb	IIb	I	II	III	I
Tetotum variant	K	IIb	IIb	I	II	III	I
Thunder	GG	IVb	IVb	IV	IV	NS*	III
Thurmont	L	IIb	IIb	I	II	III	II
Tidal Marsh	PP	V	V	V	V	NS*	NS*
Tidal Marsh, high	PP	V	V	V	V	NS*	NS*

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Tidal Marsh, low	PP	V	V	V	V	NS*	NS*
Tidal Mudflats	PP	V	V	V	V	NS*	NS*
Tidal Pool	PP	V	V	V	V	NS*	NS*
Tifton	Q	IIIa	IIIa	II	II	NS*	III
Timberville	G	IIa	IIa	I	II	II	I
Timberville variant	G	IIa	IIa	I	II	II	I
Tioga	A	Ia	Ia	I	Ia	I	I
Toccoa	II	V	V	III	V	NS*	NS*
Toddstav	HH	IVb	IVb	III	IV	NS*	IV
Tomotley (drained)	C	Ib	Ib	II	Ib	NS*	I
Tomotley (undrained)	OO	V	V	V	V	NS*	NS*
Toms	C	Ib	Ib	II	Ib	NS*	I
Toqast	V	IVa	IVa	II	III	III	III
Torhunta	E	IIa	IIa	I	II	NS*	II
Totier	U	IIIb	IIIb	II	II	III	II
Toxaway	CC	IVb	IVb	II	IV	NS*	III
Toxaway (drained)	C	Ib	Ib	II	Ib	NS*	I
Toxaway (undrained)	OO	V	V	V	V	NS*	NS*
Trappist	U	IIIb	IIIb	II	II	III	II
Trego	W	IVa	IVa	IV	III	NS*	IV
Trenholm	KK	V	V	V	V	NS*	IV
Trimont	FF	IVb	IVb	III	IV	NS*	III
Trussell	BB	IVb	IVb	III	IV	NS*	NS*
Tuckahoe	A	Ia	Ia	I	Ia	I	I
Tuckasegee	G	IIa	IIa	I	II	II	I
Tugglesgap	CC	IVb	IVb	II	IV	NS*	III
Tumbling	O	IIb	IIb	I	II	II	II
Turbeville	O	IIb	IIb	I	II	II	II
Tusquitee	G	IIa	IIa	I	II	II	I
Tygart (drained)	P	IIb	IIb	II	II	NS*	III
Tygart (undrained)	Z	IVa	IVa	IV	III	NS*	NS*
Uchee	DD	IVb	IVb	II	IV	NS*	III
Unison	L	IIb	IIb	I	II	III	II
Unison variant	L	IIb	IIb	I	II	III	II
Vance	Y	IVa	IVa	III	III	NS*	III
Vandalia	L	IIb	IIb	I	II	III	II
Varina	Q	IIIa	IIIa	II	II	NS*	III
Vaucluse	Q	IIIa	IIIa	II	II	NS*	III
Vaucluse	Q	IIIa	IIIa	II	II	NS*	III
Vertrees	M	IIb	IIb	I	II	I	II

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Virgilina	KK	V	V	V	V	NS*	IV
Wadesboro	X	IVa	IVa	II	III	III	II
Wagram	DD	IVb	IVb	II	IV	NS*	III
Wahee (drained)	C	Ib	Ib	II	Ib	NS*	I
Wahee (undrained)	OO	V	V	V	V	NS*	NS*
Wakulla	II	V	V	III	V	NS*	NS*
Wallen	JJ	V	V	IV	V	NS*	IV
Walnut	GG	IVb	IVb	IV	IV	NS*	III
Wando	II	V	V	III	IV	NS*	III
Warminster	X	IVa	IVa	II	III	III	II
Watahala	M	IIb	IIb	I	II	I	II
Watauga	V	IVa	IVa	II	III	III	III
Wateree	FF	IVb	IVb	III	IV	NS*	III
Watt	JJ	V	V	IV	V	NS*	IV
Watt variant	JJ	V	V	IV	V	NS*	IV
Waxpool	LL	V	V	V	V	NS*	IV
Waynesboro	L	IIb	IIb	I	II	III	II
Weaver	A	Ia	Ia	I	Ia	I	I
Webbtown	JJ	V	V	IV	V	NS*	IV
Wedowee	V	IVa	IVa	II	III	III	III
Weeksville (drained)	C	Ib	Ib	II	Ib	NS*	I
Weeksville (undrained)	OO	V	V	V	V	NS*	NS*
Wehadkee	MM	V	V	V	V	NS*	IV
Weikert	JJ	V	V	IV	V	NS*	IV
Westfield	V	IVa	IVa	II	IV	III	III
Westmoreland	U	IIIb	IIIb	II	II	III	II
Weston	E	IIa	IIa	I	II	NS*	II
Westphalia	II	V	V	III	V	NS*	NS*
Weverton	GG	IVb	IVb	IV	IV	NS*	III
Wharton	M	IIb	IIb	I	II	I	II
Wheeling	A	Ia	Ia	I	Ia	I	I
White Store	KK	V	V	V	V	NS*	IV
White Store variant	KK	V	V	V	V	NS*	IV
Whiteford	U	IIIb	IIIb	II	II	III	II
Wickham	B	Ia	Ia	I	Ia	II	I
Wickham variant	B	Ia	Ia	I	Ia	II	I
Widget	CC	IVb	IVb	II	IV	NS*	III
Wilkes	JJ	V	V	IV	V	NS*	IV
Wingina	A	Ia	Ia	I	Ia	I	I
Winnsboro	KK	V	V	V	V	NS*	IV
Wintergreen	O	IIb	IIb	I	II	II	II
Winton	B	Ia	Ia	I	Ia	II	I

Table 1-1 Soil Productivity Groupings for Various Cropping Categories							
Soil Series	**Soil Mgt Group**	**Corn**	**Grain Sorghum**	**Small Grain**	**Soybeans**	**Alfalfa**	**Tall Grass, Clover, Hay, Pasture**
Wolfgap	A	Ia	Ia	I	Ia	I	I
Wolftrap	K	IIb	IIb	I	II	III	I
Woodington	EE	IVb	IVb	III	IV	NS*	NS*
Woodstown	J	IIb	IIb	I	II	NS*	I
Woolvine	V	IVa	IVa	II	III	III	III
Woolwine	V	IVa	IVa	II	III	III	III
Worsham	HH	IVb	IVb	III	IV	NS*	IV
Worsham variant	HH	IVb	IVb	III	IV	NS*	IV
Wrightsboro	J	IIb	IIb	I	II	NS*	I
Wurno	JJ	V	V	IV	V	NS*	IV
Wyrick	G	IIa	IIa	I	II	II	I
Yadkin	X	IVa	IVa	II	III	III	II
Yellowbottom	V	IVa	IVa	II	III	III	III
Yemasse (drained)	C	Ib	Ib	II	Ib	NS*	I
Yemasse (undrained)	OO	V	V	V	V	NS*	NS*
Yeopim	K	IIb	IIb	I	II	III	I
Yogaville	MM	V	V	V	V	NS*	IV
York	BB	IVb	IVb	III	IV	NS*	III
Zepp	JJ	V	V	IV	V	NS*	IV
Zion	Y	IVa	IVa	III	III	NS*	III
Zion variant	Y	IVa	IVa	III	III	NS*	III
Zoar	K	IIb	IIb	I	II	III	I

Table 1-2
Estimated Yields in Bushels (Bu) or Tons (T) per Acre (A) of Various Non-Irrigated Crops for Identified Soil Productivity Groups

Crop	I		II		III		IV		V
	a	b	a	b	a	b	a	b	
Corn									
Grain (Bu/A)	180	170	160	150	140	130	120	100	80
Silage (T/A) [1]	25	24	23	22	21	20	19	18	16
Grain Sorghum (Bu/A)	140	130	120	110	100		90		80
Soybeans (Bu/A)									
Early season	50	45	40		35		25		20
Late season [2]	40	34	34	30	25		18		15
Wheat (Bu/A)									
Standard	64		56		48		40		24
Intensive	80		70		60		50		30
Barley (Bu/A)									
Standard	100		70		60		50		30
Intensive	115		88		75		63		38
Oats	80		80		80		60		60
Cereal Silage (T/A)									
Barley/Oats/Rye	>10		8-10		6-8		3-6		<3
Wheat/Triticale	>12		10-12		8-10		4-8		<4
Tallgrass Hay (T/A)	>4.0		3.5-4.0		3.0-3.5		<3.0		<3.0
Bermudagrass Hay (T/A)	>6.0		5.0-6.0		4.0-5.0		3.0-4.0		<3
Prairie Grass Hay (T/A)	>5		4.25-5		3.5-4.25		3-3.5		<3
Alfalfa (T/A)	>6.0		4.0-6.0		<4.0		<4		<4
Pasture (Ac/AU)	1.0		1.1-1.5		1.6-3.0		3.1-6.5		

1. When using documented farmer records, corn silage yield may be calculated using the following formula:

   Corn Grain Yield (bu/ac) X 0.0985 + 7.6964 = **Corn Silage Yield** Tons/ac.

2. Late season beans would be planted on or after 6/21 of that year.

Table 1-3
Utilizing Erosion/Slope Information

Soil mapping units provide information on severity of erosion as well as slope yield information. If multiple yield reductions occur in a field, for example, a soil with severe erosion (25% yield reduction) on a class D slope in the ridge and valley physiographic region (20% yield reduction), the single most limiting reduction would be used (25%) as opposed to an additive factor (45%).

1. Yield Adjustment According to Erosion:

Erosion Classes	% Yield Reduction
slight and moderate (1 and 2)	0
severe (3)	25

2. Yield Adjustment According to Slope:

Slope Classes	% Slope Coastal Plain	% Slope Piedmont, Mountain Regions	% Yield Reduction Row Crops and Hay*** Conv.till	No till	% Increase in Acres/Animal Unit**
A	0-2	0-2	&	&	&
B	2-6	2-7	&	&	&
C	6-10	7-15	6	0	&
D	10-15	15-25	20	10	25
E	15-25	25-45	too steep for tillage		50
F	25+	45+	too steep for tillage		50

***** A and B are equal and are the class standard.
****** A, B and C are equal and are the class standard.
******* Use No-till reduction for established hay.

3. Yield Adjustment According to Coarse Fragments: Exclude group GG since coarse fragments are part of its series criteria:

a. Fine gravelly, gravelly (gritty), cherty - 10% yield reduction
b. Cobbly, angular cobbly, channery, flaggy, slaty, shaly - 15% yield reduction
c. Very gravelly, extremely gravelly, very cherty - 20% yield reduction
d. Very cobbly, extremely cobbly, very channery, very flaggy - 25% yield reduction

4. Yield Adjustment According to Rock Outcrop:

a. Rocky - No yield reduction; subtract 10% of land area from field acreage to account for rock outcrop area
b. Bouldery, very bouldery, very rocky, stony, very stony - 25% yield reduction for pasture, not suited to row crops
c. Extremely bouldery, extremely rocky, extremely stony (rubbly) and all complexes with rock outcrop - 50% yield reduction for pasture, not suited to row crops
d. Karst - no row crops, extreme caution in use of fertilizers or organic nutrient sources.

Section I.A. Nitrogen Timing Criteria for Various Materials Based on Environmental Sensitivity of Sites

This criteria is to be used to interpret Table 1-4:

1. Timing of Organic Nutrient Sources (manures and biosolids materials)

a. High environmental risk soils (H) for nitrogen loss - apply no more than 30 days prior to planting crop at any time of the year.
b. Moderate (M) and Low (L) risk soils for nitrogen loss - apply no more than 60 days prior to planting spring crops only if the following conditions are met: (1) the site is not environmentally sensitive; and (2) the site has at least 60% uniform ground cover from an existing actively growing crop such as a small grain trap crop or fescue with an exposed plant height of three inches or more. If either of the above conditions cannot be met, apply material no more than 30 days before planting spring crops. Apply material no more that 30 days before timely planting of fall or summer seeded crops.

2. Timing of Inorganic Nitrogen Sources (commercial nitrogen fertilizers)

a. High environmental risk soils for nitrogen loss - must apply inorganic nitrogen in split applications if 50% or more of the crop nutrient needs for nitrogen are applied as inorganic fertilizers
b. Moderate environmental risk soils for nitrogen loss - should apply nitrogen in split applications
c. Low environmental risk soils for nitrogen loss - if split applications are not possible, may apply all nitrogen as close to planting as possible for spring planted annual row crops. Applications shall not be made more than 30 days before crop planting.

Split applications of nitrogen on corn when commercial fertilizer is used to supply 50% or more of the crop nutrient needs for nitrogen, refers to a nitrogen management program where a portion of the nitrogen needs is applied as a sidedress application. On soils with a High nitrogen loss risk, at least 50% of the inorganic nitrogen applications shall be applied as a sidedress application. On Moderate and Low nitrogen loss risk soils this management method is preferred, but not required. The combination of row starter, at planting nitrogen applications and sidedress applications cannot exceed the nitrogen need listed for that crop in that field.

A detailed nitrogen management program for small grain is outlined in Section V. For soils that are high environmental risk soils for nitrogen loss, split spring nitrogen applications shall be recommended as outlined in that program.

For other crops, if no specific program is otherwise defined in the crop specific recommendations or table footnotes in Section 5, split applications of nitrogen are recommended as the preferred method to maximize nitrogen use by the crop.

3. Timing of High Carbon/Nitrogen Ratio Compost (with a final C:N ratio of >25:1)

a. If the composted organic nutrient sources are applied greater than 30 days prior to crop planting on sites with less than 60% crop residue cover, the plan shall require chisel plowing or ridge tilling within 48 hours of application of the composted organic nutrient source. If ridge tilling or chisel plowing is utilized, the equipment should be operated predominately along the contour so that uniform parallel ridges are created that will improve soil roughness and reduce runoff potential until any finishing tillage operations are performed close to the time of crop planting.

b. The planner shall recommend soil nitrate testing to determine nitrogen application rates during the growing season following the application of composted organic nutrient sources if row crops are grown.

Section I.B. Explanation of Environmentally Sensitive Sites

The regulations define "environmentally sensitive site" to mean any field which is particularly susceptible to nutrient loss to groundwater or surface water since it contains or drains to areas which contain sinkholes; or where at least 33% of the area in a specific field contains one or any combination of the following features:

1. Soils with high potential for leaching based on soil texture or excessive drainage;
2. Shallow soils less than 41 inches deep likely to be located over fractured or limestone bedrock;
3. Subsurface tile drains;
4. Soil with high potential for subsurface lateral flow based on soil texture and poor drainage;
5. Floodplains as identified by soils prone to frequent flooding in county soil surveys; or
6. Lands with slopes greater than 15%.

Table 1-4 contains environmental risk ratings for Virginia soils for the first four criteria listed above. Determine the percentage of field area for soils listed as H (high) for Environmental Sensitivity Rating in Table 1-4 plus any field areas that meet criteria 5 or 6 above to determine if the field is an environmentally sensitive site.

The primary reason for the environmental sensitivity rating for each soil listed as high or moderate risk in Table 1-4 is identified by the following key:

Leaching - Soils with potential for leaching based on soil texture or excessive drainage
Shallow - Shallow soils less than 41 inches deep likely to be located over fractured or limestone bedrock
Drainage - Soils with subsurface tile drains or with high potential for subsurface lateral flow based on soil texture and poor drainage

The category rating should be used to develop nitrogen application programs to address this concern through rate and timing recommendations.

Table 1-4 that follows lists the environmental sensitivity rating and category for each soil in Virginia.

Table 1-4

Nitrogen Loss Risk and Environmental Sensitivity Ratings for Virginia Soils & Soil Series Associated With Environmentally Sensitive Sites

Soil Series	Environmental Sensitivity	Category
Abell	L	
Ackwater	L	
Acredale, drained	H	Drainage
Acredale, undrained	L	
Aden	L	
Aden	L	
Airmont	L	
Alaga	H	Leaching
Alamance	H	Leaching
Alanthus	M	Leaching
Albano	L	
Albemarle	M	Leaching
Alderflats	L	
Aldino	L	
Allegheny	H	Shallow
Alonemill	H	Leaching
Alonzville	M	Leaching
Altavista	L	
Altavista variant	L	
Alticrest	H	Shallow
Angie	L	
Appling	L	
Appling gritty	L	
Appomattox	L	
Aqualfs	L	
Aquents	H	Drainage
Aquic Udifluvents	L	
Aquults	L	
Arapahoe	H	Drainage
Arcola	M	Leaching
Ardilla	L	
Argent	L	
Arkaqua	L	
Ashburn	L	
Ashe	H	Leaching
Ashlar	H	Leaching
Assateague	H	Leaching
Athol	L	
Atkins	H	Drainage
Atlee	L	
Augusta variant	L	
Augusta, drained	H	Drainage
Augusta, undrained	L	
Aura	H	Leaching
Austinville	L	
Axis	H	Drainage
Aycock	L	
Ayersville	M	Leaching
Backbay	H	Drainage
Badin	L	
Baile	H	Drainage
Bailegap	M	Leaching
Balsam	H	Shallow
Bama	M	Leaching
Banister	L	
Barclay	M	Leaching
Batteau	L	
Batteau	L	
Beckham	L	
Bedington	M	Leaching
Beech	L	
Beech Grove	H	Shallow
Belhaven	H	Drainage
Bellspur	M	Leaching
Beltsville	L	
Belvoir	L	
Benthole	H	Leaching
Bentley	L	
Berks	H	Shallow
Berks variant	H	Shallow
Bermudian	M	Leaching
Berthera	L	
Bertie	L	
Bethera	L	
Bethesda	H	Leaching
Bethlehem	H	Shallow
Bibb	H	Drainage
Biltmore	H	Leaching
Birdsboro	L	
Blackthorn	L	
Bladen	L	
Blago	L	
Blairton	H	Shallow
Bland	H	Shallow
Blocktown	H	Shallow
Bloodyhorse	H	Leaching
Bluemont	M	Shallow
Bluemount	M	Leaching
Bohicket	L	
Bojac, Eastern Shore	H	Leaching

Table 1-4
Nitrogen Loss Risk and Environmental Sensitivity Ratings for Virginia Soils
& Soil Series Associated With Environmentally Sensitive Sites

Soil Series	Environmental Sensitivity	Category
Bojac, mainland	H	Leaching
Bolling	L	
Bolling variant	L	
Bolton	M	Leaching
Bonneau	H	Leaching
Bookwood	H	Shallow
Botetourt	L	
Bourne	L	
Bourne variant	L	
Bowmansville	H	Drainage
Braddock	L	
Brandywine	H	Leaching
Brecknock	M	Leaching
Bremo	H	Leaching
Brentsville	H	Shallow
Brevard	M	Leaching
Brickhaven	L	
Brikerton	L	
Brinklow	M	Leaching
Broadway	L	
Brockroad	L	
Brownsville	H	Shallow
Brownwood	H	Leaching
Brumbaugh	L	
Brushy	H	Shallow
Buchanan	L	
Buckhall	L	
Buckingham	L	
Bucks	M	Leaching
Buckton	L	
Buffstat	L	
Bugley	H	Shallow
Buncombe	H	Leaching
Burketown	L	
Burrowsville	L	
Burton	H	Shallow
Buzzrock	H	Shallow
Cahaba	L	
Calverton	L	
Calvin	H	Shallow
Camocca	H	Drainage
Caneyville	H	Shallow
Captina	L	
Carbo	H	Shallow
Carbo	H	Shallow
Carbonton	L	
Cardiff	H	Leaching
Cardova	M	Leaching
Caroline	L	
Cartecay	H	Leaching
Carteret	H	Drainage
Cataska	H	Shallow
Catharpin	L	
Catlett	H	Shallow
Catoctin	H	Shallow
Catpoint	H	Leaching
Caverns	H	Leaching
Cecil	L	
Cedarcreek	H	Shallow
Chagrin	M	Leaching
Chagrin variant	H	Leaching
Chandler	H	Leaching
Chapanoke	L	
Charity	L	
Chastain	L	
Chastaina	L	
Chatuge	H	Drainage
Chavies	H	Leaching
Chavies variant	H	Leaching
Check	H	Drainage
Chenneby	L	
Chesapeake	M	Leaching
Chester	M	Leaching
Chestnut	H	Leaching
Chewacla	L	
Chickahominy	L	
Chilhowie	H	Shallow
Chincoteague	H	Drainage
Chipley	L	
Chiswell	H	Shallow
Christian	L	
Cid	L	
Claiborne	M	Leaching
Clapham	L	
Clarksburg	L	
Clearbrook	H	Shallow
Cliffield	H	Leaching
Clifford	L	
Clifton	L	
Clover	L	
Cloverlick	H	Leaching
Clubcaf	L	
Clymer	M	Leaching
Codorus	L	
Codorus variant	L	
Colescreek	L	
Colfax	L	
Colfax variant	L	

Table 1-4
Nitrogen Loss Risk and Environmental Sensitivity Ratings for Virginia Soils
& Soil Series Associated With Environmentally Sensitive Sites

Soil Series	Environmental Sensitivity	Category
Colleen	L	
Colvard	H	Leaching
Combs	M	Leaching
Comus	M	Leaching
Conetoe	H	Leaching
Congaree	L	
Coosaw	L	
Cordorus	L	
Corolla	L	
Corydon	H	Shallow
Cotaco	L	
Cottonbend	M	Leaching
Coursey	L	
Cowee	H	Shallow
Coxville	L	
Craggey	H	Shallow
Craigsville	H	Leaching
Craven	L	
Creedmoor variant	L	
Croton	L	
Cullasaja	H	Leaching
Cullen	L	
Culleoka	M	Leaching
Culpeper	L	
Daleville	H	Drainage
Dan River	M	Leaching
Dandridge	H	Shallow
Danripple	L	
Davidson	L	
Dawhoo variant	H	Drainage
Decatur	L	
Dekalb	H	Leaching
Delanco	L	
Delila	L	
Dellwood	L	
Deloss, drained	H	Drainage
Deloss, undrained	H	Drainage
Derroc	H	Leaching
Devotion	H	Leaching
Diana Mills	L	
Dillard	L	
Dillsboro	L	
Dismal	H	Drainage
Dogue	L	
Dorovan	H	Drainage
Dothan	M	Leaching
Downer	H	Leaching
Dragston	L	
Drall	H	Leaching

Soil Series	Environmental Sensitivity	Category
Draper	M	Leaching
Drapermill	M	Leaching
Drypond	H	Shallow
Duckston	H	Drainage
Duffield	M	Leaching
Dulles	L	
Dumfries	M	Leaching
Dunbar	L	
Dunning	L	
Dunning	L	
Duplin	L	
Durham	M	Leaching
Dyke	L	
Dystrochrepts	H	Leaching
Easthamlet	L	
Ebbing	L	
Edgehill	L	
Edgehill variant	L	
Edgemont	M	Leaching
Edneytown	M	Leaching
Edneyville	H	Leaching
Edom	L	
Elbert	L	
Elbert variant	L	
Elioak	L	
Elk	L	
Elkton, drained	H	Drainage
Elkton, undrained	L	
Elliber	H	Leaching
Elsinboro	M	Leaching
Emory	L	
Emporia	M	Leaching
Endcav	L	
Enon	L	
Enott	L	
Ernest	L	
Escatawba	M	Leaching
Eubanks	M	Leaching
Eulonia	L	
Eunola	L	
Evansham	L	
Evard	M	Leaching
Evesboro	H	Shallow
Exum	L	
Faceville	L	
Fairfax	L	
Fairpoint	H	Shallow
Fairview	L	
Fairystone	L	
Fallsington	H	Drainage

Table 1-4
Nitrogen Loss Risk and Environmental Sensitivity Ratings for Virginia Soils & Soil Series Associated With Environmentally Sensitive Sites

Soil Series	Environmental Sensitivity	Category
Fauq	L	
Fauquier	L	
Faywood	H	Shallow
Featherstone	H	Drainage
Fedscreek	H	Leaching
Feedstone	L	
Fisherman	L	
Fiveblock	H	Leaching
Flatwoods	L	
Fletcher	L	
Flume	L	
Fluvanna	L	
Fluvaquents	H	Drainage
Fluvaquents, ponded	L	
Fluvaquents, saline	H	Drainage
Forestdale	L	
Fork	L	
Fork variant	L	
Frankstown	M	Leaching
Frederick	L	
Freemanville	L	
French	L	
Fresh water swamp	H	Drainage
Fripp	H	Leaching
Funkstown	L	
Gaila	M	Leaching
Gainesboro	H	Shallow
Galestown	H	Leaching
Galtsmill	H	Leaching
Georgeville	L	
Germanna	L	
Gertie	L	
Gilpin	H	Shallow
Gladehill	H	Leaching
Glenelg	M	Leaching
Glenelg, Blue Ridge	M	Leaching
Glenelg, New River Valley	M	Leaching
Glenville	L	
Glynwood	L	
Goblintown	L	
Goldsboro	L	
Goldston	H	Leaching
Goldvein	L	
Goresville	L	
Granville	L	
Grassland	L	

Soil Series	Environmental Sensitivity	Category
Greendale	L	
Greenlee	H	Leaching
Griffinsburg	H	Shallow
Grigsby	H	Leaching
Grimsley	H	Leaching
Gritney	L	
Groseclose	L	
Grover	M	Leaching
Gullion	L	
Gundy	L	
Gunstock	H	Shallow
Guyan	L	
Gwinnett variant	L	
Hagerstown	L	
Halewood	L	
Halifax	L	
Hanceville	L	
Haplaquepts	H	Leaching
Happyland	M	Leaching
Hartleton	H	Shallow
Hartsells	M	Shallow
Hatboro	H	Drainage
Hawksbill	H	Leaching
Hayesville	L	
Haymarket	L	
Hayter	M	Leaching
Haywood	H	Leaching
Hazel	H	Shallow
Hazel (channery)	H	Shallow
Hazel Run	M	Leaching
Hazleton	H	Shallow
Helena	L	
Herndon	L	
Hibler	L	
Hickoryknob	M	Leaching
Highsplint	H	Leaching
Hiwassee	L	
Hoadly	L	
Hobucken	H	Drainage
Holly	H	Drainage
Hollywood	L	
Hubersburg	L	
Huntington	L	
Hyde, drained	H	Drainage
Hyde, undrained	H	Drainage
Hydraquents	H	Drainage
Ingledove	M	Leaching
Iotla	L	

Table 1-4
Nitrogen Loss Risk and Environmental Sensitivity Ratings for Virginia Soils
& Soil Series Associated With Environmentally Sensitive Sites

Soil Series	Environmental Sensitivity	Category
Iredell	L	
Irongate	H	Leaching
Itmann	H	Shallow
Iuka	L	
Izagora	L	
Jackland	L	
Jedburg	L	
Jefferson	M	Leaching
Jefferson variant	H	Leaching
Johns, drained	H	Drainage
Johns, undrained	L	
Johnston	H	Drainage
Junaluska	H	Shallow
Kalmia	M	Leaching
Kaymine	H	Shallow
Keener	M	Leaching
Kelly	L	
Kempsville	M	Leaching
Kenansville	H	Leaching
Kenansville variant	L	
Keyport	L	
Kibler	M	Leaching
Kinkora	L	
Kinkora	L	
Kinston	H	Drainage
Klej	H	Drainage
Klinesville	H	Shallow
Konnarock	H	Shallow
Lackstown	L	
Laidig	M	Leaching
Lakehurst variant	L	
Lakeland	H	Leaching
Lakin	H	Leaching
Landsiburg	L	
Lanexa	H	Drainage
Lanside	H	Shallow
LaRoque	M	Leaching
Lawnes	H	Drainage
Leaf	L	
Leaf	L	
Leaksville	L	
Leck Kill	M	Leaching
Leedsville	M	Leaching
Leetonia	H	Shallow
Legore	M	Leaching
Lehew	H	Shallow
Lenoir	L	

Soil Series	Environmental Sensitivity	Category
Leon	H	Drainage
Levy	H	Drainage
Lew	H	Leaching
Lewisberry	H	Leaching
Library	L	
Lignum	L	
Lily	H	Shallow
Lindside	L	
Littlejoe	L	
Litz	H	Shallow
Lloyd	L	
Lloyd variant	L	
Lobdell	L	
Lodi	L	
Lostcove	H	Leaching
Louisa	H	Leaching
Louisa variant	H	Leaching
Louisburg	H	Leaching
Louisburg, hapludalfs	H	Leaching
Lowell	L	
Lucketts	L	
Lucy	H	Leaching
Lumbee	H	Drainage
Lumbee variant	H	Drainage
Lunt	L	
Lynchburg	L	
Macove	H	Leaching
Madison	L	
Madsheep	H	Shallow
Magotha	H	Drainage
Manassas	L	
Mandy	H	Shallow
Manor	H	Leaching
Mantachie	L	
Manteo	H	Shallow
Marbie	L	
Marbleyard	H	Leaching
Margo	L	
Markes	H	Drainage
Marlboro	L	
Marr	M	Leaching
Marrowbone	H	Shallow
Masada	L	
Massanetta	L	
Massanutten	H	Shallow
Matapeake	L	
Matewan	H	Leaching
Matneflat	H	Leaching
Mattamuskeet	H	Drainage
Mattan	H	Drainage

Table 1-4
Nitrogen Loss Risk and Environmental Sensitivity Ratings for Virginia Soils
& Soil Series Associated With Environmentally Sensitive Sites

Soil Series	Environmental Sensitivity	Category
Mattapex	L	
Mattaponi	L	
Maurertown	L	
Maury	L	
Mayodan	L	
McCamy	M	Leaching
McClung	M	Leaching
McGary	L	
McGary	L	
McLaurin	H	Leaching
McQueen	L	
Meadowfield	H	Shallow
Meadows	H	Shallow
Meadowville	M	Leaching
Meckesville	L	
Mecklenburg	L	
Mecklenburg variant	L	
Meggett	L	
Melfa	H	Drainage
Melvin, drained	H	Drainage
Melvin, undrained	L	
Middleburg	M	Leaching
Millrock	H	Leaching
Mine Run	H	Leaching
Minnieville	L	
Mirerock	L	
Misenheimer	H	Shallow
Mixed alluvium, poorly drained	H	Drainage
Mixed alluvium, well drained	L	
Molena	H	Leaching
Monacan	L	
Mongle	L	
Monongahela	L	
Montalto	L	
Montonia	M	Leaching
Montross	L	
Moomaw	L	
Morven	M	Leaching
Mount Lucas	L	
Mt Rogers	H	Leaching
Muckalee	H	Drainage
Munden	M	Leaching
Murrill	M	Leaching
Muskingum	H	Shallow
Myatt	H	Drainage
Myatt variant	H	Drainage
Myersville	M	Leaching

Soil Series	Environmental Sensitivity	Category
Nahunta	L	
Nanford	L	
Nansemond	M	Leaching
Nason	L	
Nathalie	L	
Nawney	H	Drainage
Neabsco	L	
Needmore	M	Shallow
Nestoria	H	Shallow
Nevarc	L	
Newark variant	L	
Newark, drained	H	Drainage
Newark, undrained	L	
Newbern	H	Shallow
Newflat	L	
Newhan	H	Leaching
Newmarc	L	
Nicelytown	L	
Nicholson	L	
Nikwasi	H	Drainage
Nimmo	H	Drainage
Nixa	L	
Nolichucky	M	Leaching
Nolin	L	
Nollville	L	
Nomberville	L	
Norfolk	M	Leaching
Oak Level	L	
Oakhill	H	Leaching
Oaklet	L	
Oatlands	M	Leaching
Occoquan	M	Leaching
Ochlockonee	H	Leaching
Ochlockonee variant	L	
Ochraquults	H	Drainage
Ochrepts, A/D	H	Drainage
Ochrepts, B/D	H	Drainage
Ochrepts, D	L	
Ocilla	L	
Ogles	H	Leaching
Okeetee	L	
Opequon	H	Shallow
Orange	L	
Orange variant	L	
Orangeburg	M	Leaching
Orenda	L	
Oriskany	H	Leaching
Orrville	L	

Table 1-4
Nitrogen Loss Risk and Environmental Sensitivity Ratings for Virginia Soils & Soil Series Associated With Environmentally Sensitive Sites

Soil Series	Environmental Sensitivity	Category
Orrville	L	
Orthents	L	
Osier	H	Drainage
Ostin	M	Leaching
Othello	L	
Othello	L	
Ott	M	Leaching
Pacolet	L	
Pactolus	L	
Paddyknob	H	Shallow
Pagebrook	L	
Palms variant	H	Drainage
Pamlico	H	Drainage
Pamunkey	M	Leaching
Pamunkey Variant	M	Leaching
Pamunkey variant	H	Leaching
Panorama	M	Leaching
Pantego	L	
Parker	H	Leaching
Partlow	H	Drainage
Pasquotank	H	Drainage
Peaks	H	Shallow
Peawick	L	
Pecktonville	L	
Penhook	L	
Penn	M	Leaching
Philo (Dr.)	M	Leaching
Philomont	H	Leaching
Pigeonroost	H	Shallow
Pilot Mountain	H	Leaching
Pineola	M	Leaching
Pineville	M	Leaching
Pineywoods	L	
Pinkston	H	Leaching
Pinoka	M	Leaching
Pisgah	L	
Plummer	H	Drainage
Pocalla	M	Leaching
Pocaty	H	Drainage
Pocomoke	H	Drainage
Poindexter	M	Leaching
Polawana	H	Drainage
Pooler variant	L	
Pooler, drained	H	Drainage
Pope	H	Leaching
Poplimento	L	
Porters	M	Leaching
Portsmouth, drained	H	Drainage
Portsmouth, undrained	H	Drainage
Pouncey	L	
Poynor	H	Leaching
Psamments, mod well	L	
Psamments, somewhat poorly	L	
Psamments, well drained	H	Leaching
Pungo	H	Drainage
Purcellville	L	
Purdy	L	
Purdy (drained)	H	Drainage
Quantico	L	
Rabun	L	
Rains, drained	H	Drainage
Rains, undrained	H	Drainage
Ramsey	H	Shallow
Rapidan	L	
Rappahannock	H	Drainage
Raritan	L	
Rasalo	L	
Rayne	M	Leaching
Readington	L	
Reaville	L	
Redbrush	L	
Remlik	H	Leaching
Rhodhiss	M	Leaching
Rigley	H	Leaching
Rion	M	Leaching
Riverview	M	Leaching
Rixeyville	H	Shallow
Roanoke	L	
Roanoke, drained	H	Drainage
Roanoke, undrained	L	
Robertsville	L	
Rockbarn	L	
Rohrersville	L	
Ross	M	Leaching
Rough	H	Shallow
Rowland	L	
Rumford	H	Leaching
Rushtown	H	Leaching
Ruston	M	Leaching
Saffell	H	Shallow
Santuc	L	
Sassafras	M	Leaching

Table 1-4
Nitrogen Loss Risk and Environmental Sensitivity Ratings for Virginia Soils
& Soil Series Associated With Environmentally Sensitive Sites

Soil Series	Environmental Sensitivity	Category
Saunook	M	Leaching
Sauratown	M	Leaching
Savannah	L	
Scattersville	L	
Schaffenaker	H	Leaching
Seabrook	L	
Seagate	H	Drainage
Sedgefield	L	
Sekil	H	Leaching
Seneca	L	
Sequatchie	L	
Sequoia	H	Shallow
Sewell	H	Shallow
Shelocta	M	Leaching
Shelocta variant	L	
Shenval	L	
Sherando	H	Leaching
Sheva	L	
Shottower	L	
Siloam	L	
Sindion	L	
Skeeterville	L	
Slabtown	L	
Slagle	L	
Snowdog	L	
Spears Mountain	L	
Speedwell	M	Leaching
Spessard	H	Leaching
Spivey	H	Leaching
Spotsylvania	L	
Spray	M	Leaching
Spriggs	M	Leaching
Springwood	L	
Starr	M	Leaching
Starr Dyke	L	
Stasser	L	
State	M	Leaching
Statler	M	Leaching
Steinsburg	H	Leaching
Stonecoal	H	Shallow
Stoneville	L	
Stott Knob	M	Leaching
Stough	L	
Straightstone	L	
Strawfield	L	
Stumptown	H	Leaching
Suches	M	Leaching
Sudley	M	Leaching
Suffolk	M	Leaching

Soil Series	Environmental Sensitivity	Category
Sugarhol	L	
Sulfaquents	H	Drainage
Summers	H	Shallow
Susquehanna	L	
Swamp	H	Drainage
Swampoodle	L	
Sweetapple	H	Leaching
Swimley	L	
Sycoline	L	
Sylco	H	Shallow
Sylvatus	H	Shallow
Talladega	H	Shallow
Tallapoosa	L	
Tallapoosa variant	L	
Tanasee	H	Leaching
Tankerville	H	Shallow
Tarboro	H	Leaching
Tarrus	L	
Tate	M	Leaching
Tatum	L	
Terric Haplohemists	H	Drainage
Tetotum	L	
Tetotum variant	L	
Thunder	H	Leaching
Thurmont	M	Leaching
Tifton	L	
Timberville	L	
Timberville variant	M	Leaching
Tioga	H	Leaching
Tipples	H	Shallow
Toast	L	
Toddstav	L	
Tomotley, drained	H	Drainage
Tomotley, undrained	H	Drainage
Toms	L	
Torhunta	H	Drainage
Totier	L	
Toxaway	H	Drainage
Trappist	M	Shallow
Trego	M	Leaching
Trego	L	
Trenholm	L	
Trimont	M	Leaching
Trussell	L	
Tuckahoe	M	Leaching
Tuckasegee	M	Leaching

Table 1-4
Nitrogen Loss Risk and Environmental Sensitivity Ratings for Virginia Soils & Soil Series Associated With Environmentally Sensitive Sites

Soil Series	Environmental Sensitivity	Category
Tugglesgap	L	
Tumbling	L	
Turbeville	L	
Tusquitee, coarse loamy	H	Leaching
Tusquitee, fine loamy	M	Leaching
Tygart	L	
Typic Udorthents	H	Drainage
Uchee	H	Leaching
Udalfs	H	Drainage
Udifluvents, fine loamy	H	Drainage
Udipsamments, mod well	L	
Udipsamments, well	L	
Udults, well drained	H	Drainage
Unison	L	
Unison variant	L	
Vance	L	
Vandalla	L	
Varina	L	
Vaucluse	M	Leaching
Vertrees	L	
Virgilina	L	
Wadesboro	L	
Wadesboro	L	
Wagram	M	Leaching
Wahee	L	
Wallen	H	Shallow
Walnut	H	Leaching
Wando	H	Leaching
Warminster	L	
Watahala	M	Leaching
Watauga	M	Leaching
Wateree	H	Leaching
Watt	H	Shallow
Watt variant	H	Shallow
Waxpool	L	
Waynesboro	L	
Weaver	L	
Webbtown	H	Shallow
Wedowee	L	
Weeksville	H	Drainage
Wehadkee	H	Drainage
Weikert	H	Shallow
Weikert, exc drained	H	Shallow
Westfield	L	
Westmoreland	M	Leaching
Weston	H	Drainage
Westphalia	H	Leaching
Weverton	H	Leaching
Wharton	L	
Wheeling	M	Leaching
White Store	L	
White Store variant	L	
Whiteford	M	Leaching
Wickham	M	Leaching
Wickham variant	M	Leaching
Widgett	H	Leaching
Wilkes	L	
Wingina	M	Leaching
Winnsboro	L	
Wintergreen	L	
Winton	L	
Wolfgap	M	Leaching
Wolftrap	L	
Woodington	H	Drainage
Woodstown	L	
Woolwine	L	
Worsham	L	
Worsham variant	L	
Wrightsboro	L	
Wurno	H	Shallow
Wyrick	M	Leaching
Yellowbottom	L	
Yemasse, drained	H	Drainage
Yemassee, undrained	L	
Yeopim	L	
Yogaville	H	Drainage
York	L	
Zepp	H	Leaching
Zion	L	
Zion variant	L	
Zoar	L	

Section I.C. Recommended Setback Areas

In addition to other management practices discussed in this section, animal waste or biosolids shall not be applied within the following setback areas around the specific features listed. Select the category which applies to the plan you are writing. **Plans written as part of Virginia Pollution Abatement (VPA) permits and Virginia Pollutant Discharge Elimination System (VPDES) permits which also are receiving biosolids, use the more restrictive setback of the two categories for plan development.**

❑ Setbacks for plans **not** associated with Biosolids applications, VPA permitted animal operations or DEQ industrial waste application permits.

- 100 feet from wells or springs
- 50 feet from surface water if surface applied
- 25 feet from surface water if injected
- 50 feet from sinkholes*****
- 50 feet from limestone rock outcrops
- 25 feet from other rock outcrops

***** Manure and biosolids should not be applied in such a manner that it would drain into sinkholes.

❑ Setback distances for manure applications in plans written as part of a VPA or VPDES permit for confined animal feeding operations.

- 100 feet from wells or springs
- 100 feet from surface waters (no vegetated buffer) or 35 feet with a vegetated buffer****** in place or a DEQ approved conservation practice that will achieve at least equivalent pollutant reductions.
- 50 feet from sinkholes*
- 50 feet from limestone rock outcrops
- 25 feet from other rock outcrops
- 10 feet from agricultural drainage ditches (5 feet if injected)
- 200 feet from occupied dwellings (unless waived in writing by the occupant)

***** Waste shall not be applied in such a manner that it would discharge into sinkholes.
****** Vegetated buffer is a permanent strip of dense vegetation established parallel to the contours of and perpendicular to the dominant slope of the field.

❑ Setback distances for plans containing Biosolids applications.

Minimum distances to Land Application Area*			
Adjacent Features	**Surface Application (ft)[1]**	**Incorporation (ft)**	**Winter (ft) [2]**
Occupied Dwellings	200	200	200
Water Supply wells and springs	100	100	100
Property Lines	100	50	100
Perennial streams and other surface waters except intermittent streams	50	35	100
Intermittent streams/drainage ditches	25	25	50
All improved roadways	10	5	10
Rock outcrops	25	25	25
Limestone rock outcrops and sinkholes	50	50	50
Agricultural drainage ditches with slopes equal to or less than 2.0%	10	5	10

Notes:

If slopes are greater than 7.0% and biosolids will be applied between November 16 and March 15, standard buffer distances to perennial streams other surface water bodies shall be doubled.

(1) Not plowed or disked to incorporate within 48 hours
(2) Application occurs on average site slope greater than 7.0% during the time between November 16 of one year and March 15 of the following year

The stated setbacks to adjacent property boundaries and drainage ditches constructed for agricultural operations may be reduced by 50% for subsurface application (includes same day incorporation) unless state or federal regulations provide more stringent requirements.

In cases where more than one buffer distance is involved, only the single most restrictive distance shall be used.

Section II. Soil Test Calibrations and Correlations

Table 2-1
Virginia Tech Soil Test Calibrations

Calibration of Phosphorus (P) & Potassium (K) Tests, Mehlich I
Virginia Tech Soil Testing Laboratory

Fertility Rating	P – lbs/ac	P - PPM	$P_2 0_5$ – lbs/ac*
L-	0-3	0-2	0-7
L	4-8	2-4	9-18
L+	9-11	5-6	21-25
M-	12-20	6-10	28-46
M	21-30	11-15	48-69
M+	31-35	16-18	71-80
H-	36-55	18-28	82-126
H	56-85	28-43	128-195
H+	86-110	43-55	197-252
VH	110+	55+	252+

Fertility Rating	K – lbs/ac	K - PPM	$K_2 0$ – lbs/ac*
L-	0-15	0-8	0-18
L	16-55	8-28	19-66
L+	56-75	28-38	68-90
M-	76-100	38-50	92-121
M	101-150	51-75	122-181
M+	151-175	76-88	182-211
H-	176-210	88-105	212-253
H	211-280	106-140	254-337
H+	281-310	141-155	339-373
VH	310+	155+	373+

***** Gaps exist between the fertility ratings because of the conversion from elemental lbs/ac to the phosphate and potash forms. When converting from another lab into the phosphate and potash forms choose the closest Fertility Rating to the converted value.

Virginia Tech Soil Test results - lbs/ac converted to ppm

VA Tech P lbs/ac x 0.5 = VA Tech P ppm

VA Tech K lbs/ac x 0.5 = VA Tech K ppm

Section II.A. Correlation of Soil Analysis Results for Phosphorus and Potassium between A & L Laboratory and Virginia Tech

Phosphorus: (Mehlich III Only)

A & L Phosphorus ppm X 0.50 = VA Tech - P ppm

Potassium

A & L Potassium ppm X 0.71 = VA Tech - K ppm

Section II.B. Correlation of Soil Analysis Results for Phosphorus and Potassium between Brookside Laboratory and Virginia Tech

Phosphorus: (Mehlich III)

Brookside **Easily Extractable** P_2O_5 lbs/A X 0.098 = VA Tech - P ppm

Potassium

Brookside K lbs/A X 0.36 = VA Tech - K ppm

Section II.C. Correlation of Soil Analysis Results for Phosphorus and Potassium between Logan Laboratories, Inc. and Virginia Tech

Phosphorus: (Mehlich III)

Logan Labs P_2O_5 lbs/ac. X .143 = VA Tech - P ppm

Potassium

Logan Labs K lbs/ac. X 0.40 = VA Tech - K ppm

Section II.D. Correlation of Soil Analysis Results for Phosphorus and Potassium between Spectrum Analytic, Inc. and Virginia Tech

Phosphorus: (Mehlich III)

Spectrum **Available Phosphorus (P)** lbs/ac. x 0.218 = VA Tech - P ppm

Potassium

Spectrum **Available Potassium (K)** lbs/ac. x 0.313 = VA Tech - K ppm

Section II.E. Correlation of Soil Analysis Results for Phosphorus and Potassium between Waters Agricultural Lab., Inc and Virginia Tech

Phosphorus: (Mehlich I)

Waters Lab. **Phosphorus (P)** lbs/ac. x 0.485 = Va Tech - P ppm

Potassium

Waters Lab. **Potassium (K)** lbs/ac. x 0.53 = Va Tech - K ppm

Section III. Lime Recommendations for Virginia Crops (Except Commercial Turf, Surface-Mined Area Crops, Greenhouse, and Nursery Production)

To use the following table for lime recommendations use the soil pH from the soil test, the soil texture of the predominate soils in the field, and the crop to be grown.

Use of various pH Ranges

The pH Desired-5.8 Table shows recommendations applicable to mainly tobacco and potatoes, where the lower pH is desired for the crop to be grown.

Lime rates shown for pH Desired-6.2 are recommendations that provide an adequate rate of aglime to adjust the pH to an acceptable range for Most Crops agronomic crops.

pH Desired – 5.8 (Tobacco)

pH of Unlimed Soil	Soil Type		
	Sandy	Loamy	Clayey
	Lime, Tons/acre		
4.8	2.25	3.0	3.5
5.0	1.75	2.5	3.0
5.2	1.25	2.0	2.5
5.5	0.75	1.25	1.5

pH Desired – 6.2 (Most Field Crops)

pH of Unlimed Soil	Soil Type		
	Sandy	Loamy	Clayey
	Lime, Tons/acre		
4.8	3.00	3.75	4.25
5.0	2.50	3.25	3.75
5.5	1.25	1.75	2.25
6.0	0.0	0.0	0.0

pH Desired – 6.8 (Alfalfa)

pH of Unlimed Soil	Soil Type		
	Sandy	Loamy	Clayey
	Lime, Tons/acre		
4.8	4.25	5.75	7.0
5.0	4.0	5.25	6.25
5.5	3.0	4.0	4.75
6.0	2.0	2.75	3.25
6.5	1.25	1.5	2.0
Greater than 6.5	0.0	0.0	0.0

The pH Desired-6.5 table may be used to determine maximum rates for lime stabilized biosolids applied **inside** the Coastal Plain area. This table shows higher rates of lime stabilized biosolids, than would normally be applied to meet the lime requirement, to get more use out of the other nutrients contained in the biosolids. Exceeding the rates shown for Desired pH - 6.5, may exceed the desirable pH range, and this may cause induced

deficiencies of some nutrients while increasing availability of other nutrients to a toxic level for the crop being grown.

The pH Desired-6.8 table may be used to determine maximum rates for lime stabilized biosolids outside the Coastal Plain area of Virginia. This table shows higher rates of lime stabilized biosolids than would normally be applied to meet the lime requirement for most agronomic crops, to get more use out of the other nutrients contained in the biosolids. Exceeding the rates shown for Desired pH-6.8 may exceed the desirable pH range and this may cause induced deficiencies of some nutrients while increasing availability of other nutrients to a toxic level for the crop being grown.

While these tables allow a higher than normal application of lime, application rates of biosolids can not exceed the nitrogen or phosphorus needs, which ever is less, as established in the nutrient management plan.

pH Desired – 6.5 (Coastal Plain)

pH of Unlimed Soil	Soil Type	
	Sandy	Loamy & Clayey
	Lime, Tons/acre	
4.8	3.5	4.5
5.0	3.0	3.75
5.5	1.75	2.5
6.0	1.25	1.5
6.3	0.75	1.0
Greater than 6.3	0.0	0.0

pH Desired – 6.8 (Outside Coastal Plain)

pH of Unlimed Soil	Soil Type	
	Sandy	Loamy & Clayey
	Lime, Tons/acre	
4.8	4.25	5.75
5.0	4.0	5.25
5.5	3.0	4.0
6.0	2.0	2.75
6.5	1.25	1.5
Greater than 6.5	0.0	0.0

Grouping of Soil textures for Lime Recommendation Table:

Sandy - Sand, Loamy Sand, Sandy Loam
Loamy - Loam, Silt Loam, Silt, Sandy Clay Loam, Clay Loam, Silty Clay Loam
Clayey - Silty Clay, Clay, Organic Soils

Limestone Application Methods

Applications of 2 tons or less per acre - Adding this amount in a single application either before or after plowing will usually give best results. Limestone applied before plowing should be disked into the soil and then plowed. Limestone applied after plowing should be disked into the soil as thoroughly as possible.

Applications of more than 2 tons per acre - For the best results, apply one-half of the limestone, disk into the soil, plow under and then apply the second-half and disk into the soil. This method offers the best incorporation of limestone into the soil and is particularly important when the soil pH is very low and large amounts of limestone are needed.

For no-till cropping systems - Where incorporation of limestone is not possible, single applications should be limited to no more than 2 tons per acre. Where more than 2 tons per acre are recommended (indicating very low pH), limestone should be incorporated as mentioned above for best results. If incorporation is not feasible, apply one-half the total amount one year and the other half the next year.

Time of application - The best time to apply limestone is several months ahead of planting. This allows for more complete reaction of the limestone with the soil. However, if this cannot be done, apply it as early as possible, before the crop is planted. Failing to apply limestone because it could not be applied at the best time is worse than applying it late.

Source: Soil Test Notes, Virginia Tech, Extension Division, Soil Testing Laboratory, MA-232, April 1979.

Lime Recommendations Using Other Testing Labs

The lime recommendation tables shown above should be applied to labs using a 1:1 water pH test to get the soil pH value, which would be Brookside Laboratories, Spectrum Analytical, and Waters Agricultural Lab. For Virginia Tech samples showing only a Soil pH test use the above lime recommendation table as well. For Virginia Tech soil samples showing a soil pH and a buffer pH use the table designated as Virginia Tech Lime recommendations using the Buffer pH Method. Recommendations may be made using the VPI&SU chart contained in this section or the lime recommendations made by the testing lab. Whichever methods are used, planners should consistently use that method throughout the plan. It would be wise to make a note either in the narrative or on the balance sheet of which method the planner used so that when the plan is updated, the same method will continue to be used.

Section IV. Phosphorus Management

Phosphorus application rates shall be managed to minimize adverse water quality impacts consistent with procedures contained in this section.

- ❑ Phosphorus applications from inorganic nutrient sources shall not exceed crop nutrient needs over the crop rotation based on a soil test.

- ❑ Phosphorus applications shall be indicated as zero in nutrient management plans for soils exceeding specified phosphorus saturation levels as listed in Table 4-1 regardless of the outcome of other procedures specified in this section. The specified phosphorus saturation levels pertain to the following plan development dates: (i) 65% for plans developed after 12/31/2005 through 12/31/2010; and (ii) 50% for plans developed after 12/31/2010.

Table 4-1
Virginia Tech Mehlich 1 Phosphorus (as ppm P) for Specified Virginia Phosphorus Saturation Levels where Phosphorus Shall Not be Applied
(Must use approved conversion factors if results are from another lab)

	Plan Development Date	
Pasture/Hayland	**After 12/31/05 65% Saturation**	**After 12/31/10 50% Saturation**
Region	**Soil Test P (ppm)**	**Soil Test P (ppm)**
Eastern Shore and Lower Coastal Plain	197	137
Middle and Upper Coastal Plain and Piedmont	266	175
Ridge and Valley	373	225

	Plan Development Date	
Continuous No-till	**After 12/31/05 65% Saturation**	**After 12/31/10 50% Saturation**
Region	**Soil Test P (ppm)**	**Soil Test P (ppm)**
Eastern Shore and Lower Coastal Plain	246	172
Middle and Upper Coastal Plain and Piedmont	333	218
Ridge and Valley	466	281

	Plan Development Date	
All Others	**After 12/31/05 65% Saturation**	**After 12/31/10 50% Saturation**
Region	**Soil Test P (ppm)**	**Soil Test P (ppm)**
Eastern Shore and Lower Coastal Plain	295	206
Middle and Upper Coastal Plain and Piedmont	399	262
Ridge and Valley	560	337

Note: All Soil Test P values in this table are shown as elemental phosphorus, expressed as a Virginia soil test value. Section II. provides conversion formulas for approved labs.

- ❑ A single phosphorus application may be recommended to address multiple crops in the crop rotation identified within the nutrient management plan if the single application does not exceed the sum of the appropriate application rates for individual crops as determined by this subsection.

For fields that do not exceed the maximum phosphorus saturation levels in the previous tables, one of the following options must be used to determine maximum organic nutrient source phosphorus applications for fields contained in nutrient management plans. The Environmental Threshold and the Virginia Phosphorus Index Version 1.3 Technical Guide, Revised March 2005 are only applicable to organic nutrient sources. Additionally, plant available nitrogen in nutrient management plans shall not exceed the crop nutrient needs for any individual crop.

Soil Test Method

With this method phosphorus recommendations are made using: (1) the soil test level for the field and (2) recommendations for the crop as shown in Section V.

Environmental Threshold Method

Table 4-2 can be used for phosphorus applications of organic nutrient containing materials.

Table 4-2
Phosphorus Environmental Thresholds

Eastern Shore and Lower Coastal Plain	
VPI&SU Soil Test (Mehlich I) P ppm	**Maximum Phosphorus Application Rate**
<55	Nitrogen Based
55 - 127	1 X Crop Removal
>127	No Phosphorus Applications

Middle and Upper Coastal Plain and Piedmont	
VPI&SU Soil Test (Mehlich I) P ppm	**Maximum Phosphorus Application Rate**
<55	Nitrogen Based
55- 148	1 X Crop Removal
>148	No Phosphorus Applications

Ridge and Valley	
VPI&SU Soil Test (Mehlich I) P ppm	**Maximum Phosphorus Application Rate**
<55	Nitrogen Based
55 - 165	1 X Crop Removal
>165	No Phosphorus Applications

An index to counties and cities by region can be found in the Virginia Phosphorus Index Version 1.3 Technical Guide, Revised March 2005.

Other laboratories results shall only be used if conversion factors are published in Virginia Nutrient Management Standards and Criteria, Revised 2005 and the appropriate conversion factor is utilized.

The Virginia Nutrient Management Planning P_2O_5 Removal Table for Grain and Forage Crops, Table 4-7, must be used to calculate the crop removal of phosphorus in this method.

Phosphorus Index Method

This method consists of a series of calculations to determine a Phosphorus Index Value which is then used to determine a management strategy for organic nutrient sources containing phosphorus which are to be applied to cropland. The complete description of the Phosphorus Index methodology with supporting instructions and data tables is found in Virginia Phosphorus Index Version 1.3 Technical Guide, Revised March 2005. The determination of acceptable phosphorus rates of application with this method must be consistent with the Virginia Phosphorus Index Version 1.3 Technical Guide, Revised March 2005 unless otherwise specified below. Any uses of the term "should" contained in the "Summary Interpretation of Phosphorus Index" table and in Table 2 – "Screening criteria based on phosphorus saturation levels for application of the Virginia Phosphorus Index", as contained in the Virginia Phosphorus Index Version 1.3 Technical Guide, Revised March 2005 must be treated as "shall" (mandatory requirements) by certified nutrient management planners.

Phosphorus Index Formula

(Erosion Risk Factor* X 6.3)

+ (Runoff Risk Factor X 6.3)

+ (Subsurface Risk Factor X 6.3) =

Phosphorus Index Value

Table 4-3

Interpretation of Phosphorus Index Value		
P Index Value	**Potential Water Quality Impact**	**Phosphorus Management Strategy based on factors used in P-Index calculations**
0-30	Low	Nitrogen cannot exceed N needs; Phosphorus applications should be managed to reduce adverse water quality impacts.
31-60	Medium	Nitrogen cannot exceed N needs; Phosphorus applications shall not exceed 1.5 times crop removal**
61-100	High	Nitrogen cannot exceed N needs; Phosphorus applications shall not exceed crop removal**
> 100	Very High	Nitrogen cannot exceed N needs; no Phosphorus shall be applied during the life of the plan

***** In the Erosion Risk Factor calculation of the Phosphorus Index the soil loss must be determined by using either the RUSLE 2 method or the "Erosion Risk Assessment Procedure (ERA)" outlined below. If soil loss for use in the Phosphorus Index is developed using RUSLE2, the crop rotations and tillage

practices in the nutrient management plan shall be consistent with RUSLE2 inputs as documented on the RUSLE2 Profile Erosion Calculation Record.

****** Phosphorus crop removal may be calculated as an application to meet each crop need or a single application per rotation to meet the total removal of all the crop needs for that rotation within the valid life of the nutrient management plan**.** The Virginia Nutrient Management Planning P_2O_5 Removal Table for Grain and Forage Crops, Table 4-7, must be used to calculate the crop removal of phosphorus in this method.

Erosion Risk Assessment Procedure (ERA)

This following procedure may be used to determine the ERA soil loss value which can be substituted for the soil loss value in the Erosion Risk Factor equation, which is part of the Phosphorus Index determination. **NOTE:** This Erosion Risk Assessment can only be used to determine this factor and should not be substituted for the RUSLE 2 soil loss method in any other program.

$[\Sigma$ (Map Unit TC_i x Map Unit SE_i x %Map Unit)] x TM = Erosion Risk Assessment (ERA)

Where: **TC -** Topography and Climate Factor
SE - Soil Erosion Factor
TM - Tillage Management Factor

For each field, estimate the area for each soil map unit and use the table below as a template to calculate the Topography and Climate Factor and Soil Erosion Factor, using the tables provided, as a weighted average for the field, then apply the remaining factor to the entire field.

Table 4-4
Erosion Risk Assessment Formula

Topography & Climate (TC)	X Soil Erosion (SE)	X % Area of Field = Subtotal (express as a decimal)	
		0. _ _	
		0. _ _	
		0. _ _	
		0. _ _	
Total of Weighted Averages for TC and SE			

_____ x TM = _____ Tons/ac. (ERA soil loss value)

ERA-TC Factors

These factors represent a combination of the Topography and Climate factors for the areas of Virginia listed below designated by map unit slope.

Table 4-5
Topography and Climate Factors

Coastal Plain (East of I-95)

Soil Survey Map Unit Slope	Hay/Pasture TC	Crop TC
A	.40	.44
B	1.24	1.41
C	2.48	2.78
D	4.35	4.92
E	7.80	8.57
F	11.58	10.87

Northern Piedmont (North of James River-West of I-95)

Soil Survey Map Unit Slope	Hay/Pasture TC	Crop TC
A	.29	.33
B	.96	1.17
C	2.40	2.67
D	4.63	5.17
E	7.17	7.20
F	11.33	11.07

Southern Piedmont (South of James River-West of I-95)

Soil Survey Map Unit Slope	Hay/Pasture TC	Crop TC
A	.33	.37
B	1.08	1.32
C	2.69	3.00
D	5.20	5.80
E	8.05	8.09
F	12.72	12.43

Mountain and Valley

Soil Survey Map Unit Slope	Hay/Pasture TC	Crop TC
A	.26	.28
B	.85	.97
C	2.19	2.40
D	4.35	4.59
E	7.99	8.42
F	11.20	11.25

SE Factor

This factor represents the soil erodibility factor based on soil texture and designated by county and map unit symbol. The SE factor is determined by using the K factor for specific soils found in the USDA-NRCS electronic Field Office Technical Guide.

ERA - TM Factors

This factor represents the Tillage Management designated by crop or crop rotation being grown.

Table 4-6
Tillage Management

Annual Crop Rotation	Tilled	Mixed *	No-till
Corn Silage - Continuous	30	-	15
Corn Silage / Small Grain.Silage	22	19	16
Corn Silage / Small Grain	18	9	7
Corn Grain - Continuous	12	-	3
Corn Grain / Small Grain	6	5	1
Corn Grain / Small Grain Silage	13	7	6
Small Grain / DC Soybeans	10	6	4
Soybeans – Full Season	17	-	8
Peanuts	19	-	-
Peanuts / Small Grain	11	8	3
Cotton	20	-	12
Cotton / Small Grain	11	8	3
Tobacco	46	-	-
Tobacco / Small Grain	30	25	18
Vegetables	35	-	16
Vegetables / Small Grain	20	16	8
Other Row Crops (Grain)	17	-	8
Other Summer Annuals with Small Grain	13	8	7
Other Summer Annuals with Small Grain Silage	22	19	16
Hay – Legume (maintenance)	-	-	2
Hay – Grass or Mixed (maintainance)	-	-	1
Pasture < 50% cover or heavily grazed	-	-	4
Pasture 50-75% cover not heavily grazed	-	-	2
Pasture >75% cover and lightly grazed	-	-	1
Hay or Pasture Establishment**	11	-	3

***Mixed** = double crop with one crop tilled and one crop no-till
**Fall Establishment-use previous crop sequence TM Factor or Establishment Factor – whichever is greater. For Spring Establishment use number shown.

- The TM factor is determined by the rotation and the tillage types, regardless of the beginning season of the plan.

(Notes continued on next page)

- Add the TM factor for each year of the rotation, not to exceed a three year plan life, and divide by the number of years to determine the TM factor to be used for that field during the life of the plan.
- If the crop rotation is not included in the table above, RUSLE 2 must be used to determine the soil loss for that rotation.
- If tillage or crop rotation is changed, the TM must be re-calculated and the P-Index must be re-calculated.
- Corn Grain assumes all stalks remain on field after harvest.
- Small Grain = cover crop or grain harvest only, no straw removal. If straw is removed use silage TM Factor

Table 4-7
Virginia Nutrient Management Planning P_2O_5 Removal Table for Grain and Forage Crops

Use the following table to determine the pounds of P_2O_5 removed per unit of harvest.

CROP	YIELD UNIT	LBS P_2O_5 PER YIELD UNIT
GRAINS		
Barley (cover crop)	NA	0
Barley	bushels	0.40
Barley straw (per bushel grain)	bushels	0.11
Barley-soybean dbl crop	bushels	**
Buckwheat	bushels	0.37
Canola	bushels	1.3
Corn	bushels	0.40
Oat (cover)	NA	0
Oat	bushels	0.30
Oat straw (per bushel grain)	bushels	0.09
Proso millet	bushels	0.39
Rye (cover crop)	NA	0
Rye	bushels	0.44
Rye straw (per bushel grain)	bushels	0.17
Sorghum	bushels	0.4
Soybean	bushels	0.8
Sunflower	tons	27
Triticale	bushels	0.39
Wheat (cover crop)	NA	0
Wheat	bushels	0.5
Wheat straw (per bushel grain)	bushels	0.11

CROP	YIELD UNIT	LBS P_2O_5 PER YIELD UNIT
SILAGE *		
Barley silage	tons	5.1
Corn silage	tons	4.0
Grass silage	tons	3.7
Oats silage	tons	5
Rye silage	tons	5.6

Table 4-7
Virginia Nutrient Management Planning P_2O_5 Removal Table for Grain and Forage Crops

CROP	YIELD UNIT	LBS P_2O_5 PER YIELD UNIT
SILAGE *		
Sorghum silage	tons	3
Soybean silage	tons	10
Wheat silage	tons	4.2

CROP	YIELD UNIT	LBS P_2O_5 PER YIELD UNIT
FORAGES *		
Alfalfa hay	tons	12.5
Alfalfa-grass hay	tons	12.5
Bermudagrass hay	tons	10.4
Bermudagrass pasture	NA	****
Birdsfoot trefoil	tons	21
Bluegrass	tons	18
Bromegrass	tons	13
Bluestem species	tons	10
Clover and grass	tons	14
Fescue grass hay	tons	16
Fescue grass-Ladino Clover hay,	tons	14
Gamagrass	tons	11
Hay/Pasture	***	16
Hairy vetch	tons	14
Indiangrass	tons	10
Legume cover crop	NA	0
Lespedeza	tons	10
Millet	tons	8.4
Native/unimproved pasture	NA	****
Orchardgrass hay	tons	16
Orchardgrass hay-Ladino clover	tons	16
Orchardgrass/Fescue pasture	NA	****
Perennial ryegrass	tons	17
Red clover	tons	10
Red clover-grass hay	tons	14
Reed canarygrass	tons	12

Table 4-7
Virginia Nutrient Management Planning P_2O_5 Removal Table for Grain and Forage Crops

CROP	YIELD UNIT	LBS P_2O_5 PER YIELD UNIT
FORAGES *		
Small grain hay	tons	10
Sorghum	tons	8.4
Sorghum x sudangrass (Sudax)	tons	10
Sorghum-sudan, millet, sudan (hay)	tons	10
Soybean and sorghum	tons	9.2
Soybean hay	tons	10
Soybean and millet	tons	9.2
Soybean and Sudangrass	tons	10
Switchgrass	tons	10
Sudangrass	tons	10
Tall fescue hay	tons	16
Timothy	tons	14
Weeping lovegrass	tons	10

CROP	YIELD UNIT	LBS P_2O_5 PER YIELD UNIT
SEED CROPS		
Crimson clover seed	pounds	0.018
Lespedeza seed	pounds	0.016
Red clover seed	pounds	0.016
White clover	pounds	0.030

CROP	YIELD UNIT	LBS P_2O_5 PER YIELD UNIT
VEGETABLES		
Asparagus	cwt	0.13
Beet (root)	cwt	0.092
Beet (top)	cwt	0.12
Broccoli	cwt	0.18
Brussels sprout	cwt	0.29
Cabbage	tons	1.8
Carrot	cwt	0.092
Cauliflower	cwt	0.14
Celery	cwt	0.083

Table 4-7
Virginia Nutrient Management Planning P_2O_5 Removal Table for Grain and Forage Crops

CROP	YIELD UNIT	LBS P_2O_5 PER YIELD UNIT
VEGETABLES		
Chive	cwt	0.12
Collard	cwt	0.13
Cucumber	tons	1.1
Eggplant	cwt	0.050
Endive	cwt	0.051
Escarole	cwt	0.032
Garlic	cwt	0.39
Kale	cwt	0.13
Leek	cwt	0.080
Lettuce (head)	cwt	0.79
Lettuce (leaf)	cwt	0.10
Lima bean	cwt	0.34
Mustard green	cwt	0.10
Okra	cwt	0.15
Onion (dry)	cwt	0.60
Onion (green)	cwt	0.084
Parsley	cwt	0.092
Parsnip	cwt	0.16
Pea	cwt	0.57
Pepper	cwt	0.066
Potato	cwt	0.14
Pumpkin	tons	1.7
Radish	cwt	0.064
Rutabaga	cwt	0.092
Snap bean	cwt	0.23
Spinach	cwt	0.15
Squash (summer)	cwt	0.064
Squash (winter)	cwt	0.079
Sweet corn	cwt	0.14
Sweet potato	cwt	0.12
Tomato	tons	2.0
Turnip (root)	cwt	0.065
Turnip (green)	cwt	0.14

Table 4-7
Virginia Nutrient Management Planning P_2O_5 Removal Table for Grain and Forage Crops

CROP	YIELD UNIT	LBS P_2O_5 PER YIELD UNIT
FRUITS		
Apple	bushels	0.020
Grape	tons	2.0
Honeydew melon	tons	1.3
Muskmelon	tons	3.5
Peach	bushels	0.033
Watermelon	tons	0.47
Strawberry	cwt	0.043

CROP	YIELD UNIT	LBS P_2O_5 PER YIELD UNIT
MISCELLANEOUS		
Cotton (seed & lint)	tons	26
Cotton (stalk, leaf & bur)	tons	10
Tobacco (leaf & stalk - based on harvest leaf weight)	lb leaves	.009

NOTES:

***** Use 1/2 of the yield from VALUES if planted in the spring, 0 if planted in the fall, to calculate crop removal for the establishment year.

****** For double crops, add removal for each crop

******* Use 2/3 hay yield from VALUES or use the actual yield from field records, to calculate crop removal.

******** 30 lbs P_2O_5 Removal for Productivity Group I
30 lbs P_2O_5 Removal for Productivity Group II
25 lbs P_2O_5 Removal for Productivity Group III
20 lbs P_2O_5 Removal for Productivity Group IV

Section V. Crop Nutrient Recommendations (VALUES)

Phosphorus and Potash recommendations in this table are based on soil test results.

Corn Grain Recommendations*

Productivity Group	N Recommendation
IA	180
IB	170
IIA	160
IIB	150
IIIA	140
IIIB	130
IVA	120
IVB	100
V	80

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L	80 -120	80 -120
M	40 - 80	40 - 80
H	20 - 40	20 - 40
VH	0	0

***See nitrogen management explanation after Corn Silage Recommendations.**

Corn Silage Recommendations*

Productivity Group	N Recommendation
IA	200
IB	185
IIA	175
IIB	165
IIIA	155
IIIB	145
IVA	130
IVB	110
V	90

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L	80 - 120	160 - 240
M	40 - 80	80 - 160
H	20 - 40	40 - 80
VH	0	0

***See nitrogen management explanation after Corn Silage Recommendations.**

Nitrogen Management Recommendations for Corn

On soils with a High nitrogen loss risk, at least 50% of the inorganic nitrogen applications shall be applied as a sidedress application. On Moderate and Low nitrogen loss risk soils this management method is preferred, but not required. The combination of row starter, at planting nitrogen applications and sidedress applications cannot exceed the nitrogen need listed for that crop in that field.

Fields which contain high environmental risk soils for nitrogen loss where organic nutrient sources are used to meet most of the nitrogen need for corn shall include a split application of nitrogen which is at least 33% of the nitrogen needs to be applied as a sidedress application. If no pre-plant nitrogen will be broadcast and planting conditions exist where the cold soil temperatures may be limiting mineralization of nitrogen, starter nitrogen may aid in plant establishment and early season growth. Starter nitrogen any pre-plant nitrogen plus the plant available nitrogen supplied from the organic sources cannot exceed the nitrogen needs shown in the plan for that field.

Irrigated Corn

These expected yields and nitrogen recommendations should not be used for manure irrigation unless supplemental clean water irrigation is utilized since manure applications should usually occur prior to the times of peak moisture demand by crops to allow time for mineralization, and the quantity of water supplied would probably be insufficient.

Expected Corn Yield, BU/AC	Soil Management Groups	N Recommendation
210	A,B,D	210
200	C,E,F,G,J,K,L,M,N,O,Q,R,S,T	200
190	I,DD	190
180	V,W,X	180
170	AA,BB,II	170
160	Y	160
140	KK	140

Irrigation of soils in the following soil management groups is not recommended; factors other than water-holding capacity may be the yield limiting factor; H, P, U, Z, CC, EE, FF, GG, HH, LL, MM, NN, OO, PP, QQ. Use dryland yields in Table 1-2.

The following criteria is recommended for all irrigated. Nitrogen use efficiency by irrigated corn can be increased by splitting the total sidedress rate of nitrogen into two applications, with the second of the two applications occurring just before the corn is too tall to drive through with the application equipment. If this second application is applied through system, it should be applied about 7-10 days before silking.

For traveling gun systems, yield response will be highly variable depending upon management of the system. A reasonable estimate of planning yield is 90% of the above estimates for properly scheduled irrigation. If historical yields are available, their use is preferred. An average of the high three yields in the last five years should be used.

Phosphorus and Potash Recommendations for irrigated corn fields as defined above.

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L	130 - 170	130 - 170
M	80 - 120	80 - 120
H	30 - 70	30 - 70
VH	0	0

Pre-Sidedress Soil Nitrate Test (PSNT)

Sample collection essentials for PSNT for corn:

Select fields where organic sources of nitrogen have been applied, according to the timing criteria listed in the Virginia Nutrient Management Training and Certification Regulations under Nutrient Application Timing, to supply nitrogen to the present corn crop

Sample collection - At least 10-20 cores per field, 12 inches deep, between rows to avoid starter bands and areas where roots have not depleted nitrogen

Sample time - corn should be 10" to 15" tall at the whorl as it stands, **NOT** to the tallest part of the plant.

Only **one** of the following options can be used to determine sidedress rate adjustment in any one season, based on the criteria outlined for each option. **Only** Option One can be used for sidedress rate adjustment if relatively "normal" weather conditions have occurred up to sidedress time.

Option 1 - Adjustment of Nitrogen Sidedress Recommendations

Nitrogen needs and timing of applications for corn shall be calculated based on criteria outlined in section VAC 5-15-150.A.2.e. of the Virginia Nutrient Management Training and Certification Regulations. When organic nutrient sources have been used to supply a significant portion of the nitrogen need and a nitrogen sidedress application rate has been recommended, the PSNT results and the guidance below shall be used to adjust the sidedress rate when applicable. This guidance should be used as one factor along with rate of organic material applied, field history, seasonal conditions, and an understanding of the effects of soil properties and management practices related to nitrogen availability to corn to adjust the sidedress Nitrogen rate stated in
the nutrient management plan to improve the economics of crop production and enhance water quality.

Nitrate-N Conc.	N Rate Recommendation
< 11 ppm	Apply full rate of sidedress N that is specified for the field in the nutrient management plan.
11-20 ppm	Apply 50 - 75% of sidedress N that is specified for the field in the nutrient management plan. The decision to reduce the recommended nitrogen rate must be made on a site-by site basis and should take into account previous field history, organic N additions, and management practices.
> 20 ppm	Nitrate nitrogen at a level to meet the yield goal without any sidedress nitrogen needed.

Option 2 - Adjustment of Nitrogen Sidedress Recommendations Considering Extreme Weather

If extreme weather conditions occur, such as two of more rainfall events exceeding 2"+ since the nitrogen application, which have caused significant amounts of nitrogen to be leached below the root zone or mineralization of organic nitrogen sources are much lower than expected, a one time corrective nitrogen sidedress application can be made consistent with the following table if: a) nitrogen applications have been made such that rate and timing of applications have been consistent with the criteria in 4VAC 5-15-150, b) and corn shows visual signs of nitrogen deficiency, c) and a PSNT indicates NO_3-N is below 20 ppm in the top 12" of the field.

Nitrate-N Conc.	N Rate Recommendation
< 6 ppm	Apply planned sidedress N that is specified for the field **OR** 50% of the nitrogen needs shown in the nutrient management plan for that field, whichever is greater.
6 - 11 ppm	Apply planned sidedress N that is specified for the field **OR** 40% of the nitrogen needs shown in the nutrient management plan for that field, which ever is greater.
12 - 20 ppm	Apply 50 - 75% of sidedress N that is specified for the field **OR** 30% of the nitrogen needs shown in the nutrient management plan for that field.
> 20 ppm	Nitrate nitrogen at a level to meet the yield goal without any sidedress nitrogen needed.

Grain Sorghum

Productivity Group	N Recommendation
IA	140
IB	130
IIA	120
IIB	110
IIIA	100
IIIB	90
IVA	90
IVB	90
V	80

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L	80 -120	80 -120
M	40 - 80	40 - 80
H	20 - 40	20 - 40
VH	0	0

Soybeans - All Productivity Groups

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L	80 -120	80 -120
M	40 - 80	40 - 80
H	20 - 40	20 - 40
VH	0	0

Small Grain Management Options: Choose recommendations based on the intended use of the crop by the farmer.

1. Cover Crop - this crop is grown for the sole purpose of scavenging any residual nitrogen from the previous crop due to lower than expected yield or mineralization of applied organic nutrient materials to the previous crop is expected to occur after the crop is harvested.

2. Small Grain Silage - this crop is planted for the intended purpose of harvest in early Spring for silage. Similar Fall tiller management practices should be applied as used in Standard/Intensive Management of Wheat and Barley.

3. Wheat and Barley: Standard/Intensive Grain Production- this crop is to be managed based on a program to maximize grain yield by planting within the window of acceptable dates according to location within the state, careful tiller management through the Fall and Winter months and Spring split application rates of nitrogen based on tiller counts and tissue tests.

4. Small Grain Trap Crop - the purpose of this crop is to provide fields which can receive manure, biosolids, or other organic nutrient source applications through the fall and winter months for management of limited storage facilities of these materials. The crop may be used as mulch cover or harvested, however, achieving a harvestable crop with acceptable yield is not the primary purpose of this management practice, and should NOT be substituted the standard/intensive management program or the silage program.

Nutrient Recommendations by Small Grain Program

Cover Crop

Crop should be planted early enough in the Fall to be quickly established after the harvested crop from which expected residual nitrogen release may be substantial. Nutrients from any source shall NOT be applied to this crop, unless it is within acceptable criteria of timing for a Spring planted crop.

Nutrient Recommendations (lbs/ac)

Nitrogen	P_2O_5	K_2O
0	0	0

Cereal Grain Trap Crop

The propose of the following recommendations are to provide fields which can receive manure, biosolids and other organic nutrient source applications through the fall and winter months for management of storage facilities. This program is **NOT** intended to be used for Intensive Small Grain recommendations or for Small Grain silage recommendations.

1. Eligible Fields:

a. Acceptable small grains are barley, wheat, rye, triticale
b. Seeding of all seed types must be established by the dates indicated in the table below.

Region	Established Date
Cites of Chesapeake & VA Beach	November 30
Coastal Plain	November 15
Piedmont	November 1
Mountain and Valley	October 25

2. Fall - Winter Nitrogen Rates

Nitrogen rates will be calculated Using Spring or Early Fall Applied Coefficients for Manures and Year of Application Coefficient for Biosolids to calculate the PAN for the organic fraction and appropriate coefficient for PAN ammonium fraction for all materials.

Nutrient Recommendations (lbs/ac)

Nitrogen	P_2O_5	K_2O
0-40	0	0

3. Late Winter - Early Spring Nitrogen Rates

a. Trap crop will be killed before Spring Crop is planted ⊘ No Nitrogen applied

OR

b. Trap crop will be harvested for silage:

Triticale - Maximum of 70 lbs/ac.
Rye - Maximum of 70 lbs/ac.
Wheat - Maximum of 60 lbs/ac.
Barley - Maximum of 50 lbs/ac.

OR

c. Trap crop will be harvested for grain - Follow recommendations in table below. **Warning** - Using maximum N rates listed in table below may cause lodging of crop when a high rate of Nitrogen was applied in the Fall.

(Feb. - Early March)	Tiller Count:	N Recommendation
Single Application:	<70/sq. ft.	80 lbs/acre-Feb.(Growth Stage 25)
	>100; plants dark green; tissue N levels >3.75%	30-40 lbs/acre-late March (Zadoks Growth Stage 30)
Split Application:		
February (Zadoks Growth Stage 25)	<60/sq. ft.	60 lbs N/acre
	60-100/sq. ft.	40 lbs N/acre
	>100/sq. ft. and dark green color	none; tissue test at growth stage 30
March (growth stage 30 tissue test)		No more than 120 lbs N/acre -**total of Growth Stages 25 and 30**

Rye Grown for Grain

1. Soil productivity groups are the same as for wheat and barley

2. Nitrogen recommendations:

   a. At planting - 25-30 lbs N/acre

   b. Late winter - a single application made in February
      (1) For grain production - 45 lbs N/acre

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L	80 -120	80 -120
M	40 - 80	40 - 80
H	20 - 40	20 - 40
VH	0	0

Small Grain for Silage

1. Soil productivity groups same as for wheat and barley

2. Nitrogen recommendations:

   a. At planting - 0-30 lbs N/acre
      - use lower rate on fields, which will be timely planted, with a history of frequent manure applications, and good growing conditions are expected 10 days after planting.

   b. Late winter - a single application made in February
      (1) Triticale, Rye, Wheat silage production - 40-90 lbs N/acre
      (2) Barley silage production - 40-70 lbs N/acre
         (a) Preferred application period would be after green-up occurs and before first joint has emerged.
         (b) Use lower rates on field which are well established, have dark green color, and a history of lodging.

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L	80 -120	80 -120
M	40 - 80	40 - 80
H	20 - 40	20 - 40
VH	0	0

Wheat and Barley for Grain - Nitrogen Management Applications

Standard/Intensive

1. At planting:

    a. With NO_3^- soil test from top 6 inches measuring above 30 ppm, no nitrogen needed at planting.

    b. If soil test is below 30 ppm, apply 15-30 pounds of nitrogen.
    c. Without NO_3^- soil test results:

        (1) Conventional tillage: broadcast and incorporate 1-2 inches, 25-30 lbs N/acre during land preparation for planting. Reduce N application if high residual N levels are expected.

        (2) No-till: broadcast 30-40 lbs N/acre shortly before planting, if heavy residue (60% or greater cover) is present. Follow N recommendations for conventional planting if light residue (less than 60% cover) or no residue is present.

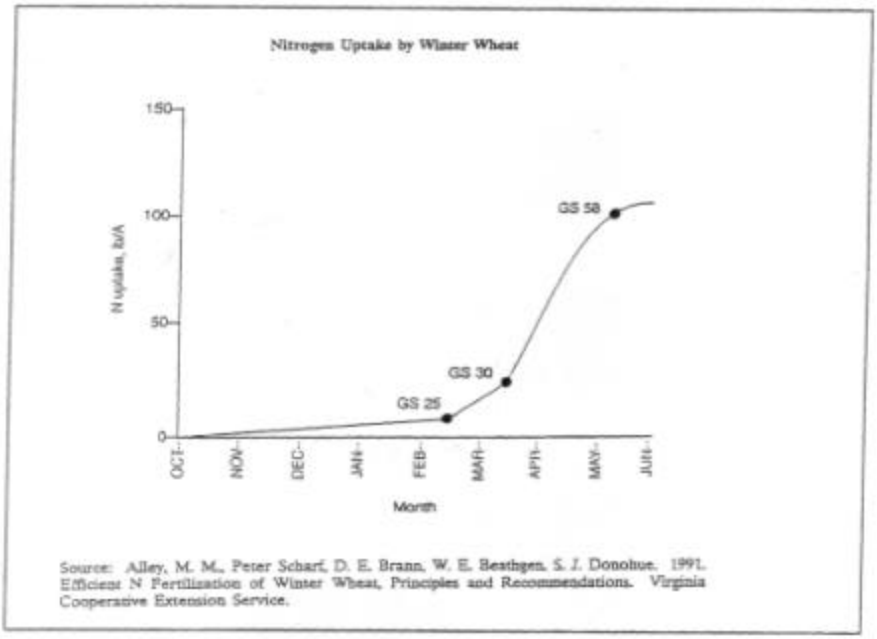
Intensive Management Only

2. Midwinter (December-January)

    If:

    a. Significant leaching rains have occurred during the October-December period, i.e., two or more rainfall events of 2.0 inches or more, and
    b. there has been very little tiller development, i.e., less than 3 tillers per plant, and the crop has a pale green color, and
    c. there is an expectation of several days during January and February when maximum daily temperature will exceed 50^0F; **apply:** 30 lbs N/acre as a topdress.

Figure 5-1



Source: Alley, M. M., Peter Scharf, D. E. Brann, W. E. Beathgen, S. J. Donohue. 1991. Efficient N Fertilization of Winter Wheat, Principles and Recommendations. Virginia Cooperative Extension Service.

Management of Spring Nitrogen

3. Late Winter (February-early March)

   a. Single Spring application of N, (Standard management):

      (1) Fields with less than 70 tillers per sq.ft., **apply** 80 lbs/acre in February. Fertilize those fields with less than 60 tillers per sq.ft. first.

      OR

      (2) Fields with 70 to 100 tillers per sq.ft., and plants are pale green and tissue test levels are lower than 3.75%, **apply:** 60 lbs/acre in February.

      OR

      Fields have 70 to 100 tillers per sq.ft., plants are dark green and N tissue test levels are 3.75% or higher, **apply:** 30-40 lbs/acre in late March (Zadoks growth stage 30.)

      OR

      (3) Fields have more than 100 tillers per sq.ft., plants are dark green and tissue test levels are 3.75% or higher **apply:** 30-40 lbs/acre in late March (Zadoks growth stage 30.)

   b. Split applications of Spring N (Intensive small grain management):

      (1) February (Zadoks growth stage 25.)

         (a) Fields with less than 60 tillers per sq. ft. - apply 60 lbs N/acre.

         OR

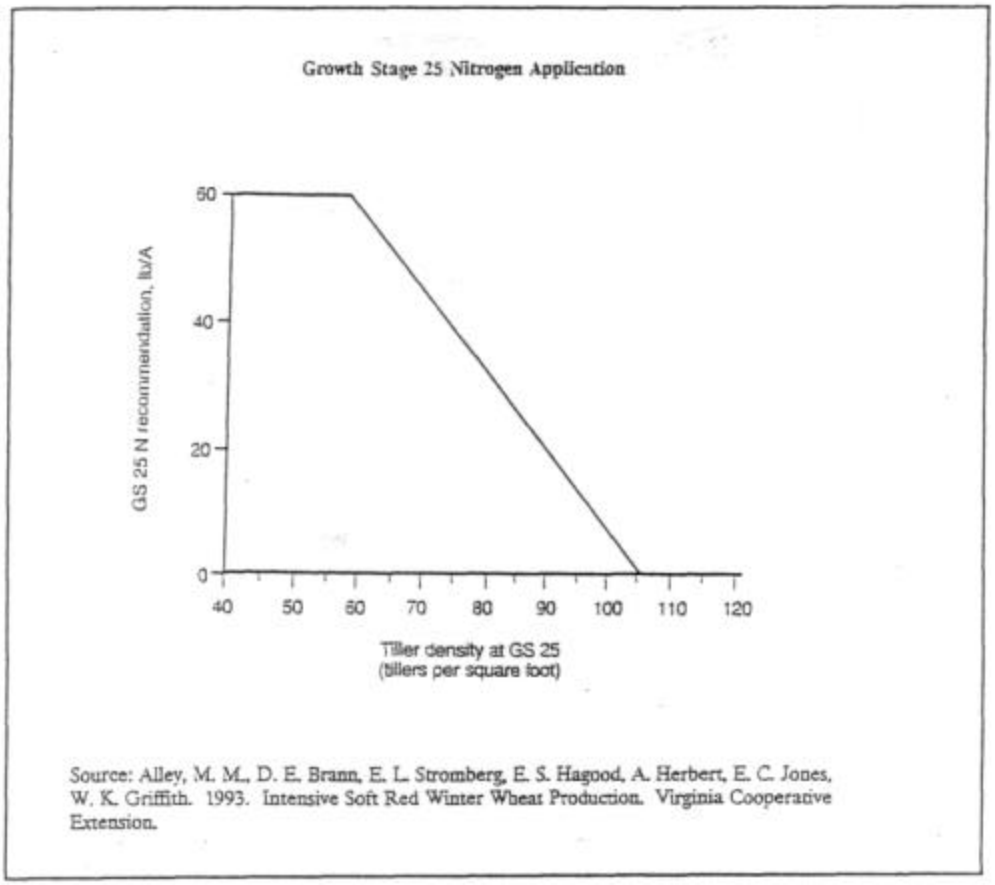
         (b) Fields with 60 to 100 tillers per sq. ft. - apply 40 lb N/acre.

         OR

         (c) Fields with more than 100 tillers per sq. ft. and the crop has a good green color - do not apply nitrogen at this time. Tissue test at Zadoks growth stage 30 to determine N application needs.

Use **Figure 5-2** for more detailed nitrogen application rates based on exact tiller counts.

Figure 5-2



Source: Alley, M. M., D. E. Brann, E. L. Stromberg, E. S. Hagood, A. Herbert, E. C. Jones, W. K. Griffith. 1993. Intensive Soft Red Winter Wheat Production. Virginia Cooperative Extension.

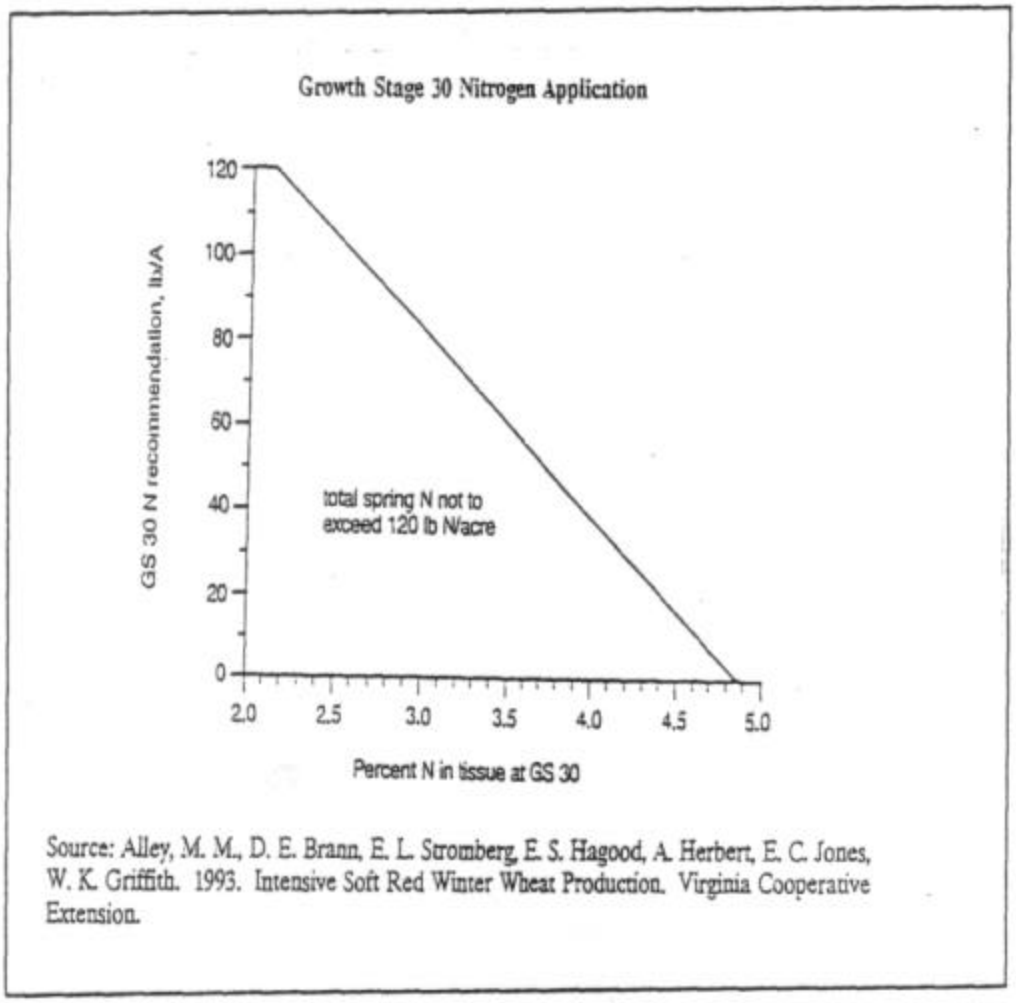
To determine the rate for the growth stage 25 application, one needs to determine the number of tillers per square foot in the field. If there are less than 60 per square foot, apply 60 pounds per acre at growth stage 25. If there are between 60 and 100 tillers, determine the rate from Figure 5-2. If there are more than 100 tillers per square foot and the crop has a dark green color, do not apply any nitrogen at this time.

(Spring N management continued on next page)

(2) March (Zadoks growth stage 30).

(a) N application rate for wheat based on the % N in a plant tissue sample taken at Zadoks growth stage 30 using Fig. 5-3. **NOTE:** Observations have shown that barley topdress rate should be decreased by 0.5% N.

Figure 5-3



Source: Alley, M. M., D. E. Brann, E. L. Stromberg, E. S. Hagood, A. Herbert, E. C. Jones, W. K. Griffith. 1993. Intensive Soft Red Winter Wheat Production. Virginia Cooperative Extension.

Nitrogen Application Recommendations for Wheat and Barley (Summary)

SEASON	APPLICATION CRITERIA	N RECOMMENDATION
I. Planting	**Nitrate Soil Test**	
	>30 ppm (top 6 inches)	None
	<30 ppm (top 6 inches)	Apply 15-30 lbs N
	None	Conventional Tillage-broadcast & incorporate to 1-2 inches, 25-30 lbs N/acre; No-Till-broadcast 25-30 lb N/acre
II. Midwinter (Dec.-January)		
Precipitation	2 or more rainfalls >2.0 inches **AND**	
Tiller Development	<3 tillers per plant; pale green **AND**	
Max. Daily Temp.	$>50^0$F	**THEN:** Apply 30 lbs N/acre topdressed
III. Late Winter (Feb. & Early March)	**Tiller Count:**	
Single Application:	<70/sq. ft.	80 lbs/acre-Feb.(Growth Stage 25)
	>100; plants dark green; tissue N levels >3.75%	30-40 lbs/acre- late March (Zadoks Growth Stage 30)
Split Application:		
February (Zadoks Growth Stage 25)	<60/sq. ft.	60 lbs N/acre
	60-100/sq. ft.	40 lbs N /acre
	>100/sq. ft. and dark green color	none; tissue test at growth stage 30
March (growth stage 30 tissue test)	Refer to Figure 5-3 for N rates based on tissue test	No more than 120 lbs N/acre - **total of Growth Stages 25 and 30**

Phosphorus and Potassium Recommendations
(Standard/Intensive Small Grain Management)

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L	80 – 120	80 – 120
M	40 – 80	40 – 80
H	20 – 40	20 – 40
VH	0	0

Canola

Nitrogen Fertilization:

1. Apply 30 - 40 lb N/A at planting time. Broadcast and disc-in before planting.

2. Apply 90 - 120 lb N/A in late February just before spring growth begins. For soils which are a High environmental risk for nitrogen loss, the late winter application should be split with the first 45 to 60 lbs/ac being applied in late February and the second 45 to 60 lbs/ac being applied 4 weeks later.

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L	80 -120	80 -120
M	40 - 80	40 - 80
H	20 - 40	20 - 40
VH	0	0

Peanuts

Phosphorus and Potassium Recommendations:

The phosphorus and potassium recommended for peanuts can be applied at the same time the crop preceding peanuts in the rotation is fertilized. If not applied at that time, it should be plowed down before peanuts are planted.

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L	100-200	80 -120
M	55 – 85	0
H	0 - 40	0
VH	0	0

***** Apply 40 lbs/A at H-. No P_20_5 recommended at H and H+.

Cotton

Nitrogen Recommendations:

The planned rate of total nitrogen application should take into consideration the crop that cotton will be following and the soil on which it will be grown. The following suggestions consider both:

Soil Management Groups on Which Cotton Will Be Grown		Total N Application Lbs/Acre
I.	A, AA, B, C, E, J, K	50-60
II.	F, Q, R, S, T, DD, II	60-90
III.	N, O, V, X	50-70
IV.	Soil Management Groups that are not suited for cotton production: P, Z, BB, CC, EE, FF, HH, JJ, KK, LL, MM, NN, OO, PP, QQ.*	
V.	Soil Management Groups on which cotton will not be grown: D, G, H, I, J, L, M, U, W, Y, GG.	

*** "Soils in this field are not suited for cotton production. If at all possible, select another field, but if cotton will be grown, apply 50-70 lbs of N per acre."**

Reduce the planned rate of nitrogen application by 10 pounds per acre if cotton will be following soybeans and by 20 pounds per acre if it will follow peanuts.

Timing of Nitrogen Application

Only about 20 percent of the total nitrogen uptake will have occurred by early square formation (approximately 45 days after planting). To avoid possible stimulation of excessive vegetative growth and loss of unneeded nitrogen through leaching, apply only one third of the planned nitrogen application rate at planting. The most effective method of application of this nitrogen is in a starter fertilizer which would also supply 20 to 40 pounds of P_2O_5 depending upon P_2O_5 needs as shown by a soil test. This can be done by using either a 1:1:0 ratio fertilizer such as 15-15-0, a 1:2:0 ratio fertilizer such as 18-46-0 or a 1:3:0 fertilizer such as 10-34-0. Use of a starter fertilizer has been shown to stimulate the early growth rate and increase lint cotton yields by 60 to 100 pounds per acre, both of which are desirable.

The preferred placement of this starter fertilizer is two inches to one side of the seed and at least as deep as the seeds are planted but preferably one to two inches below seed level. Placing the starter fertilizer in the row behind the subsoiler shank while ripping under the row has also been shown to be an effective placement. However, applying the starter fertilizer in a 3 to 4 inch wide band on the soil surface in front of the press wheel has not proven to be an effective placement method in research conducted in North Carolina.

The remainder of the planned nitrogen application can be applied at first square formation (approximately 45 days after planting).

(Phosphorus and Potassium recommendations on next page)

Cotton (cont.)

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L	80 – 120	80 -120
M	40 – 80	40 - 80
H	20 – 40	20 - 40
VH	0	0

White Potatoes - All Soil Productivity Groups

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	125-150*	200	300
L	125-150*	200	300
L+	125-150*	200	300
M-	125-150*	150	200
M	125-150*	150	200
M+	125-150*	150	200
H-	125-150*	100	100
H	125-150*	100	100
H+	125-150*	100	100
VH	125-150*	30**	50

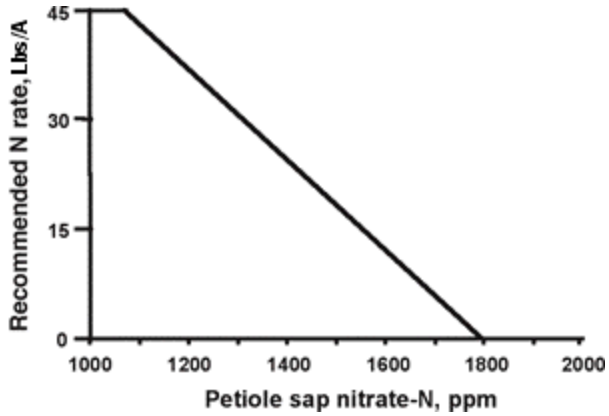
* Nitrogen recommendation for yields up to 250 cwt/acre. Split apply nitrogen with 1/3 of the rate applied at planting and remaining 2/3 to be applied 1-2 weeks after emergence.

** For phosphorus soil test levels exceeding 65% saturation, no phosphorus application shall be made to the field, including starter.

When documented yields for the field (average of the high 3 yields in the last 5 years) indicate an expected yield of greater than 250 cwt/acre use .6 (six-tenths) X the expected tuber yield (cwt/ac) to determine the nitrogen recommendation. At this higher nitrogen recommendation, use a three way split as follows, 1/6 -1/3 of the total recommendation at planting, 1/2 to 2/3 of the total recommendation at emergence, and 1/6 of the total recommendation at flowering. The combination of nitrogen applications applied before flowering shall not exceed 5/6 of the total nitrogen need when using this program.

For more efficient nitrogen management application at flowering apply the remaining nitrogen from the the 3-way nitrogen split, or use the figure below showing petiole sap concentrations at flowering to adjust nitrogen application rate.

Figure 5-4 White Potatoe Petiole Sap Nitrate before Flowering



Note: At greater than 1500 ppm, response to addition nitrogen is unlikely.

Sudangrass, Sudan-Sorghum Hybrids and Millet Plantings

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	70*	120	120
L	70*	110	110
L+	70*	100	100
M-	70*	90	90
M	70*	80	80
M+	70*	70	70
H-	70*	60	60
H	70*	50	50
H+	70*	40	40
VH	70*	0	0

* The N recommendation is for application at planting. If additional pasture, hay, silage production is desired, apply 40-60 lbs/A N after each cutting, or 30-40 lbs/A N after each grazing. Do not apply more than 130 lbs/A N per year.

Alfalfa and Alfalfa-Orchardgrass Establishment

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L-	170	170
L	160	160
L+	150	150
M-	140	140
M	130	130
M+	120	120
H-	110	110
H	80	80
H+	50	50
VH	0	0

Alfalfa and Alfalfa-Grass Hay Maintenance, Soil Productivity Group I

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L-	120	450*
L	110	420*
L+	100	390*
M-	90	360*
M	80	330*
M+	70	300*
H-	60	210*
H	50	120
H+	40	40
VH	0	0

*For K_2O rates greater than 200 lbs/ac, split the application, applying 1/2 in the fall and 1/2 in the spring. (Alternate recommendation where field sampled in spring - apply 1/2 in early spring, and 1/2 after the first cutting).

Alfalfa and Alfalfa-Grass Hay Maintenance, Soil Productivity Group II

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L-	120	330*
L	110	300*
L+	100	280*
M-	90	270*
M	80	245*
M+	70	220*
H-	60	200
H	50	120
H+	40	60
VH	0	0

* For K_2O rates greater than 200 lbs/ac, split the application, applying 1/2 in the fall and 1/2 in the spring. (Alternate recommendation where field sampled in spring - apply 1/2 in early spring, and 1/2 after the first cutting).

Alfalfa and Alfalfa-Grass Hay Maintenance, Soil Productivity Group III

Soil Test Level	Nutrient Recommendations (lbs/ac)	
	P_2O_5	K_2O
L-	90	240*
L	80	220*
L+	70	200
M-	60	185
M	50	170
M+	40	160
H-	40	145
H	40	90
H+	40	40
VH	0	0

- For K_2O rates greater than 200 lbs/ac, split the application, applying 1/2 in the fall and 1/2 in the spring. (Alternate recommendation where field sampled in spring - apply 1/2 in early spring, and 1/2 after the first cutting).

Red Clover-Orchardgrass, Orchardgrass/Fescue-Ladino Clover, Orchardgrass and Fescue Establishment

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	40*	170	170
L	40*	160	160
L+	40*	150	150
M-	40*	140	140
M	40*	130	130
M+	40*	120	120
H-	40*	110	110
H	40*	75	75
H+	40*	40	40
VH	40*	0	0

***** Apply the nitrogen at the time the grass is seeded in late summer, early fall or early spring. Overseed the grass with clover the following February.

Red Clover-Grass Hay Maintenance, Soil Productivity Groups I, II

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	0	120	240
L	0	110	220
L+	0	100	200
M-	0	90	185
M	0	80	170
M+	0	70	160
H-	0	60	145
H	0	50	90
H+	0	40	40
VH	0	0	0

Red Clover-Grass Hay Maintenance, Soil Productivity Groups III, IV

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	0	90	145
L	0	80	130
L+	0	70	120
M-	0	60	110
M	0	50	95
M+	0	40	85
H-	0	40	75
H	0	40	55
H+	0	40	40
VH	0	0	0

Stockpiled Tall Fescue, Soil Productivity Groups I, II

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	60-100*	120	120
L	60-100*	110	110
L+	60-100*	100	100
M-	60-100*	90	90
M	60-100*	80	80
M+	60-100*	40	40
H-	60-100*	0	0
H	60-100*	0	0
H+	60-100*	0	0
VH	60-100*	0	0

* Remove animals by early August and apply the N between August 1-15. Keep animals off pasture until November to allow stand to mature. Where clover makes up more than 25% of the stand, use the 60 lb N rate. If clover is not present and you desire maximum production, apply the 100 lb N rate.

Stockpiled Tall Fescue, Soil Productivity Groups III, IV

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	50-80*	60	80
L	50-80*	50	70
L+	50-80*	40	60
M-	50-80*	30	50
M	50-80*	30	40
M+	50-80*	30	30
H-	50-80*	0	0
H	50-80*	0	0
H+	50-80*	0	0
VH	50-80*	0	0

* Remove animals by early August and apply the N between August 1-15. Keep animals off pasture until November to allow stand to mature. Where clover makes up more than 25% of the stand, use the 50 lb N rate. If clover is not present and you desire maximum production, apply the 80 lb N rate.

Orchardgrass/Fescue-Clover Pastures, Soil Productivity Groups I, II

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	0*	120	120
L	0*	110	110
L+	0*	100	100
M-	0*	90	90
M	0*	80	80
M+	0*	40	40
H-	0*	0	0
H	0*	0	0
H+	0*	0	0
VH	0*	0	0

* If stand contains less than 25% clover, apply 50-80 lbs/A of N.

If additional production is needed later on, apply 40 to 60 lbs/A of N in late summer.

If you are planning to overseed a legume into the stand, do not apply any N.

If organic nutrient sources are utilized, up to 120 lbs of N may be applied if the application is no more frequent than once every 2 years.

Orchardgrass/Fescue-Clover Pastures, Soil Productivity Groups III, IV

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	0*	60	80
L	0*	50	70
L+	0*	40	60
M-	0*	30	50
M	0*	30	40
M+	0*	30	30
H-	0*	0	0
H	0*	0	0
H+	0*	0	0
VH	0*	0	0

* If stand contains less than 25% clover, apply 40-60 lbs/A of N.

If additional production is needed later on, apply 40 to 60 lbs/A of N in late summer.

If you are planning to overseed a legume into the stand, do not apply any N.

If organic nutrient sources are utilized, up to 100 lbs of N may be applied if the application is no more frequent than once every 2 years.

Native or Unimproved Pastures, Soil Productivity Groups I, II

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	0*	200	200
L	0*	175	175
L+	0*	150	150
M-	0*	125	125
M	0*	100	100
M+	0*	75	75
H-	0*	0	0
H	0*	0	0
H+	0*	0	0
VH	0*	0	0

* If stand contains less than 25% clover, apply 40-60 lbs/A of N.

For phosphorus + potassium application once each three or four years. If you are planning to overseed a legume into the stand, omit the N application.

Native or Unimproved Pastures, Soil Productivity Groups III, IV

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	0*	120	120
L	0*	110	110
L+	0*	100	100
M-	0*	90	90
M	0*	80	80
M+	0*	40	40
H-	0*	0	0
H	0*	0	0
H+	0*	0	0
VH	0*	0	0

* If stand contains less than 25% clover, apply 40-60 lbs/A of N.

For phosphorus + potassium application once each three or four years.

Orchardgrass/Fescue (Tall Grass) Hay Production, Soil Productivity Groups I, II

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	80-100*	120	240
L	80-100*	110	220
L+	80-100*	100	200
M-	80-100*	90	185
M	80-100*	80	170
M+	80-100*	70	160
H-	80-100*	60	145
H	80-100*	50	90
H+	80-100*	40	40
VH	80-100*	0	0

* The N recommendation is for a March application of commercial fertilizer.

If additional hay production is needed, apply 80 lbs N/acre after each cutting during the growing season. Use the number of cuttings to determine total nitrogen rate with a maximum annual rate not to exceed 250 lbs/acre per year.

Organic nutrient sources may be applied in one or more applications with the first application to be in March or April. If applied after 9/1, apply up to ½ the total nitrogen rate based on above criteria while crop is still actively growing, with the remaining rate not to be applied until after 3/1 of the following year. Any nitrogen application applied after 3/1 must be deducted from that year's nitrogen need and the balance may be applied evenly between cuttings.

Orchardgrass/Fescue (Tall Grass) Hay Production, Soil Productivity Groups III, IV

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	60-80*	90	145
L	60-80*	80	130
L+	60-80*	70	120
M-	60-80*	60	110
M	60-80*	50	95
M+	60-80*	40	85
H-	60-80*	40	70
H	60-80*	40	55
H+	60-80*	40	40
VH	60-80*	0	0

* N recommendation is for a March application of commercial fertilizer.

For additional fall hay production apply 60-80 lbs N/acre in late August/early September. Do not apply more than 160 lbs N/acre/year.

Organic nutrient sources may be applied in one or more applications with the first application to be in March or April. If applied after 9/1, apply up to ½ the total nitrogen rate based on above criteria while crop is still actively growing, with the remaining rate not to be applied until after 3/1 of the following year. Any nitrogen application applied after 3/1 must be deducted from that year's nitrogen need and the balance may be applied evenly between cuttings.

Bermudagrass Establishment

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	70	120	120
L	70	110	110
L+	70	100	100
M-	70	90	90
M	70	80	80
M+	70	70	70
H-	70	60	60
H	70	50	50
H+	70	40	40
VH	70	0	0

Bermudagrass Pastures - Soil Productivity Groups I, II

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	175-225*	120	120
L	175-225*	110	110
L+	175-225*	100	100
M-	175-225*	90	90
M	175-225*	80	80
M+	175-225*	40	40
H-	175-225*	0	0
H	175-225*	0	0
H+	175-225*	0	0
VH	175-225*	0	0

* The N recommendation represents the total amount of N to be applied during the season. Split the N into three applications - April, June and July.

Organic nutrient sources may be applied in one or more applications. If applied after 7/1, apply up to ½ the total nitrogen rate based on above criteria while crop is still actively growing up to 9/15, with the remaining rate not to be applied until after 4/1 of the following year. Any nitrogen application applied after 4/1 must be deducted from that year's nitrogen need and the balance may be applied evenly between cuttings.

Bermudagrass Pastures - Soil Productivity Groups III, IV, V**

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	120-180*	120	120
L	120-180*	110	110
L+	120-180*	100	100
M-	120-180*	90	90
M	120-180*	80	80
M+	120-180*	40	40
H-	120-180*	0	0
H	120-180*	0	0
H+	120-180*	0	0
VH	120-180*	0	0

* The N recommendation represents the total amount of N to be applied during the season. Split the N into three applications - April, June and July.

** Use the lower end of range for Group V soils.

Organic nutrient sources may be applied in one or more applications. If applied after 7/1 apply up to ½ the total nitrogen rate based on above criteria while crop is still actively growing up to 9/15, with the remaining rate not to be applied until after 4/1 of the following year. Any nitrogen application applied after 4/1 must be deducted from that year's nitrogen need and the balance may be applied evenly between cuttings.

Bermudagrass Hay Production, Soil Productivity Groups I, II
(Use Tall Grass Productivity Group)

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	240-300*	120	275
L	240-300*	110	255
L+	240-300*	100	235
M-	240-300*	90	225
M	240-300*	80	205
M+	240-300*	70	185
H-	240-300*	60	165
H	240-300*	50	100
H+	240-300*	40	40
VH	240-300*	0	0

* Total application of N should be divided equally between an early April application and applications made after the first and second harvests.

Organic nutrient sources may be applied in one or more applications. If applied after 7/1, apply up to ½ the total nitrogen rate based on above criteria while crop is still actively growing up to 9/15, with the remaining rate not to be applied until after 4/1 of the following year. Any nitrogen application applied after 4/1 must be deducted from that year's nitrogen need and the balance may be applied evenly between cuttings.

Bermudagrass Hay Production, Soil Productivity Groups III, IV, V**
(Use Tall Grass Productivity Group)

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	210-260*	120	275
L	210-260*	110	255
L+	210-260*	100	235
M-	210-260*	90	225
M	210-260*	80	205
M+	210-260*	70	185
H-	210-260*	60	165
H	210-260*	50	100
H+	210-260*	40	40
VH	210-260*	0	0

* Total application of N should be divided equally between an early April application and applications made after the first and second harvests.

** Use the lower end of range for Group V soils.

Organic nutrient sources may be applied in one or more applications. If applied after 7/1 apply, up to ½ the total nitrogen rate based on above criteria while crop is still actively growing up to 9/15, with the remaining rate not to be applied until after 4/1 of the following year. Any nitrogen application applied after 4/1 must be deducted from that year's nitrogen need and the balance may be applied evenly between cuttings.

Annual Ryegrass Hay Production, Soil Productivity Groups I and II
(Use Tall Grass Productivity Group)

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	40-50*	120	240
L	40-50*	110	220
L+	40-50*	100	200
M-	40-50*	90	185
M	40-50*	80	170
M+	40-50*	70	160
H-	40-50*	60	145
H	40-50*	50	90
H+	40-50*	40	40
VH	40-50*	0	0

* The above N rates are recommended at seeding during the Fall. For additional production 30-40 lbs/ac of N should be added after each grazing, not to exceed160 lbs/ac annually. For hay production 40-60 lbs/ac N after each cutting, not exceed 200 lbs/ac annually.

Annual Ryegrass Hay Production, Soil Productivity Groups III and IV (Use Tall Grass Productivity Group)

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	40-50*	90	145
L	40-50*	80	130
L+	40-50*	70	120
M-	40-50*	60	110
M	40-50*	50	95
M+	40-50*	40	85
H-	40-50*	40	75
H	40-50*	40	55
H+	40-50*	40	40
VH	40-50*	0	0

* The above N rates are recommended at seeding during the Fall. For additional production 30-40 lbs/ac of N should be added after each grazing, not to exceed 140 lbs/ac annually. For hay production 40-60 lbs/ac N after each cutting, not exceed 180 lbs/ac annually.

Prairie Grass (Matua) Hay Production, Soil Productivity Groups I and II (Use Tall Grass Productivity Group)

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	80-100*	120	330
L	80-100*	110	300
L+	80-100*	100	280
M-	80-100*	90	270
M	80-100*	80	245
M+	80-100*	70	220
H-	80-100*	60	200
H	80-100*	50	120
H+	80-100*	40	60
VH	80-100*	0	0

* The N recommendation is for a March application. Apply 40-60 lbs/A after hay or silage cutting. Do not exceed 300 lbs/A per year for hay. When pastured after hay harvest, apply 30-40 lbs/ac after each grazing. Do not exceed 200 lbs/A per year for intensive rotational grazing.

Prairie Grass (Matua) Hay Production, Soil Productivity Groups III and IV (Use Tall Grass Productivity Group)

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	60-80*	120	240
L	60-80*	110	220
L+	60-80*	100	200
M-	60-80*	90	185
M	60-80*	80	170
M+	60-80*	70	160
H-	60-80*	60	145
H	60-80*	50	90
H+	60-80*	40	40
VH	60-80*	0	0

* The N recommendation is for a March application. Apply 40-60 lbs/A after hay or silage cutting. Do not exceed 250 lbs/A per year for hay. When pastured after hay harvest, apply 30-40 lbs/ac after each grazing. Do not exceed 180 lbs/A per year for intensive rotational grazing.

Hardwood and Pine Plantation Establishment - All Soil Productivity Groups

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	0	70	80
L	0	60	60
L+	0	50	40
M-	0	50	40
M	0	30	25
M+	0	10	10
H-	0	0	0
H	0	0	0
H+	0	0	0
VH	0	0	0

Phosphorus and potassium are best applied by incorporation before planting, but may be banded along the planting rows. Any lime needed is also best incorporated before planting.

Hardwood Maintenance – All Soil Productivity Groups

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	50-100*	70	80
L	50-100*	60	60
L+	50-100*	50	40
M-	50-100*	50	40
M	50-100*	30	25
M+	50-100*	10	10
H-	50-100*	0	0
H	50-100*	0	0
H+	50-100*	0	0
VH	50-100*	0	0

* Nitrogen applications should begin when hardwoods are at least 5 inches in diameter with subsequent applications no more frequently than once every of five years thereafter. Soil tests should be taken prior to nitrogen application to determine phosphorus and potassium rates, if needed.

Control of competing vegetation within the stand is essential so that nutrients remain available for tree production.

Pine Maintenance – All Soil Productivity Groups

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	50-100*	70	80
L	50-100*	60	60
L+	50-100*	50	40
M-	50-100*	50	40
M	50-100*	30	25
M+	50-100*	10	10
H-	50-100*	0	0
H	50-100*	0	0
H+	50-100*	0	0
VH	50-100*	0	0

* Nitrogen rates are for a single application to be applied 5 to 8 years before harvest. *Lower coastal plain pine stands **only**, may receive a one time nitrogen application at ages from 3 to 10 years.

** Soil tests should be taken prior to nitrogen application to determine phosphorus and potassium rates, if needed.

Control of competing vegetation within the stand is essential so that nutrients remain available for tree production.

Loblolly Pine Maintenance, One time Nitrogen Applications - All Soil Productivity Groups

For established stands 10-25 years old, on low to medium fertility soils, a one time application of an organic nutrient source may be made at a Nitrogen rate not to exceed 200 lbs/acre of plant available nitrogen.

For established stands less than 10 years old and that have achieved canopy closure, a one time application of an organic nutrient source may be made at a nitrogen rate not to exceed 100 lbs/acre of plant available nitrogen.

Christmas Trees - Establishment (broadcast before planting)
White Pine, Virginia Pine, Scotch Pine

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	100-120	150	160
L	100-120	120	130
L+	100-120	90	100
M-	100-120	90	100
M	100-120	65	75
M+	100-120	40	50
H-	100-120	40	50
H	100-120	30	40
H+	100-120	30	30
VH	100-120	0	0

Christmas Trees – Establishment (broadcast before planting)
Fraser Fir, Norway Spruce, Hemlock, Blue Spruce, Red Cedar

Soil Test Level	Nutrient Recommendations (lbs/ac)		
	N	P_2O_5	K_2O
L-	100-120	300	250
L	100-120	230	200
L+	100-120	160	150
M-	100-120	160	150
M	100-120	110	105
M+	100-120	60	60
H-	100-120	60	60
H	100-120	45	45
H+	100-120	30	30
VH	100-120	0	0

Christmas Trees – Maintenance

A nitrogen application of 50-60 lbs/acre should be made with the first Spring application to be made about 2 weeks before budbreak. A Fall application of 50-60 lbs/acre can be made anytime beginning in September but no later than the end of October**.**

Use the Fertilizer Recommendations table under **Establishment** for the appropriate rate for the specific species. Base P_2O_5 and K_2O applications on soil test results taken before planned maintenance applications.

Maintenance fertilizer applications should be uniformly applied in 2- to 3- foot wide bands between the trees along the planted row

OR

For a rate per tree determine the fertilizer rate in ounces (lbs/ac X 16) then divide by the number of trees per acre. (100 lbs/ac of N X 16 ozs/lb = 1600 ozs. Then 1600 ozs ÷ no. of trees/ac = ozs/tree)

Section VI. Turfgrass Nutrient Recommendations for Home Lawns, Office Parks, Public Lands and Other Similar Residential/Commercial Grounds

Recommended Season of Application For Nitrogen Fertilizers - Applies to all Turf

A nitrogen fertilization schedule weighted toward fall application is recommended and preferred for agronomic quality and persistence of cool season turfgrass; however, the acceptable window of applications is much wider than this for nutrient management. The nutrient management recommended application season for nitrogen fertilizers to cool season turfgrasses begins six weeks prior to the last spring average killing frost date and ends six weeks past the first fall average killing frost date (see Figures 6-1 & 6-2). Applications of nitrogen during the intervening late fall and winter period should be avoided due to higher potential leaching or runoff risk, but where necessary, apply no more than 0.5 pounds per 1,000 ft^2 of water soluble nitrogen. Higher application rates may be used during this late fall and winter period by using materials containing slowly available sources of nitrogen, if the water soluble nitrogen contained in the fertilizer does not exceed the recommended maximum of 0.5 pounds per 1,000 ft^2 rate. Do not apply nitrogen or phosphorus fertilizers when the ground is frozen.

The acceptable nitrogen fertilizer application season for non-overseeded warm season turfgrass begins no earlier than the last spring average killing frost date and ends no later than one month prior to the first fall average killing frost date (see Figures 6-1 & 6-2).

Figure 6-1

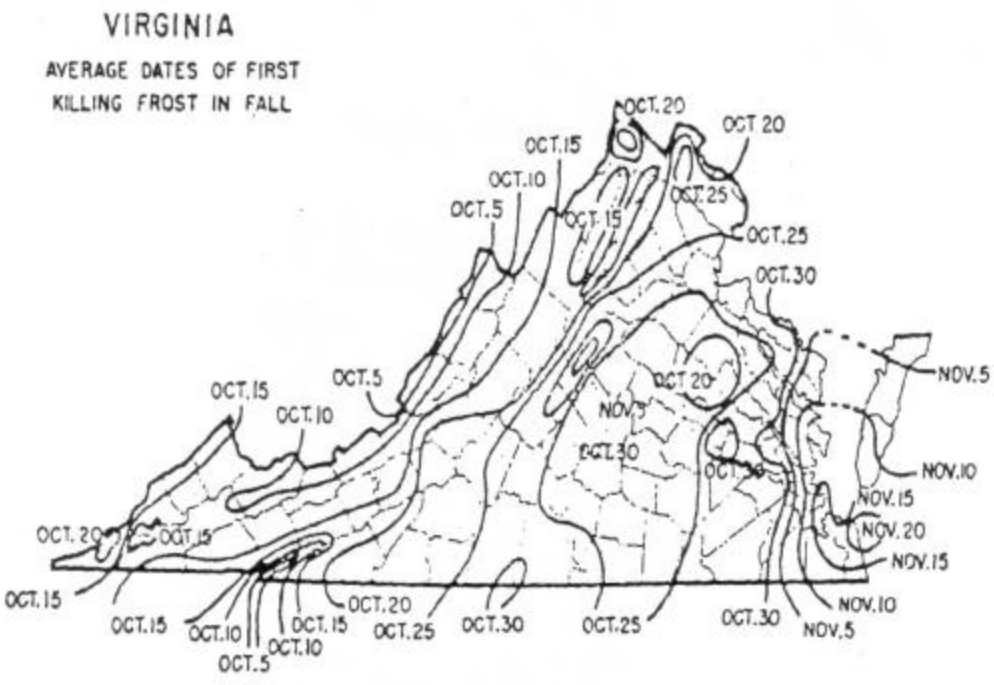
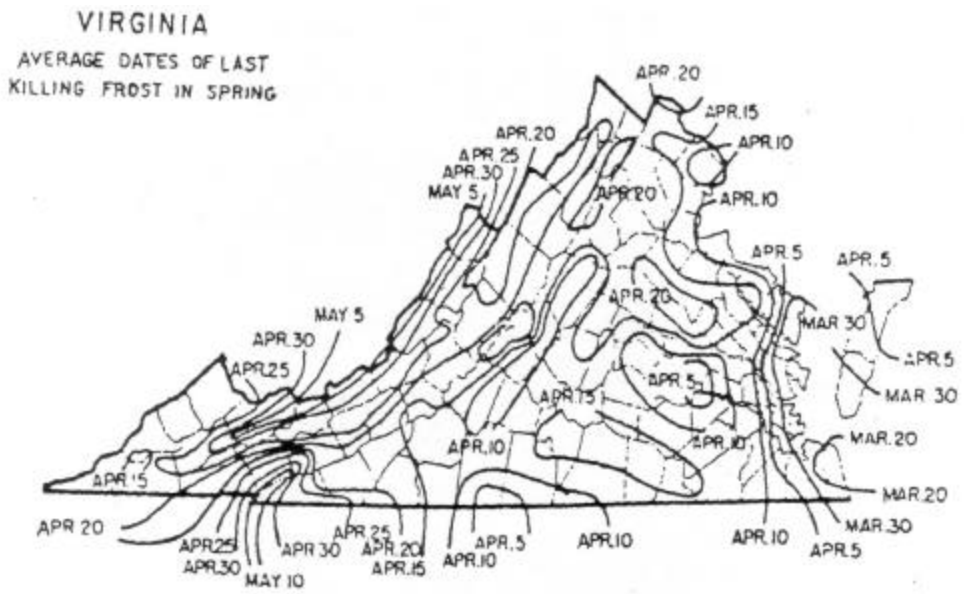


Figure 6-2



Per Application Rates

Do not apply more than one (1) pound of water soluble nitrogen per 1,000 ft^2 within a 30 day period. For applications of materials containing slowly available sources of nitrogen, higher application rates are acceptable if the water soluble nitrogen contained in the fertilizer does not exceed the maximum recommended rate for a 30 day period. Lower per application rates of water soluble nitrogen sources or use of slowly available nitrogen sources should be utilized on very permeable sandy soils, shallow soils over fractured bedrock, or areas near water wells.

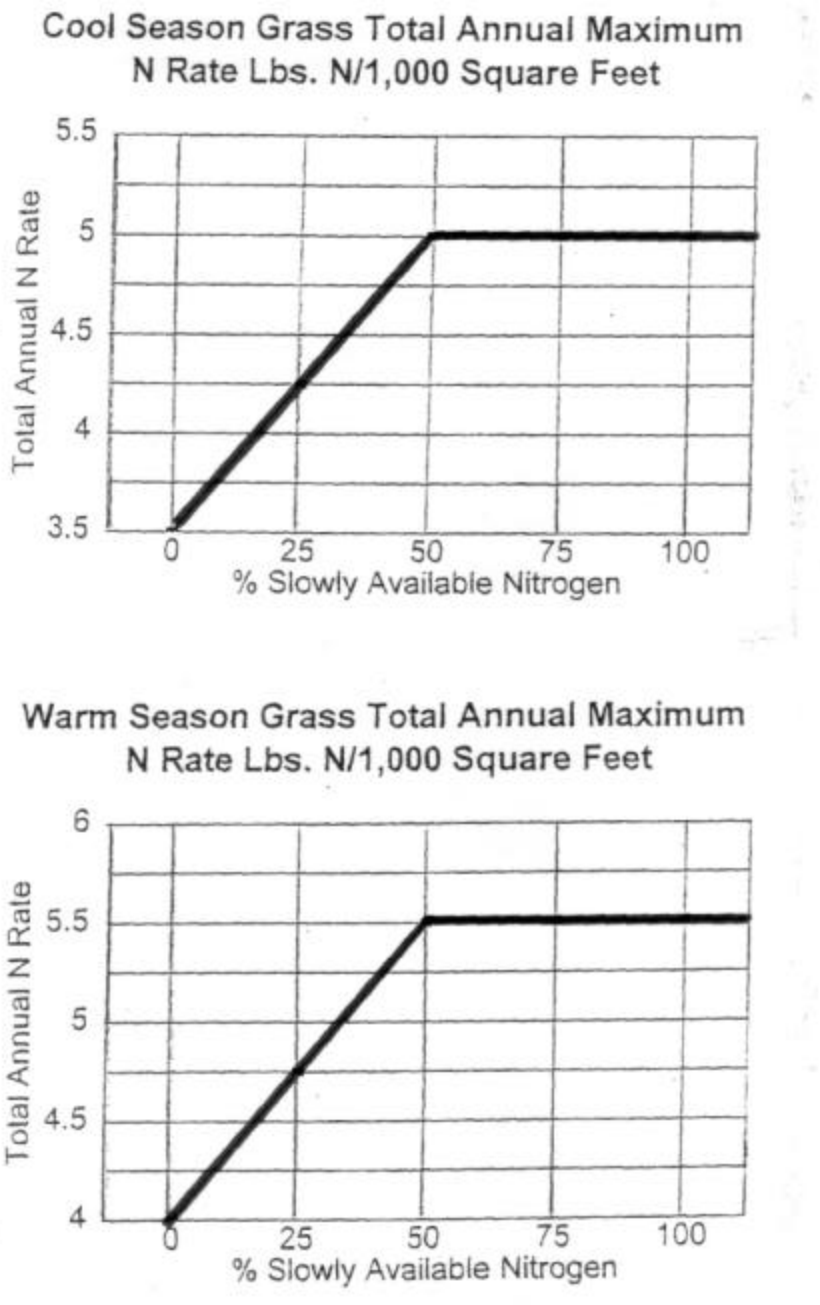
Annual Application Rate

Up to 3.5 pounds per 1,000 ft^2 of nitrogen may be applied annually to cool season grass species or up to 4 pounds per 1,000 ft^2 may be applied annually to warm season grass species using 100 percent watersoluble nitrogen sources. Lower rates of nitrogen application may be desirable on those mature stands of grasses that require less nitrogen for long-term quality. As a result, lower application rates will probably be more suited to the fine leaf fescues (hard fescue, chewnings fescue, creeping red fescue, and sheeps fescue) and non-overseeded zoysiagrass. Lower rates should also be used on less intensively managed areas.

Use of Slowly Available Forms of Nitrogen

For applications of materials containing Slowly Available Nitrogen sources, total annual nitrogen application rates may be adjusted incrementally by referring to the following figure (maximum annual N rates when using 50% or greater Slowly Available Nitrogen [SAN] are 5.0 lbs/1000 ft^2 for cool season grasses, and 5.5 lbs/1000 ft^2 for warm season grasses):

Figure 6-3



Phosphorus and Potassium Recommendations (Established Turf)

Apply phosphorus (P_2O_5) and potassium (K_2O) fertilizers as indicated necessary by a soil test using the following guidelines:

Soil Test Level	pounds /1000 ft^2 *	
	P_2O_5	K_2O
L	2-3	2-3
M	1-2	1-2
H	.5-1	.5-1
VH	0	0

***** For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range.

Avoid the general use of high phosphorus ratio fertilizers such as 10-10-10 or 5-10-10, unless soil tests indicate phosphorus availability below the M+ level.

Recommendations for Establishment of Turf

These recommendations are for timely planted turfgrass, that is, the seed is planted at a time of the year when temperatures and moisture are adequate to establish a good stand of grass within one month of the planting date.

Nitrogen Applications

No more than 1 lb/1,000 ft^2 at planting, followed by one or two applications beginning 30 days after planting, not to exceed a total of 2 lbs/1,000 ft^2 total for the establishment period.

Phosphorus and Potassium Recommendations for Establishment

Soil Test Level	pounds /1000 ft^2 *	
	P_2O_5	K_2O
L	3-4	2-3
M	2-3	1-2
H	2-1	.5-1
VH	0	0

***** For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range.

Nitrogen Timing

The beginning and ending dates for application of nitrogen shall be determined using guidance and frost date maps contained in the Season of Application for Nitrogen section. Application dates listed in the table below are suggested and can be adjusted for specific areas of the state. Application intervals for nitrogen shall be at least 30 days to allow turf to utilize previous nitrogen applications.

Nutrient Recommendations for Golf Courses

Nitrogen Rates

	Maximum N Rate Per Application lbs/1,000 ft^2	Total Annual N Rate lbs/1,000 ft^2
Greens	**.75**	**3-6**
Tees	**.75**	**2-5**
Fairways	**1**	**1-3**
Roughs	**1**	**0-1**

Notes:

- Use of slowly available forms of Nitrogen is encouraged.
- Soluble N rates of ¼ lb/1,000 ft^2 or less which may be a component of a pesticide or minor element application, may be applied any time during the application windows described in part 1 of this section, but must be considered with the total annual N application rate.
- Use higher rates for intensively used turf where rapid re-growth is required, lower rates for maintenance of lesser used areas, do not exceed total annual N levels as stated above.
- When overseeding warm season grasses, an additional 0.50-.75 lb/1,000ft^2 of Nitrogen may be applied in the Fall after perennial ryegrass overseeding is well established. An additional N application of 0.50 lb/1,000ft^2 may be made in Feb-March to over seeded perennial ryegrass if turf and color indicate need.

Nitrogen Management on Athletic Fields

This program is intended for those fields which are under heavy use with obvious need for nitrogen as part of an overall program to maintain turf quality.

Cool Season Grasses		Bermuda Grass	
When to Apply*	**Lbs/1,000 ft^2 Nitrogen**	**When to Apply***	**Lbs/1,000 ft^2 Nitrogen**
August	1	April	1
Sept - Oct	1	May 15 - June	1
Nov	1	July - mid Aug	0.5 - 1*
		Mid Aug - Sept	0.5 - 1**
May 20 - June	0 -.5***	If overseeded Oct - Nov	.5 -.75****

Notes:

- Total annual soluble N rate shall not exceed **3.5** lbs/1,000 ft^2 for cool season and **4** lbs/1,000 ft^2 for warm season grasses. Up to 1 lb/1,000 ft^2 may be applied from soluble N sources in any application.
- Use of slowly available forms of Nitrogen is encouraged.
- Soluble N rates of ¼ lb/1,000 ft^2 or less which may be a component of a pesticide or minor element application may be applied any time the turf is actively growing, but must be considered with the total annual N application rate.

* Refer to frost date maps contained in the Season of Application for Nitrogen section.

** Use higher levels for intensively used turf where rapid regrowth is required, do not exceed annual N levels as stated above.

*** Apply this application only if turf use warrants the maintenance for adequate growth and color.

**** For warm season grasses, and additional 0.5. - 0.75 lb/1,000ft^2 of Nitrogen may be applied in the Fall after perennial ryegrass overseeding is well established. Additional N application of 0.50 lb/1,000ft^2 may be made in Feb-March to overseeded perennial ryegrass if turf and color indicate need.

Phosphorus and Potassium Recommendations - Established Golf Courses and Athletic Fields.

Apply phosphorus (P_2O_5) and potassium (K_2O) fertilizers as indicated necessary by a soil test using the following guidelines:

Soil Test Level	pounds /1000 ft^2 *	
	P_2O_5	K_2O
L	2-3	2-3
M	1-2	1-2
H	.5-1	.5-1
VH	0	0

***** For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range.

Avoid the general use of high phosphorus ratio fertilizers such as 10-10-10 or 5-10-10, unless soil tests indicate phosphorus availability below the M+ level.

Other Turf Management Considerations

Lime Recommendations

Limestone applications should be recommended as necessary based on a soil test to maintain soil pH within an agronomic range for turfgrass.

For new seedings where lime is recommended, incorporate the lime into the top soil for best results.

Returning Grass Clippings

Recycling of clippings on turf should be encouraged as an effective means of recycling N, P, and K. Proper mowing practices that ensure no more than 1/3 of the leaf blade is removed in any cutting event will enhance turf appearance and performance when clippings are returned.

Use of Iron

Iron applications (particularly foliar applications) may periodically be used for enhanced greening as an alternative to nitrogen. These applications are most beneficial if applied in late spring through summer for cool season grasses and in late summer/fall applications for warm-season grasses.

Impervious Surfaces

Do not apply fertilizers containing nitrogen or phosphorus to impervious surfaces (sidewalks, streets, etc.). Remove any granular materials that land on impervious surfaces by sweeping and collecting, and either put the collected material back in the bag, or spread it onto the turf and /or using a leaf blower etc. to return the fertilizer back to the turfgrass canopy.

Section VII. Estimated Nitrogen Availability to Succeeding Crops From Legumes

Table 7-1

Estimated Nitrogen Availability to Succeeding Crops From Legumes

Crop	% Stand	Description	Residual N (Lbs/ac)
Alfalfa	50-75	Good (>4 T/A)	90
	25-49	Fair (3-4 T/A)	70
	<25	Poor (<3 T/A)	50
Red Clover	>50	Good (>3 T/A)	80
	25-49	Fair (2-3 T/A)	60
	<25	Poor (<2 T/A)	40
Hairy Vetch	80-100	Good	100
	50-79	Fair	75
	<50	Poor	50
Peanuts	-	-	45
Soybeans	1/2 lb. N per bushel of yield, if previous yield unknown, 20 lbs.		

Table 8-1
Manure Ammonium Nitrogen Availability Coefficients

Method of Application	Semi-Solid Manure	Liquid Manure Slurry	Lagoon Liquid	Dry Litter
Injection	-	0.95	0.95	-
Broadcast with incorporation immediate	0.75	0.75	0.90	0.90
Incorporated after 2 days	0.65	0.65	0.80	0.80
Incorporated after 4 days	0.40	0.40	0.60	0.65
Incorporated after 7 days or no incorporation	0.25	0.25	0.45	0.50
Irrigation without incorporation	-	0.20	0.50	-

To utilize the table, the pounds of NH_4-N per ton or 1000 gallons of manure is determined from a manure test. Multiply the NH_4-N content of the manure by the availability coefficient in the table to obtain plant available nitrogen from the manure ammonium content.

Table 8-2
Coefficients for Organic N Availability in Manures[1]

	Spring or Early[2] Fall Applied	Winter Topdress/ Spring Residual[3]	Perennial Grass
Dairy Manure	.35	.20/.15	.35
Poultry Manure	.60	.30/.30	.60
Swine Manure	.50	.25/.25	.50

1. Multiply the organic nitrogen content by the coefficient in the table to obtain expected available nitrogen.

2. Manure applied in spring for summer annuals such as corn, or early fall (prior to December 1) for small grains.

3. Use the first coefficient to calculate Organic N released from manure applied in early winter on winter annuals such as rye, wheat, or barley as a topdressing, Use the second coefficient to calculate Organic N released the following Spring.

Table 8-3
Manure Residual Factors for Previous Applications*

Historical Frequency of Manure Application on the Field	Residual Factor
Rarely Received Manure in Past (0-1 years in last 5)	0
Frequent Past Applications (2-3 out of 5 years)	0.10
Continuously Received Manure (4-5 out of 5 years)	0.20

* The appropriate rate of manure to use in residual calculations is generally the average rate applied for years in which manure was land applied to the field.

* Multiply the initial organic N content by the appropriate manure residual factor to obtain an estimate of residual nitrogen from past manure applications.

* If more detailed manure history information is available, a residual availability of the initial organic nitrogen content of .12, .05, .02 may be used for one, two, and three years respectively following application.

Primary Nutrient Availability for Manures

Manure Phosphorus

Available P_2O_5 = Manure Analysis P_2O_5

If soils are testing M+ or above in phosphorus and the manure will supply enough phosphorus for the crop according to the formula Available P_2O_5 = Total P_2O_5, no fertilizer phosphorus should be used due to unlikely crop response and water quality concerns.

For soils testing Medium or below, starter applications of fertilizer phosphorus should be made even if the manure contains sufficient phosphorus since it is contained in slow release organic forms. For soils testing low, higher levels of phosphorus starter fertilizer are recommended.

Manure Potassium

Available K_2O = Manure Analysis K_2O

Table 8-4
Average Analysis for Manure Tested in Virginia

Manure Type	TKN	NH_4	P_2O_5	K_2O	% Moisture
Liquid Dairy Slurry (518)*	19.22	8.88	9.08	17.35	94.60
Semi-Solid Dairy (167)	15.34	3.47	7.58	14.33	67.35
Semi-Solid Beef (47)	18.00	2.36	9.88	19.02	63.13
Dry Chicken Broiler Litter (937)	64.86	11.48	52.18	53.36	27.83
Dry Chicken Layer/Breeder (172)	47.87	8.51	60.79	43.68	29.49
Dry Turkey Litter (475)	62.03	13.05	50.23	38.31	28.64
Dry Turkey Breeder (62)	58.82	12.64	61.23	36.18	25.48
Liquid Swine Lagoon (250)*	7.20	5.66	2.81	12.23	99.35
Liquid Swine Pit (38)*	23.56	15.29	16.71	15.74	97.48

* Values presented in pounds/1000 gallons. All other values in pounds/ton.

The above table is a compilation of average values for Virginia manure samples from 2001 through 2004 analyzed by Clemson University Agricultural Service Lab. Numbers in parentheses indicate the number of samples analyzed for each category.

Table 8-5
Animal Manure Production Rates[1]

Animal	Daily Manure Production Per 1,000 lb weight				% Dry Matter
	Animal Size	lbs.	cu. ft.	gals	
Cattle					
Dairy	150 - 1,500	82	1.4	10.0	13
Beef	400 – 1,400	60	1.0	7.5	12
Veal	100 – 350	63	1.0	7.5	1.6
Swine					
Pigs	35 – 200	65	1.1	7.5	9
Gestation Sow	275	32	0.5	4.0	9
Sow and 8 pigs	375	88	1.4	10.6	9
Boar	350	31	0.5	4.0	9
Sheep	100	40	0.6	4.6	25
Horse	1,000	45	0.7	5.6	20
Poultry					
Poultry[2] Liquid	-	300	-	-	5
Fresh, wet, sticky and caked	-	61	-	-	25
Moist crumbly to sticky	-	32	-	-	50
Crumbly	-	22	-	-	70
Dry	-	18	-	-	85

1. Does not include bedding, wash water, runoff water and other inputs which increase manure volume.

2. Storage losses already deducted.

Broiler houses generate approximately 1.25 tons of litter per 1000 birds during each cycle. Six cycles per year is average. Houses are cleaned out at variable intervals ranging from after each cycle to once every two years.

Turkey Tom production generates approximately 10 tons of litter per 1000 birds during each cycle for 4 cycles per year. Turkey hens produce about 8 tons per 1000 birds during each of 5 cycles per year.

Complete clean outs of poultry houses should be scheduled during spring or summer, consistent with the availability of a suitable crop for uptake of N, unless covered storage is available, to minimize water quality impacts and maximize agronomic efficiency.

Table 8-6
Annual Liquid Animal Waste Volume Available for Land Application

A. Manure Production

Animal Type	Ave. Wt*		Gal/Yr		# Animals		% Confined		Volume (Gals)
Feeder Swine	_____	x	2.74	x	_____	x	___ . ___	=	_____
Sow & Litter	_____	x	3.84	x	_____	x	___ . ___	=	_____
Gestation Sow	_____	x	1.46	x	_____	x	___ . ___	=	_____
Boar	_____	x	1.46	x	_____	x	___ . ___	=	_____
Beef Cattle	_____	x	2.74	x	_____	x	___ . ___	=	_____
Dairy Cattle	_____	x	3.65	x	_____	x	___ . ___	=	_____

Subtotal Annual Manure Production _____ gallons

*Typical Weights					
	Lbs.				Lbs.
Feeder Swine	145		Dairy Cattle		
Sow & Litter	375		Mature		1400
Gestation Sow	275		Heifers	16-24 Mo	1050
Boar	350			9-16 Mo	680
Beef Cattle (Finishing)	1000			2-9 Mo	350
			Calves	0-2 Mo	150

B. Process Wastewater

Type	# Animals		Gals. Per Day		365 Days/Yr.		Total Wastewater	
Dairy	_____	x	_____	x	365	=	_____	gals
Hogs	_____	x	_____	x	365	=	_____	gals
Other	_____	x	_____	x	365	=	_____	gals

Dairy Cows Milked	Wastewater (Gal/Cow/Day)
0 - 50	5 - 8
50 - 150	4 - 6
150+	2 – 4

*** Typical Wastewater — excludes flushing systems**

Note: Most modern swine operations with lagoons use recirculated flush water for some of the production areas, therefore, when calculating process wastewater, you should consider only the clean water that is added during each flush.

C. Feedlot Runoff

$$\frac{(A \times ROF \times AnnPrec)}{12} \times 7.48 = \text{Feedlot Runoff}$$

Where: A = lot area in square feet
ROF = runoff factor
ROF for paved lot = .60
ROF for unpaved lot = .25
AnnPrec = annual average precipitation from Table 8-7
7.48 converts cubic feet to gallons

$$\frac{(\_\_\_\_\_)}{12} \times 7.48 = \_\_\_\_\_ \text{gallons}$$

D. Net Precipitation Excess Over Pit or Lagoon (Precipitation less Evaporation

Lagoons: **NPE = Rainfall - (Lake Evaporation x .9)***

NPE = _____ - (_____ x _____)
NPE = _____

Pits: **NPE = Rainfall - (Lake Evaporation X .3)***

NPE = _____ - (_____ x _____)
NPE = _____

***See** Table 8-7

$$\frac{(SA \times NPE)}{12} \times 7.48 = \textbf{Total NPE (gallons)}$$

where: SA = surface area of pit or lagoon at the top,
NPE = net precipitation excess as calculated above,
7.48 converts cubic feet to gallons

$$\frac{(\_\_\_\_\_)}{12} \times 7.48 = \_\_\_\_\_ \text{gallons}$$

Total Annual Liquid Animal Waste Volume Produced =
(A. Manure + B. Process Wastewater + C. Feedlot Runoff + D. Net Precipitation Excess) _____ **gallons**

Table 8-7
Virginia Annual Normal Precipitation and Lake Evaporation

County	Annual Precip.	Lake Evaporation
Accomack	42	38
Albemarle	44	36
Allegheny	37	32
Amelia	42	40
Amherst	45	36
Appomatox	40	38
Augusta	38	33
Bath	41	32
Bedford	43	37
Bland	39	32
Botetort	42	34
Brunswick	42	41
Buchanan	42	31
Buckingham	41	38
Campbell	38	38
Caroline	42	38
Carroll	41	35
Charles City	42	40
Charlotte	43	40
Chesapeake	48	40
Chesterfield	42	40
Clarke	37	34
Craig	38	32
Culpeper	40	36
Cumberland	41	39
Dickenson	42	32
Dinwiddie	42	40
Essex	44	39
Fairfax	42	37
Fauquier	40	36
Floyd	44	35
Fluvanna	39	38
Franklin	43	38
Fredrick	37	33
Giles	35	32
Gloucester	43	40
Goochland	40	39
Grayson	43	33
Greene	41	36
Greenville	43	41
Halifax	42	40
Hanover	42	39
Henrico	43	40
Henry	44	39
Highland	39	32
Isle of Wight	44	40
James City	42	40
King & Queen	44	39
King George	40	38
King William	44	39
Lancaster	42	39
Lee	50	33
Loudoun	40	37
Louisa	42	38
Lunenburg	42	40
Madison	41	36
Mathews	43	40
Mecklenburg	42	41
Middlesex	42	39
Montgomery	37	34
Nelson	46	36
New Kent	44	40
Northampton	41	39
Northumberland	42	38
Nottoway	42	40
Orange	40	37
Page	39	34
Patrick	44	38
Pittsylvania	41	39
Powhatan	40	40
Prince Edward	41	40
Prince George	42	40
Prince William	36	37
Pulaski	35	33
Rappahannock	40	35
Richmond	43	38
Roanoke	40	34
Rockbridge	38	34
Rockingham	34	33
Russell	45	31
Scott	45	32
Shenandoah	34	33
Smyth	43	32
Southampton	45	41
Spotsylvania	40	38
Stafford	38	37
Suffolk	47	40
Surry	44	40
Sussex	44	40
Tazewell	42	31
Virginia Beach	46	40
Warren	35	34
Washington	45	32
Westmoreland	41	38
Wise	46	32
Wythe	37	32
York	44	40

Table 8-8
Maximum Wastewater Irrigation Application Rates for Different Soil Types

Soil Characteristics	%-5% Slope Inches per hour	
	Cover	Bare
Clay; very poorly drained	0.30	0.15
Silty Surface; poorly drained clay or claypan subsoil	0.40	0.25
Medium textured surface soil; moderate to imperfectly drained profile	0.50	0.30
Silt loam; loam, and very fine sandy loam; well to moderately well drained	0.60	0.40
Loamy sand, sandy loam or peat; well drained	0.90	0.60

Reduce hydraulic application rates on sloping ground:

Slope	Application Rate Reduction
0% - 5%	0%
6% - 8%	20%
9% -12%	40%
13% -20%	60%
Over 20%	75%

Caution: Check application rates to insure that desired nutrient levels are not exceeded, use the most restrictive criteria.

Do not irrigate wastewater to sites where soil moisture will exceed field capacity immediately following irrigation. Field capacity is defined as the amount of water held in the soil after the excess gravitational water has drained away and after free drainage has practically ceased.

Allow sufficient drying time between subsequent irrigations so that field capacity is not exceeded due to the irrigation events.

Source: Pennsylvania Department of Environmental Resources, 1990. "***Assessment of Field Manure Nutrient Management.***"

Section IX. Biosolids Management

Table 9-1
Estimated Nitrogen Mineralization Rates for Biosolids[1]

Biosolids Type	Application Year			
	Application Year	1 Year After Application	2 Years After Application	3 Years After Application
Lime Stabilized	0.30	0.10	0.10	0.05
Aerobic Digestion	0.30	0.10	0.10	0.05
Anaerobic Digestion	0.30	0.10	0.10	0.05
Composted[2]	0.10	0.05	0.03	0.00

1. To determine nitrogen available from previous Biosolids applications, multiply the percent organic nitrogen by the appropriate mineralization factor.

2. Total organic nitrogen content of 2% or less and no significant ammonia nitrogen.

Table 9-2
Biosolids Ammonium Nitrogen Availability Coefficients[1]

Method of Application	Biosolids pH < 10	Biosolids pH > 10
Injection	1.00	1.00
Incorporated within 24 hours	0.85	0.75
Incorporated with 1-7 days	0.70	0.50
Incorporated after 7 days or no incorporation	0.50	0.25

1. To determine the plant-available Biosolids ammonium nitrogen in the soil, multiply the Biosolids ammonium nitrogen concentration or total weight applied by the appropriate availability coefficient.

Primary Nutrient Availability for Biosolids

Biosolids Phosphorus

Available P_2O_5 = Biosolids Analysis P_2O_5

If soils are testing M+ or above in phosphorus and the Biosolids will supply enough phosphorus for the crop according to the formula Available P_2O_5 = Total P_2O_5, no fertilizer phosphorus should be used due to unlikely crop response and water quality concerns.

For soils testing Medium or below, starter applications of fertilizer phosphorus should be made even if the Biosolids contain sufficient phosphorus, since it is contained in slow release organic forms. For soils testing low, higher levels of phosphorus starter fertilizer are recommended.

Biosolids Potassium

Available K_2O = Biosolids analysis K_2O