Nutrient Management Plan

Prepared For:

Montgomery County
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Christiansburg, VA 24073
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Prepared By:

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Acreage – 13 Fields at 6 locations, 6 soil samples (Breakdown on Page 5)	
Total:	19.8 Acres

County:	Montgomery County
Watershed:	NE59 – 10.6 – Stroubles Creek, Back Creek, Upper New River
	NE58 – 9.2 – Crab Creek, Back Creek, Upper New River

Plan Written: July 1, 2018

Plan Expires: July 1, 2021

Robert F. Habel
Planner Signature

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Sources:

Maps – Maps are produced using Google Earth or provided by client.
Photos/Logos – Obtained from client, clients website, or taken by planner.
Site information – Obtained from client or clients website.
Technical Information –

Agronomy Handbook – A&L Labs – 2001
Best Golf Course Management Practices – McCarty – 2001
Environmental Best Management Practices for Golf Courses – Virginia GCSAA – January 2012
Golf Course Management and Construction, Environmental Issues – Balogh, Walker, USGA – 1992
Soil Fertility and Fertilizers 6th Ed. – Havlin, Beaton, Tisdale, Nelson – 1999
Spectrum Analytic Agronomic Library – www.spectrumanalytic.com
Sports Turf Management in the Transition Zone – Goatley, Askew, Ervin, Mcall, VSTMA, Etc. – 2008
Turf Management for Golf Courses 2nd Ed. – Beard, USGA – 2002
Turfgrass Soil Fertility and Chemical Problems – Carrow, Waddington, Rieke – 2001
Urban Nutrient Management Handbook – VA DCR, Virginia Tech, Virginia State Uni. – May 2011
Virginia Nutrient Management Standards and Criteria – Commonwealth of Virginia – July 2014

Disclaimer: *Statements and recommendations made within this document based on published research data and experience. Recommendations are based on the soil tests included in this document and not intended for use on any other facility. Products suggested are used in methods suggested by label guidelines when available, be sure to read label before using products as labels can change. Maximum rates are provided by Virginia Department of Conservation and Recreation Standards and Criteria and are not to be exceeded even when product label suggests otherwise. No guarantee or warranty is made, expressed or implied, concerning crop performance as a result of using the contents of this document.*

Definitions:

M = 1000 FT^2
 # = Pounds of product
N = Nitrogen
P = Phosphorus
K = Potassium
NMP = Nutrient Management Plan
MS4 = Municipal Separate Storm Sewer System
SAN = Slowly Available Nitrogen
WSN = Water Soluble Nitrogen

1. Narrative

1.1. Statement of Compliance

Montgomery County is required to have and follow this Nutrient Management Plan according to the Rules and Regulations of the Code of Virginia**.** According to 9VAC25-890-40 MS4 General Permit, permittees are required under the "Turf and Landscape Management" section of the permit (GP Section II.B.6.c) to develop NMPs on "all lands owned or operated by the MS4 operator where nutrients are applied to a contiguous area greater than one acre." Thus, Montgomery County agrees to comply with all requirements set forth in the Nutrient Management Training and Certification Regulations, 4VAC50-85-10 et seq., and to follow recommendations for turf fertilization and management as described in the Virginia Nutrient Management Standards and Criteria, Revised July 2014. This includes implementing this Department of Conservation and Recreation reviewed Nutrient Management Plan and maintaining fertilization records. All nutrient applications to Montgomery County properties, performed by Montgomery County staff or other contractors, shall comply with the provisions of this Nutrient Management Plan as of July 1, 2018. This plan is affective for three years (until July 1, 2021) or until major renovations or major changes to maintenance occurs. The planner should be alerted if this occurs or if new soil tests are taken within the three-year period, a minor revision may be needed if tests show major differences. The process of updating this plan for a new three-year cycle should begin no later than 6 months prior to plan expiration.

1.2. Plan Overview

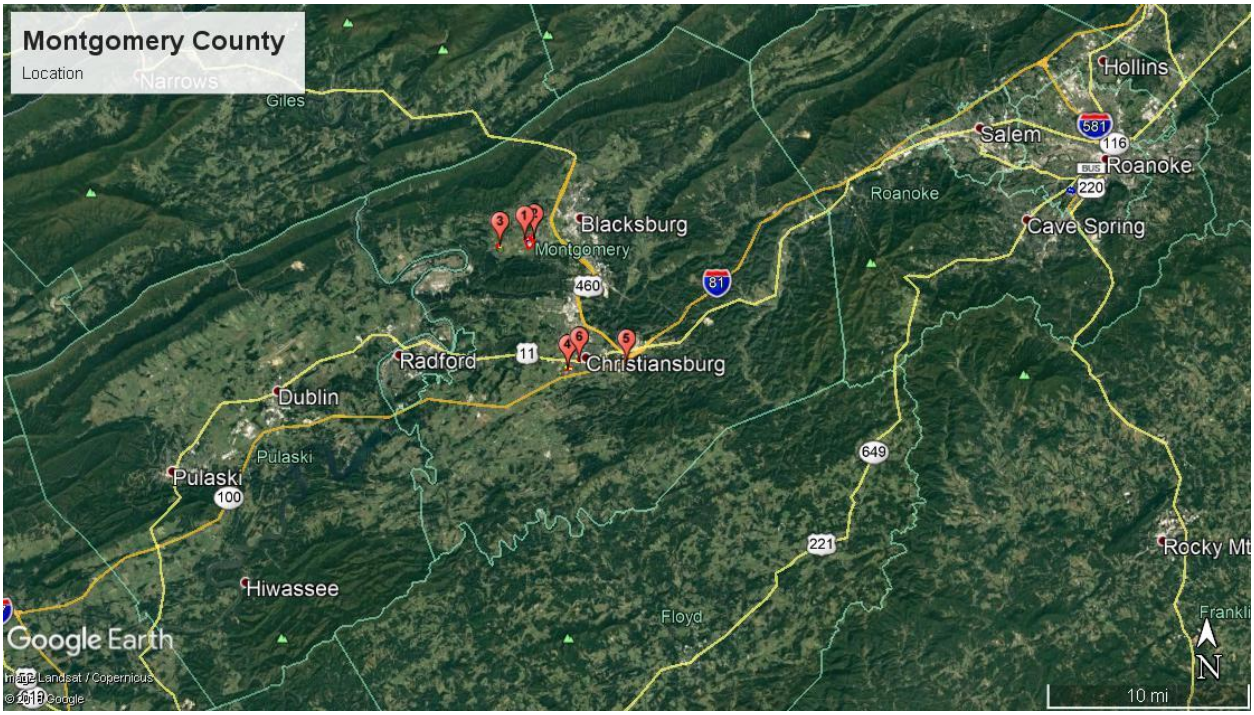
Montgomery County is in the Valley and Ridge area of Virginia. As population in the area increased, Montgomery County was formed in 1777 from Fincastle County, which in turn had been taken from Botetourt County. The county is named for Richard Montgomery, an American Revolutionary War general killed in 1775 while attempting to capture Quebec City, Canada.

According to the U.S. Census Bureau, the county has a total area of 389 square miles, of which 387 square miles is land and 2.2 square miles (0.6%) is water. The western part of the county is in the New River watershed and the eastern part of the county is in the Roanoke River watershed. The northernmost part of the county between Brush Mountain and Sinking Creek Mountain in the Craig Creek area drain to the James River and the Chesapeake Bay Watershed.

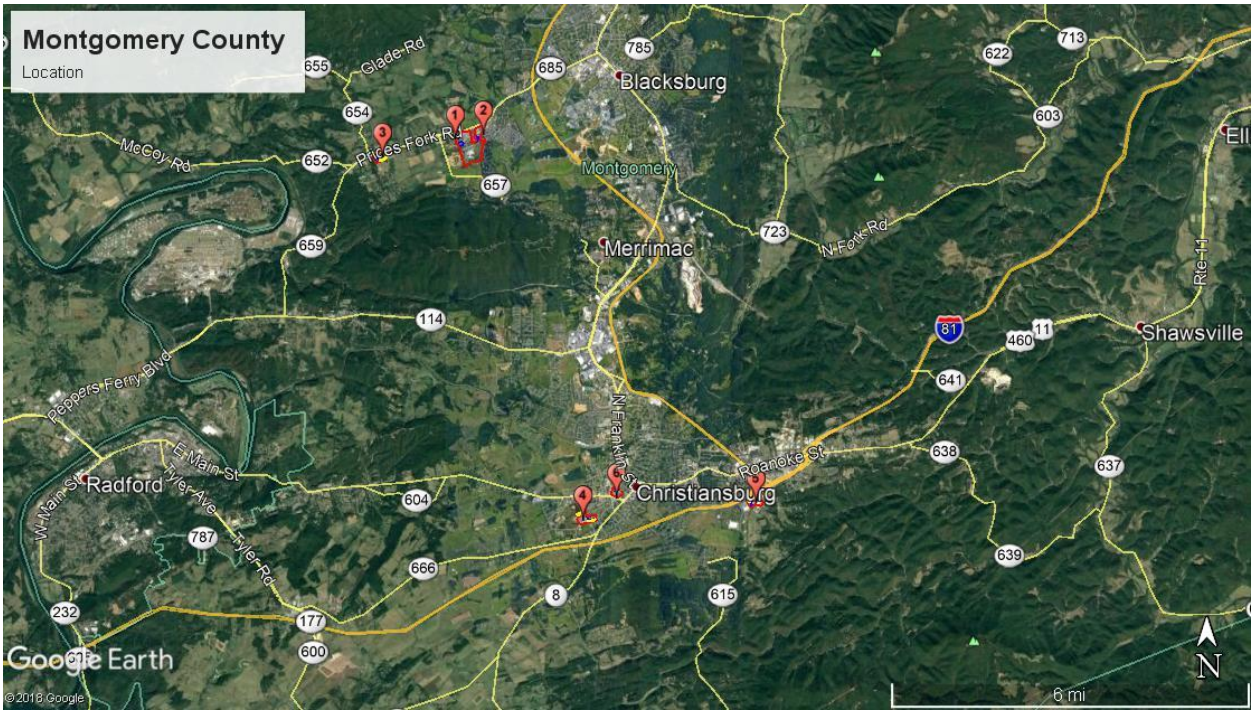
This plan covers 13 sports fields, covering 19.8 acres at 6 locations across the county. A total of 6 soil samples were taken.

1.3. Location

Montgomery County is one of the most heavily populated areas of the New River Valley. It is located along Interstate 81 west of Roanoke. It contains the Towns of Christiansburg and Blacksburg and boarders the City of Radford.



Location/Acreage/Watershed Code Breakdown				
Location	**Acres**	**Irrigation**	**Grass**	**Watershed Code**
1. Blacksburg Middle School	5	No	Cool	**NE59 10.6 Acres**
2. Kipps Elementary	1.6	No	Cool	
3. Prices Fork Elementary	4	No	Cool	
4. Christiansburg Middle School	5.2	No	Cool	**NE58 9.2 Acres**
5. Falling Branch Elementary	1.4	No	Cool	
6. Montgomery Central Middle	2.6	No	Cool	
Total	19.8			



1.4. Nutrient Management Principals

Nutrient Management Plans focus on two primary objectives healthy plants and clean water.

There are four different types of elements essential for plant health. Non-mineral, Primary and Secondary elements are all considered Macronutrients. The fourth is Micronutrients. Non-mineral elements consist of carbon, hydrogen, and oxygen; these elements are obtained from air and water. The Primary nutrients are nitrogen, phosphorus, and potassium. Secondary elements are calcium, magnesium, and sulfur. Micronutrients are iron, manganese, boron, zinc copper, molybdenum, chlorine, cobalt, and nickel. These elements are obtained from the soil and must be supplemented with fertilizer, lime or other soil amendments when a soil test shows a deficiency. In high maintenance situations, some elements are spray applied and absorbed through the leaf tissue.

Nitrogen and phosphorus are the focus of a nutrient management plan, as these nutrients cause ecological problems. Lime is also important because having improper pH can make applied fertilizers unavailable to the plant and more likely to leach or runoff. While nitrogen and phosphorus are the focus, other nutrients are also discussed in the plan, these nutrients are beneficial to plant health, but do not cause water quality problems.

Soil tests are required to determine the current level of soil nutrients available to the plant so fertilizer can be applied at rates that ensure excess nutrients do not enter our waters. Basic soil tests provide data on phosphorus, potassium, magnesium, calcium and pH. Nitrogen cannot be tested for using a basic soil test as it is very volatile. Magnesium and calcium are included in basic soil tests so that proper liming materials can be chosen.

Soil test results are compared to a reference guide provided by DCR. These Standards and Criteria are based upon years of scientific research and the rates suggested are optimal for plant health within the intended usage. Low input areas, like home lawns, require some fertilizer to maintain plant vigor thus maintaining turf cover and preventing erosion. High use areas, like sports fields, require frequent fertilizer input to help maintain plant health and to aid in recovery from stress. Clean water is maintained by applying fertilizer in a responsible manner that ensures minimum movement away from the intended site.

The following information discusses the role of the nutrients in the plant. Highlighted information is specific to this plan.

Nitrogen (N) – This element is responsible for green color, shoot growth and density, root growth, carbohydrate reserves, recuperative potential, heat, cold, drought hardiness, wear tolerance, and disease susceptibility. Nitrogen has a very complex cycle and only certain forms are available to the plant. It leaches through the soil rapidly and does not accumulate thus you cannot soil test for N. Due to these factors, nitrogen management is a large part of nutrient management. Nitrogen management includes but is not limited to using slow release materials, timing the applications in accordance with plant growth, and making multiple applications so that the element is available when it is needed by the plant.

All areas in the plan are cool season, unirrigated sports turf. Slow release products were used exclusively. Labels are included at end of plan. If making changes, please continue to use slow release fertilizers, or contact your planner for help determining the proper rates.

Phosphorus (P) – Phosphorus controls the establishment rate of newly seeded turf, plant maturation, root growth, and seed production. Like nitrogen, P also has a complex cycle. The major difference is that P readily attaches soil, it can be quantified by a soil test and only leaches when it completely saturates the soil. Phosphorus moves away from the application site when it is improperly applied to compacted soil or other impervious surfaces, when applied in excess, and since it attaches to the soil, with sediment rich runoff. Phosphorus management is also important to nutrient management. It should only be applied when called for by a soil test, to soils that are not compacted to prevent runoff and only applied to actively growing turf with sufficient turf cover/rooting to hold the soil in place.

Maximum P rates are outlined in application worksheets. Do not exceed this number.

Potassium (K) - Potassium is responsible for root growth, heat, cold, and drought hardiness, wear tolerance, and disease susceptibility. While the *Standards and Criteria* do regulate the application of K, but in some cases, K input may exceed recommended levels, as it does not have the same detrimental effects on the health of Virginia's waters as N and P. Potassium is considered the plant nutrient most responsible for turf quality. It helps plants respond to stresses like drought, extreme heat/cold, and insect/disease pressure. The plants increased ability to respond to stress in a positive manner can help reduce the need for increased N and P fertility and reseeding caused by stress. In addition to the benefits of K, it is difficult to limit the amount of K used as most modern slow release fertilizers contain both N and K while limiting or completely removing P. Nitrogen only products are not readily available in slow release form and custom blended fertilizers are expensive.

Potassium levels have been exceeded in most of areas of this plan. As discussed above, K helps the plant deal with stress. Sports fields and common areas are generally stressed be it from excessive use, compaction, improper pH, or lack of proper care due to budget and personnel restraints.

Lime - Liming is a critical management practice for maintaining soil pH at optimal levels for plant growth. Liming supplies the essential elements Calcium and/or Magnesium, reduces the solubility and potential toxicity of Aluminum and Manganese, and increases the availability of essential nutrients. Many soil elements change form because of chemical reactions in the soil due to pHs that are either too acidic or too basic. Plants may not be able to use elements in some of these forms making some elements essential to plant health unavailable. Most plants grow well in the pH range 5.8 to 6.5.

Buffer pH is used to provide an indication of the soil's total (active + reserve) acidity and ability to resist a change in pH. This buffer measurement is the major factor in determining the amount of lime to apply. The Buffer pH starts at 7 (no lime needed) and goes lower as the soil's total acidity increases and more lime is needed to raise the soil pH. As an example, a clay soil with a pH of 6.1 could have a buffer pH of 6.8 and need 1 ton/A of lime in order to maintain/increase that pH around 6.2. A sandy soil could have a much lower pH but have the same buffer pH thus, needing the same amount of lime to change the pH to 6.2. This is because sandy soils have a lower cation exchange capacity thus, less storage for reserve acid.

Attempting to change the pH in the deep rooting zone of an established turf is difficult at best. One method of getting lime somewhat deeper in established turf areas is to apply lime in

conjunction with aeration. Applying lime in the fall and winter months is recommended because the freeze/thaw cycle aids in mixing lime throughout the root zone.

Lime provides the essential nutrients Calcium and Magnesium. Calcium is the main component of plant cell walls while magnesium is the atom upon which chlorophyll is built. It is important that these elements be present in the soil not only to help regulate the soils acidity but to insure plant health. When a soils pH is acidic, these elements can be added with lime. Calcitic lime should be used when calcium is deficient and magnesium is high. Dolomitic lime, which is more common, is used when the both are deficient or balanced. If pH does not need to be adjusted, calcium levels can be raised with gypsum and magnesium is raised with Epsom salts. The *Standards and Criteria* provide guidance on adjusting soil pH levels but do not include any recommendations for Ca or Mg, as they do not affect water quality.

Not all liming materials are the same, if the liming material chosen does not equate to 100% Calcium Carbonate Equivalent (CCE% should be listed on bag) see chart on page 55 to adjust the required amount of lime.

Christiansburg Middle and Falling Branch Elementary both need lime. See application sheets for specifics.

Sulfur (S) - Sulfur is responsible for the plants green color, shoot growth and density, root growth, carbohydrate reserves, and disease susceptibility. Elemental sulfur applications should be avoided unless you are attempting to acidify (lower pH) the soil and should be applied at no more than 5#/M and watered in due to the turf burn potential. Unless called for by a soil test, the occasional use of sulfur containing fertilizers and micro nutrient packages should be the only S input needed to supplement the soil S content. This element is not included in the *Standards and Criteria*.

Iron (Fe) – Iron contributes to the plants green color, shoot growth and density, root growth, carbohydrate reserves, heat, cold and drought hardiness and wear tolerance. Iron is often included in fertilizer and micronutrient blends because it produces a faster greening of turf than nitrogen. According to the *Standards and Criteria,* Fe applications can be occasionally substituted for N applications because it produces greening. This is a good strategy, but Fe apps cannot replace N. While Fe is used inside the plant, the greening created by Fe is superficial and caused by the iron rusting on the plants surface. Fe should be used as an N replacement only when the plant is healthy and greening is desired without increased growth.

Micros – Other micronutrients are not mentioned by the *Standards and Criteria*. These elements are very important to plant growth, but regular input is not needed unless you are managing a sand based soil with low nutrient holding capacity. Most soils contain all the necessary micros and they will be available for the plant as long as the proper pH is maintained.

Soil Sampling – DCR suggests soil testing every 3 years to properly monitor soil conditions. An accurate, representative sample is important to ensure optimal fertility. Please remember, a 1 lb soil sample can represent up to 20 acres, there are approximately 2 million lbs of soil per acre and the lab only uses about 1 gram of soil in the testing process.

1.5. Best Management Practices for Water Quality Protection

The following list comes from the *Urban Nutrient Management Handbook* page 8-12 and details steps that can reduce the impact of nutrient management practices on water quality. A PDF of the complete handbook can be found online through ext.vt.edu, on the CD provided with the plan or a printed copy can be obtained from DCR.

• Base fertilization practices on a soil test.
• Supplement the soil test with a plant tissue test when necessary.
• Aerate compacted soil to reduce runoff and aid phosphorus and lime in entering the soil.
• Minimize fertilizer rates on slopes and sandy soils. If using quickly available sources of nitrogen on deep, sandy soils or near shallow water tables, use no more than 0.25 to 0.50 pound of nitrogen per 1,000 square feet per application.
• Establish and maintain a buffer zone of reduced- to zero-input vegetation around bodies of water. In some cases, native vegetation might be appropriate, but whatever plant material is selected, it must persist indefinitely to serve as a functional buffer zone.
• Consider using iron as a supplement to nitrogen for greening response.
• Use at least 50 percent slowly available sources of nitrogen on soils subject to leaching.
• Time applications carefully. Do not apply fertilizer before a heavy rainfall.
• Irrigate lightly (0.10 to 0.25 inch) after each application of quick-release fertilizer so it is washed off the foliage and moved into the soil. (Wait to irrigate if foliar activity is desired)
• Avoid over irrigation.
• Return grass clippings to the turf to improve nutrient cycling and reduce the amount of fertilizer needed to produce healthy plants. Use a mulching mower whenever possible and consider that a mulching mower can even be used to manage fall leaves (Goatley 2006).
• When collected, compost grass clippings rather than disposing of them in landfills.
• Use a drop (gravity) spreader near bodies of water or impenetrable areas to lessen the chance of spreading material on these surfaces.
• Perhaps the most important best management practice toward improving water quality is to simply sweep or blow fertilizers and clippings off hardscape surfaces and back into the turf.

1.6. Application Equipment Calibration

An agronomically and environmentally sound fertilizer program can be negated by improperly calibrated equipment. It is important to calibrate your equipment prior to every application. Even moving from one location to another can knock your application equipment out of adjustment so once you have your equipment calibrated for a product write down the setting. Use that setting to check the calibration for every site and adjust if necessary. The next time you use that product, use your records as a starting point and not a final calibration as equipment can wear over time thus changing the calibration point. For more information on how to calibrate your equipment see the *Urban Nutrient Management Handbook* Chapter 10 (ext.vt.edu) or visit your equipment manufactures website. Please remember that the number on the bag is not sufficient, every spreader and every application is different, and that the bag number only serves as a calibration starting point.

1.7. Season of Fertilization

Per the Virginia Nutrient Management Standards and Criteria, Revised July 2014, fertilizers must be applied in between the following dates.

- These are guidelines and averages, in warmer years, fertilizer could be applied earlier and in cooler years, fertilizer should be applied later.
- Fertilizers should not be applied to frozen ground or to grass that is not actively growing. For warm season grasses please wait for green up to occur.
- For warm season grasses that are overseeded, follow the cool season application window. If overseeding is skipped, please revert to warm season window.

Data for frost date comes from the Southeast Regional Climate Center using 50% probability of frost at 32.5 degrees at the Blacksburg 3 SE Station.

http://www.sercc.com/cgi-bin/sercc/cliMAIN.pl?va0766

	Average Frost Dates	Cool Season Applications	Warm Season Applications
Spring	May 2	March 21	May 2
Fall	October 8	November 19	September 8

Maps – *Maps created using Google Earth are to scale as shown in bottom left of each map. For all maps, unless otherwise indicated, North is oriented towards top of page. Additional Flood maps created by Web Soil Survey.*

Flooding Frequency Class Designations *– Areas indicated as flood prone by Web Soil Survey. Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.*

Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent.

	"None" means that flooding is not probable. The chance of flooding is nearly 0 percent in any year. Flooding occurs less than once in 500 years.
	"Very rare" means that flooding is very unlikely but possible under extremely unusual weather conditions. The chance of flooding is less than 1 percent in any year.
	"Rare" means that flooding is unlikely but possible under unusual weather conditions. The chance of flooding is 1 to 5 percent in any year.
	"Occasional" means that flooding occurs infrequently under normal weather conditions. The chance of flooding is 5 to 50 percent in any year.
	"Frequent" means that flooding is likely to occur often under normal weather conditions. The chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year.
	"Very frequent" means that flooding is likely to occur very often under normal weather conditions. The chance of flooding is more than 50 percent in all months of any year.

2. Management Areas

2.1. Blacksburg Middle School

Location

From I-81 take exit 118 A-B-C. Continue on ramp to exit 118 B onto 460 W towards Blacksburg. Stay on 460 for 10.8 miles then take second Prices Fork Road exit. Stay on Prices Fork for 1.7 miles. The school will be on your left. Blacksburg Middle, Blacksburg High and Kipps Elementary are located on the same property. These fields are located at the 3rd entrance to the property just to the west of Blacksburg Middle.

Address: 3109 Price's Fork Road
Blacksburg, VA 24060

GPS Coordinates: 37.213455, -80.461778

Areas Managed

There are 3 fields at this location. All fields are cool season, unirrigated turf, totaling 5 acres.

Environmentally Sensitive

- According to city GIS there is no risk of flooding in this area.
- There is a retention pond like area between the two fields. There are also several storm drians positioned near the field corners that could potentially carry nutrient rich runoff in to this basin. It is suggested that these drains be covered before making any applications. It is also suggested to avoid applications prior to moderate to heavy rainfalls which could create runoff.
- Applications of inorganic fertilizers will not occur on frozen or snow-covered ground.
- Any fertilizer that makes its way onto impervious surfaces (sidewalks, cart paths, etc.) should be swept or blown back into pervious turfgrass-covered areas.
- Cover any catchment basins before applying fertilizer so product is not applied directly into these runoff catchment systems.
- Do not use fertilizers as ice melt.

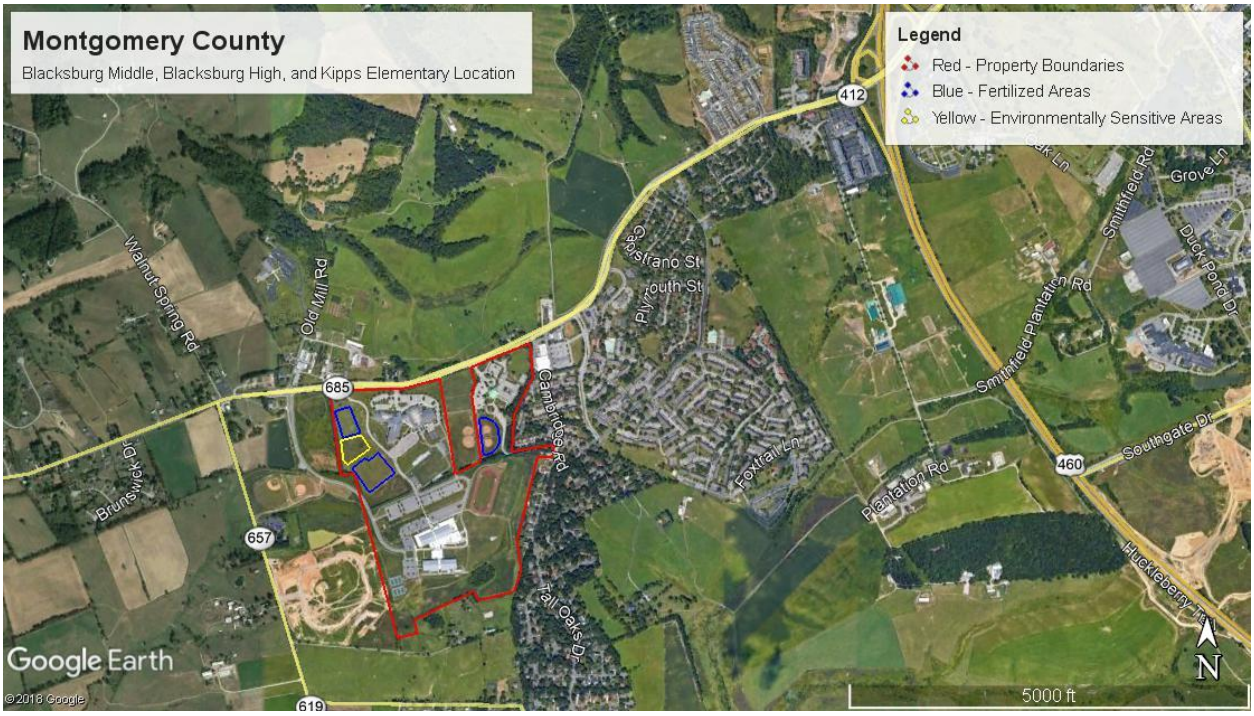
2.2. Kipps Elementary School

Location

From I-81 take exit 118 A-B-C. Continue on ramp to exit 118 B onto 460 W towards Blacksburg. Stay on 460 for 10.8 miles then take second Prices Fork Road exit. Stay on Prices Fork for 1.3 miles. The school will be on your left. Blacksburg Middle, Blacksburg High and Kipps Elementary are located on the same property. These fields are located at the 1st entrance to the property which leads to Kipps Elementary. Bare to the right in the parking lot and continue to the end of the lot. These fields are located to the east side of the walking path.

Address: 2801 Price's Fork Road
Blacksburg, VA 24060

GPS Coordinates: 37.214443, -80.457589



Areas Managed

There are 2 fields at this location. They are cool season, unirrigated turf, totaling 1.6 acres.

Environmentally Sensitive

- According to city GIS there is no risk of flooding in this area.
- There are roads, sidewalks and storm water drains throughout the area. Be cautious when making fertilizer applications near these areas and always clean up any fertilizers accidently spread on pavement and sidewalks. If possible, cover drains to prevent direct application of fertilizer to water.
- Applications of inorganic fertilizers will not occur on frozen or snow-covered ground.
- Do not use fertilizers as ice melt.

2.3. Prices Fork Elementary School

Location

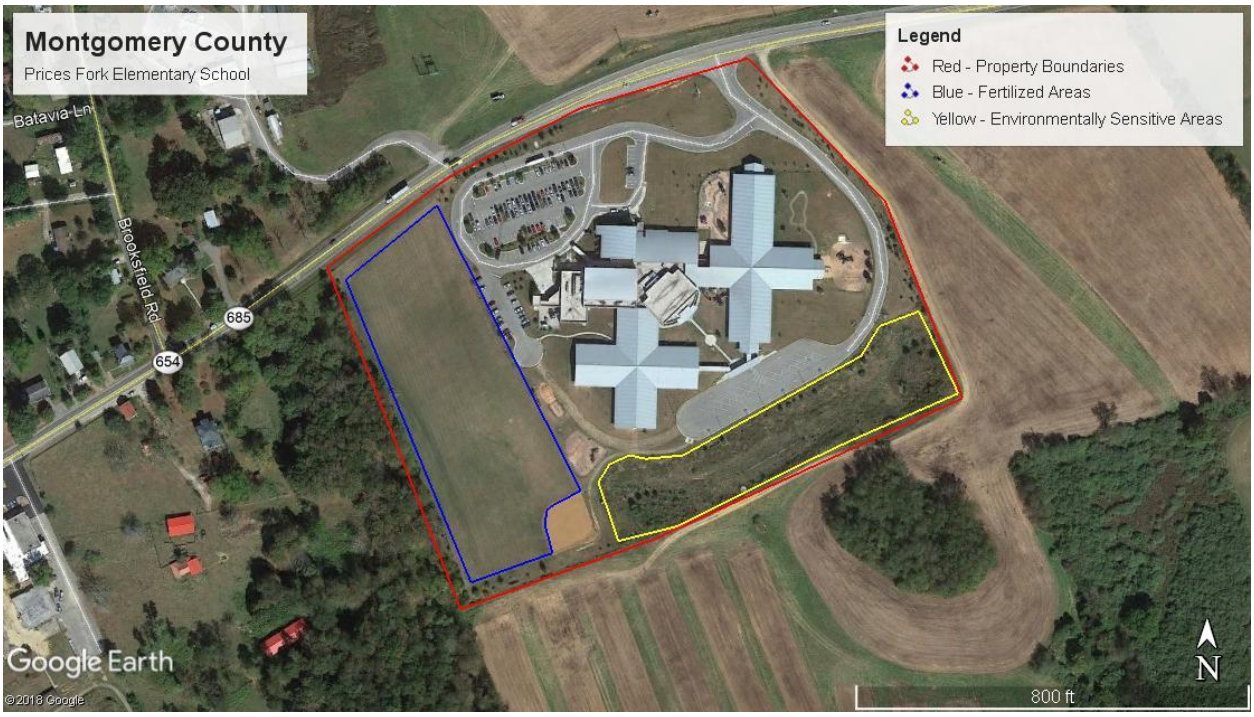
From I-81 take exit 118 A-B-C. Continue on ramp to exit 118 B onto 460 W towards Blacksburg. Stay on 460 for 10.8 miles then take second Prices Fork Road exit. Stay on Prices Fork for 3 miles. The school will be on your left.

Address: 4021 Price's Fork Road
Blacksburg, VA 24060

GPS Coordinates: 37.209720, -80.487719

Areas Managed

There is a large multi-use field at this location. It is 4 acres of cool season, unirrigated turf.



Environmentally Sensitive

- According to city GIS there is no risk of flooding in this area.
- There is a retention pond area behind the school and to the east of the dirt portion of the field. There are also several storm drains positioned to the eastern edge of the field between the fertilized area and the parking lot. These could potentially carry nutrient rich runoff in to the retention pond. It is suggested that these drains be covered before making any applications. It is also suggested to avoid applications prior to moderate to heavy rainfalls which could create runoff.
- There are roads, sidewalks and storm water drains throughout the area. Be cautious when making fertilizer applications near these areas and always clean up any fertilizers accidently spread on pavement and sidewalks. If possible, cover drains to prevent direct application of fertilizer to water.
- Applications of inorganic fertilizers will not occur on frozen or snow-covered ground.
- Do not use fertilizers as ice melt.

2.4. Christiansburg Middle School

Location

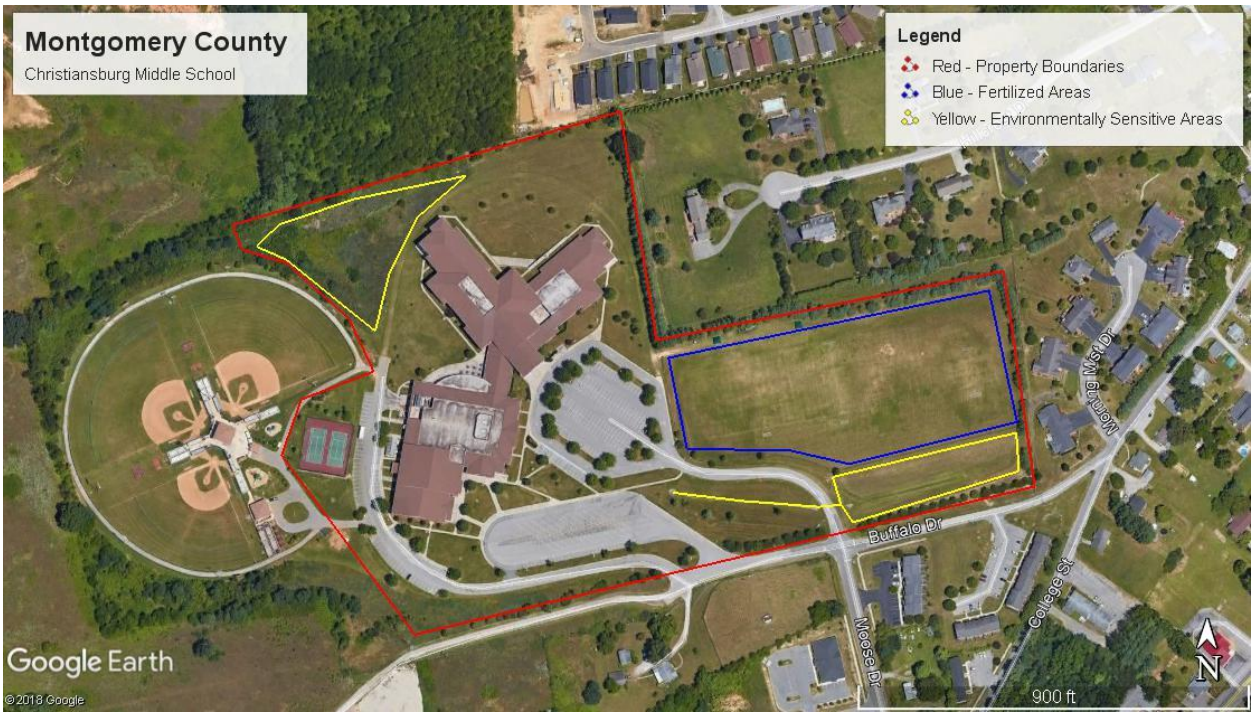
From I-81 take exit 114 onto VA-8 N/W. Main St. Take a left at the stoplight onto College Street and continue straight onto Moose Drive. At the 4 way stop continue straight and the fields will be on the right.

Address: 1205 Buffalo Drive, NW
Christiansburg, VA24073

GPS Coordinates: 37.121913, -80.423861

Areas Managed

This area has multiple soccer fields. It is 5.2 acres of unirrigated, cool season turf.



Environmentally Sensitive

- According to city GIS there is no risk of flooding in this area.
- There is a retention pond to the south of the field. Surface runoff could potentially carry nutrients into the retention pond. It is suggested to avoid applications prior to moderate to heavy rainfalls which could create runoff.
- There are roads, sidewalks and storm water drains throughout the area. Be cautious when making fertilizer applications near these areas and always clean up any fertilizers accidently spread on pavement and sidewalks. If possible, cover drains to prevent direct application of fertilizer to water.
- Applications of inorganic fertilizers will not occur on frozen or snow-covered ground.
- Do not use fertilizers as ice melt.

2.5. Falling Branch Elementary School

Location

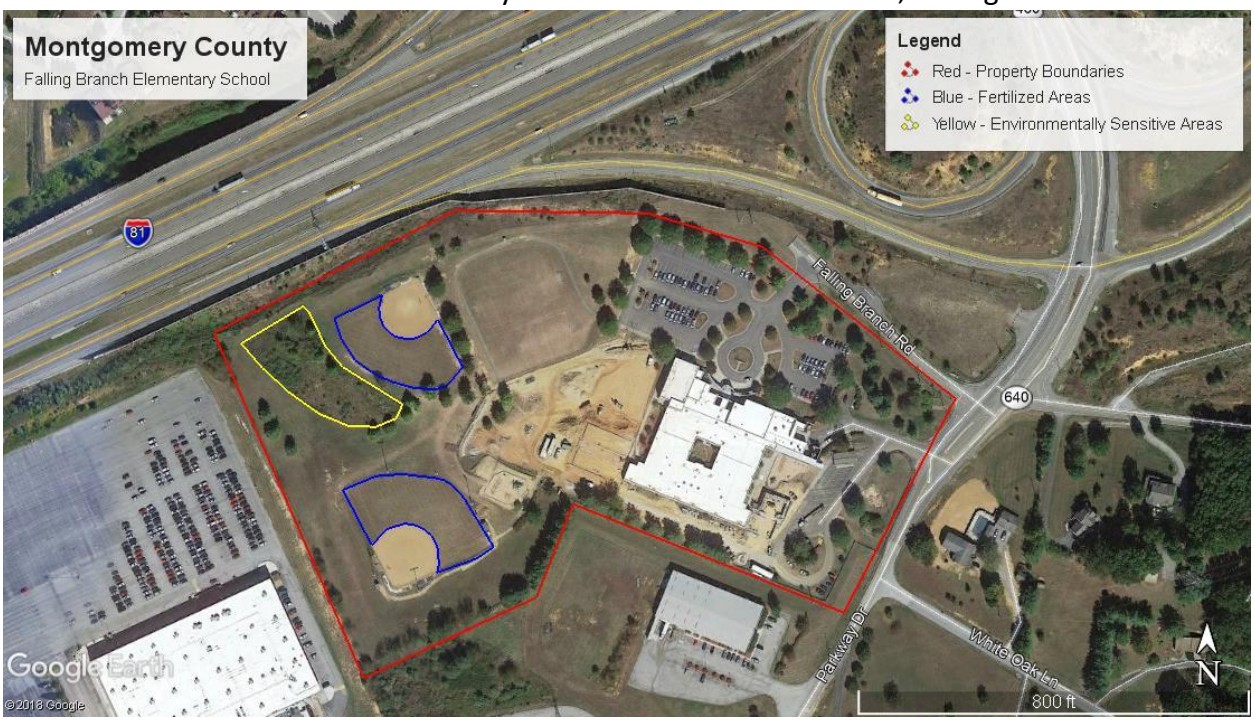
From I-81, take exit 118 A-B-C, continue on ramp to exit A. Continue on Parkway Drive for 0.4 miles then take a right onto Falling Branch Road.

Address: 735 Falling Branch Road
Christiansburg, VA 24073

GPS Coordinates: 37.126627, -80.372477

Areas Managed

There are 2 fields at this location. They total 1.4 acres of cool season, unirrigated turf.



Environmentally Sensitive

- According to city GIS there is no risk of flooding in this area.
- There is a retention pond between the two fields. Surface runoff could potentially carry nutrients into the retention pond. It is suggested to avoid applications prior to moderate to heavy rainfalls which could create runoff.
- There are roads, sidewalks and storm water drains throughout the area. Be cautious when making fertilizer applications near these areas and always clean up any fertilizers accidently spread on pavement and sidewalks. If possible, cover drains to prevent direct application of fertilizer to water.
- Applications of inorganic fertilizers will not occur on frozen or snow-covered ground.
- Do not use fertilizers as ice melt.

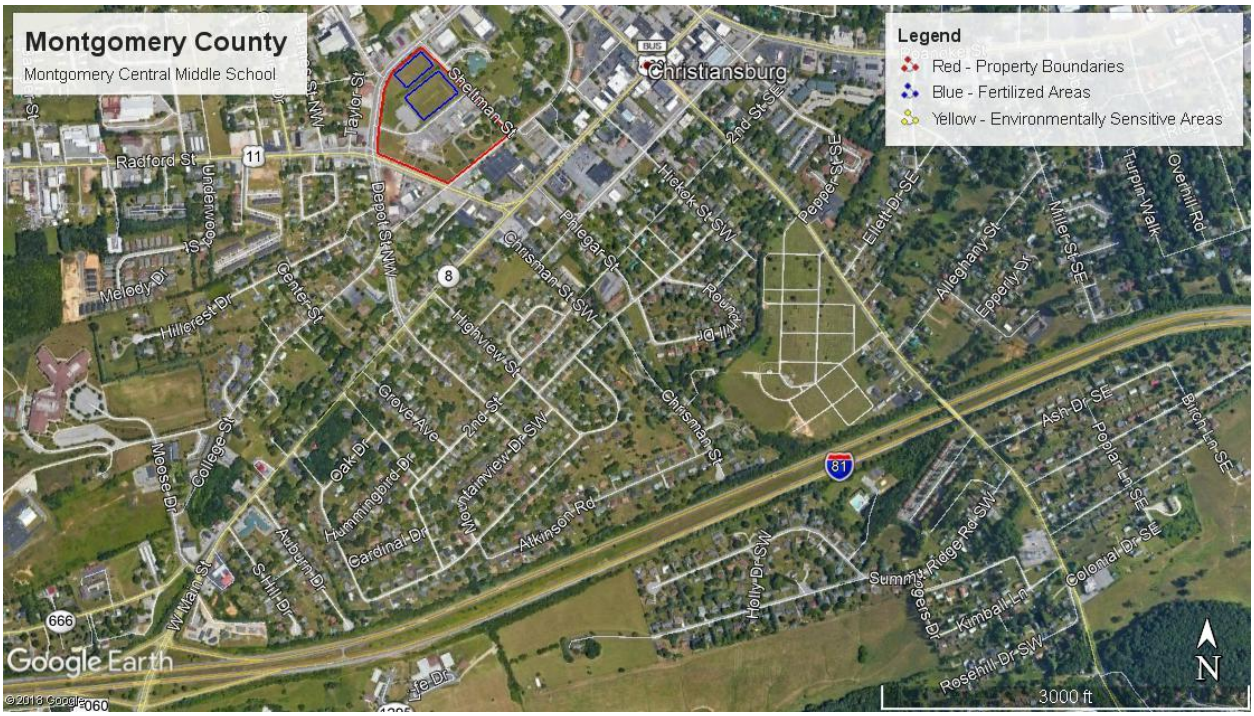
2.6. Montgomery Central Middle School

Location

From I-81 take exit 114 onto VA-8 N/W. Main St. Stay on Main St. for 0.6 miles, then turn left onto Depot Street. In 0.3 miles turn right on Middle School Rd. The fields will be on the left.

Address: 208 College Street
Christiansburg, VA 24073

GPS Coordinates: 37.128478, -80.415457



Areas Managed

There are 2 fields at this location. They total 2.6 acres of unirrigated, cool season turf.

Environmentally Sensitive

- According to city GIS there is no risk of flooding in this area.
- There are roads, sidewalks and storm water drains throughout the area. Be cautious when making fertilizer applications near these areas and always clean up any fertilizers accidently spread on pavement and sidewalks. If possible, cover drains to prevent direct application of fertilizer to water.
- Applications of inorganic fertilizers will not occur on frozen or snow-covered ground.
- Do not use fertilizers as ice melt.

3. Soil Test Summaries

Discussion of soil test results and allowable nutrient inputs. Specific applications details can be found in Nutrient Application Worksheet.

Soil samples were taken by Robert Habel on 6/4/2018 and tested by Waypoint Analytical on 6/6/2018.

Soil tests are rated in terms of Very Low to Very High. To comply with Virginia Nutrient Management Standards and Criteria, Revised July 2014, no phosphorus may be applied if a soil test rates that element Very High. In economic terms, nutrients are not necessarily needed if they test above a medium rating; plant response is not guaranteed if soils already test above medium and therefore money can be saved by using a nitrogen only fertilizer. (See plant response chart page 41)

A. All turf in this plan is cool season, unirrigated sports turf.

B. Soil samples were taken for each location. Locations are grouped based on phosphorus need using a limiting result. This means the lowest input allowed was chosen for each group of results. Group 1 – Low P input can be used on all fields.

C. For cool season sports turf, application schedule and rates are based on DCR guidelines and must be followed as written. Large applications outside of these windows or more than these rates are not permitted.

D. For cool season sports turf, soluble nitrogen rates of 0.25 #/M N or less may be applied as a part of a pesticide or minor element application and can be applied any time the turf is actively growing within the frost dates but must be considered part of the total annual nitrogen.

E. Plan is written for maximum nitrogen input. The grounds manager will decide if all applications are needed by monitoring turf conditions.

F. Lime is needed in some areas.

Soil Test Summary	
Customer Name:	Montgomery County
Testing Lab:	WayPoint Analytical
Sample Date:	6/4/18
Analysis Date:	6/6/2018
Planner Name	Five Oaks Agronomy Consulting, LLC
Certification Number	654

Managed Area ID		Soil pH	Buffer pH	Lab P (ppm)	VT P (ppm)	VT (H/M/L)	Lab K (ppm)	VT K (ppm)	VT (H/M/L)
ID #	Location								
MoCo 02	Blacksburg Middle	6.60		46	17.8	M+	101	71.7	M
MoCo 03	Kipps Elem	6.30		14	3.2	L	98	69.6	M
MoCo 01	Prices Fork	6.40		21	6.4	M-	126	89.5	H-
MoCo 06	Chritiansburg Middle	5.80	6.80	61	24.7	H-	121	85.9	M+
MoCo 04	Falling Branch	5.60	6.76	38	14.1	M	149	105.8	H-
MoCo 05	Montgomery Central	6.80		63	25.6	H-	272	193.1	VH

3.1. Group 1 – Low P Input

Soil Test Summary	
Customer Name:	Montgomery County
Testing Lab:	WayPoint Analytical
Sample Date:	6/4/18
Analysis Date:	6/6/2018
Planner Name	Five Oaks Agronomy Consulting, LLC
Certification Number	654

Managed Area ID		Soil pH	Buffer pH	Lab P (ppm)	VT P (ppm)	VT (H/M/L)	Lab K (ppm)	VT K (ppm)	VT (H/M/L)
ID #	Location								
MoCo 02	Blacksburg Middle	6.60		46	17.8	M+	101	71.7	M
MoCo 06	Chritiansburg Middle	5.80	6.80	61	24.7	H-	121	85.9	M+
MoCo 04	Falling Branch	5.60	6.76	38	14.1	M	149	105.8	H-
MoCo 05	Montgomery Central	6.80		63	25.6	H-	272	193.1	VH
Limiting Results					**25.6**	**H-**		**193.1**	**VH**
Allowed Inputs		**Lime**	**1 T/A**		**P**	**1 #/M**		**K**	**0 #/M**

2.8 #/M nitrogen allowed per year on these unirrigated cool season fields. For September through October applications, if using 100% water-soluble nitrogen 0.7 #/M may be applied every 30 days. If using slow release materials, 0.9 #/M may be used every 30 days. For applications made from November to May, the maximum application rate is 0.5 #/M every 30 days. Do not exceed stated per year total. These applications must be made within this time frame, see footnote D on page 24 for exceptions.

Soil test results were high (H-) levels of phosphorus and very high (VH) levels of potassium. 1 #/M of phosphorus is allowed. Soil tests call for 0 #/M of potassium, but applications will be allowed as potassium does not pose a threat to water quality and helps protect the plant from stresses.

Lime is needed on the fields at Christiansburg Middle School and Falling Branch elementary. The buffer pH of 6.8 calls for 1 T/A or 46 #/M. Calcium is more deficient than magnesium on both fields so calcitic limestone is recommended. Attempt to apply at aeration.

3.2. Group 2 – High P Input

Soil Test Summary									
Customer Name:		Montgomery County							
Testing Lab:		WayPoint Analytical							
Sample Date:		6/4/18							
Analysis Date:		6/6/2018							
Planner Name		Five Oaks Agronomy Consulting, LLC							
Certification Number		654							
Managed Area ID		Soil pH	Buffer pH	Lab P (ppm)	VT P (ppm)	VT (H/M/L)	Lab K (ppm)	VT K (ppm)	VT (H/M/L)
ID #	Location								
MoCo 03	Kipps Elem	6.30		14	3.2	L	98	69.6	M
MoCo 01	Prices Fork	6.40		21	6.4	M-	126	89.5	H-
Limiting Results			**N/A**		**6.4**	**M-**		**89.5**	**H-**
Allowed Inputs		**Lime**	**0.00**		**P**	**2 #/M**		**K**	**1 #/M**

2.8 #/M nitrogen allowed per year on this unirrigated cool season field. For September through October applications, if using 100% water-soluble nitrogen 0.7 #/M may be applied every 30 days. If using slow release materials, 0.9 #/M may be used every 30 days. For applications made from November to May, the maximum application rat is 0.5 #/M every 30 days. Do not exceed stated per year total. These applications must be made within this time frame, see footnote D on page 24 for exceptions.

Soil test results were medium (M-) levels of phosphorus and high (H-) levels of potassium. 2 #/M of phosphorus is allowed. Soil tests call for 1 #/M of potassium, but this number can be exceeded as potassium does not pose a threat to water quality and helps protect the plant from stresses.

Lime is not needed at this time.

4. Nutrient Application Worksheets

The following worksheets detail specific fertilizer applications using the previously discussed soil test information. All nutrient input level recommendations come from the Department of Conservation and Recreation's Nutrient Management Standards and Criteria, this document is part of the Code of Virginia and thus is law for those required to have a Nutrient Management Plan. While applications do not have to be followed specifically, it is important to note that per month nitrogen levels shall not be exceeded and per year phosphorus levels shall not be exceeded. In some cases, potassium input may exceed recommended levels, as it does not have the same detrimental effects on the health of Virginia's waters as nitrogen and phosphorus. Potassium is considered the plant nutrient most responsible for quality. It helps plants respond to stresses like drought, extreme heat/cold, and insect/disease pressure. The plants increased ability to respond to stress in a positive manner can help reduce the need for increased N and P fertility and reseeding caused by stress.

Specific fertilizers have been recommended. Fertilizer analyses are subject to change dependent on availability, suppliers chosen, etc. It is your responsibility to choose fertilizers and calculate appropriate rates that follow discussed regulations. Do not exceed stated monthly Total N or yearly total P. Please contact your planner if you need help adjusting a fertilizer application to meet the requirements of this plan. A spreadsheet to help calculate rates is available on provided flash drive.

All fertilizers suggested are granular, spray applications may be substituted. Labels for suggested fertilizers are located at the end of the document. Fertilizer analyses may be changed, but rates and slow release content must adhere to guidelines.

Making fertilizer applications without calibrating your equipment will lead to inaccurate applications. Application rates (# product/M) and amount of product needed per application (lb/app) are included in spreadsheet.

Please stay within dates indicated on spreadsheets.

Class B bio-solids and animal manures cannot be used without revising this plan to reflect the appropriate setbacks and environmental hazards. Class A bio-solids like Milorganite can be used without problem.

Potassium applications have been exceeded. Potassium helps protect the plant from stress and poses no threat to water quality.

Fertilizer labels of products chosen are located at end of document.

All applications are shown in #/M.

4.1. Blacksburg Middle School

NUTRIENT APPLICATION WORK SHEET														
Name:	Montgomery County			Management Area:	Blacksburg Middle School									
Prepared:	7/1/2018			Area:	5		Turf Type:		Cool Season Unirrigated Sports Turf - Low P Input					
Expires:	7/1/2021													
Total Yearly Nutrient Needs	Application Month/Day	Analysis N - P - K	Interval (days)	Fertilizer Description	Rate/M	lbs/app	% Slow Release N	Total/M N - P - K			Lime lbs/M	Gypsum lbs/M	lbs/app lime/gyp
Nitrogen	No applications before March 21												
2.8	April 15 - May 15	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	3.13	682	55	0.50	- 0.09	- 0.25			
Phosphorus													
1	September	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	5.63	1226	55	0.90	- 0.17	- 0.45			
Potassium													
0	October	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	5.63	1226	55	0.90	- 0.17	- 0.45			
	November	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	3.13	682	55	0.50	- 0.09	- 0.25			
	No applications after November 19												
	Lime												
	No Lime Needed												
						Total used:		2.80	- 0.52	- 1.40			
				Do not exceed yearly maximum allowed by Regulation (Except for K):				**2.8**	**- 1**	**- 0**			

Notes:

- Limiting results are H- in Phosphorus and VH Potassium.
- 2.8 #/M nitrogen allowed per year on this unirrigated cool season field. For September through October applications, if using 100% water-soluble nitrogen 0.7 #/M may be applied every 30 days. If using slow release materials, 0.9 #/M may be used every 30 days. For applications made from November to May, the maximum application rat is 0.5 #/M every 30 days. Do not exceed stated per year total. These applications must be made within this time frame, see footnote D on page 24 for exceptions.
- Application schedule and rates are based on DCR guidelines and must be followed as written. Large applications outside of these windows or more than these rates are not permitted.
- Soluble nitrogen rates of 0.25 #/M N or less may be applied as a part of a pesticide or minor element application and can be applied any time the turf is actively growing within the frost dates but must be considered part of the total annual nitrogen.

4.2. Kipps Elementary School

NUTRIENT APPLICATION WORK SHEET														
Name:	Montgomery County			Management Area:	Kipps Elementary School									
Prepared:	7/1/2018			Area:	1.6		Turf Type:				Cool Season Unirrigated Sports Turf - High P Input			
Expires:	7/1/2021													
Total Yearly Nutrient Needs	Application Month/Day	Analysis N - P - K	Interval (days)	Fertilizer Description	Rate/M	lbs/app	% Slow Release N	Total/M N - P - K			Lime lbs/M	Gypsum lbs/M	lbs/app lime/gyp
Nitrogen	No applications before March 21												
2.8	April 15 - May 15	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	3.13	218	55	0.50	- 0.09	- 0.25			
Phosphorus													
2	September	18 - 24 - 12	30	Lebanon Pro 18-24-12 25% PCU	5.00	348	27	0.90	- 1.20	- 0.60			
Potassium													
1	October	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	5.63	392	55	0.90	- 0.17	- 0.45			
	November	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	3.13	218	55	0.50	- 0.09	- 0.25			
	No applications after November 19												
	Lime												
	No Lime Needed												
						Total used:		2.80	- 1.55	- 1.55			
				Do not exceed yearly maximum allowed by Regulation (Except for K):				**2.8**	**- 2**	**- 1**			

Notes:

- Limiting results are M- in Phosphorus and H- Potassium.
- 2.8 #/M nitrogen allowed per year on this unirrigated cool season field. For September through October applications, if using 100% water-soluble nitrogen 0.7 #/M may be applied every 30 days. If using slow release materials, 0.9 #/M may be used every 30 days. For applications made from November to May, the maximum application rat is 0.5 #/M every 30 days. Do not exceed stated per year total. These applications must be made within this time frame, see footnote D on page 24 for exceptions.
- Application schedule and rates are based on DCR guidelines and must be followed as written. Large applications outside of these windows or more than these rates are not permitted.
- Soluble nitrogen rates of 0.25 #/M N or less may be applied as a part of a pesticide or minor element application and can be applied any time the turf is actively growing within the frost dates but must be considered part of the total annual nitrogen.

4.3. Prices Fork Elementary School

NUTRIENT APPLICATION WORK SHEET														
Name:	Montgomery County			Management Area:	Prices Fork Elementary School									
Prepared:	7/1/2018			Area:	4		Turf Type:				Cool Season Unirrigated Sports Turf - High P Input			
Expires:	7/1/2021													
Total Yearly Nutrient Needs	Application Month/Day	Analysis N - P - K	Interval (days)	Fertilizer Description	Rate/M	lbs/app	% Slow Release N	Total/M N - P - K			Lime lbs/M	Gypsum lbs/M	lbs/app lime/gyp	
Nitrogen	No applications before March 21													
2.8	April 15 - May 15	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	3.13	545	55	0.50	- 0.09	- 0.25				
Phosphorus														
2	September	18 - 24 - 12	30	Lebanon Pro 18-24-12 25% PCU	5.00	871	27	0.90	- 1.20	- 0.60				
Potassium														
1	October	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	5.63	981	55	0.90	- 0.17	- 0.45				
	November	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	3.13	545	55	0.50	- 0.09	- 0.25				
	No applications after November 19													
	Lime													
	No Lime Needed													
						Total used:		2.80	- 1.55	- 1.55				
				Do not exceed yearly maximum allowed by Regulation (Except for K):				**2.8**	**- 2**	**- 1**				

Notes:

- Limiting results are M- in Phosphorus and H- Potassium.
- 2.8 #/M nitrogen allowed per year on this unirrigated cool season field. For September through October applications, if using 100% water-soluble nitrogen 0.7 #/M may be applied every 30 days. If using slow release materials, 0.9 #/M may be used every 30 days. For applications made from November to May, the maximum application rat is 0.5 #/M every 30 days. Do not exceed stated per year total. These applications must be made within this time frame, see footnote D on page 24 for exceptions.
- Application schedule and rates are based on DCR guidelines and must be followed as written. Large applications outside of these windows or more than these rates are not permitted.
- Soluble nitrogen rates of 0.25 #/M N or less may be applied as a part of a pesticide or minor element application and can be applied any time the turf is actively growing within the frost dates but must be considered part of the total annual nitrogen.

4.4. Christiansburg Middle School

NUTRIENT APPLICATION WORK SHEET														
Name:	Montgomery County				Management Area:	Christiansburg Middle School								
Prepared:	7/1/2018				Area:	5.2		Turf Type:		Cool Season Unirrigated Sports Turf - Low P Input				
Expires:	7/1/2021													
Total Yearly Nutrient Needs	Application Month/Day	Analysis N - P - K		Interval (days)	Fertilizer Description	Rate/M	lbs/app	% Slow Release N	Total/M N - P - K			Lime lbs/M	Gypsum lbs/M	lbs/app lime/gyp
Nitrogen	No applications before March 21													
2.8	April 15 - May 15	16 - 3 - 8		30	16-3-8 50%XCU 20%Biosolids 2%FE	3.13	709	55	0.50	- 0.09	- 0.25			
Phosphorus														
1	September	16 - 3 - 8		30	16-3-8 50%XCU 20%Biosolids 2%FE	5.63	1275	55	0.90	- 0.17	- 0.45			
Potassium														
0	October	16 - 3 - 8		30	16-3-8 50%XCU 20%Biosolids 2%FE	5.63	1275	55	0.90	- 0.17	- 0.45			
	November	16 - 3 - 8		30	16-3-8 50%XCU 20%Biosolids 2%FE	3.13	709	55	0.50	- 0.09	- 0.25			
	No applications after November 19													
	Lime													
	1 T/A or 46 #/M Calcitic Limestoned Needed											46		10,420
							Total used:		2.80	- 0.52	- 1.40			
					Do not exceed yearly maximum allowed by Regulation (Except for K):				**2.8**	**- 1**	**- 0**			

Notes:

- Limiting results are H- in Phosphorus and VH Potassium.
- 2.8 #/M nitrogen allowed per year on this unirrigated cool season field. For September through October applications, if using 100% water-soluble nitrogen 0.7 #/M may be applied every 30 days. If using slow release materials, 0.9 #/M may be used every 30 days. For applications made from November to May, the maximum application rat is 0.5 #/M every 30 days. Do not exceed stated per year total. These applications must be made within this time frame, see footnote D on page 24 for exceptions.
- Application schedule and rates are based on DCR guidelines and must be followed as written. Large applications outside of these windows or more than these rates are not permitted.
- Soluble nitrogen rates of 0.25 #/M N or less may be applied as a part of a pesticide or minor element application and can be applied any time the turf is actively growing within the frost dates but must be considered part of the total annual nitrogen.

4.5. Falling Branch Elementary School

NUTRIENT APPLICATION WORK SHEET														
Name:	Montgomery County			Management Area:	Falling Branch Elementary School									
Prepared:	7/1/2018			Area:	1.4		Turf Type:					Cool Season Unirrigated Sports Turf - Low P Input		
Expires:	7/1/2021													
Total Yearly Nutrient Needs	Application Month/Day	Analysis N - P - K	Interval (days)	Fertilizer Description	Rate/M	lbs/app	% Slow Release N	Total/M N - P - K				Lime lbs/M	Gypsum lbs/M	lbs/app lime/gyp
Nitrogen	No applications before March 21													
2.8	April 15 - May 15	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	3.13	191	55	0.50	-	0.09	- 0.25			
Phosphorus														
1	September	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	5.63	343	55	0.90	-	0.17	- 0.45			
Potassium														
0	October	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	5.63	343	55	0.90	-	0.17	- 0.45			
	November	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	3.13	191	55	0.50	-	0.09	- 0.25			
	No applications after November 19													
	Lime													
	1 T/A Calcitic Limestone or 46 #/M											46		2,805
						Total used:		2.80	-	0.52	- 1.40			
				Do not exceed yearly maximum allowed by Regulation (Except for K):				**2.8**	**-**	**1**	**- 0**			

Notes:

- Limiting results are H- in Phosphorus and VH Potassium.
- 2.8 #/M nitrogen allowed per year on this unirrigated cool season field. For September through October applications, if using 100% water-soluble nitrogen 0.7 #/M may be applied every 30 days. If using slow release materials, 0.9 #/M may be used every 30 days. For applications made from November to May, the maximum application rat is 0.5 #/M every 30 days. Do not exceed stated per year total. These applications must be made within this time frame, see footnote D on page 24 for exceptions.
- Application schedule and rates are based on DCR guidelines and must be followed as written. Large applications outside of these windows or more than these rates are not permitted.
- Soluble nitrogen rates of 0.25 #/M N or less may be applied as a part of a pesticide or minor element application and can be applied any time the turf is actively growing within the frost dates but must be considered part of the total annual nitrogen.

4.6. Montgomery Central Middle School

NUTRIENT APPLICATION WORK SHEET														
Name:	Montgomery County			Management Area:	Montgomery Central Middle School									
Prepared:	7/1/2018			Area:	2.6		Turf Type:					Cool Season Unirrigated Sports Turf - Low P Input		
Expires:	7/1/2021													
Total Yearly Nutrient Needs	Application Month/Day	Analysis N - P - K	Interval (days)	Fertilizer Description	Rate/M	lbs/app	% Slow Release N	Total/M N - P - K			Lime lbs/M	Gypsum lbs/M	lbs/app lime/gyp
Nitrogen	No applications before March 21												
2.8	April 15 - May 15	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	3.13	354	55	0.50	- 0.09	- 0.25			
Phosphorus													
1	September	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	5.63	638	55	0.90	- 0.17	- 0.45			
Potassium													
0	October	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	5.63	638	55	0.90	- 0.17	- 0.45			
	November	16 - 3 - 8	30	16-3-8 50%XCU 20%Biosolids 2%FE	3.13	354	55	0.50	- 0.09	- 0.25			
	No applications after November 19												
	Lime												
	No lime needed												
						Total used:		2.80	- 0.52	- 1.40			
				Do not exceed yearly maximum allowed by Regulation (Except for K):				**2.8**	**- 1**	**- 0**			

Notes:

- Limiting results are H- in Phosphorus and VH Potassium.
- 2.8 #/M nitrogen allowed per year on this unirrigated cool season field. For September through October applications, if using 100% water-soluble nitrogen 0.7 #/M may be applied every 30 days. If using slow release materials, 0.9 #/M may be used every 30 days. For applications made from November to May, the maximum application rat is 0.5 #/M every 30 days. Do not exceed stated per year total. These applications must be made within this time frame, see footnote D on page 24 for exceptions.
- Application schedule and rates are based on DCR guidelines and must be followed as written. Large applications outside of these windows or more than these rates are not permitted.
- Soluble nitrogen rates of 0.25 #/M N or less may be applied as a part of a pesticide or minor element application and can be applied any time the turf is actively growing within the frost dates but must be considered part of the total annual nitrogen.

5. Fertilizer Application Records

Fertilizer Application Records								
Location Information					Management Area information			
Name:	Montgomery County				Management Area ID:		Blacksburg Middle	
Address:	755 Roanoke St. Ste. 1C				Management Area Size:		5	
	Christiansburg, VA 24073				Plant Species:		Cool Season Unirrigated Sports Turf	
					Notes:			
Phone#:	540-394-2090							
Date	Applicator/Supervisor	Weather Info			Fertilizer Analysis	Rate	Amount Fertilizer Used	Equipment Used
		Temp	Wind	Precip				
When was the last time your fertilizer equipment was calibrated??? For information on calibration, see Chapter 10 of the "Urban Nutrient Management Handbook". Available for download at http://pubs.ext.vt.edu/430/430-350/430-350.html								

Fertilizer Application Records

Location Information		Management Area information	
Name:	Montgomery County	Management Area ID:	Kipps Elementary
Address:	755 Roanoke St. Ste. 1C Christiansburg, VA 24073	Management Area Size:	1.6
		Plant Species:	Cool Season Unirrigated Sports Turf
		Notes:	
Phone#:	540-394-2090		

Date	Applicator/Supervisor	Weather Info			Fertilizer Analysis	Rate	Amount Fertilizer Used	Equipment Used
		Temp	Wind	Precip				

When was the last time your fertilizer equipment was calibrated???
For information on calibration, see Chapter 10 of the "Urban Nutrient Management Handbook".
Available for download at http://pubs.ext.vt.edu/430/430-350/430-350.html

Fertilizer Application Records

Location Information		Management Area information	
Name:	Montgomery County	Management Area ID:	Prices Fork Elementary
Address:	755 Roanoke St. Ste. 1C Christiansburg, VA 24073	Management Area Size:	4
		Plant Species:	Cool Season Unirrigated Sports Turf
Phone#:	540-853-6302	Notes:	

Date	Applicator/Supervisor	Weather Info			Fertilizer Analysis	Rate	Amount Fertilizer Used	Equipment Used
		Temp	Wind	Precip				

When was the last time your fertilizer equipment was calibrated???
For information on calibration, see Chapter 10 of the "Urban Nutrient Management Handbook".
Available for download at http://pubs.ext.vt.edu/430/430-350/430-350.html

Fertilizer Application Records

Location Information		Management Area information	
Name:	Montgomery County	Management Area ID:	Christiansburg Middle
Address:	755 Roanoke St. Ste. 1C Christiansburg, VA 24073	Management Area Size:	5.2
		Plant Species:	Cool Season Unirrigated Sports Turf
		Notes:	
Phone#:	540-853-6302		

Date	Applicator/Supervisor	Weather Info			Fertilizer Analysis	Rate	Amount Fertilizer Used	Equipment Used
		Temp	Wind	Precip				

When was the last time your fertilizer equipment was calibrated???
For information on calibration, see Chapter 10 of the "Urban Nutrient Management Handbook".
Available for download at http://pubs.ext.vt.edu/430/430-350/430-350.html

Fertilizer Application Records

Location Information		Management Area information	
Name:	Montgomery County	Management Area ID:	Falling Branch Elementary
Address:	755 Roanoke St. Ste. 1C Christiansburg, VA 24073	Management Area Size:	1.4
		Plant Species:	Cool Season Unirrigated Sports Turf
		Notes:	
Phone#:	540-853-6302		

Date	Applicator/Supervisor	Weather Info			Fertilizer Analysis	Rate	Amount Fertilizer Used	Equipment Used
		Temp	Wind	Precip				

When was the last time your fertilizer equipment was calibrated???
For information on calibration, see Chapter 10 of the "Urban Nutrient Management Handbook".
Available for download at http://pubs.ext.vt.edu/430/430-350/430-350.html

Fertilizer Application Records

Location Information		Management Area information	
Name:	Montgomery County	Management Area ID:	Montgomery Central
Address:	755 Roanoke St. Ste. 1C Christiansburg, VA 24073	Management Area Size:	2.6
		Plant Species:	Cool Season Unirrigated Sports Turf
Phone#:	540-853-6302	Notes:	

Date	Applicator/Supervisor	Weather Info			Fertilizer Analysis	Rate	Amount Fertilizer Used	Equipment Used
		Temp	Wind	Precip				

When was the last time your fertilizer equipment was calibrated???
For information on calibration, see Chapter 10 of the "Urban Nutrient Management Handbook".
Available for download at http://pubs.ext.vt.edu/430/430-350/430-350.html

6. Reference Material

Nutrient Availability According to pH

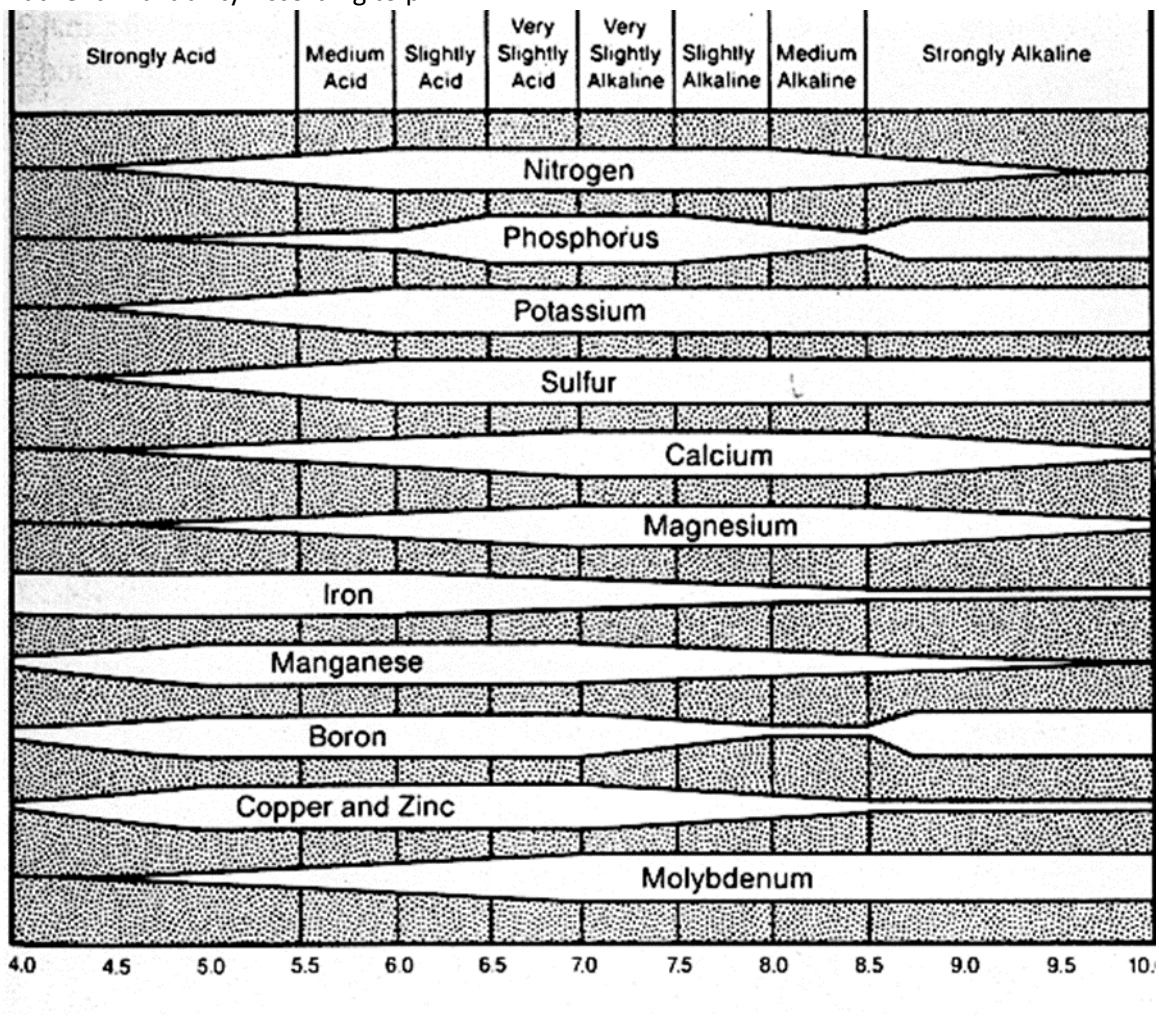


Figure 1: Nutrient Availability at pH

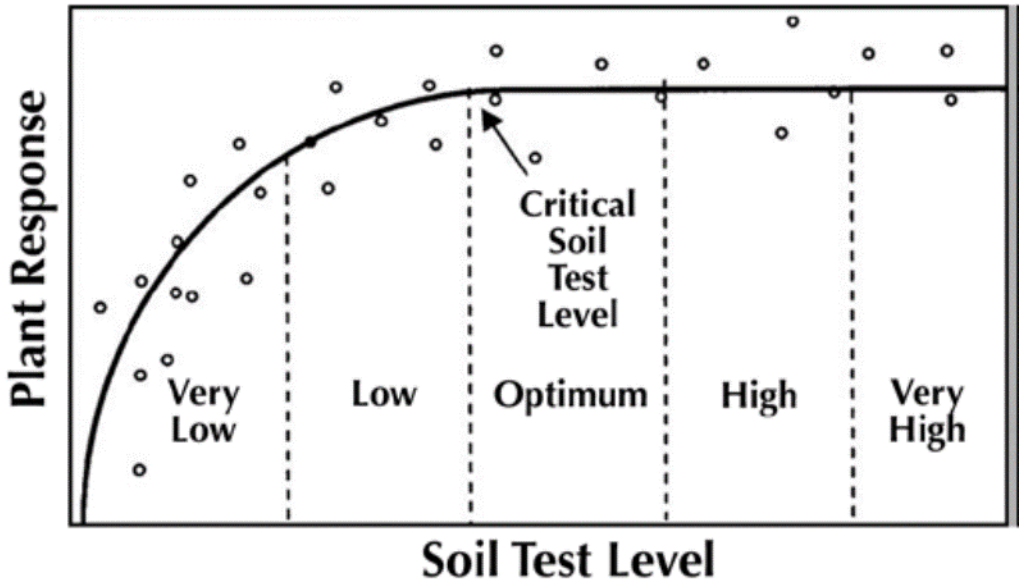


Figure 2: Plant Response Chart

Very low: A plant response is most likely if the indicated nutrient is applied. A large portion of the nutrient requirement must come from fertilization.

Low: A plant response is likely if the indicated nutrient is applied. A portion of the nutrient requirement must come from fertilization.

Medium: A plant response may or may not occur if the indicated nutrient is applied. A small portion of the nutrient requirement must come from fertilization.

High: Plant response is not expected. No additional fertilizer is needed.

Very high: Plant response is not expected. The soil can supply much more than the turf requires. Additional fertilizer should not be added to avoid nutritional problems and adverse environmental consequences.

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

Definitions

For the purposes of this section, the following definitions, as presented by the Association of American Plant Food Control Officials (AAPFCO), apply:

"Enhanced efficiency fertilizer" describes fertilizer products with characteristics that allow increased plant nutrient availability and reduce the potential of nutrient losses to the environment when compared to an appropriate reference product.

"Slow or controlled release fertilizer" means a fertilizer containing a plant nutrient in a form which delays its availability for plant uptake and use after application, or which extends its availability to the plant significantly longer than a reference "rapidly available nutrient fertilizer" such as ammonium nitrate, urea, ammonium phosphate or potassium chloride. A slow or controlled release fertilizer must contain a minimum of 15 percent slowly available forms of nitrogen.

"Water soluble nitrogen", "WSN", or "readily available nitrogen" means: Water soluble nitrogen in either ammonical, urea, or nitrate form that does not have a controlled release, or slow response.

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 within a 30-day period. 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

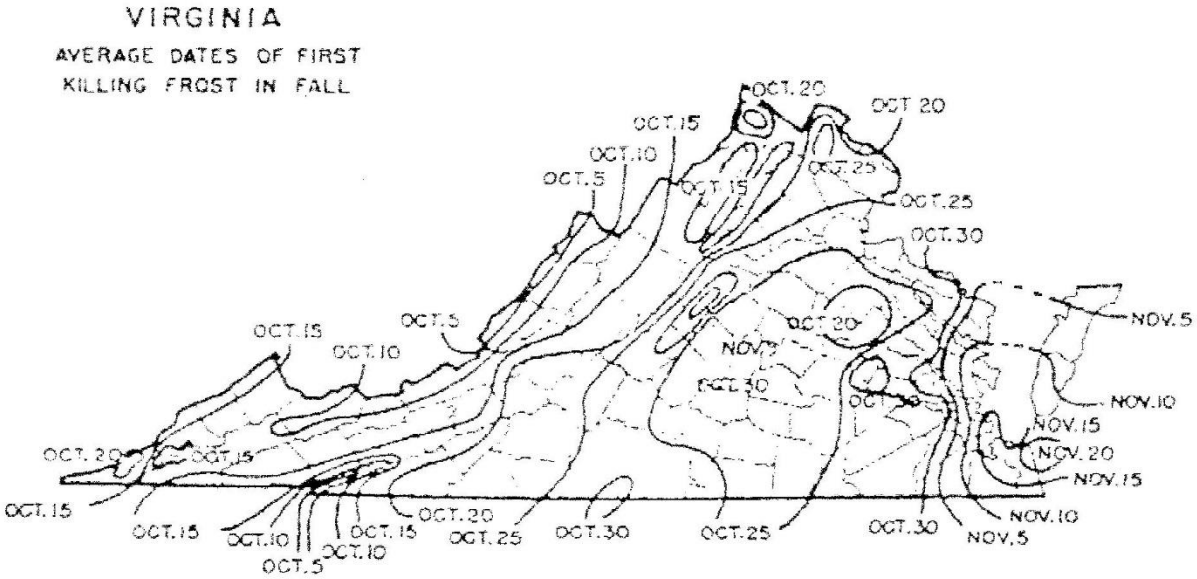
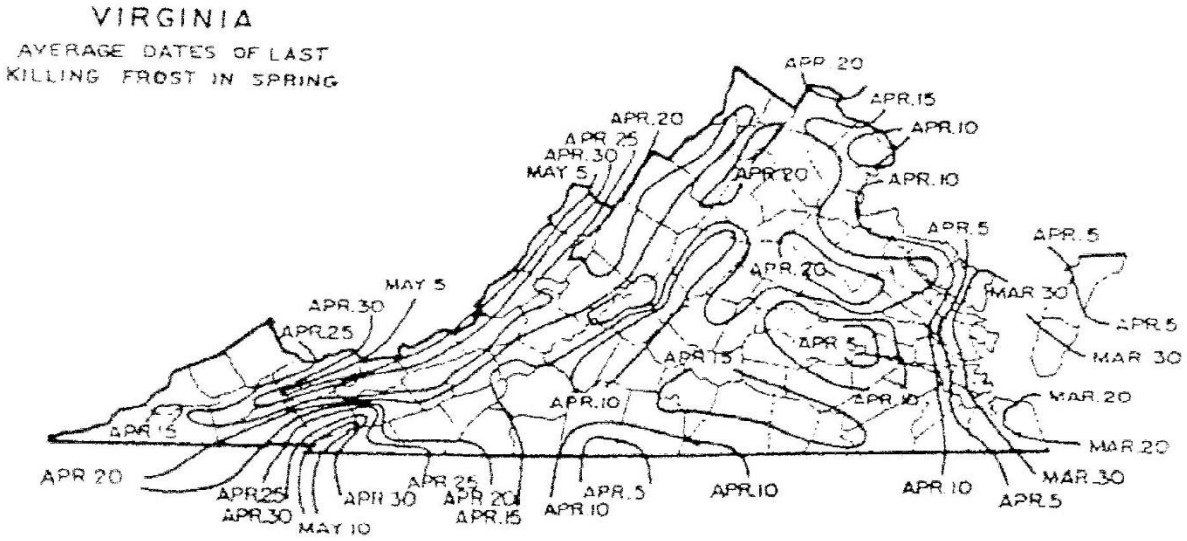


Figure 6-2



Per Application Rates

Do not apply more than 0.7 pounds of water soluble nitrogen per 1,000 ft^2 within a 30-day period. For cool season grasses, do not apply more than 0.9 pounds of total nitrogen per 1,000 ft^2 within a 30-day period. For warm season grasses, do not apply more than 1.0 pounds of total nitrogen per 1,000 ft^2 within a 30-day period. Lower per application rates of water soluble nitrogen sources or use of slowly available nitrogen sources should be ut ilized on very permeable sandy soils, shallow soils over fractured bedrock, or areas near water wells.

Annual Application Rates for Home Lawns and Commercial Turf

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 water soluble 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, chewings fescue, creeping red fescue, and sheep fescue) and non-overseeded zoysiagrass. Lower rates should also be used on less intensively managed areas.

Use of Slowly Available Forms of Nitrogen

For slow or controlled release fertilizer sources, or enhanced efficiency fertilizer sources, no more than 0.9 pounds of nitrogen per 1,000 ft^2 may; be applied to cool season grasses within a 30-day period and no more than 1.0 pounds of nitrogen per 1,000 ft^2 may be applied to warm season grasses within a 30-day period.

Provided the fertilizer label guarantees that the product can be used in such a way that it will not release more than 0.7 pounds of nitrogen per 1,000 ft^2 in a 30-day period, no more than 2.5 pounds of nitrogen per 1,000 ft^2 may be appl ied in a single application. A dditionally, total annual applications shall not exceed 80 percent of the annual nitrogen rates for cool or warm season grasses.

Phosphorus and Potassium Nutrient Needs (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	Nutrient Needs (pounds per 1,000 ft^2)*	
	P_2O_5	K_2O
L	2-3	2-3
M	1-2	1-2
H	0.5-1	0.5-1
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. (For example the recommendation for a P_2O_5 soil test level of L- would be 3 pounds per 1,000 ft^2.)

Do not use 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 or vegetative material (sod, plugs, and /or sprigs), are planted at a time of the year when temperatures and moisture are adequate to maximize turfgrass establishment. These recommended establishment periods would be late summer to early fall for cool-season turfgrasses and late spring through mid-summer for warm-season turfgrasses.

Nitrogen Applications

At the time of establishment, apply no more than 0.9 pounds per 1,000 ft^2 of total nitrogen for cool season grasses or 1.0 pounds per 1,000 ft^2 of total nitrogen for warm season grasses, using a material containing slowly available forms of nitrogen, followed by one or two applications beginning 30 days after planting, not to exceed a total of 1.8 pounds per 1,000 ft^2 total for cool season grasses and 2.0 pounds per 1,000 ft^2 for warm season grasses for the establishment period. Applications of WSN cannot exceed more than 0.7 pounds per 1,000 ft^2 within a 30-day period.

Phosphorus and Potassium Recommendations for Establishment

Soil Test Level	Nutrient Needs (pounds per 1,000 ft^2) *	
	P_2O_5	K_2O
L	3-4	2-3
M	2-3	1-2
H	2-1	0.5-1
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.

Nutrient Recommendations for Golf Courses

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, Figures 6-1 and 6-2.

If the full rate or the highest rate of the recommendation range for a monthly application is applied in a single application, then the interval of application for nitrogen shall be at least 30 days to allow turf to utilize previous nitrogen applications. If several applications are to be made for the monthly nitrogen rate, then the timing of the applications shall be at approximately even intervals, with the rate per application to be evenly divided between each application with the total nitrogen applied not to exceed the maximum monthly rate. Use of Water Insoluble Nitrogen forms of Nitrogen is encouraged.

Nitrogen Rates

	Grass Type	Maximum WSN Rate Per Application - pounds per 1,000 ft^2	Total Annual Nitrogen Rate - pounds per 1,000 ft^2 [a]
Greens		0.7 [b]	3-6
Tees		0.7 [b]	2-5
Fairways	Cool Season	0.7 [c]	2-3
	Warm Season	0.7 [c]	3-4
Fairways – Intensive Management	Cool Season	0.5 [d]	3-4
	Warm Season	0.5 [d]	3.5-4.5
Overseeding Warm Season Fairways		.5	1.25
Roughs		0.7 [e]	1-3

Fairways-Overseeding Warm Season Fairways

- For warm season grasses, up to 0.7 pounds of nitrogen per 1,000 ft^2 in a 30-day period may be applied in the Fall after perennial ryegrass overseeding is well established. An additional nitrogen application of 0.7 pounds per 1,000 ft^2 may be made in February-March to overseeded perennial ryegrass if growth and color indicate need. Applications using WSN may not exceed 0.7 pounds per 1,000 ft^2 within a 30-day period.

  - Soluble nitrogen rates of 0.25 pounds per 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 Recommended Season of Application for Nitrogen Fertilizers of this section, but must be considered with the total annual nitrogen application rate.

(a)Use higher rates for intensively used turf where accelerated growth and/or rapid recovery are required, use lower rates for maintenance of lesser used areas; do not exceed total annual nitrogen levels as stated above.

(b)Greens and Tees – Per application timing must be a minimum of 30 days between applications. A rate of 0.9 pounds per 1,000 ft^2 of total nitrogen may be applied for cool season grasses or 1.0 pounds per 1,000 ft^2 of total nitrogen may be applied for warm season grasses using a material containing slowly available forms of nitrogen.

(c) Fairways-Normal Management (Non-Irrigated or Irrigated) - Per Application timing must be a minimum of 30 days between applications. Total nitrogen application rates of 0.9 pounds per 1,000 ft^2 of total nitrogen may be applied for cool season grasses or 1.0 pound per 1,000 ft^2 of total nitrogen may be applied for warm season grasses using a material containing slowly available forms of nitrogen.

(d) Fairways-Intensive Management (Irrigated)- Per Application timing must be a minimum of 15 days between applications. This option requires optimized timing of more frequent applications of nitrogen with lesser rates per application. Alternatively, a maximum application rate of 0.9 pounds per 1,000 ft^2 of total nitrogen for cool season grasses or 1.0 pounds per 1,000 ft^2 of total nitrogen for warm season grasses using a material containing slowly available forms of nitrogen may be applied with a minimum of 30 days between applications.

(e) Foliar fertilizer may be applied to warm season grasses within 30 days prior to the first killing frost in the fall, at a rate not to exceed 0.1 pounds per 1,000 ft^2 of nitrogen per application. This application must be accounted for in the total annual nitrogen rate.

Phosphorus and Potassium Recommendations for Established Golf Courses

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

Soil Test Level	Nutrient Needs (pounds per 1,000 ft^2)*	
	P_2O_5	K_2O
L	2-3	2-3
M	1-2	1-2
H	0.5-1	0.5-1
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.

- For irrigated turf grown on Naturally Occurring and Modified Sand Based soils only, up to 0.5 pounds of P_2O_5 per 1,000 ft^2 may be applied, if needed, to aid in recovery of damaged turf during times of extreme use. No phosphorus applications shall be made when the soil phosphorus test level is above 65% saturation, based on the soil test phosphorus values and region as listed in Table 4-1 of Section IV.

- 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.

Nitrogen Management on Athletic Fields - Cool Season Grasses

- This program is intended for those fields which are under heavy use.

- Nitrogen recommendations are based on the assumption that there is adequate soil moisture to promote good turf growth at the time of application. If no rainfall has occurred since the last application, further applications should be delayed until significant soil moisture is available.

Cool Season Grasses	Maintenance Program[a] Normal	Intensive
When to Apply[b]	Pounds per 1,000 ft^2 Nitrogen	
After August 15	------	0.5
September	0.7	0.7[c]
October	0.7[c]	0.7[c]
November	0.5	0.7[c]
April 15 - May 15	0.5	0.5
June 1 - June 15	----	0.5

Notes:

- Soluble nitrogen rates of 0.25 pounds per 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 nitrogen application rate.
- WSN = water soluble nitrogen; WIN = water insoluble nitrogen

(a) Intensive managed areas must be irrigated.

(b) The beginning and ending dates for application of nitrogen shall be determined using guidance and frost date maps contained in the preceding Season of Application for Nitrogen section, using Figures 6-1 and 6-2.

(c) Rates up to 0.9 pounds per 1,000 ft^2 of total nitrogen can be applied using a material containing slowly available forms of nitrogen, with a minimum of 30 days between applications.

(d) Make this application only if turf use warrants additional nitrogen for sustaining desirable growth and /or color.

Nitrogen Management on Athletic Fields - Warm Season Grasses

The following comments apply to both Naturally Occurring or Modified Sand based Fields and Predominantly Silt/Clay Soil Fields:

- Annual nitrogen rates for warm season grasses shall not exceed **4 pounds** in areas which have the average first killing frost on or before October 20, and shall not exceed **5 pounds** in areas which have the average first killing frost after October 20 as shown in Figure 6-1. Nitrogen rates and timings for overseeding warm season grasses are not included in these rates.

- April 15 - May 15 applications should not be made until after complete green-up of turf.

- Nitrogen applications June through August should be coordinated with anticipated rainfall if irrigation is not available.

- Use the lower end of the ranges for non-irrigated fields and the higher end of the ranges should be used on fields with irrigation.

- Nitrogen rates towards the higher end of the ranges may be applied on heavily used fields to accelerate recovery, however per application and annual rates cannot be exceeded.

Bermudagrass - Predominantly Silt/Clay Soil Fields [a]		
When to Apply[b]	**Pounds per 1,000 ft^2 Nitrogen[e]**	**First Fall Killing Frost Date[b]**
April 15 - May 15	0.5- 0.7[(c)]	Before Oct. 20
June	0.7	
July	0.5 – 0.7 [(d)]	
August	0.5 - 0.7 [(d)]	
Sept 1 - Sept 15	0.5 -0.7 [(c)]	After Oct. 20
If overseeded with perennial ryegrass		
Oct - Nov	0.5 [(e)]	
Feb-Mar	0.5 [(e)]	

Bermudagrass - Naturally Occurring or Modified Sand based Fields [a]		
When to Apply[b]	**Pounds per 1,000 ft^2 Nitrogen**	**First Fall Killing Frost Date[b]**
April 15 - May 15	0.5 -0.7[(c)]	Before Oct. 20
June1	0.7[(c)]	
July	0.7[(c)]	
August	0.7[(c))]	
Sept 1 - Sept 15	0.7[c]	After Oct. 20
If overseeded with perennial ryegrass		
Oct - Nov	0.5 [(e)]	
Feb - Mar	0.5 [(e)]	

The following notes apply to both of the Bermudagrass tables above:

(a) In the Piedmont and the Ridge and Valley areas of Virginia, the existing native soil will normally be comprised predominantly of clay and/or silt and these soils have inherently lower water infiltration and percolation rates and greater nutrient holding capacity. However, most areas of the Coastal Plain have existing native soils that are predominantly sandy textured soils and other facilities throughout the state may choose to install modified soil root zones that are predominantly sand (>50%) in order to maximize drainage and reduce compaction tendency. If subsurface drain tile surrounded by sand and/or gravel has been installed under the playing surface of any of these fields, their nitrogen programs should be managed as predominantly sand-based systems to minimize nutrient leaching.

(b) 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, Figures 6-1 and 6-2.

(c) WSN must be applied as two applications not to exceed 0.35 pounds per 1,000 ft^2 each with a minimum of 15 days between applications. Alternatively, using a material that contains slowly available nitrogen sources, split applications of 0.5 pounds per 1,000 ft^2 may be applied with a minimum of 15 days between applications.

(d) If a material containing slowly available forms of nitrogen is used, rates up to 1.0 pounds of nitrogen per 1,000 ft^2 may be applied in a single application with a minimum of 30 days between applications.

(e) For overseeded warm season grasses, an additional 0.7 pounds per 1,000ft^2 of WSN may be applied in the Fall after the perennial ryegrass overseeding is well established. The WSN must be applied as two applications not to exceed 0.35 pounds per 1,000 ft^2 of nitrogen each, with a minimum of 15 days between applications. Additional WSN application of 0.5 pounds per 1,000 ft^2 may be made in February-March to overseeded perennial ryegrass if growth and color indicate need. Alternatively, split applications of 0.5 pounds of nitrogen per 1,000 ft^2 each with a minimum of 15 days between applications may be applied using a material containing slowly available nitrogen sources.

Phosphorus and Potassium Recommendations Athletic Fields
Apply phosphorus (P_2O_5) and potassium (K_2O) fertilizers as indicated by a soil test using the following guidelines:

Soil Test Level	Nutrient Needs (pounds per 1,000 ft^2)*	
	P_2O_5	K_2O
L	2-3	2-3
M	1-2	1-2
H	0.5-1	0.5-1
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.

- For irrigated turf grown on Naturally Occurring and Modified Sand Based soils only, up to 0.5 pounds of P_2O_5 per 1,000 ft^2 may be applied, if needed, to aid in recovery of damaged turf during times of extreme use. No phosphorus applications shall be made when the soil phosphorus test level is above 65% saturation, based on the soil test phosphorus values and region as listed in Table 4-1 of Section IV.

- 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.

Establishment/Grow-In Recommendations for Golf Courses, Athletic Fields, and Sod Production

(These rates replace normal maintenance fertilizer applications that would have occurred during these time periods.)

Warm Season Grasses:

Predominantly Silt/Clay Soils

- Plant Date - late May -June for sprigs, plugs, sod, or seeding.
- Apply P_2O_5 and K_2O as needed based on soil test recommendations, incorporate into the top 2 inches if possible.
- At Planting - Up to 1.0 pounds of nitrogen per 1,000 ft^2 using a material containing slowly available forms of nitrogen may be applied as one application or lesser amounts applied at regular intervals, through the first 4 weeks, not to exceed a total of 1.0 pounds of nitrogen per 1,000ft^2.
- Four weeks after planting - 0.25 pounds.of WSN per 1,000 ft^2 per week for the next 4 weeks.

Naturally Occurring or Modified Sand Based Soils

- Plant Date - late May -June for sprigs, plugs, sod, or seeding.
- Apply P_2O_5 and K_2O as needed based on soil test recommendations, incorporate into the top 2 inches if possible.
- At Planting - Up to 1.0 pounds of nitrogen per 1,000 ft^2 using a material containing slowly available forms of nitrogen may be applied as one application or lesser amounts at regular intervals through the first 4 weeks, not to exceed a total of 1.0 pounds of nitrogen per 1,000 ft^2.
- Four weeks after planting - 0.25 pounds per1,000 ft^2 using a material containing slowly available forms of nitrogen per week for the next 4 weeks.

Cool Season Grasses:

Predominantly Silt/Clay Soils

- Plant Date - August - September (preferred)
- Apply P_2O_5 and K_2O as needed based on soil test recommendations, incorporate into the top 2 inches if possible.
- At Planting - up to 0.9 pounds of nitrogen per 1,000 ft^2 using a material containing slowly available forms of nitrogen may be applied; 30 days after planting, apply up to 0.5 pounds of nitrogen per 1,000 ft^2 every week for the next 4 weeks.

Naturally Occurring or Modified Sand Based Soils

- Plant Date - August -September (preferred)
- Apply P_2O_5 and K_2O as needed based on soil test recommendations, incorporate into the top 2 inches if possible.
- At Planting - up to 0.9 pounds of nitrogen per 1,000 ft^2 using a material containing slowly available forms of nitrogen may be applied.
- Apply up to 0.25 pounds of nitrogen per 1,000 ft^2 per week after germination is complete, for the next 8 weeks. If using a material that contains slowly available forms of nitrogen, up to 0.5 pounds of nitrogen per 1,000 ft^2 every two weeks may be applied after germination is complete for the next 8 weeks.

Sod Installations:

Site preparation should include a soil test, which can be done several months before the project begins in order to have time to get test results back. Phosphorus, potassium and lime applications should be based on soil test analysis to increase the likelihood of a successful installation. Shallow incorporation of material into the top 2 inches of the soil is preferred prior to sod installation, especially if lime is required.

No more than 0.7 pounds of nitrogen per 1,000 ft^2 of WSN may be applied before sod is installed. Alternatively, using a material with slowly available forms of nitrogen, 0.9 pounds of nitrogen per 1,000 ft^2 for cool season grasses or 1.0 pounds of nitrogen per 1,000 ft^2 for warm season grasses may be applied before sod is installed.

After installation apply adequate amounts of water to maintain sufficient soil moisture (i.e. to prevent visible wilt symptoms). Excessive water will limit initial root development. After roots begin to establish (as verified by lightly tugging on the sod pieces), shift irrigation strategy to a deep and infrequent program in order to encourage deep root growth. Apply approximately 1 inch of water per week (either by rainfall or irrigation), making sure that the water is being accepted by the soil profile without running off. This will insure thorough wetting of the soil profile.

After sod has completed rooting and is well established, initiate the normal nitrogen management program as described for the appropriate use shall be recommended.

Phosphorus and Potassium Recommendations for Establishment/Grow-In/Installation

Soil Test Level	Nutrient Needs (pounds per 1,000 ft^2) *	
	P_2O_5	K_2O
L	3-4	2-3
M	2-3	1-2
H	2-1	0.5-1
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.

Other Turf Management Considerations for Golf Courses, Athletic fields, and Home Lawns

Lime Recommendations

Lime should be recommended 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 topsoil for best results.

Returning Grass Clippings

Recycling of clippings on turf should be encouraged as an effective means of recycling nitrogen, phosphorus, and potassium. 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. Return all leaf clippings from mowing events to the turf rather than discharging them onto sidewalks or streets. Rotary mulching mowers can further enhance clipping recycling by reducing the size of clippings being returned to the turfgrass canopy.

Management of Collected Clippings

If clippings are collected they should be disposed of properly. They may be composted or spread uniformly as a thin layer over other turf areas or areas where the nutrient content of the clippings can be recycled through actively growing plants. They should not be blown onto impervious surfaces or surface waters, dumped down stormwater drains, or piled outside where rainwater will leach out the nutrients creating the potential for nutrient loss to the environment.

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.

Table 3-1
Lime Recommendations for Virginia Crops (tons/acre)
Lime Rates based on Va Tech Soil buffer pH

	Target Soil pH					
Buffer pH	5.2	5.8.	6.2	6.5	6.8	Acidity meq/100g
6.60	0.00	0.00	0.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00	0.00	0.00	0.03
6.40	0.00	0.00	0.00	0.00	0.50	0.06
6.38	0.00	0.00	0.25	0.25	0.50	0.12
6.36	0.00	0.00	0.25	0.25	0.75	0.24
6.34	0.00	0.00	0.25	0.50	0.75	0.36
6.32	0.00	0.00	0.50	0.50	0.75	0.48
6.30	0.00	0.00	0.50	0.75	1.00	0.59
6.28	0.00	0.25	0.75	0.75	1.00	0.71
6.26	0.00	0.25	0.75	1.00	1.25	0.83
6.24	0.00	0.25	0.75	1.00	1.25	0.95
6.22	0.00	0.50	1.00	1.00	1.50	1.07
6.20	0.00	0.50	1.00	1.25	1.50	1.19
6.18	0.00	0.75	1.25	1.25	1.75	1.30
6.16	0.00	0.75	1.25	1.50	1.75	1.42
6.14	0.25	0.75	1.50	1.50	2.00	1.54
6.12	0.25	1.00	1.50	1.75	2.00	1.66
6.10	0.50	1.00	1.50	1.75	2.25	1.78
6.08	0.50	1.25	1.75	2.00	2.25	1.90
6.06	0.50	1.25	1.75	2.00	2.25	2.02
6.04	0.75	1.25	2.00	2.00	2.50	2.13
6.02	0.75	1.50	2.00	2.25	2.50	2.25
6.00	1.00	1.50	2.00	2.25	2.75	2.37
5.95	1.00	1.75	2.25	2.50	3.00	2.67
5.90	1.25	2.00	2.50	3.00	3.25	2.96
5.85	1.50	2.25	2.75	3.25	3.50	3.26
5.80	1.75	2.50	3.25	3.50	3.75	3.56
5.75	2.00	2.75	3.50	3.75	4.25	3.85
5.70	2.25	3.00	3.75	4.00	4.50	4.15
5.65	2.50	3.25	4.00	4.25	4.75	4.45
5.60	2.75	3.50	4.25	4.50	5.00	4.74
5.55	3.00	3.75	4.50	4.75	5.25	5.04
5.50	3.25	4.00	4.75	5.25	5.50	5.34
5.40	3.75	4.50	5.25	5.75	6.25	5.93
5.30	4.25	5.00	5.75	6.25	6.75	6.52

Lime recommendations in the table above are based on the use of a liming material equivalent in neutralizing power to 100% $CaCO_3$. For application rates of liming material that is less than 100% neutralizing power of $CaCO_3$ (pure calcium carbonate) use the table in this section, Lime Rate Adjustment for CCE.

Lime Recommendations Using Other Testing Labs

For approved labs other than Virginia Tech, use the lime recommendations given by the lab. IF there are no recommendations with the soil analysis, use the table below for A&L Agricultural, Spectrum Analytical, and Brookside Laboratories.

Table 3-2
Lime Application Rate[1] (tons/acre) to achieve desired pH based on SMP Buffer Test

Soil-Buffer pH	Target Soil pH				
	5.2	5.8	6.2	6.5	6.8
6.9	0	0.25	0.50	0.50	0.75
6.8	0.50	0.75	1.00	1.00	1.25
6.7	1.00	1.50	1.50	1.75	2.00
6.6	1.50	1.75	2.00	2.25	2.50
6.5	2.00	2.25	2.50	3.00	3.25
6.4	2.75	3.00	3.25	3.75	4.00
6.3	3.25	3.50	4.00	4.50	5.00

[1] Ag-ground lime of 90% plus total neutralizing power (TNP) or $CaCO_3$equivalent., and fineness of 40% < 100 mesh, 50% < 60 mesh, 70% < 20 mesh and 95% < 8 mesh. Adjustments in the application rate should be made for liming materials with different particle sizes, or neutralizing value.

Waters Agricultural Laboratories uses the Adams and Evans single buffer method which uses a different table for recommendations than the Mehlich or the SMP tables supplied here. In the event you would have lab reports from Waters Lab, which do not have lime recommendations, contact the lab for recommendations based on their analysis procedure.

Lime Rate Adjustment for CCE

Using the lime application rate to achieve the desired target pH based on the soil test buffer pH, use the table below to adjust that rate based on the % CCE of the liming material to be applied.

Table 3-3
Lime Application Rate Adjustment Based on % CCE of Material

	% CCE of Your Liming Material										
T/ac*	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	**140**	**150**
0.5	1.00	0.75	0.75	0.75	0.50	0.50	0.50	0.50	0.50	0.25	0.25
1.0	2.00	1.75	1.50	1.25	1.00	1.00	1.00	0.75	0.75	0.75	0.75
1.5	3.00	2.50	2.25	2.00	1.75	1.50	1.25	1.25	1.25	1.00	1.00
2.0	4.00	3.25	2.75	2.50	2.25	2.00	1.75	1.75	1.50	1.50	1.25
2.5	5.00	4.25	3.50	3.25	2.75	2.50	2.25	2.00	2.00	1.75	1.75
3.0	6.00	5.00	4.25	3.75	3.25	3.00	2.75	2.50	2.25	2.25	2.00
3.5	7.00	5.75	5.00	4.50	4.00	3.50	3.25	3.00	2.75	2.50	2.25
4.0	8.00	6.75	5.75	5.00	4.50	4.00	3.75	3.25	3.00	2.75	2.75

* Lime recommendation to adjust pH as determined from soil test analysis.

Figure 3: CEC Chart

7. Fertilizer Labels

16-3-8 50%XCU 20%Biosolids

15%AS 2%Fe 0.2%B 0.5%Zn Mn Mg Cu

GUARANTEED ANALYSIS

Total Nitrogen (N) …….. 16.00%

3.90% Urea Nitrogen*

3.2% Ammoniacal Nitrogen

0.80% Water Insoluble Nitrogen

8.10% Slowly Available Water Soluble Nitrogen

Available Phosphate (P_2O_5) ……3.00%

Soluble Potash (K_2O) …… 8.00%

Iron (Fe)…….. 2.00%

Derived From: *8.00% slow release nitrogen derived from XCU

CONTAINS: EXCEPTIONAL QUALITY BIOSOLIDS

THIS FERTILIZER IS INTENDED ONLY FOR NONAGRICULTURAL USE ON (A) TURF DURING ITS FIRST GROWING SEASON (B) TURF BEING RENOVATED OR REPAIRED (C) OR WHERE A SOIL TEST INDICATES A PHOSPHOROUS DEFICIENCY

Net Weight 50 lbs (22.70 kg)

APPLY ONLY AS DIRECTED

MFG FOR LANDSCAPE SUPPLY, INC Roanoke, Va. 24016

By TIMAC USA, INC. Reading, Pa.

Lebanon Pro BRAND

STARTER FERTILIZER

SIZE GUIDE NUMBER SGN 220

18-24-12

GUARANTEED ANALYSIS		GUARANTEED MINIMUM ANALYSIS	
Total Nitrogen (N)	**18%**	**Total Nitrogen (N)**	**18%**
0.4% Water Insoluble Nitrogen*		0.4% Water Insoluble Nitrogen*	
17.6% Urea Nitrogen*		17.6% Urea Nitrogen*	
Available Phosphate (P_2O_5)	**24%**	**Available Phosphate (P_2O_5)**	**24%**
Soluble Potash (K_2O)	12%	Soluble Potash (K_2O)	12%
Derived From: Ammonium Phosphate, Biosolids, Polymer Coated Urea, Muriate of Potash.		**Derived From:** Ammonium Phosphate, Biosolids, Polymer Coated Urea, Muriate of Potash.	
*4.9% Slowly available Nitrogen from Polymer Coated Urea and biosolids.		Chlorine (Cl) maximum	10.0%
Chlorine (Cl) not more than	10.0%	*4.9% Slowly available Nitrogen from Polymer Coated Urea and biosolids.	

8. Soil Test Results

See attached file.