Nutrient Management Plan

Prepared For:

Wild Hare Country Club
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Prepared By:

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Acreage

Total:	83.50	Rough:	40.00
Greens:	3.00	Clubhouse Grounds:	2.00
Tees:	3.50	Flower Beds:	0.00
Fairways:	35.00		
	County:	Richmond	
	Watershed:	JL25	

Plan Written: 4/1/2014
Plan Expires: 4/1/2019

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The Wild Hare Country Club agrees to comply with all requirements set forth in the Nutrient Management Training and Certification Regulations, 4VAC5-15-10 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 the Department of Conservation and Recreation's approved Nutrient Management Plan and maintaining fertilization records. All nutrient applications performed by Wild Hare Country Club staff shall comply with the provisions of this Nutrient Management Plan as of April 1, 2014. This plan is effective for five years (until April 1, 2019) or until major course renovation or major changes to maintenance practices occur.

1. Site Description and Supporting Information

Wild Hare Country Club is located in Richmond County, on gently sloping topography. The course is located within the Odyssey Residential Community, accessed from Richmond Road (Route 60). The club recognizes the importance of nutrient management as a fundamental way to protect water quality.

The club owns 135.35 acres of land which includes an 18-hole golf course, driving range, and clubhouse. The course was built in 1996 and no major renovations have occurred to the golf course. The course is comprised of 3 acres of bentgrass greens, 3.5 acres of bermudagrass tees, 30 acres of bermudagrass fairways and 35 acres of bermudagrass rough. The clubhouse grounds account for 2 acres of tall fescue. The fairways, roughs and clubhouse grounds exhibit similar soil conditions. The golf course does not overseed in the fall and the course is irrigated from on-course ponds. The golf course receives approximately 30,000 rounds a year.

There are several surface runoff collection areas on each hole that direct runoff from playing surfaces to natural areas; each green also contains subsurface drain tiles, making both of these areas environmentally sensitive sites. In the Site Maps section of this plan, soils that are frequently flooded are indicated on the Environmentally Sensitive Sites map. Applications of fertilizer to these areas should follow the recommended per application maximums outlined in the Virginia Nutrient Management Standards and Criteria Revised October 2005, as an effort to decrease the chance of nutrient loss to the environment.

Applications of inorganic fertilizers will not occur on frozen or snow-covered ground. Any fertilizer that makes its way onto impervious surfaces should be swept or blown back into pervious turfgrass-covered areas. Do not use fertilizers as ice melt.

Wild Hare CC Fertilization Season

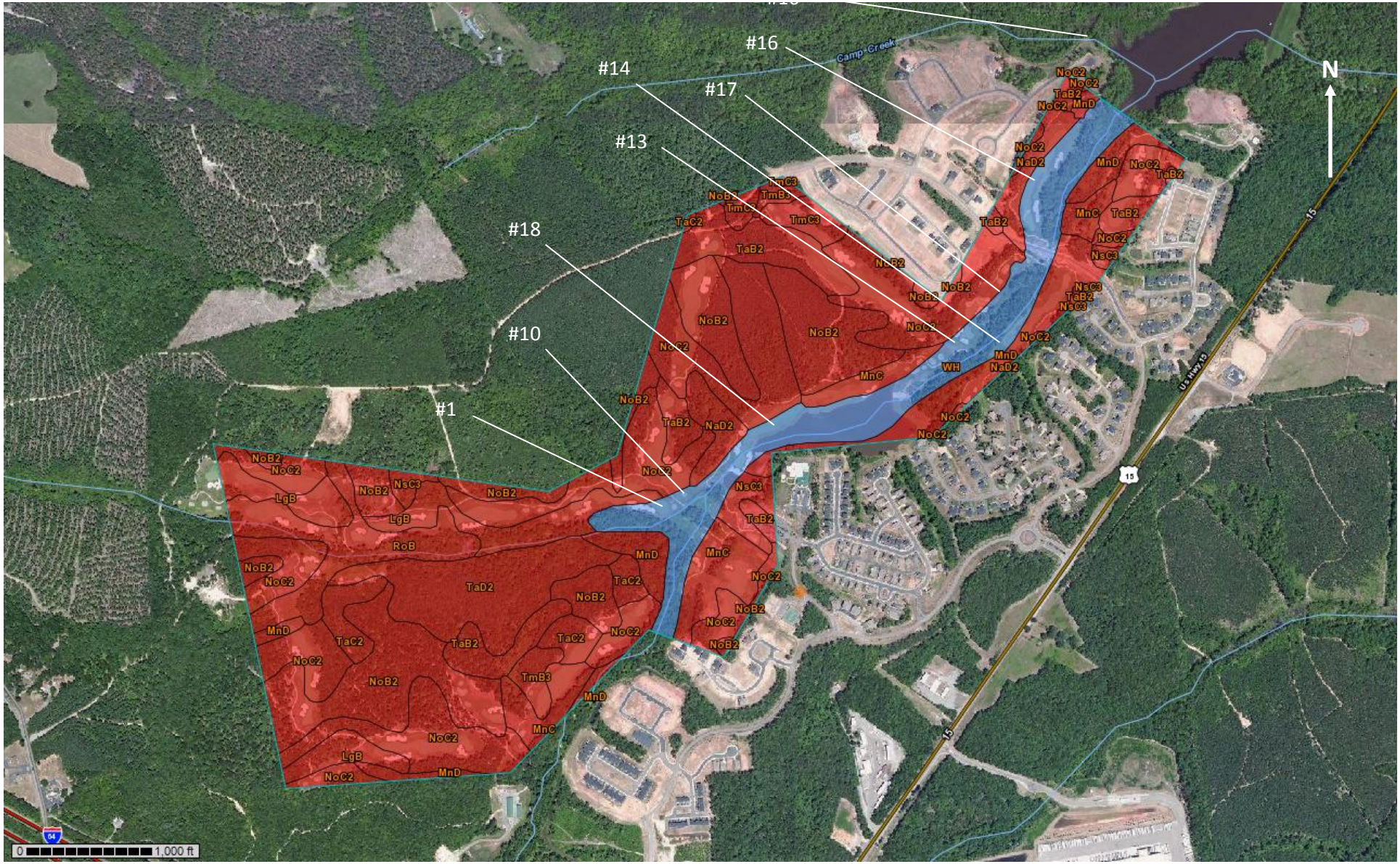
	Killing Frost Dates	Cool Season Applications	Warm Season Applications
Spring	April 10	February 27	April 10
Fall	November 2	December 14	October 2

2. Site Maps
Overview Map: Location and Boundaries

Environmentally Sensitive Sites

Areas shaded in blue are soils that are prone to frequent flooding

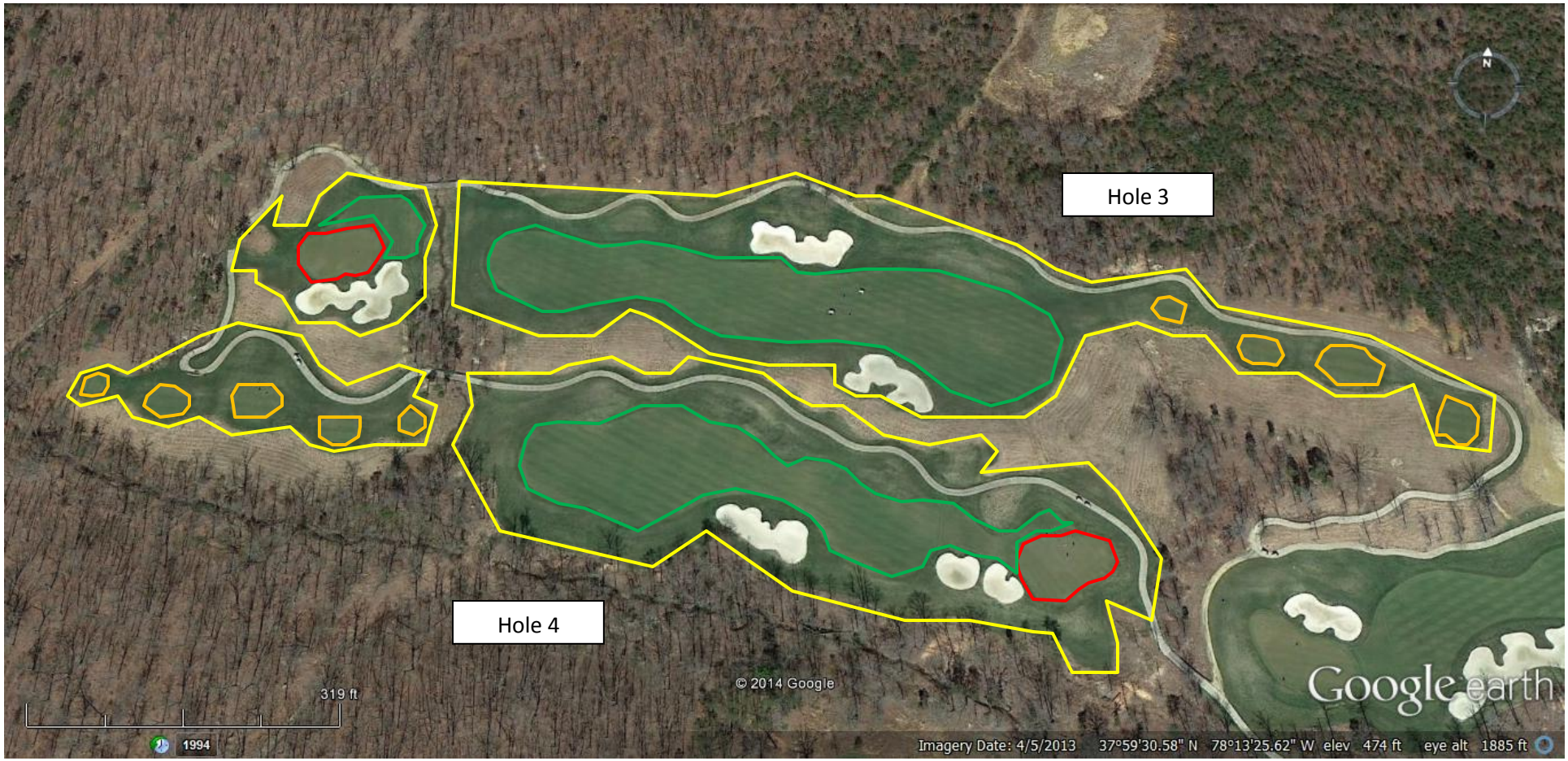
These soils are found on parts of holes 1, 10, 13, 14, 16, 17 and 18



Management Areas

Individual Management areas are outlined. Red= Greens, Orange= Tees, Green= Fairways, Yellow= Rough


Hole 2
N
351 ft
© 2014 Google
Google earth
1994
Imagery Date: 4/5/2013 37°59'28.44" N 78°13'08.03" W elev 442 ft eye alt 1936 ft


Hole 3
Hole 4
© 2014 Google
Google earth
319 ft
1994
Imagery Date: 4/5/2013 37°59'30.58" N 78°13'25.62" W elev 474 ft eye alt 1885 ft

Clubhouse Grounds

3. Soil Test Results

Soil samples were taken from greens, tees, fairways and rough. Several sub-samples from the upper 4" of soil were taken for the greens, tees, fairways and roughs. These sub-samples were taken in a random manner, such as a zigzag pattern to minimize the variability that is present in the sampling area. When sufficient sub-samples from a uniform area were taken they were thoroughly mixed, breaking apart clumps and removing all foreign matter such as roots, stalks, rocks, etc. Sub-samples from the fairways, and roughs were combined and submitted as one sample because of similar soil and fertility conditions seen in both management areas. The clubhouse grounds exhibit similar soil and fertility conditions as seen in the fairways and rough and will follow the corresponding nutrient recommendations.

Soil samples were analyzed by Virginia Tech Soil Testing Lab. Standard soil test results provide values for pH, cation exchange capacity, phosphorus, calcium, magnesium, potassium, sodium. The soil samples collected are valid for the life of this plan (five years) or upon a major renovation or redesign of the golf course lands, whichever occurs sooner.

A. Greens 1-18, Putting Green; 3 acres
Soil pH measures 6.9. No lime is recommended. Phosphorus levels averaged in the High + range. Applications of phosphorus are recommended, not to exceed 0.5 lbs/1,000 ft^2 annually. Green number 13 tested Very High for phosphorus and no additional phosphorus is needed. See additional notes on the greens application worksheet. Potassium levels averaged in the Low range. Applications of potassium are recommended, not to exceed 2.5 lbs/1,000 ft^2 annually Nitrogen applications may not exceed 6 lbs/1,000 ft^2 annually.

B. Tees 1-18; 3.5 acres
Soil pH measures 7.0. No Lime is recommended. For the number 17 tee complex, pH was 5.2 and lime is recommended at a rate of 1.5 tons/acre. Split the applications into three 0.5 tons/acre applications throughout at the year. Phosphorus levels averaged in the High - range. Applications of phosphorus are recommended, not to exceed 1.0 lbs/1,000 ft^2 annually. Potassium levels averaged in the Medium - range. Applications of potassium are recommended, not to exceed 2.0 lbs/1,000 ft^2 annually Nitrogen applications may not exceed 5 lbs/1,000 ft^2 annually.

C. Fairways 1-18; 30 acres, Roughs 1-18; 35 acres and Clubhouse Grounds; 2 acres
Soil pH measures 6.7. No lime is recommended. For the number 17 fairway and rough, pH was 5.4 and lime is recommended at a rate of 1.5 tons/acre. Split the applications into three 0.5 tons/acre applications throughout at the year. Phosphorus levels averaged in the Medium - range. Applications of phosphorus are recommended, not to exceed 2.0 lbs/1,000 ft^2 annually. Potassium levels averaged in the Low + range. Applications of potassium are recommended, not to exceed 2.0 lbs/1,000 ft^2 annually. Nitrogen applications may not exceed 4.5 lbs/1,000 ft^2 annually on fairways; 3 lbs/1,000 ft^2 annually on roughs and clubhouse grounds.

4. Soil Test Summaries

A. Greens

Managed Area	Soil pH	Buffer pH	Lab P_2O_5 (lbs/A)	VT P (ppm)	VT (H/M/L)	Lab K_2O (lbs/A)	VT K (ppm)	VT (H/M/L)
2	6.9	6.52	108	54	H+	26	13	L
5	7.0	N/A	89	44.5	H+	31	15.5	L
7	6.8	6.5	109	54.5	H+	38	19	L
11	6.9	6.51	74	37	H	24	12	L
13	7.0	N/A	129	64.5	VH	34	17	L
17	6.9	6.49	82	41	H	24	12	L
Recommendation			**92.4**		**H+**	**23**		**L**

B. Tees

Managed Area	Soil pH	Buffer pH	Lab P_2O_5 (lbs/A)	VT P (ppm)	VT (H/M/L)	Lab K_2O (lbs/A)	VT K (ppm)	VT (H/M/L)
2	7.1	N/A	69	34.5	H	97	48.5	M-
5	6.9	6.5	60	30	H	140	70	M
7	7.3	N/A	43	21.5	H-	82	41	M-
11	7.4	N/A	23	11.5	M	84	42	M-
13	6.6	6.42	26	13	M	64	32	L+
17	5.2	6.14	21	10.5	M	63	31.5	L+
Recommendation			**40.3**		**H-**	**88.3**		**M-**

C. Fairways, Roughs and Clubhouse Grounds

Managed Area	Soil pH	Buffer pH	Lab P_2O_5 (lbs/A)	VT P (ppm)	VT (H/M/L)	Lab K_2O (lbs/A)	VT K (ppm)	VT (H/M/L)
2	6.6	6.39	23	11.5	M	63	31.5	L+
5	6.7	6.44	16	8	M-	96	48	M-
7	6.7	6.47	15	7.5	M-	66	33	L+
11	7.3	N/A	16	8	M-	92	46	M-
13	6.2	6.32	15	7.5	M-	66	33	L+
17	5.4	6.16	17	8.5	M-	68	34	L+
Recommendation			**17**		**M-**	**75.2**		**L+**

5. Nutrient Application Worksheets

Applications outlined in each application worksheet will be made each year (2014-2019)

A. Greens Worksheet

Nutrient Application Worksheet

NAME: Wild Hare Country Club
Management Area: Greens: 1-18, Putting Green
Prepared: 4/1/14
Area: 130,680
Species: bentgrass
Expires: 4/1/19

Total Nutrient Needs	Application Month/Day	Analysis			# of Apps	Application Interval	Fertilizer Type	Fertilizer Description	Rate per 1000ft^2	lbs or oz	Wt. per Gal.	%Slow Release N	Total NPK lbs/1000ft^2			Gypsum	Lime	Total Product (lbs/Area)
Nitrogen		N	P	K									N	P_2O_5	K_2O			
	Mar 1	16	0	3	1				2.00	lbs	128.00		0.32	0.00	0.06			261.36
Phosphorus	Mar 15	21	0	0	5	monthly			0.50	lbs	128.00		0.53	0.00	0.00			65.34
	Mar 30	14	0	14	3	monthly	liquid		13.70	oz	11.20	60%	0.50	0.00	0.50			1790.316
Potassium	July 30	46	0	0	4	2 weeks			0.25	lbs	128.00		0.46	0.00	0.00			32.67
	Sept 15	14	0	14	2	monthly	liquid		13.70	oz	11.20	60%	0.34	0.00	0.34			1790.316
	Oct 1	21	0	0	1				1.50	lbs	128.00		0.32	0.00	0.00			196.02
	Nov 1	28	0	18	1		water sol		0.12	lbs	128.00		0.03	0.00	0.02			15.6816
	Dec 1	19	0	6	1		liquid		9.50	oz	10.84		0.15	0.00	0.05			1241.46
	Dec 10	18	46	0	1		granular	DAP	1.00	lbs	128.00		0.18	0.46	0.00			130.68
											128.00		0.00	0.00	0.00			0
											128.00		0.00	0.00	0.00			0
											128.00		0.00	0.00	0.00			0
											128.00		0.00	0.00	0.00			0
											128.00		0.00	0.00	0.00			0
											128.00		0.00	0.00	0.00			0
											128.00		0.00	0.00	0.00			0
											128.00		0.00	0.00	0.00			0
											128.00		0.00	0.00	0.00			0
											128.00		0.00	0.00	0.00			0
											128.00		0.00	0.00	0.00			0
									Total			60%	2.83	0.46	0.97			
						N Recommendation Range and Soil Test Recommendation							3-6	0.5	2.5			

Notes: 1. Maximum WSN rate per application is 0.7 lbs N/1,000 sqft. 2. Replace Dec. 10 application of 18-46-0 on hole #13 with a 0.85 lbs of product/M of 21-0-0

B. Tees Worksheet

Nutrient Application Worksheet														
NAME:	**Wild Hare Country Club**						**Management Area: Tees:**				1-18, Driving Range			
Prepared:	**4/1/14**						**Area:**	**152,460**			**Species:**	**bermudagrass**		
Expires:	**4/1/19**													
Total Nutrient Needs	**Application Month/Day**	**Analysis**	**# of Apps**	**Application Interval**	**Fertilizer Type**	**Fertilizer Description**	**Rate per $1000ft^2$**	**lbs or oz**	**Wt. per Gal.**	**%Slow Release N**	**Total NPK lbs/$1000ft^2$**	**Gypsum**	**Lime**	**Total Product (lbs/Area)**
Nitrogen		N - P - K									N - P_2O_5 - K_2O			
	April 10	44 - 0 - 0	1				1.70	lbs	128.00	100%	0.75 - 0.00 - 0.00			259.182
Phosphorus	May 1	10 - 18 - 18	1				5.00	lbs	128.00		0.50 - 0.90 - 0.90			762.3
	June 1	44 - 0 - 0	1				1.70	lbs	128.00		0.75 - 0.00 - 0.00			259.182
Potassium	July 1	25 - 0 - 3	1				3.00	lbs	128.00	30%	0.75 - 0.00 - 0.09			457.38
	August 1	21 - 0 - 0	1				0.70	lbs	128.00		0.15 - 0.00 - 0.00			106.722
	Sept 1	8 - 2 - 2	1				5.00	lbs	128.00		0.40 - 0.10 - 0.10			762.3
	Sept 15	12 - 0 - 24	2	2 weeks			1.00	lbs	128.00		0.24 - 0.00 - 0.48			152.46
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
							Total			65%	3.53 - 1.00 - 1.57			
				N Recommendation Range and Soil Test Recommendation							2-5 / 1 / 2			
Notes:														

C. Fairways Worksheet

Nutrient Application Worksheet														
NAME:	Wild Hare Country Club						Management Area: Fairways:				1-18, Driving Range			
Prepared:	4/1/14						Acres:	30			Species:	bermudagrass		
Expires:	4/1/19													
Total Nutrient Needs	Application Month/Day	Analysis	# of Apps	Application Interval	Fertilizer Type	Fertilizer Description	Rate per Acre	lbs or oz	Wt. per Gal.	%Slow Release N	Total NPK lbs/Acre	Gypsum	Lime	Total Product (lbs/Area)
Nitrogen		N - P - K									N - P_2O_5 - K_2O			
	April 10	44 - 0 - 0	1				1.70	lbs	128.00	100%	0.75 - 0.00 - 0.00			51
Phosphorus	May 1	10 - 10 - 18	1				5.00	lbs	128.00		0.50 - 0.50 - 0.90			150
	June 1	21 - 0 - 0	1				2.00	lbs	128.00		0.42 - 0.00 - 0.00			60
Potassium	July 1	25 - 0 - 3	1				3.00	lbs	128.00	30%	0.75 - 0.00 - 0.09			90
	August 1	21 - 0 - 0	1				0.70	lbs	128.00		0.15 - 0.00 - 0.00			21
	September 1	8 - 2 - 2	1				5.00	lbs	128.00		0.40 - 0.10 - 0.10			150
	Septemeber 15	12 - 0 - 24	2	2 weeks			1.00	lbs	128.00		0.24 - 0.00 - 0.48			30
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
							Total			65%	3.21 - 0.60 - 1.57			
				N Recommendation Range and Soil Test Recommendation							3.5-4.5 / 2 / 2			
Notes:														

D. Rough Worksheet

Nutrient Application Worksheet

NAME:	Wild Hare Country Club	**Management Area: Rough:**	1-18,	
Prepared:	4/1/14	**Acres:**	35	**Species:** bermudagrass
Expires:	4/1/19			

Total Nutrient Needs	Application Month/Day	Analysis	# of Apps	Application Interval	Fertilizer Type	Fertilizer Description	Rate per Acre	lbs or oz	Wt. per Gal.	%Slow Release N	Total NPK lbs/Acre	Gypsum	Lime	Total Product (lbs/Area)
Nitrogen		N - P - K									N - P_2O_5 - K_2O			
	April 10	44 - 0 - 0	1				2.25	lbs	128.00	100%	0.99 - 0.00 - 0.00			78.75
Phosphorus	June 1	18 - 46 - 0	1				1.50	lbs	128.00		0.27 - 0.69 - 0.00			52.5
	June 1	0 - 0 - 22	1			SulPoMag	4.00	lbs	128.00		0.00 - 0.00 - 0.88			140
Potassium	July 1	12 - 0 - 24	1				3.00	lbs	128.00	30%	0.36 - 0.00 - 0.72			105
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
							Total			65%	1.62 - 0.69 - 1.60			
				N Recommendation Range and Soil Test Recommendation							1-3 | 2 | 2			
Notes:														

E. Clubhouse Grounds

Nutrient Application Worksheet														
NAME:	Wild Hare Country Club					Management Area: Clubhouse Grounds:					Clubhouse Grounds			
Prepared:	4/1/14						Area:		87,120		Species:	tall fescue		
Expires:	4/1/19													
Total Nutrient Needs	Application Month/Day	Analysis	# of Apps	Application Interval	Fertilizer Type	Fertilizer Description	Rate per 1000ft²	lbs or oz	Wt. per Gal.	%Slow Release N	Total NPK lbs/1000ft²	Gypsum	Lime	Total Product (lbs/Area)
Nitrogen		N - P - K									N - P_2O_5 - K_2O			
	April 10	12 - 24 - 8	1				4.00	lbs	128.00		0.48 - 0.96 - 0.32			348.48
Phosphorus	Sept 1	44 - 0 - 0	1				2.00	lbs	128.00	100%	0.88 - 0.00 - 0.00			174.24
	Oct 1	12 - 0 - 24	1				5.50	lbs	128.00		0.66 - 0.00 - 1.32			479.16
Potassium		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
		- -							128.00		0.00 - 0.00 - 0.00			0
							Total			100%	2.02 - 0.96 - 1.64			
				N Recommendation Range and Soil Test Recommendation							1-3 / 2 / 2			
Notes:														

6. Fertilizer Application Record

Fertilizer Application Records								
Customer Information					Management Area Information			
Name:	Wild Hare Country Club				Management Area ID:			
Address:	1501 Augusta Dr				Management Area Size:			
	Town, VA 22543				Plant Species:			
					Notes:			
Phone #:	555-855-5855							
Date (M/D/Y)	Supervisor/Applicator	Weather Conditions			Fertilizer Analysis	Rate	Amount Fertilizer Used	Application Equipment Used
		Temp	Wind Speed	Precip				

7. Virginia Nutrient Management Standards and Criteria, VI. Turfgrass Nutrient Recommendations

Nitrogen Application Guidelines

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.*** 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.

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.

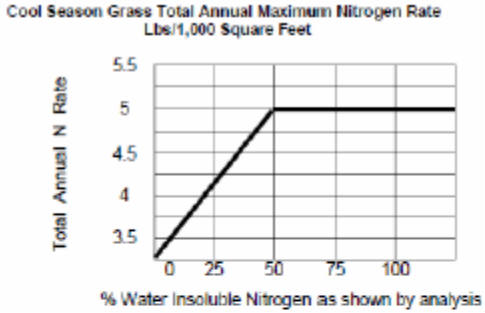
Annual Application Rates for Home Lawns and Commercial Turf

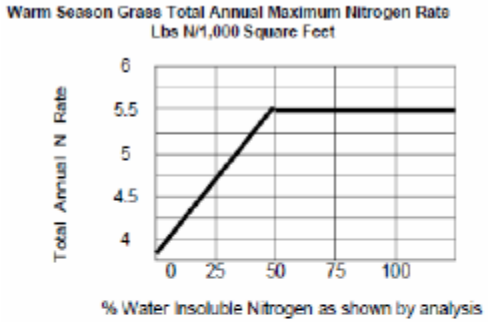
Up to 3.5 pounds per 1,000 ft^2 of nitrogen may be applied annually to cool season grass species or up to 4 pounds per 1,000 ft^2 may be applied annually to warm season grass species using 100 percent water soluble nitrogen sources. Lower rates of nitrogen application may be desirable on those mature 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 applications of materials containing Water Insoluble Nitrogen (WIN) sources, total annual nitrogen application rates may be adjusted incrementally from Water Soluble Nitrogen (WSN) rates by referring to the following figure (maximum annual N rates when using 50% or greater Water Insoluble Nitrogen are 5.0 lbs/1000 ft^2 for cool season grasses, and 5.5 lbs/1,000 ft^2 for warm season grasses):

Rates already stated as WIN should be applied as stated without adjustment.





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 (pg 96).

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 Application Rates

	Grass Type	Maximum N Rate per application lbs/1000 ft²	Total Annual N Rate lbs/1000 ft² [a]
Greens		0.75	3-6
Tees		0.75	2-5
Fairways: Normal Management	Warm-season	1.0 [b]	3-4
Fairways: Normal Management	Cool-season [e]	1.0 [b]	2-3
Fairways: Intensive Management	Warm-season[e]	0.5 [c]	3.5-4.5
Fairways: Intensive Management	Cool-season[e]	0.5 [c]	3-4
Fairways: Overseeded	Warm-season	0.5 [d]	1.25
Roughs		1	1-3
Growing-in (land under repair)[g]		1	1-2

• For warm season grasses, 0.50-0.75 lb/1,000 ft² of Nitrogen may be applied in the Fall after perennial ryegrass overseeding is well established. An additional N application of 0.50 lb/1,000ft² may be made in February-March to overseeded perennial ryegrass if growth and color indicate need.

• Soluble N rates of ¼ lb/1,000 ft² 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 N 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 N levels as stated above.

(b) Fairways-Normal Management (Non-Irrigated or Irrigated) - Per Application timing must be a minimum of 30 days between applications.

(c) 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 1 lb N/1,000 ft² of a material with 50% or greater WIN may be applied a minimum of 30 days between applications.

(d) 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 lb/1,000ft² 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 (VT) Rating	P_2O_5 lb/1000 ft²	K_2O lb/1000 ft²
L-	3	3
L	2.5	2.5
L+	2	2
M-	2	2
M	1.5	1.5
M+	1	1
H-	1	1
H	0.75	0.75
H+	0.5	0.5
VH	0	0

- For irrigated turf grown on Naturally Occurring and Modified Sand Based soils only, up to 0.5 lb of P_2O_5 /1,000 ft² 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 (pg 47).

- 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
(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 lb N/1,000 ft² of WIN 50% or greater 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 lb N/1,000ft².
- Four weeks after planting - ¼ - ½ lb. of WSN/1,000 ft2 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.
- Pre-plant - 1lb/N 1,000 ft² of WIN 50% or greater.
- Four weeks after planting - ¼ - ½ lb. of WSN/1,000 ft² 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 1 lb N/1,000 ft² using a slowly available N source; 30 days after planting, apply up to 0.5 lb N/1,000 ft² 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 1 lb N/1,000 ft² using a WIN 50% or greater N source.
- Apply up to ¼ lb N/1,000 ft2 per week after germination is complete, for the next 8 weeks.

If material is 50% or greater WIN, then apply up to ½ lb N/1,000 ft² every two weeks 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 0.5 lb of N/1,000 ft^2 as water soluble Nitrogen or 1 lb N/1,000 ft^2 as at least 50% WIN should 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 (VT) Rating	P_2O_5 lb/1000 ft^2	K_2O lb/1000 ft^2
L-	4	3
L	3.5	2.5
L+	3	2
M-	3	2
M	2.5	1.5
M+	2	1
H-	2	1
H	1.5	0.75
H+	1	0.5
VH	0	0

Other Turf Management Considerations for Golf Courses

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
Foliar iron supplements may be used to stimulate a greening effect on the turfgrass as an alternative to additional applications of nitrogen. These applications are most beneficial if applied in late spring through summer for cool season grasses and in late summer through fall for warm-season grasses. A rate of 1 to 1.5 pounds of iron per acre is appropriate.

Impervious Surfaces
Do not apply fertilizers containing nitrogen or phosphorus to impervious surfaces (sidewalks, streets, etc.). DO NOT use urea as an ice melting substance in cold weather. 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 use a leaf blower etc., to return the fertilizer back to the turfgrass canopy.

Environmentally Sensitive Areas
Avoid fertilizer applications within 15 feet of waterways. This setback is reduced to 10 feet if a drop spreader, rotary spreader with deflector or targeted spray liquid is used to apply the fertilizer. The use of fertilizers with slow release nitrogen is greatly encouraged, especially where there is any reason to suspect environmental concerns.

Spreader Calibration

Spreaders and boom sprayers must be properly calibrated if they are to deliver fertilizers and pesticides to turf at correct rates. If calibration is done incorrectly, the product may be misapplied and either too much or too little of the product will reach the turf. Sprayers and spreaders should be calibrated at first use and every fourth application. Spreaders and sprayers be calibrated in several ways. Refer to the following publication for detailed instructions:

www.turfgrass.ncsu.edu/Articles/admin/2008/Calibration_of_Turfgrass_Boom_Sprayers_and_Spreaders_(AG-628).pdf