NUTRIENT MANAGEMENT GUIDELINES FOR COMMERCIAL TURFGRASS SEEDING

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Nutrient management laws passed by the Maryland Legislature in 1998 require that certain commercial fertilizer applicators adhere to University of Maryland Cooperative Extension guidelines when establishing or maintaining turfgrass sites. This publication is intended to serve as a nutrient management guideline for the establishment of turfgrass by seeding. When establishing a new site by seeding turfgrass, proper fertilization at the time of establishment is essential for obtaining a satisfactory stand of turfgrass for both the short and long-term.

One of the major concerns regarding the health of the Chesapeake Bay is soil erosion and the subsequent movement of nitrogen (N) and particularly phosphorus (P) into the Bay. Thus, the rapid establishment of turfgrass on disturbed soil is environmentally important and can drastically reduce the movement of soil, and thus nutrients, by erosion into sensitive areas. A critical factor in the rapid establishment of turfgrass is providing adequate N and P at the time of establishment. In addition, once turfgrass has been established successfully, soil loss is negligible, water runoff is greatly reduced, and water infiltration is increased. Runoff from established turf has compared favorably to forested land.

Key Points

Adequate nitrogen and phosphorus are critical for rapid turf establishment and prevention of soil erosion. Soil tests should be obtained to determine how much P, K and limestone are needed. Long term problems, such as weed encroachment, diseases, and drought susceptibility can be reduced with proper seedbed fertility.

Phosphorus and Potassium Applications

Phosphorus is essential for the growth and development of seedling turfgrass. Inadequate P in the seedbed will result in poor initial growth and a stand that rapidly thins, resulting in a site that is prone to soil erosion and weed encroachment. Research has shown that providing adequate P at the time of seeding will reduce long-term weed encroachment problems, reduce soil erosion, and reduce runoff while increasing water infiltration.

Potassium is generally not critical during the establishment phase of turfgrass unless soil levels are particularly low. However, adequate potassium is essential for established turf in improving tolerance to environmental stresses and wear, and may increase the resistance to some diseases. It is recommended that soil K levels be adjusted at the time of seeding so that no deficiencies develop as the turfgrass matures. This is particularly advisable if fertilizer is being incorporated into the soil during soil preparation so that the entire potential root zone can be modified.

Phosphorus (P) and potassium (K) fertilizers shall be applied according to soil test recommendations. Recommendations for P and K are outlined in Tables 1 and 2, respectively. The amounts recommended are a function of initial soil test levels, and whether fertilizer will be surface applied or incorporated into the soil to depths over 2 inches. Occasionally, job contracts or the time during the year when a site will be seeded necessitate immediate seeding before a soil test can be completed. In such cases, a maximum of 2 pounds per 1000 square feet (90 pounds per acre) of P_2O_5 and K_2O may be applied to ensure that P and K deficiencies do not

occur, and maximum ground cover is achieved to prevent soil erosion. However, it is strongly recommended that all efforts be made to obtain soil test results before seeding operations begin.

Table 1. Phosphorus Recommendations for Turfgrass Seeding, Based on Soil Test Results

	Soil Test Phosphorus Category			
	Low (FIV 0-25)	**Medium** (FIV 26-50)	**Optimum*** (FIV 51-100)	**Excessive** (FIV >100)
	pounds P_2O_5/acre			
Broadcast or incorporated up to 2 inches	90 - 175	45 - 90	0 - 90	0
Incorporated over a 2 inch depth	130 - 220	45 - 90	0 - 90	0

* In cool weather, seedbed applications of P may prove beneficial despite soil test results that indicate “optimum” soil phosphorus.

Table 2. Potassium Recommendations for Turfgrass Seeding, Based on Soil Test Results

	Soil Test Potassium Category			
	Low (FIV 0-25)	**Medium** (FIV 26-50)	**Optimum*** (FIV 51-100)	**Excessive** (FIV >100)
	pounds K_2O/acre			
Broadcast or incorporated up to 2 inches	90 - 175	45 - 90	0 - 90	0
Incorporated over a 2 inch depth	130 - 220	45 - 90	0 - 90	0

Nitrogen Applications

Nitrogen has a dramatic impact on root, shoot, rhizome, and stolon growth rates of turfgrass plants. Adequate N is essential in maintaining a dense turfgrass stand that minimizes soil erosion, increases water infiltration, competes against weed encroachment, and recovers from physical or biological damage. However, excessive N may reduce disease resistance and drought tolerance, and could potentially leach if the amounts applied exceed the amount utilized by the turfgrass plant.

A wide range of N-containing fertilizers are available. These fertilizers generally fall into one of two broad categories; 1) fertilizers that contain only soluble, quickly available N, and 2) fertilizers that contain some N in a slowly available form which is not immediately available for plant use. Quickly available N-fertilizers contain NO_3-N or NH_4-N which are soluble and readily available for uptake by turfgrass plants. Turfgrass uptake may occur within a few days with NO_3-N fertilizer. Nitrogen uptake may begin within 7 – 10 days with NH_4-N fertilizers, as NH_4-N is converted to NO_3-N in the soil. Nitrogen uptake by turfgrass roots is predominately in the NO_3 form.

Leaching and runoff potential are much higher for NO_3-N. Thus, where conditions exist that are conducive to leaching or runoff, fertilizers that contain significant amounts of NO_3-N shall not be used. These conditions include sandy sites (sands and loamy sands) with high water tables, and sites that are highly sloped. Also, fertilizer is applied to the seedbed prior to seed germination and turfgrass growth. Thus, fertilizer containing soluble NH_4-N is preferable to NO_3-N. Fertilizers high in NO_3-N include NH_4NO_3, potassium NO_3, and calcium NO_3.

Slow release fertilizers contain significant amounts of N that is not immediately available for plant uptake. Examples of fertilizer sources that contain various amounts of slow release N include; sulfur coated ureas, polymer coated ureas, methylene ureas, ureaformaldehydes, isobutylidenediurea (IBDU), natural organics, and various types of sludge. Slow release fertilizers, while varying considerably in individual characteristics, typically provide more even turfgrass response, provide N over a longer period of time, and are less prone to N leaching and runoff as compared to soluble N fertilizers. The expense of slow release fertilizers makes their widespread use in turfgrass establishment limited. Their use, however, should be considered on the aforementioned sites that are prone to leaching or runoff, or when it is anticipated that follow-up maintenance applications on the site may be missed.

Nitrogen recommendations are not obtained from soil tests; however, extensive research has been conducted to determine rates that are adequate for successful turfgrass culture. Whereas N rates recommended for maintaining turfgrass vary considerably depending on a variety of factors such as turfgrass species, length of growing season, management practices, and use, the N rates recommended for establishing turfgrass from seed are generally uniform. It is recommended that up to 45 lbs. of readily available (soluble) N per acre be applied prior to seeding if fertilizer is broadcast. If fertilizer is incorporated deeper than 2 inches, then up to 90 lbs. readily available N per acre may be applied and incorporated into the soil. If fertilizers are applied containing slow release N (water insoluble N [WIN]), no more should be applied than that which provides the aforementioned rates of readily available N. For example, if a slow release fertilizer contains 50% WIN and the recommended application rate is 45 lbs. N/acre, then no more than 90 lbs. N/acre of this fertilizer should be applied (this would provide 45 lbs. soluble and 45 lbs slow release N.

The slow release N applied to the seedbed should be factored into the first year’s maintenance applications of N. Maintenance applications of N should begin after the new turfgrass stand has been mowed at least once. Recommendations for maintenance fertilization of turfgrass can be found in Turfgrass Technical Update #115, "Nutrient Management Guidelines for State Property and Commercially Managed Turfgrass". In addition, organic matter sources such as compost are occasionally incorporated into the seedbed to improve physical characteristics of the soil. These materials contain varying amounts of N and P. The amount of N and P must be determined, and the amount of fertilizer applied reduced by the appropriate amount so that neither the recommended amounts of N and P are not exceeded.

Soil Reaction

Maintaining soil pH in an optimum range is important for maximizing the efficiency of nutrient use, and can be important in reducing weed and disease problems. Turfgrass can withstand a rather broad range of soil pH, but 5.8 to 6.4 is generally considered ideal. Wide deviations from this range can result in reduced P and micronutrient availability, and can interfere with soil N metabolism and availability. Depending on turfgrass species, problems in turf may start to occur at soil pH above 7.8 and below 5.4 Thus, to maximize efficiency of nutrient availability and use, soil tests should be taken as recommended previously for soil P and K to determine soil pH.

Recommended limestone applications to achieve a soil pH of about 6.4 are shown in Table 3. If diseases such as take-all patch of bentgrass, summer patch of Kentucky bluegrass, or spring dead spot of bermudagrass are of concern, maintaining lower soil pH (5.4 - 5.7) may be desirable, and reduced or no limestone should be applied to achieve this level. Also, it is recommended, when practical, that limestone be applied approximately one month or more before seeding to minimize potential P availability problems and the potential for volatilization loss of applied N.

These recommendations should result in satisfactory establishment in most situations; however, there are many factors that could impact whether modifications of these recommendations are warranted for a specific site.

Table 3: Limestone Establishment Recommendations (Pounds per Acre)

	Coastal Plain				Piedmont & Mountain	
pH	loamy sand	sandy loam	loam	silt loam & silty clay loam	loam	silt loam & silty clay loam
6.4	0	0	0	0	0	0
6.3	0	0	0	0	1090	1305
6.2	0	0	1090	1090	1525	2180
6.1	0	1090	1305	1525	1960	2830
6.0	870	1525	1740	1960	2395	3700
5.9	1090	1740	2180	2395	2830	4355
5.8	1305	2180	2395	2830	3485	5010
5.7	1525	2395	2830	3265	3920	5880
5.6	1740	2615	3265	3700	4355	6535
5.5	1960	3050	3700	4140	4790	7185
5.4	2180	3265	4140	4355	5445	7840
5.3	2395	3700	4355	4790	5880	8710
5.2	2615	3920	4575	5225	6315	8710
5.1	2830	4140	5010	5665	6750	8710
5.0	3050	4575	5445	6100	7185	8710
4.9	3265	4790	5880	6315	7625	8710
4.8	3485	5010	6100	6750	8275	8710
4.7	3700	5445	6535	7185	8710	8710
4.6	3920	5665	6750	7625	8710	8710
4.5	4140	6100	7185	8060	8710	8710

1) Divide the above rates by 43.5 to obtain the equivalent rates in pounds per 1000 square feet.
2) These rates are for limestone that is tilled into the soil to a 4 to 6 inch depth. Use maintenance rates if not tilled in.
3) Divide the above rates by 2 to obtain maintenance limestone recommendations for turfgrass.
4) Do not apply more than 2,000 pounds per acre for any one maintenance application to turfgrass.

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