

Chapter 12

Wildflower Management Nutrient Management Plan Virginia Department of Transportation

This Plan Prepared By:

Sam Doak
427 Smyth Hall 0404
Department of Crop and Soil Environmental Sciences
Virginia Tech
Blacksburg, VA 24061

Certification Number: 460
Phone Number (540) 250-6903
Email: sdoak@vt.edu

Signature

A handwritten signature in black ink, appearing to read 'S. Doak', is written over a horizontal line. The signature is cursive and somewhat stylized.

Plan Written 07-1-06
Valid until 07-1-09

Table of Contents

Chapter 12: Wildflower Management Nutrient Management Plan for VDOT	Page Number
1. Site Description & Sampling Information	3
2. Nutrient & Lime Recommendations and Nutrient Application Worksheet	4
3. Nutrient Management Guidelines	5
A. Season of Application and Cautions	5
B. Impervious Surfaces	5
C. Environmentally Sensitive Areas	5
D. Organic Nutrient Sources	6
E. Samples of Fertilizer Ratios Appropriate for VDOT Use	8
F. Spreader Calibration	8
4. Record of Actual Nutrient Applications	10

Chapter 12: Wildflower Management

Nutrient Management Plan for VDOT

The Virginia Department of Transportation (VDOT) agrees to comply with all requirements set forth in the Nutrient Management Training and Certification Regulations, 4 VAC 5-15-10 *et seq.*, and to follow recommendations for wildflower fertilization and management as described in the Virginia Nutrient Management Standards and Criteria, Revised October 2005. This includes implementing the Department of Conservation and Recreation's approved **Nutrient Management Plan**, and submitting an **Annual Activity Report**.

All nutrient applications performed by VDOT staff shall comply with the provisions of this Nutrient Management Plan as of July 1, 2006. Any contracts bid on or after July 1, 2006, must comply with this Nutrient Management Plan. Nutrient applications performed by those already under contract or bid prior to July 1, 2006 must comply with this Plan by July 1, 2007.

1. Site Description & Sampling Information

This nutrient management plan was written to accommodate lime and fertility management for existing and new wildflower sites on roadsides statewide. The data and information presented in this plan were compiled by Jody Booze-Daniels and W. Lee Daniels, CSES Dept., Virginia Tech. 540-231-7175; wdaniels@vt.edu.

Soil Types, Sampling and Fertilizer Application Requirements:

Virtually all portions of VDOT wildflower management areas that receive fertilizers are drastically disturbed cut/fill landscapes which are mapped by USDA-NRCS as either "Udorthents" or "made land". Therefore, it is impossible to assign conventional soil series and associated soil productivity groupings for nutrient management planning. Due to their general lack of native topsoil covers, and frequent occurrence of compaction and poor soil structure, all soils managed by VDOT are assigned to Productivity Group III or IV for the purpose of nutrient management planning.

For wildflower beds, a recent (< 1 year) composite soil sample must be taken from each specific area that is limed and/or fertilized. Once sampled, soil test data for a given location may be used for all remaining years under this plan.

Soil Sampling Methods: Take 20 or more sub-samples from the upper 4" of soil, from different locations within each uniform sampling area to make a composite sample. Take the sub-samples in a random manner, such as with a zigzag pattern to minimize the variability that may be present in your sampling area. This allows you to obtain a reasonably representative soil sample. Soil samples must be analyzed for pH, phosphorus, and potassium.

The larger the area, the more sub-samples are needed. The more sub-samples you take, the more representative your sample will be of your landscape area. When you realize that your 1/2 pound composite sample could represent up to 2 million pounds of soil, you can understand why proper sampling is so important.

When you have taken sufficient sub-samples from a uniform area, thoroughly mix the sub-sample slices or cores, breaking up clumps and removing all foreign matter such as roots, stalks, rocks, etc. (<http://www.soiltest.vt.edu>).

2. Nutrient & Lime Recommendations and Nutrient Application Worksheet

Appropriate soil sampling and analysis is essential for effective nutrient management planning. In order to maximize fertilizer effectiveness and uptake efficiency, soil pH must be adjusted to the optimal range of 6.0 to 6.5 whenever fertilizers are applied.

Nutrient Recommendations:

Nitrogen Fertilizer: The rate is limited to 45 lb nitrogen /A (1 lb/1000 ft²) at each application per year. A maximum of 45 lb/A (1 lb/1000 ft²) of 100 % water soluble nitrogen (WSN) may be applied per year to wildflowers. Slowly available N (water insoluble nitrogen – WIN) may be used and is strongly encouraged. The application rates of a fertilizer that has at least 30% WIN can be raised to 60lb nitrogen per acre per application.

Phosphorus and Potassium Fertilizers: Apply each fertilizer (P₂O₅ and K₂O) as indicated necessary by soil test using the following table.

For Wildflower Management: The amount of P₂O₅ & K₂O that may be applied according to appropriate soil test levels.

Soil Test (Va Tech)	P ₂ O ₅		K ₂ O	
	lb/A	lb/1000ft ²	lb/A	lb/1000ft ²
L	90-100	2.00-2.25	90-100	2.00-2.25
M-	75-90	1.75-2.00	75-90	1.75-2.00
M	55-75	1.25-1.75	55-75	1.25-1.75
M+	40-55	1.00-1.25	40-55	1.00-1.25
H	0	0	0	0
VH	0	0	0	0

Liming Recommendations:

For normal soil materials, liming recommendations will be based upon standard agronomic criteria to maintain soil pH between 6.0 and 6.5. Lime rates are based on Tables 3-1 and 3-3 in the Virginia Nutrient Management Standards and Criteria, Revised October 2005.

For sulfidic materials (see Orndorff and Daniels, 2002 for maps and definitions) or **any** soil sample with a water pH < 4.0, liming recommendations must be based on reactive potential acidity or acid-base-accounting analysis.

Citation: Orndorff, Z.W. and W.L. Daniels, 2002. Delineation and Management of Sulfidic Materials in Virginia Highway Corridors, Final Contract Report VTRC 03-CR3. Virginia Trans. Res. Council, Charlottesville, VA. <http://vtrc.virginiadot.org/PubDetails.aspx?PubNo=03-CR3>

3. Nutrient Management Guidelines

A. Season of Application of Fertilizers and Cautions

All fertilizer will be applied between March 15th and November 1th. In the Fredericksburg, Hampton Roads and Richmond Districts, fertilizers may be applied from March 1 to November 15. Fertilization of wildflowers outside of this window may result in lost nutrients. Tillage will not be performed nor will fertilizer be applied more than 30 days prior to seeding any wildflower area.

B. 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 wildflower areas and/or use a leaf blower etc., to return the fertilizer back to the wildflowers.

C. Environmentally Sensitive Areas

VDOT will recognize environmentally sensitive sites as defined in Section 1A of the 2005 Virginia Nutrient Management Standards and Criteria and limit N and P applications appropriately. Nutrient application set-backs as set forth in Section 1B (e.g. 100 feet from wells or springs, 50 feet from surface water, 50 feet from sinkholes, 50 feet from naturally occurring limestone outcrops and 25 feet from all other naturally occurring rock outcrops) will be rigorously followed. However, this plan was developed such that the rate and timing of nutrient applications safeguards water quality and the plan is appropriate for use in environmentally sensitive areas.

The use of fertilizers with slow release nitrogen is greatly encouraged, especially where there is any reason to suspect environmental concerns.

D. Use of Organic Sources as Nutrients:

Organic by-products (composted and uncomposted manures, biosolids, and sludges) should be applied to supply 45-50 lbs plant available nitrogen (PAN) per acre to the vegetation. The amount of PAN in organic by-products is determined according to the following formula:

$$\text{PAN} = \text{NO}_3\text{-N} + K_{\text{vol}} * [\text{NH}_4\text{-N}] + K_{\text{min}} * [\text{Org-N}]$$

Where:

PAN = lbs plant available N/dry ton

NO₃-N = lbs nitrate N/dry ton

K_{vol} = volatilization factor, or plant available fraction of NH₄-N

NH₄-N = lbs of ammonium N/dry ton

K_{min} = mineralization factor, or plant available fraction of Org-N

Org-N = lbs organic N/dry ton (calculated by subtracting NH₄-N from total Kjeldahl N)

Volatilization (Tables 8.1 and 9.2) and mineralization (Tables 8.2 and 9.1) factors for various organic by-products are listed in the Virginia Nutrient Management Standards and Criteria (<http://www.dcr.state.va.us/docs/StandardsandCriteria.pdf>; Virginia Department of Conservation and Recreation, 2005). The use of these tables will enable rates to be calculated for by-products top-dressed over established vegetation or applied (with or without incorporation) directly to soil prior to establishment of vegetation.

When composts are utilized they must meet the minimum quality standards given in Table 1 below. Use of manures, biosolids, sludges or other non-composted organic materials must also comply with applicable Virginia DCR, DEQ and VDH regulatory programs.

Soil test levels for P must be between L- and M+ for P if organic amendments are utilized. Organic amendments will not be utilized by VDOT for any soil testing H- or above for P.

Table 1. Recommended Specifications for Compost

Parameters ^{1,6}	Units of measure	Turf establishment or topdressing, planting bed establishment	Surface mulch to be vegetated
pH ²		6.0-8.5	5.5-9.0
Soluble Salt Concentration ² (electrical conductivity)	dS/m (mmhos/cm)	≤10	≤10
Moisture Content	%, wet weight basis	30-60	25-60
Organic Matter Content	%, dry weight basis	30-65	>30
Particle Size	% passing through a selected mesh size, dry weight basis	98% passing through ¾" screen or smaller	99% passing through 3" screen, >25% passing through 3/8" screen
Stability ³ (Carbon dioxide evolution rate)	mg CO ₂ -C per gram organic matter per day	<8	<8
Maturity ³ (Bioassay): Seed emergence and Seedling vigor		≥80% ≥80%	≥80% ≥80%
Physical Contaminants (inerts)	%, dry weight basis	<1	<1
Chemical Contaminants ⁴	mg/kg (ppm)	Meet or exceed US EPA standard, 40 CFR, Part 503.13, Tables 1 and 3 levels	
Biological Contaminants ⁵ Fecal coliform bacteria or Salmonella	MPN per gram (dry wt) MPM per 4 grams (dry wt)	Meet or exceed US EPA Class A standard, 40 CFR, Part 503.32(a) levels	

¹ Recommended test methodologies are provided in the Test Methods for the Examination of Composting and Compost (TMECC, The U.S. Composting Council)

² The pH and soluble salt content are more relevant for the amended soil than for the compost for the establishment and growth of a particular plant. Plant species vary in their sensitivity to pH and soluble salts. Most ornamental plants and turfgrass species can tolerate a soil soluble salt level of 2.5 dS/m and 4 dS/m, respectively. Seeds, young seedlings and salt sensitive species often prefer soluble salt levels at half the aforementioned levels.

³ Stability and maturity ratings comprise an evolving area of compost science, for which new, alternative test methods should be considered as deemed acceptable by the scientific community.

⁴ US EPA standard, 40 CFR Part 503.13, Tables 1 and 3 levels are: arsenic (As) ≤ 41 mg/kg, cadmium (Cd) ≤ 39 mg/kg, copper (Cu) ≤ 1500 mg/kg, lead (Pb) ≤ 300 mg/kg, mercury (Hg) ≤ 17 mg/kg, molybdenum (Mo) ≤ TBD, nickel (Ni) ≤ 420 mg/kg, selenium (Se) ≤ 100 mg/kg, zinc (Zn) ≤ 2800 mg/kg.

⁵ US EPA Class A standard, 40 CFR 503.32(a) levels: Salmonella <3 MPM/4 g total solids or fecal coliform <1000 MPM/g total solids.

⁶ Landscape architects and project (field) engineers may modify the allowable specification ranges based on specific field conditions and plant requirements.

E. Samples of Fertilizer Ratios Appropriate for VDOT Use

This chart can be used to determine the best ratio of fertilizer for application to existing and new wildflower plantings.

Fertilizer Application Chart

Fertilizer Analysis	Pounds of fertilizer/A (lb/1000 ft²)	Pounds of Nitrogen/A (lb/1000 ft²)	Pounds of P₂O₅/A (lb/1000 ft²)	Pounds of K₂O/A (lb/1000 ft²)
5-10-10	900 (20)	45 (1.0)	90 (2.0)	90 (2.0)
10-10-10	450 (10)	45 (1.0)	45 (1.0)	45 (1.0)
15-30-15	300 (6.7)	45 (1.0)	90 (2.0)	45 (1.0)
46-0-0	96 (2.2)	45 (1.0)	0	0
18-46-0	240 (5.5)	45 (1.0)	110 (2.5)	0
0-46-0	98 (2)	0	45 (1.0)	0

F. Spreader Calibration

All fertilizer spreaders will be calibrated per the guidance given below.

Calibration of Spreaders¹

Pan Method

Push the spreader over a pan(s) and collect and weigh the material that was spread. By knowing the area of the pan and weight of the material, the application rate can be determined by:

$$\text{Material per } \frac{\text{Grams}}{1,000 \text{ sq. ft}} = 1,000 \times \frac{\text{Grams Material Collected}}{\text{ft}^2 \text{ Pan} \times \# \text{ of Pans} \times \# \text{ of Passes}}$$

Sweep and Weigh Method for Drop Spreader

Push a drop spreader over a clean, smooth surface of a known distance and sweep and weigh the material. The application rate can be determined by:

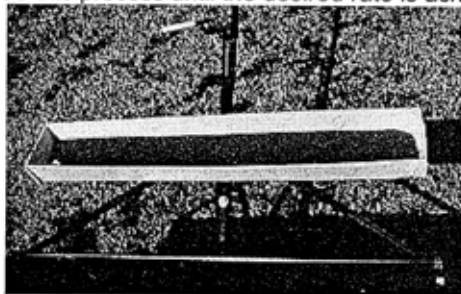
$$\text{Material per } \frac{\text{Grams}}{1,000 \text{ sq. ft}} = 1,000 \times \frac{\text{Grams Material Collected}}{\text{Spreader Width} \times \text{Distance Traveled}}$$

Catch Pan Method

Attach a catch pan to the bottom of the spreader. Establish and mark two points of a known distance. Push the spreader over the known distance, opening the hopper at the starting point, and closing at the finish point, while collecting the material in the catch pan. The application rate is determined by using the following formula:

$$\text{Material per } \frac{\text{Grams}}{1,000 \text{ sq. ft}} = 1,000 \times \frac{\text{Grams Material Collected}}{\text{Spreader Width} \times \text{Distance Traveled}}$$

Whichever method is used, make enough passes or travel enough distance so that the material collected is enough to be weighed accurately. If the calculated rate is too high, reduce the setting adjustment. If it is too low, increase the setting adjustment. Continue this process until the desired rate is achieved.



4. Record of Actual Nutrient Applications July 1, 2006 to July 1, 2007

Wildflower Management : Nutrient Management Plan for VDOT					
District: _____			Acreage: _____		
Location: _____ _____					
County: _____					
Year, Month	Fertilizer Ratio Applied	Amount Fertilizer Applied lb/A (lb/1000 ft ²)	Nitrogen Applied lb/A (lb/1000 ft ²)	P ₂ O ₅ Applied lb/A (lb/1000 ft ²)	K ₂ O Applied lb/A (lb/1000 ft ²)
Year, Month	Agricultural limestone applied ton/A (lb/1000 ft ²)				

Date Worksheet Prepared: 7/1/06

Note: This 'Record of Actual Nutrient Applications' sheet must be submitted with the subsequent plan regardless of amount and timing of fertilizer or lime application with this plan's period.