



Turf and Landscape Nutrient Management Certification Knowledge Areas

Revised April 2024

General Nutrient Management

1. Define nutrient management and list the primary purposes
2. Nutrient cycling in the Mid-Atlantic region and local areas
3. Nutrient balance in turfgrass and landscape systems compared to agriculture

Basic Soil Science

1. Soil texture
2. Soil structure and factors affecting aggregation
3. Soil porosity and bulk density
4. Factors affecting organic matter content
5. Soil-water relationships including water holding capacity, plant-available water, drainage, infiltration rate
6. Tillage effects on soil structure
7. Identification of major soil horizons categories
8. Soil properties affecting runoff and leaching risk
9. Compaction effects on soil properties and water movement
10. Plant adaptation to differences in soil physical properties
11. Use of soil maps/USGS Web Soil Survey to determine soil types, drainage classes, depth to water table, environmental risk factors
12. Identify character of disturbed, imported or manufactured soils and determine appropriate nutrient management related management considerations

Basic Soil Fertility

1. Liebig's Law – limiting factors of plant growth
2. Recognize essential elements for plant growth and categorize as a non-mineral, primary, secondary, or micronutrient
3. Relative mobility of nutrients in soils
4. How pH influences availability and toxicity of nutrients
5. The nitrogen cycle, including mineralization, nitrification, denitrification, leaching, and C/N ratio concepts
6. Appropriate timing and placement of N fertilizers for plant and environmental benefits
7. Phosphorus cycle and soil phosphorus availability
8. Phosphorus loss mechanisms from soils, and management practices to minimize potential loss
9. pH relationship to soil P forms and retention by soils

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Basic Soil Fertility (continued)

10. Appropriate timing and placement of P fertilizers for plant and environmental benefits
11. Potassium cycle, movement, and deposition within the soil profile
12. Timing and placement of K fertilizers
13. Sources and behavior of secondary nutrients
14. Common micronutrient sources and fertilizer placement techniques
15. Cation exchange capacity related to soil properties, productivity, and liming
16. How cations are held in soil
17. Differences in major liming materials and lime quality
18. Use of buffer pH on soil tests to determine lime requirement
19. Timing and placement of lime
20. The properties of lime influencing its reaction rate

Sampling, Testing, and Analysis for Nutrient Management

1. Soil sampling procedures and frequency of sampling
2. Causes of variability of in sample results and reducing variability
3. Nutrient availabilities in soil and likelihood of crop response with fertilizer applications
4. Correlating numerical soil sample results to soil test levels (L, M, H, VH) and to a nutrient recommendation using Virginia Nutrient Management Standards & Criteria (revised July 2014).
5. Soil test P and K result conversions from approved labs (Mehlich III to Mehlich I)
6. Troubleshooting crop problems by using concurrent plant tissue and soil tests
7. Appropriate plant parts and growth stages to be used in tissue testing

Turfgrass and Landscape Plant Management

1. Classification of warm and cool season grasses
2. Description and primary uses of adapted cool and warm season grasses
3. Anticipated seasonal growth responses of cool and warm season grasses
4. Climate and soil variables affecting turfgrass selection, performance and fertility
5. Turfgrass establishment strategies including seeding, sodding, sprigging, plugging, over-seeding and renovation
6. Turfgrass establishment and maintenance fertility needs for both cool and warm season turfgrass on lawns, golf courses, athletic fields and sod farms
7. Mowing strategies and clipping management, including clippings on impervious surfaces
8. Life cycles of annuals and perennials for landscape plants

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Turfgrass and Landscape Plant Management (continued)

9. Soil testing and pH requirements for landscape plants
10. Timing and placement of nutrients related to life cycle, stage of maturity and vegetation type of ornamentals
11. Nutrient uptake differences for different families of ornamentals in the landscape
12. Distinguish between native and invasive plant species
13. Proper plant/site selection
14. Plant biology

Fertilizer Management

1. Mathematical conversion of P and K to P_2O_5 and K_2O
2. Relative losses of N from inorganic sources containing ammonium with delayed incorporation or if surface applied
3. Basic fertilizer calculations relating grades and quantities of material applied to meet nutrient requirements and remain within standards
4. Fertilizer application methods, advantages/disadvantages/limitations of each
5. Proper storage of fertilizer materials
6. Sources of slowly available and quickly available nitrogen
7. Management of fertilizer applications near impervious surfaces
8. Knowledge of various lime and fertilizer materials including nutrient content to make product recommendations
9. Calibration of fertilizer applicators

Organic Materials Management

1. Relative levels of N, P_2O_5 , and K_2O in organic materials compared to plant needs
2. Proper timing and placement of organic materials
3. Timing and placement of supplemental fertilizers used with organic materials
4. Organic material sources and nutrient analysis

Environmental Management

1. Hydrologic cycle including the relationship between ground and surface waters
2. Effects of excessive nutrients in surface/ground water and eutrophication processes
3. Factors causing the decline of the Chesapeake Bay
4. Nutrient loss mechanisms to ground and surface waters

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Environmental Management (continued)

5. Identification of environmentally sensitive site features
6. Nutrient management practices for environmentally sensitive sites
7. Critical times when nutrient losses are most likely to occur
8. Management of applied nutrient sources near impervious surfaces and other environmental site features, including buffers and setbacks
9. Selection and management of de-icing materials to reduce water quality impact

Irrigation Management

1. Concept of water balance relative to irrigation management, including field capacity, water inputs and evapotranspiration
2. Irrigation using natural and recycled sources of water, relative nutrient content of each
3. Determining available nutrients in wastewater and other irrigation water
4. Determine available nutrient application rates from a wastewater nutrient analysis and the amount of water applied
5. Determining nitrogen residuals from past applications
6. Methods of determining or estimating soil moisture content and pros and cons of each
7. Determine maximum appropriate irrigation rates per hour for various soil and site characteristics
8. Timing and method of application for supplemental fertilizers used on sites receiving wastewater or other irrigation water
9. Buffers and setbacks for wastewater application
10. Types of irrigation systems for applying wastewater and advantages/disadvantages of each
11. Forms of nitrogen in wastewater
12. Phosphorus management for sites receiving wastewater
13. Sensitivity of vegetation to other constituents that may be in some irrigation waters

Incentives and Regulations

1. Nutrient Management Training and Certification Regulations including required Nutrient Management Plan components
2. Virginia Nutrient Management Standards and Criteria (Revised July 2014)
3. Use of plan writing guidance documents issued by the Virginia Nutrient Management Program.
4. Nutrient Management Plan mandates for state-owned lands, golf courses (July 1, 2017), localities with MS4 permits
5. The Chesapeake Bay Preservation Act

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Incentives and Regulations (continued)

6. Nutrient management related provisions of wastewater reuse and reclamation regulations
7. Erosion and Sediment Control regulations
8. Nutrient management related provisions of MS4 regulations

Development of Nutrient Management Plan Components

1. Use Virginia Standards and Criteria (revised July 2014) tables and soil test information to develop plant nutrient recommendations
2. Know how to calculate phosphorus application rates based on soil tests
3. Know when phosphorus applications are not allowed based on soil phosphorus saturation level
4. Understand specific nitrogen management criteria when dealing with environmentally sensitive sites as related to various nitrogen sources and plants
5. Develop a schedule for the timing and placement of fertilizers
6. Develop an integrated nutrient balance sheet for all nutrient sources, application rates and timings
7. Understand issues to address in a plan narrative
8. Determine hydrologic unit code from Virginia National Watershed Boundary Dataset maps
9. Generate appropriate maps to:
 - a. show site and boundaries where nutrients will be applied,
 - b. delineate management areas and indicate size in acres or square feet, environmentally sensitive areas
 - c. setback areas for application of organic materials
10. Determine how to define management areas as a function of use or vegetation type and how nutrient applications are impacted
11. Determine acceptable periods of nitrogen application for various turfgrass types based on location in Virginia and characteristics of the fertilizer to be applied
12. Inclusion of a statement that fertilizer applications should never occur on frozen ground
13. Inclusion of supplemental plan information materials including instruction sheets for calibration of fertilizer applicators or other reference materials