Using Technical Standard 1100 to Develop a Turfgrass Nutrient Management Plan

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What is NR 151?

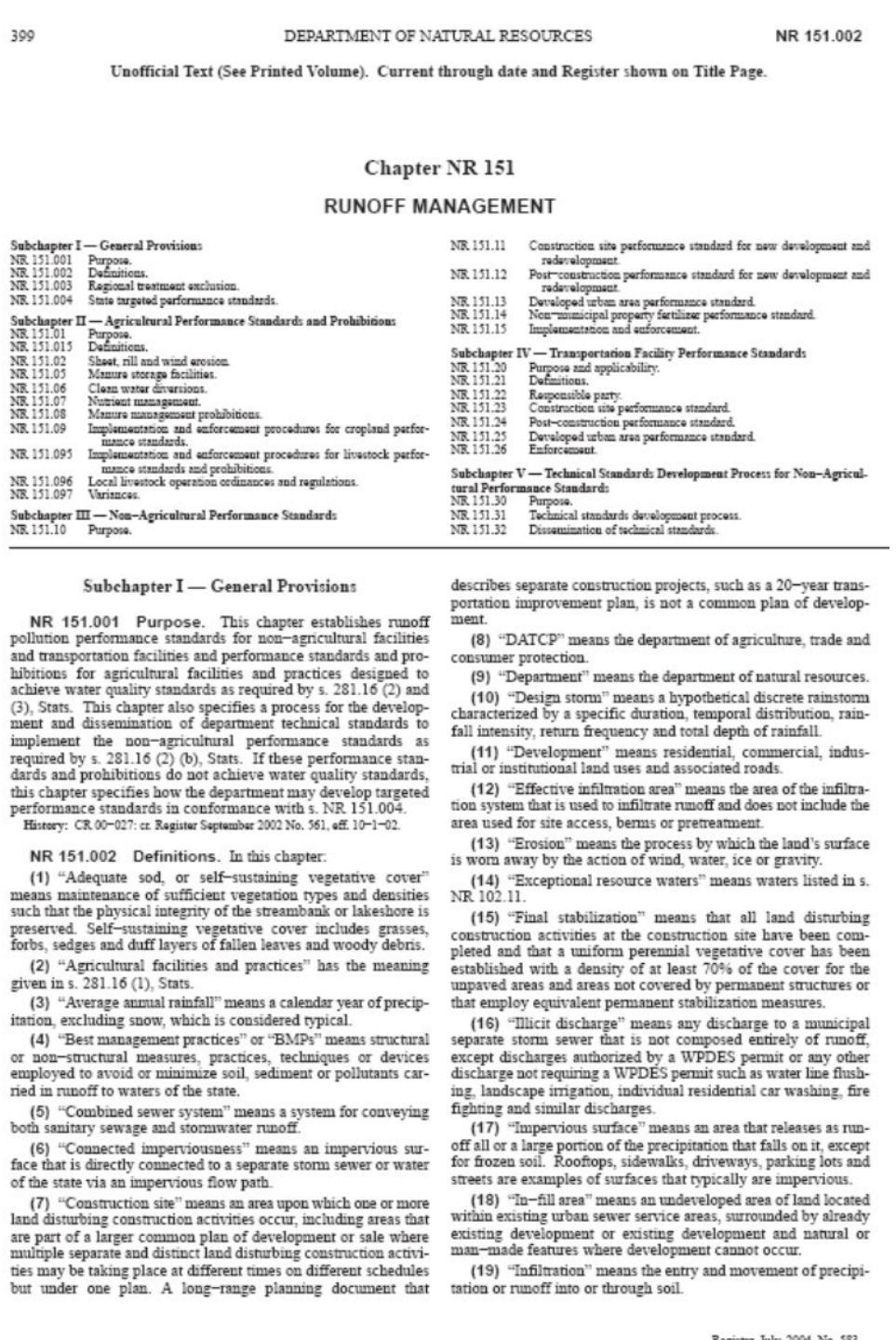
- NR 151 is an administrative rule that was designed to address pollution from agricultural areas
  - Turfgrass areas were added during later stages almost as an afterthought

- DNR has authority to write administrative rules which can be enforceable under State statutes.

- Think of a statute like a law

Birth of NR 151

- 1990 EPA Storm Water Rule
  - Plan to ↓ amount of pollutants reaching impaired lakes/streams to meet water quality standards
  - Allocated between point and nonpoint sources
  - Total Maximum Daily Loads
  - States must identify implementation of TMDLs
- WI Legislative act 27 (1997) and act 9 (1999)
  - Control runoff pollution



399 DEPARTMENT OF NATURAL RESOURCES NR 151.002

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

Chapter NR 151

RUNOFF MANAGEMENT

Subchapter I — General Provisions

NR 151.001 Purpose. This chapter establishes runoff pollution performance standards for non–agricultural facilities and transportation facilities and performance standards and prohibitions for agricultural facilities and practices designed to achieve water quality standards as required by s. 281.16 (2) and (3), Stats. This chapter also specifies a process for the development and dissemination of department technical standards to implement the non–agricultural performance standards as required by s. 281.16 (2) (b), Stats. If these performance standards and prohibitions do not achieve water quality standards, this chapter specifies how the department may develop targeted performance standards in conformance with s. NR 151.004.

History: CR 00–027: cr. Register September 2002 No. 561, eff. 10–1–02.

NR 151.002 Definitions. In this chapter:

(1) "Adequate sod, or self–sustaining vegetative cover" means maintenance of sufficient vegetation types and densities such that the physical integrity of the streambank or lakeshore is preserved. Self–sustaining vegetative cover includes grasses, forbs, sedges and duff layers of fallen leaves and woody debris.

(2) "Agricultural facilities and practices" has the meaning given in s. 281.16 (1), Stats.

(3) "Average annual rainfall" means a calendar year of precipitation, excluding snow, which is considered typical.

(4) "Best management practices" or "BMPs" means structural or non–structural measures, practices, techniques or devices employed to avoid or minimize soil, sediment or pollutants carried in runoff to waters of the state.

(5) "Combined sewer system" means a system for conveying both sanitary sewage and stormwater runoff.

(6) "Connected imperviousness" means an impervious surface that is directly connected to a separate storm sewer or water of the state via an impervious flow path.

(7) "Construction site" means an area upon which one or more land disturbing construction activities occur, including areas that are part of a larger common plan of development or sale where multiple separate and distinct land disturbing construction activities may be taking place at different times on different schedules but under one plan. A long–range planning document that describes separate construction projects, such as a 20–year transportation improvement plan, is not a common plan of development.

(8) "DATCP" means the department of agriculture, trade and consumer protection.

(9) "Department" means the department of natural resources.

(10) "Design storm" means a hypothetical discrete rainstorm characterized by a specific duration, temporal distribution, rainfall intensity, return frequency and total depth of rainfall.

(11) "Development" means residential, commercial, industrial or institutional land uses and associated roads.

(12) "Effective infiltration area" means the area of the infiltration system that is used to infiltrate runoff and does not include the area used for site access, berms or pretreatment.

(13) "Erosion" means the process by which the land's surface is worn away by the action of wind, water, ice or gravity.

(14) "Exceptional resource waters" means waters listed in s. NR 102.11.

(15) "Final stabilization" means that all land disturbing construction activities at the construction site have been completed and that a uniform perennial vegetative cover has been established with a density of at least 70% of the cover for the unpaved areas and areas not covered by permanent structures or that employ equivalent permanent stabilization measures.

(16) "Illicit discharge" means any discharge to a municipal separate storm sewer that is not composed entirely of runoff, except discharges authorized by a WPDES permit or any other discharge not requiring a WPDES permit such as water line flushing, landscape irrigation, individual residential car washing, fire fighting and similar discharges.

(17) "Impervious surface" means an area that releases as runoff all or a large portion of the precipitation that falls on it, except for frozen soil. Rooftops, sidewalks, driveways, parking lots and streets are examples of surfaces that typically are impervious.

(18) "In–fill area" means an undeveloped area of land located within existing urban sewer service areas, surrounded by already existing development or existing development and natural or man–made features where development cannot occur.

(19) "Infiltration" means the entry and movement of precipitation or runoff into or through soil.

What is NR 151?

NR 151.14 Non−municipal property fertilizer performance standard. (1) APPLICABILITY. This section applies when all of the following conditions are met:

(a) The property is not owned by a municipality.

(b) The property has over 5 acres of pervious surface where fertilizers are applied.

(c) The property discharges runoff to waters of the state.

(2) RESPONSIBLE PARTY. The landowner shall comply with this section.

(3) REQUIREMENTS. No later than March 10, 2008, the application of lawn and garden fertilizers on these properties shall be done in accordance with site−specific nutrient application schedules based on appropriate soil tests. The nutrient application schedule shall be designed to maintain the optimal health of the lawn or garden vegetation.

Note: The landowner should consider using slow release fertilizers or "spoon feeding" nutrients to reduce the concentration of nitrates reaching groundwater.

History: CR 00−027: cr. Register September 2002 No. 561, eff. 10−1−02.

For municipal properties:

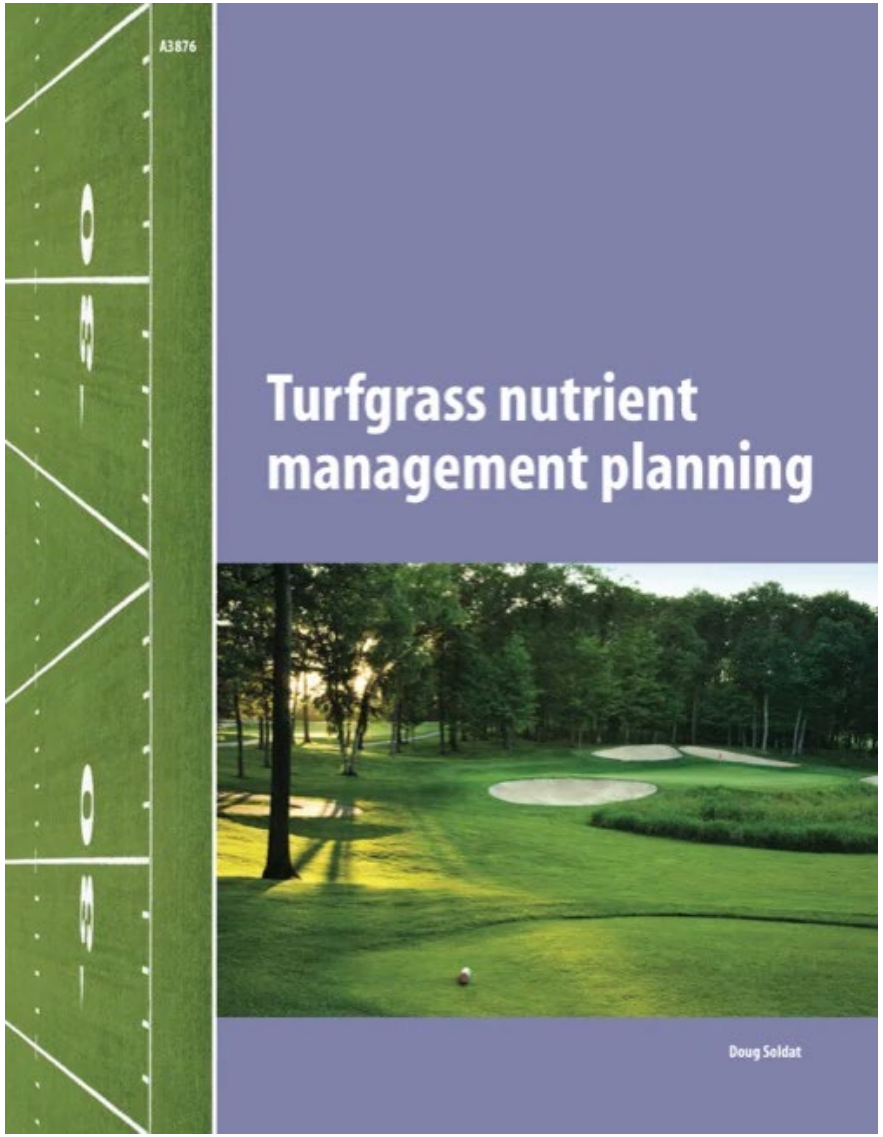
3. The application of lawn and garden fertilizers on municipally controlled properties, with pervious surface over 5 acres each, shall be done in accordance with a site specific nutrient application schedule based on appropriate soil tests. The nutrient application schedule shall be designed to maintain the optimal health of the lawn or garden vegetation.

Who may write a nutrient management plan?

- A certified golf course superintendent (GCSAA) or certified sports field manager (STMA)
- Individual with bachelors in turf or related field
- Equivalent experience or training in turf management

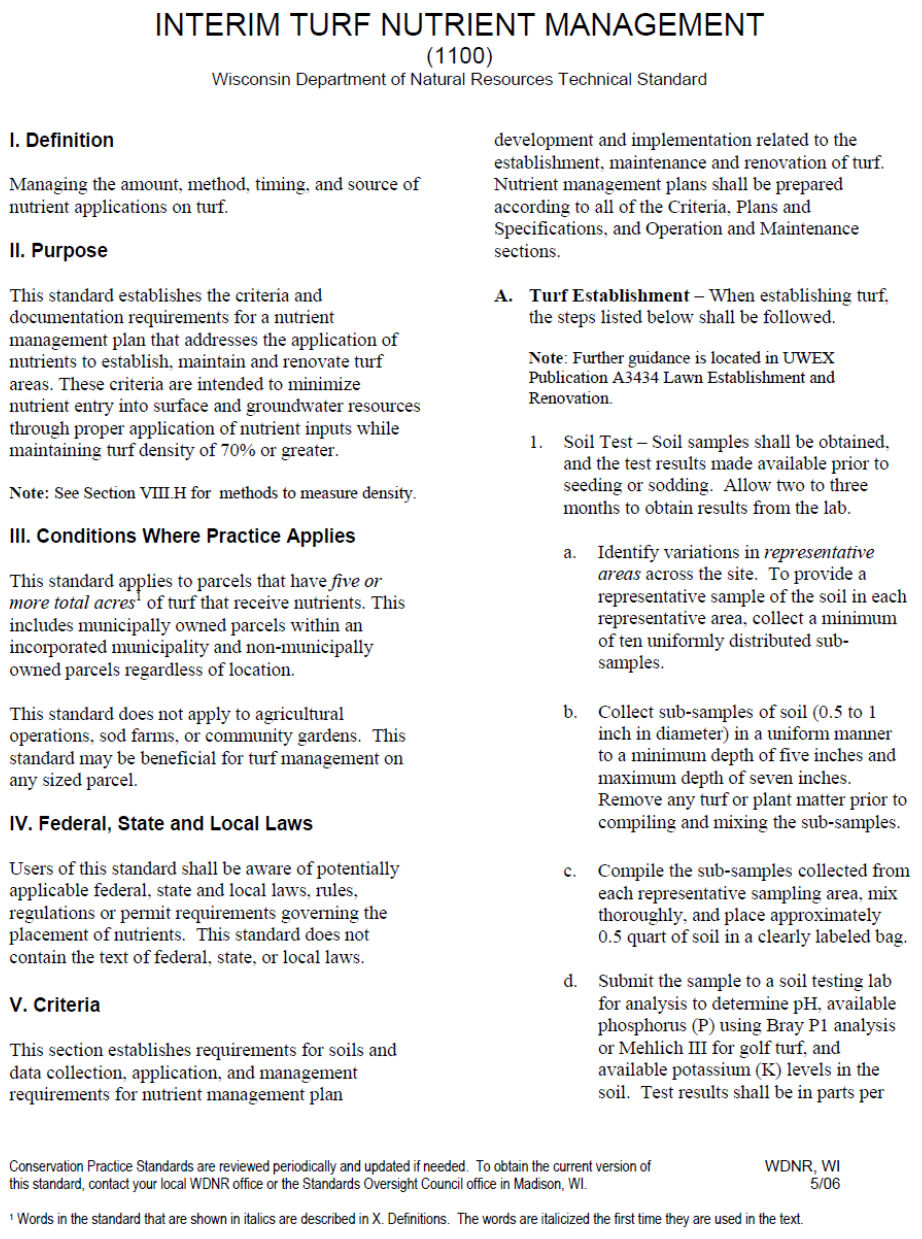
What Does a Nutrient Management Plan Look Like?

- “site-specific nutrient application schedule based on appropriate soil tests” – NR 151



The Technical Standard

- Establishes guidelines to achieve performance standard. Not regulatory.
- 2005: Standards Oversight Council
  - DNR, WDATCP, UWEX, environmental consulting industry, golf industry, and lawn care industry



INTERIM TURF NUTRIENT MANAGEMENT
(1100)
Wisconsin Department of Natural Resources Technical Standard

I. Definition

Managing the amount, method, timing, and source of nutrient applications on turf.

II. Purpose

This standard establishes the criteria and documentation requirements for a nutrient management plan that addresses the application of nutrients to establish, maintain and renovate turf areas. These criteria are intended to minimize nutrient entry into surface and groundwater resources through proper application of nutrient inputs while maintaining turf density of 70% or greater.

Note: See Section VIII.H for methods to measure density.

III. Conditions Where Practice Applies

This standard applies to parcels that have *five or more total acres*[1] of turf that receive nutrients. This includes municipally owned parcels within an incorporated municipality and non-municipally owned parcels regardless of location.

This standard does not apply to agricultural operations, sod farms, or community gardens. This standard may be beneficial for turf management on any sized parcel.

IV. Federal, State and Local Laws

Users of this standard shall be aware of potentially applicable federal, state and local laws, rules, regulations or permit requirements governing the placement of nutrients. This standard does not contain the text of federal, state, or local laws.

V. Criteria

This section establishes requirements for soils and data collection, application, and management requirements for nutrient management plan development and implementation related to the establishment, maintenance and renovation of turf. Nutrient management plans shall be prepared according to all of the Criteria, Plans and Specifications, and Operation and Maintenance sections.

A. Turf Establishment – When establishing turf, the steps listed below shall be followed.

Note: Further guidance is located in UWEX Publication A3434 Lawn Establishment and Renovation.

1. Soil Test – Soil samples shall be obtained, and the test results made available prior to seeding or sodding. Allow two to three months to obtain results from the lab.

   a. Identify variations in *representative areas* across the site. To provide a representative sample of the soil in each representative area, collect a minimum of ten uniformly distributed sub-samples.

   b. Collect sub-samples of soil (0.5 to 1 inch in diameter) in a uniform manner to a minimum depth of five inches and maximum depth of seven inches. Remove any turf or plant matter prior to compiling and mixing the sub-samples.

   c. Compile the sub-samples collected from each representative sampling area, mix thoroughly, and place approximately 0.5 quart of soil in a clearly labeled bag.

   d. Submit the sample to a soil testing lab for analysis to determine pH, available phosphorus (P) using Bray P1 analysis or Mehlich III for golf turf, and available potassium (K) levels in the soil. Test results shall be in parts per

Conservation Practice Standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your local WDNR office or the Standards Oversight Council office in Madison, WI.

WDNR, WI
5/06

[1] Words in the standard that are shown in italics are described in X. Definitions. The words are italicized the first time they are used in the text.

Outline of the Technical Standard for Nutrient Management

- Guidelines for Establishment
- Guidelines for Established Turf
  - High Traffic Areas
  - Low Traffic Areas
  - Groundwater Management Areas
  - Surface Water Management Areas


For all fertilized areas, phosphorus fertilizer must be applied according to soil test recommendations

Soil Testing

- Define Representative Areas (management units)
  - Soil fields vs. sand greens
  - Areas built at different times
  - Areas cut out of forest vs. old ag land
  - Areas of drastically different soil type

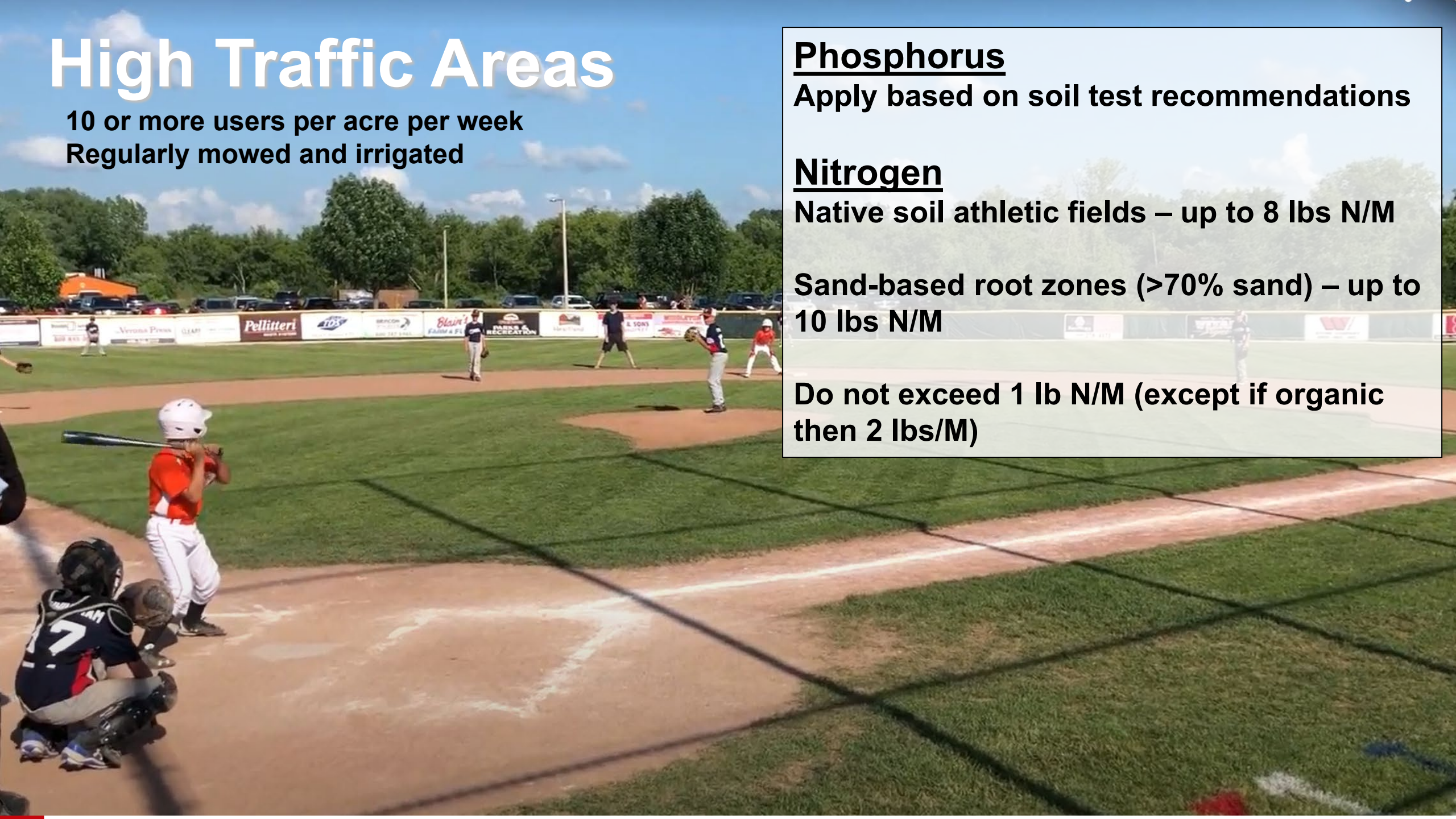
- Sample to a depth of 5 – 7 inches using a standard soil probe
- Take 10 cores per representative area
- Remove grass/thatch, mix 10 cores well
- Submit to laboratory for Mehlich 3 or Bray-1 analysis

Establishment/Renovation Guidelines

- Soil Test Prior to Seeding, Sodding, or Overseeding
- Apply P based on Soil Test
- N Recommendations
  - Max of 6 lbs N/M during 12 mo. Following seeding, no more than 1 lb N/M per application
  - Exception: Greens, Athletic Fields, Sand-based root zones – up to 10 lbs N/M

High Traffic Areas

10 or more users per acre per week
Regularly mowed and irrigated



Phosphorus

Apply based on soil test recommendations

Nitrogen

Native soil athletic fields – up to 8 lbs N/M

Sand-based root zones (>70% sand) – up to 10 lbs N/M

Do not exceed 1 lb N/M (except if organic then 2 lbs/M)

Low Traffic Areas

10 or fewer users per acre per week, or non-irrigated sites

Phosphorus

Apply based on soil test recommendations

Nitrogen

Clippings removed apply up to 4 lbs N/M

Clippings returned apply up to 3 lbs N/M

Do not exceed 1 lb N/M (except if organic then 2 lbs/M)

Surface Management Areas

General Guidelines

Don’t apply to frozen* or saturated soils
Sweep up fertilizer applied to impervious surfaces
Avoid drift of liquid fertilizer into water bodies

Two Specific Restriction Categories

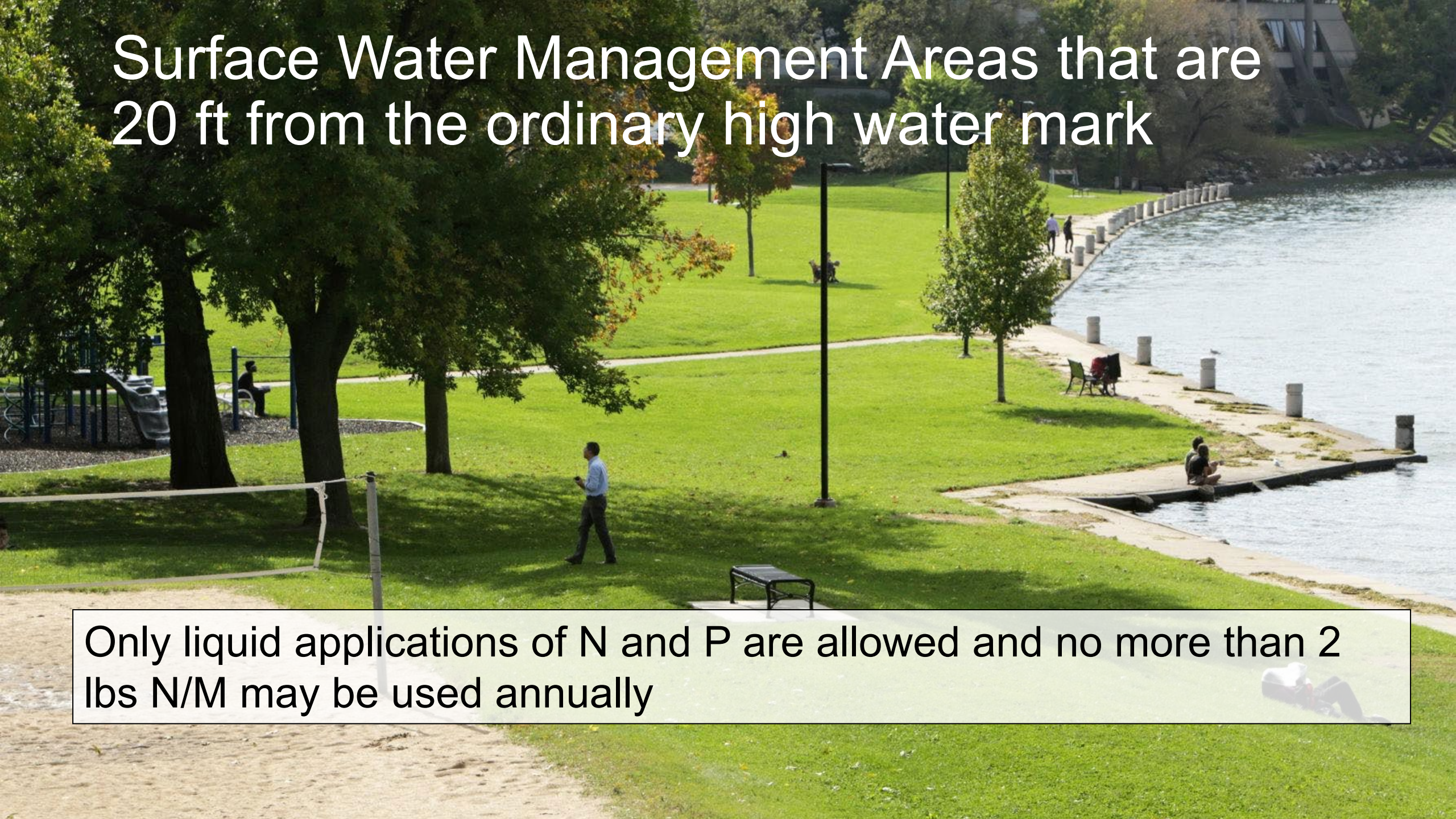
#1) 1000 ft from ordinary high water mark of navigable waters that consist of a lake, pond or flowage; and 300 ft from perennial rivers and streams.

#2) 20 ft from ordinary high water mark

Surface Water Management Areas that are 1000 ft from ordinary high water mark of navigable waters that consist of a lake, pond or flowage; and 300 ft from perennial rivers and streams

- On slopes steeper than 10%, use fertilizers with < 50% SRN
- Do not apply fertilizer when heavy rainfall is expected, unless fertilizer is watered-in sufficiently

Surface Water Management Areas that are 20 ft from the ordinary high water mark



Only liquid applications of N and P are allowed and no more than 2 lbs N/M may be used annually

Groundwater Management Areas

General Guidelines

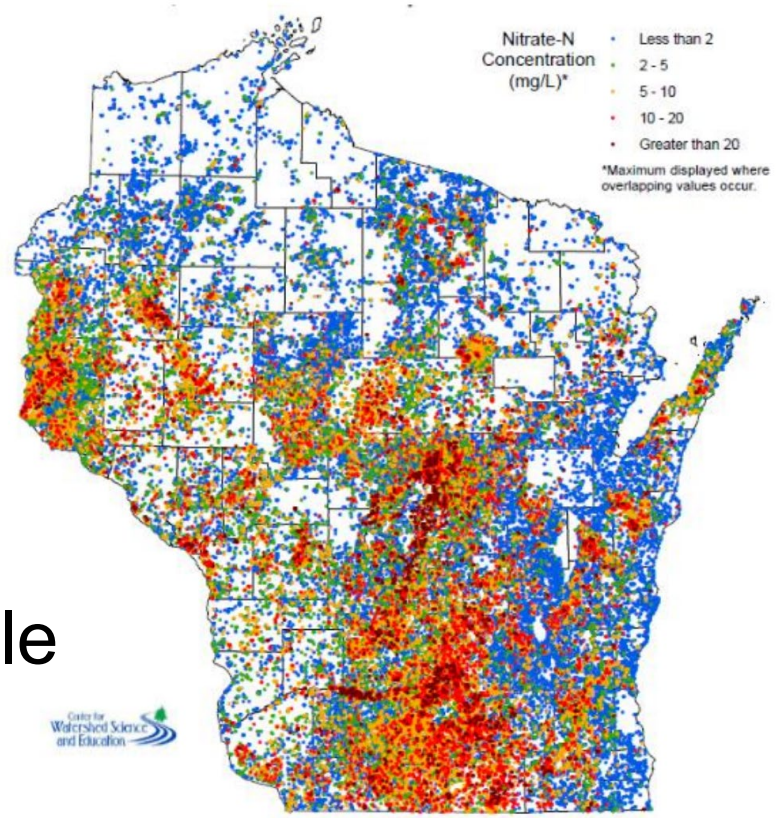
Don’t apply to frozen* or saturated soils

One Specific Restriction Category

Soils with high permeability

OR less than 20 inches to bedrock

OR less than 12 inches to apparent water table



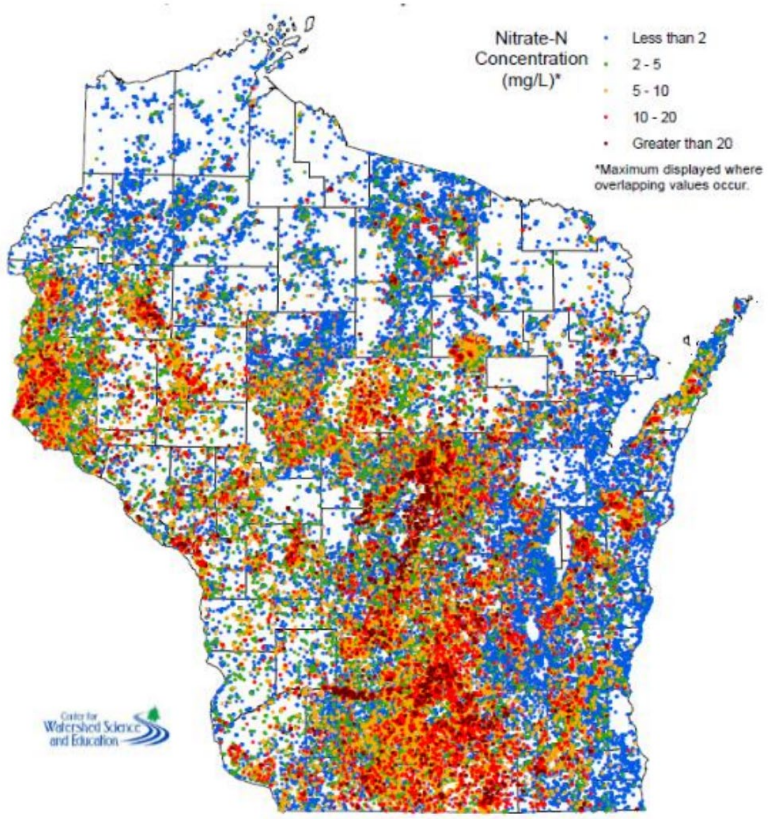
Groundwater Management Areas

For these areas:

- Use fertilizer with > 50% SRN unless rates are ¼ lb N/M or less

- Do not apply ANY fertilizer within 100 feet upslope of a direct conduit to groundwater (ex: fractured bedrock)

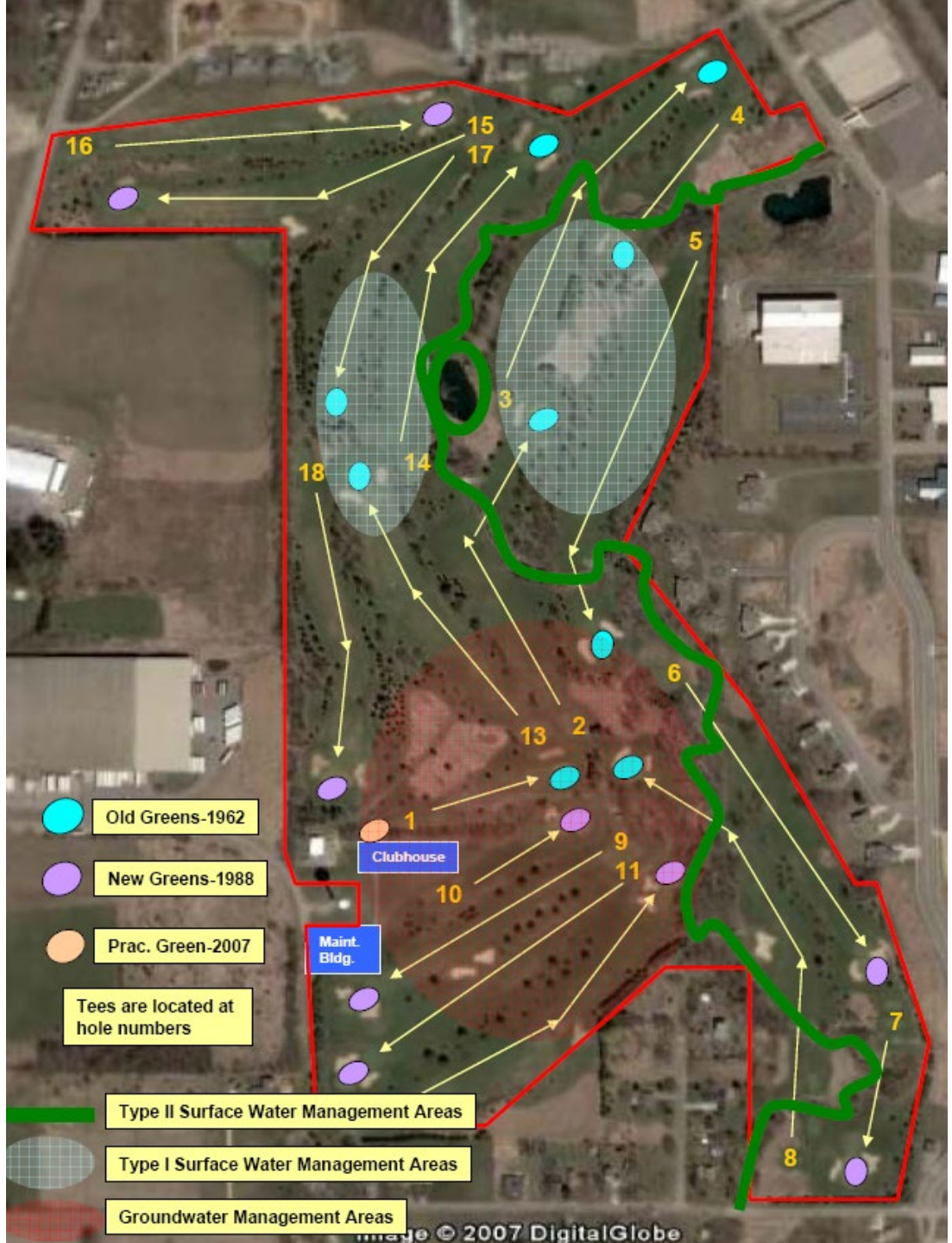
- Tile inlets, drain tiles, and similar stormwater infrastructure must be covered prior to application unless they drain to on-site ponds disconnected from ground and surface water.



Steps for Creating a Nutrient Management Plan

1. Assemble your resources
    1. Maps
    2. Soil properties from web soils survey
    3. Soil test reports
2. Identify high traffic, low traffic, and restricted areas (surface water or groundwater management areas)
3. Describe fertilization program for all areas

The end goal is to produce something like this



Grab aerial photos from Google Maps or similar

Andersons GOLF PRODUCTS

Analysis conducted by:

MDS HARRIS
621 Rose Street
P.O. Box 80837
Lincoln, Nebraska 68502

THIS ANALYSIS RUN FOR:
[illegible]

THIS ANALYSIS REQUESTED BY:
[illegible]

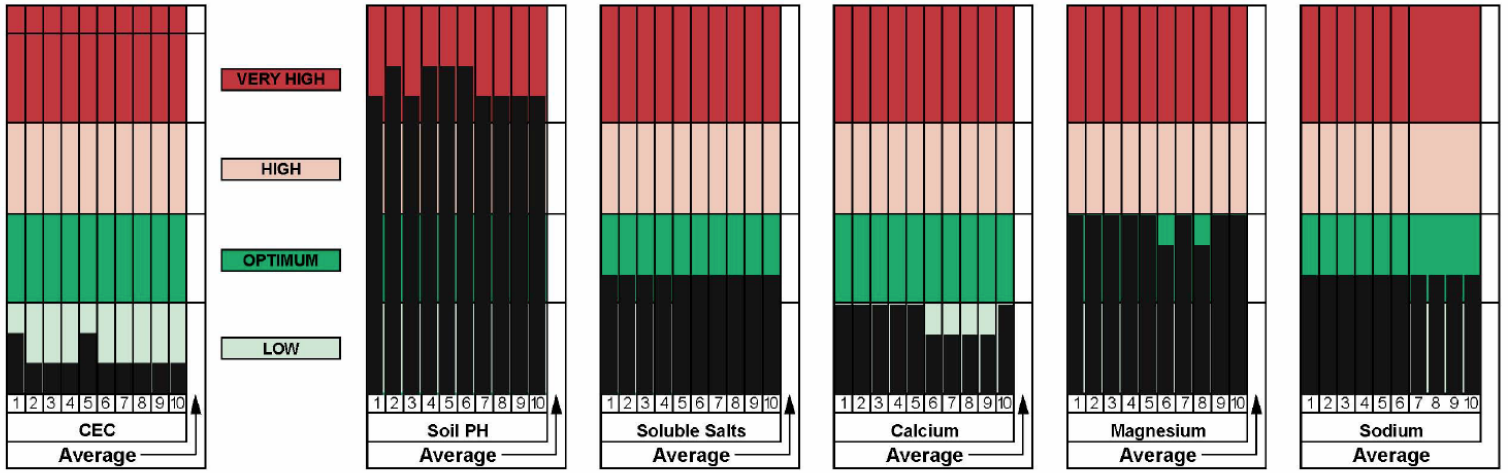
DATE REC'D.	18-Jun-2008	DATE REPORTED	19-Jun-2008	SAMPLE WILL BE KEPT UNTIL	03-Jul-2008	LABORATORY NUMBER	07418897-07418906

ALL NUTRIENT RESULTS EXPRESSED IN PPM

CODE	1	2	3	4	5	6	7	8	9	10	AVERAGES
Sample Description	GRN1	GRN4	GRN7	GRN9	GRN11	GRN13	GRN14	GRN16	GRN17	GRNPV	
CEC	3.9	3.2	3.2	3.3	3.4	2.9	2.9	2.8	3.1	3.3	3.2
Soil pH	7.4*	7.6*	7.4*	7.5*	7.5*	7.5*	7.4*	7.3*	7.3*	7.5*	7.4
Buffer pH	----	----	----	----	----	----	----	----	----	----	----
Soluable Salts	0.16	0.14	0.13	0.12	0.13	0.12	0.12	0.13	0.14	0.13	0.13
Exchangeable Calcium (Ca)	554.0*	436.0*	431.0*	455.0*	441.0*	375.0*	385.0*	365.0*	398.0*	437.0*	427.7
Exchangeable Magnesium (Mg)	115.0	105.0	108.0	103.0	117.0	95.0	101.0	99.0	107.0	110.0	106.0
Exchangeable Sodium (Na)	12.0	11.0	11.0	9.0	13.0	9.0	11.0	8.0	10.0	10.0	10.4
% H Base Saturation	0	0	0	0	0	0	0	0	0	0	0
% K Base Saturation	3.4*	4.4*	4.4*	4.2*	3.9*	5.1*	4.4*	5.8*	4.8*	4.4*	4.5
% Mg Base Saturation	24.5*	27.0*	27.7*	25.9*	29.0*	27.8*	28.6*	29.0*	29.0*	27.9*	27.6
% Ca Base Saturation	70.8	67.2	66.4	68.7	65.5	65.7	65.4	64.1	64.7	66.4	66.5
% Na Base Saturation	1.3	1.5	1.5	1.2	1.7	1.4	1.6	1.2	1.4	1.3	1.4

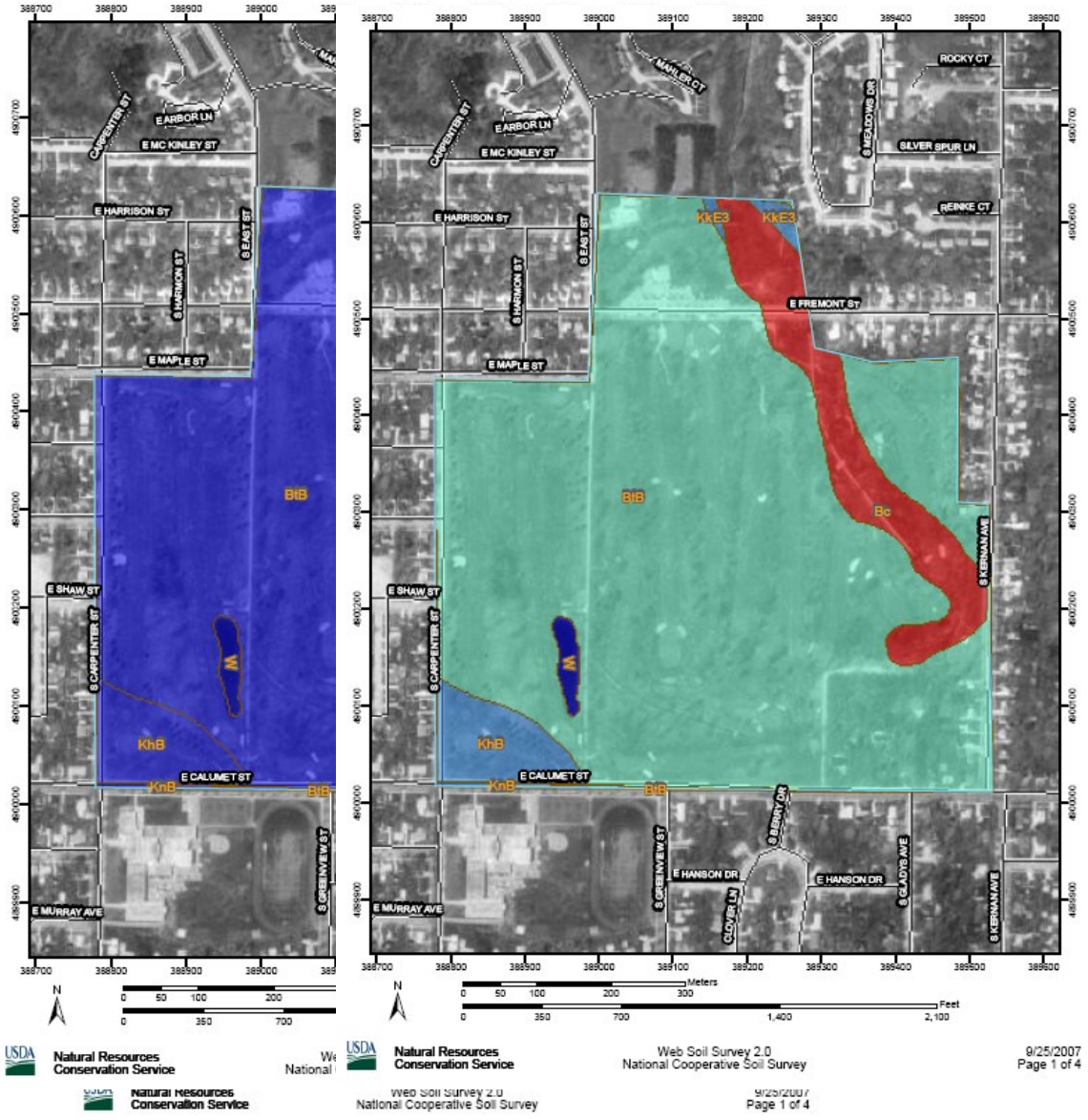
CODING INFORMATION:

	Sample Identification	Plant Variety
1	GRN1	GA
2	GRN4	GA
3	GRN7	GA
4	GRN9	GA
5	GRN11	GA
6	GRN13	GA
7	GRN14	GA
8	GRN16	GA
9	GRN17	GA
10	GRNPV	GA



Get Soil Maps for Groundwater Management Areas

- Maps
  - Hydrologic groups
    - All B or C
  - Depth to bedrock
    - All > 200 cm
  - Depth to water table
    - Red area indicates area of concern



Describe your fertilization restrictions for your management units

High traffic, irrigated fields

Soil test P = 68 ppm Mehlich 3

Maximum allowable P based on soil test = 0 lbs/M

Maximum allowable N = 8 lbs/M

Low traffic areas (unirrigated, clippings mulched)

Soil test P = 72 ppm Mehlich 3

Maximum allowable P based on soil test = 0 lbs/M

Maximum allowable N = 3 lbs/M

Fertilized Areas

- Fill out the template form using fact sheets as a guide

- Information you'll need:
  - Amount of traffic (high or low)
  - Use: fairway, tee box, or green
  - Soil type (mineral soil or sand root zone)

From the NR-151 Template (Word Document) on the www.turf.wisc.edu website:

Site:	**Main Stadium**
Location:	#1 Eagle Drive
Size:	1.2 acre total
Age:	25 Years
Grass species:	Kentucky bluegrass/perennial ryegrass mix
Root zone or soil type:	Sand
Traffic:	High
Max. allowable N/year:	10 lbs
Soil Test P Level:	37 – 58 ppm Bray P1
Max. allowable P_2O_5/year:	0 lbs

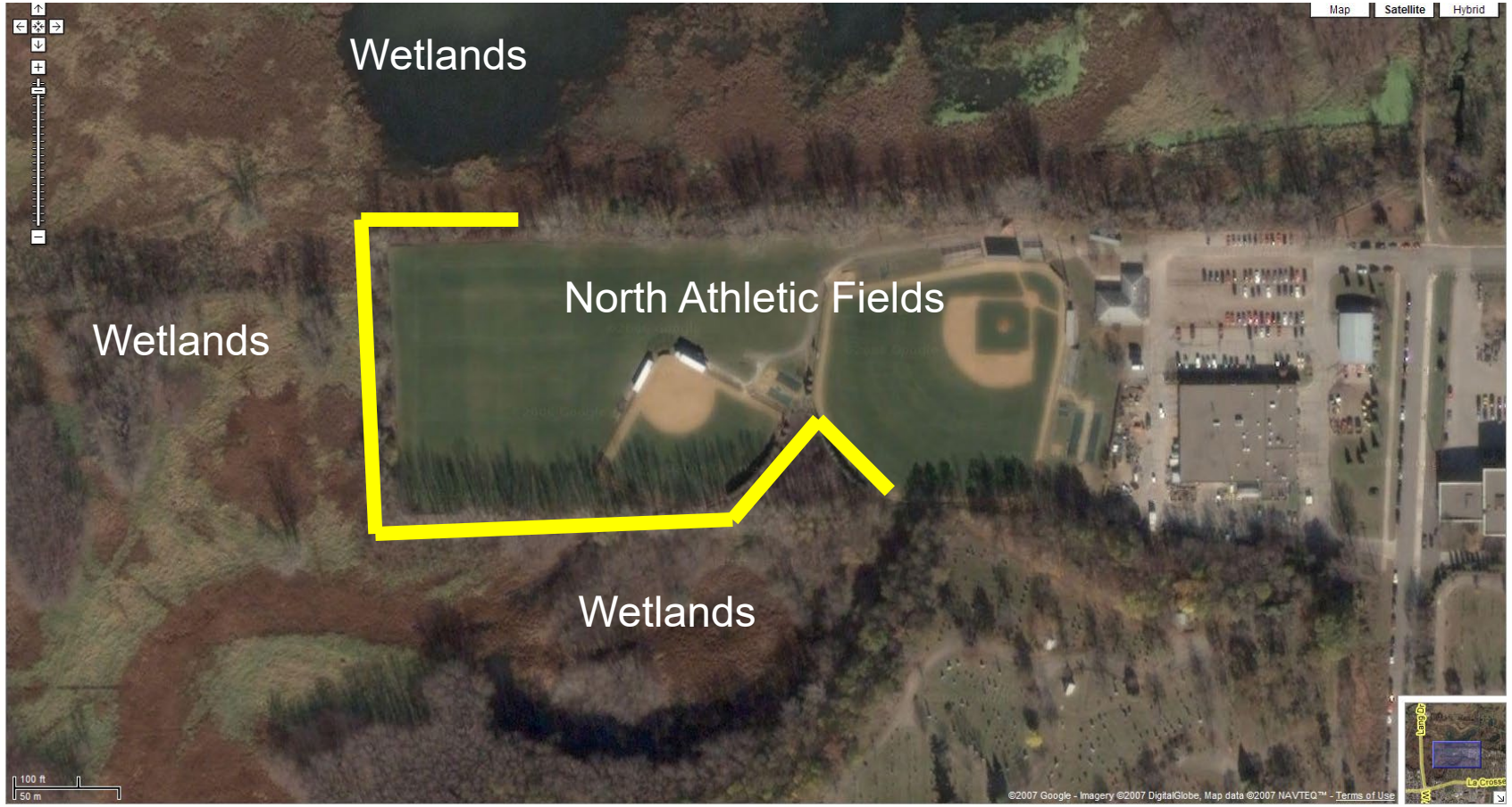
Site:	**Practice Fields**
Location:	#2 Eagle Drive
Size:	2.4 acres total
Age:	18 Years
Grass species:	Kentucky bluegrass/perennial ryegrass mix
Root zone or soil type:	Silt Loam
Traffic:	High
Max. allowable N/year:	8
Soil Test P Level:	37 – 42 ppm Mehlich-3
Max. allowable P_2O_5/year:	0

Site:	**General Grounds**
Location:	Throughout campus
Size:	10 acre total
Age:	Various
Grass species:	Kentucky bluegrass
Root zone or soil type:	Silt loam
Traffic:	Low (non-irrigated)
Max. allowable N/year:	3 lbs (clippings mulched)
Soil Test P Level:	88 – 136 ppm Bray P1
Max. allowable P_2O_5/year:	0 lbs

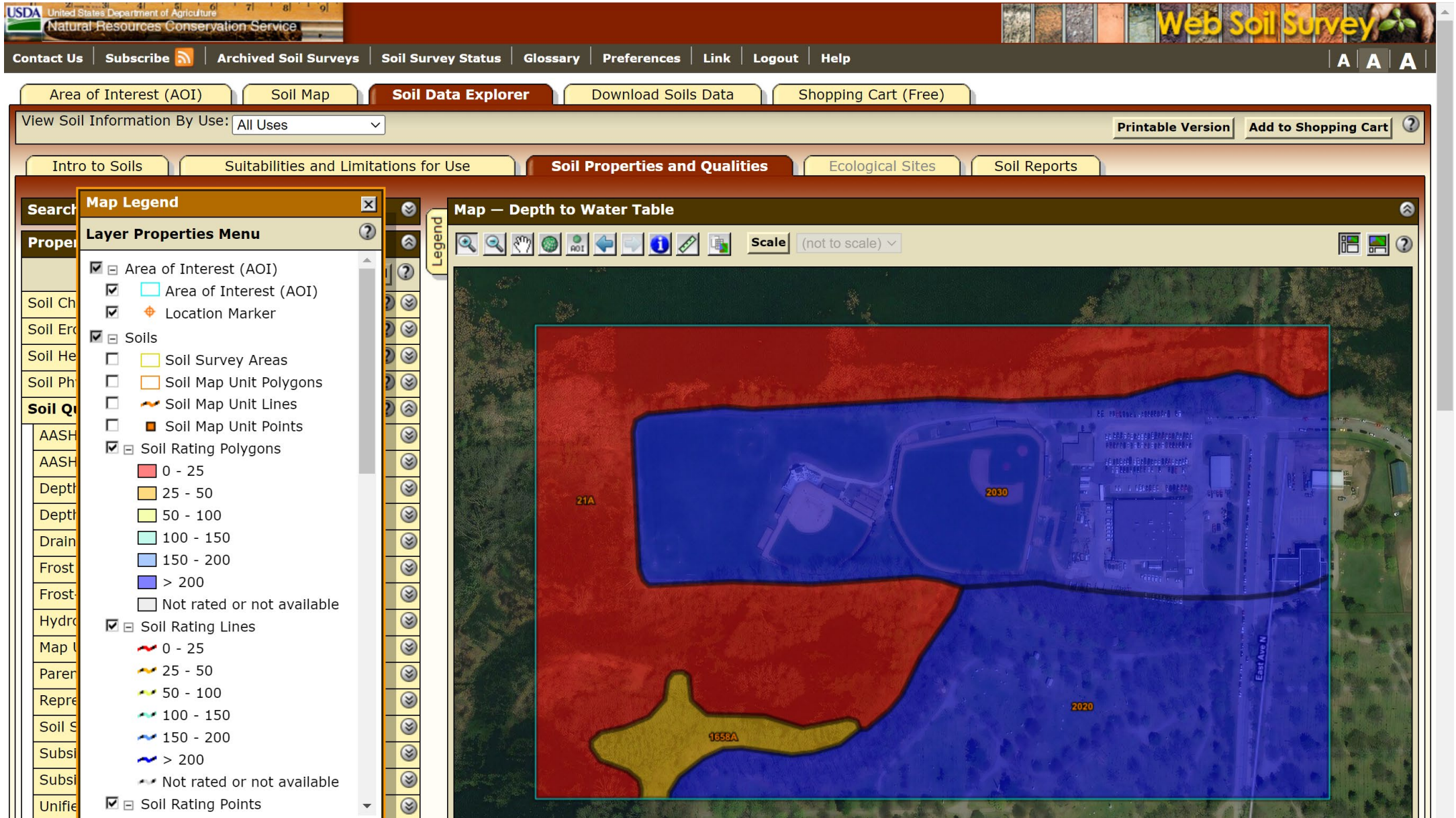
Sometime maps aren't accurate

- Depth to groundwater changes when fill is brought in (area raised) or when drainage is added to keep water table low.
- Construction often modifies slopes. If slopes have been removed, but still show up on the map, document and justify.
- If you think the maps are incorrect, provide evidence, document, and justify

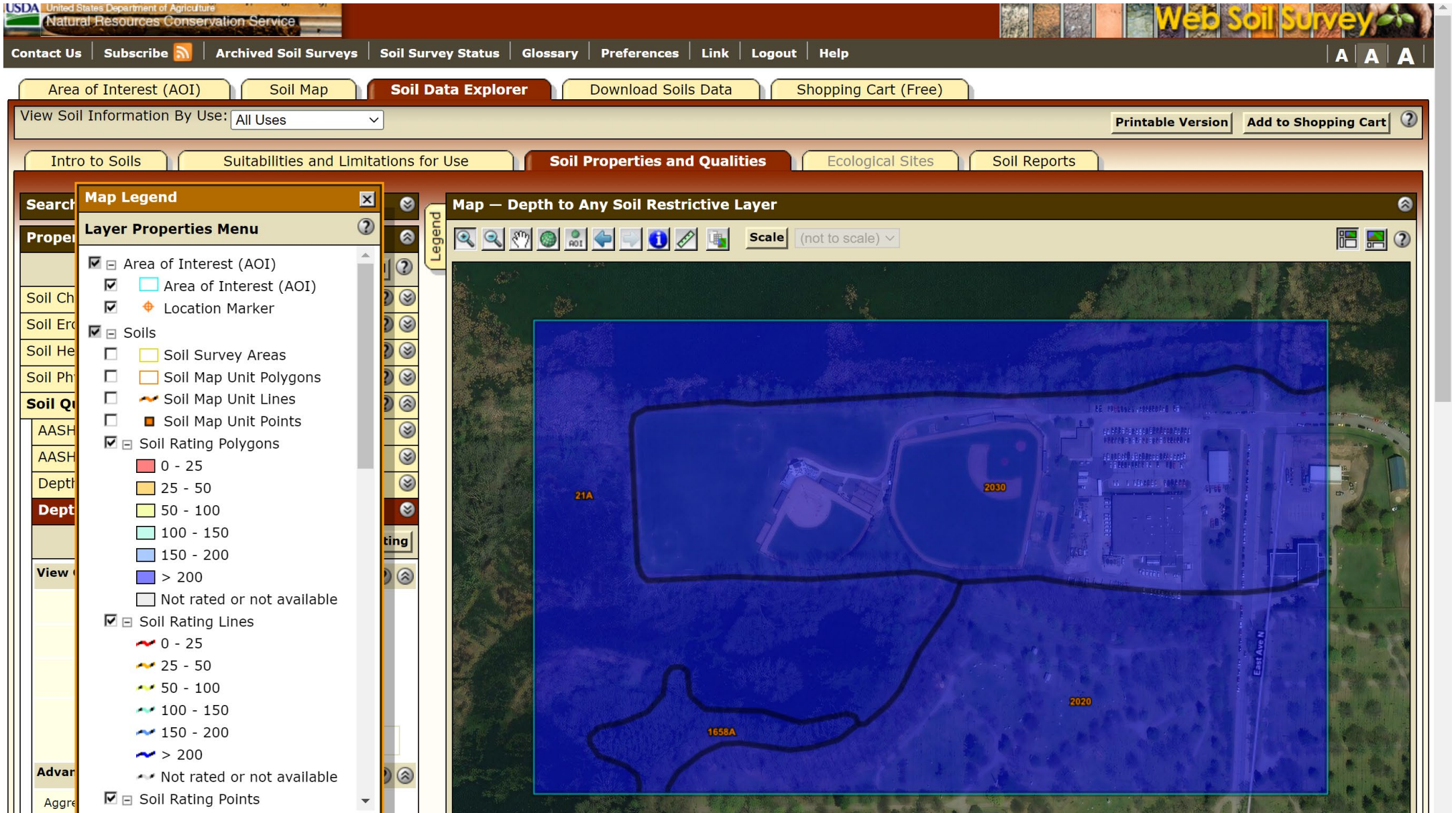
Are these fields in a groundwater management area?



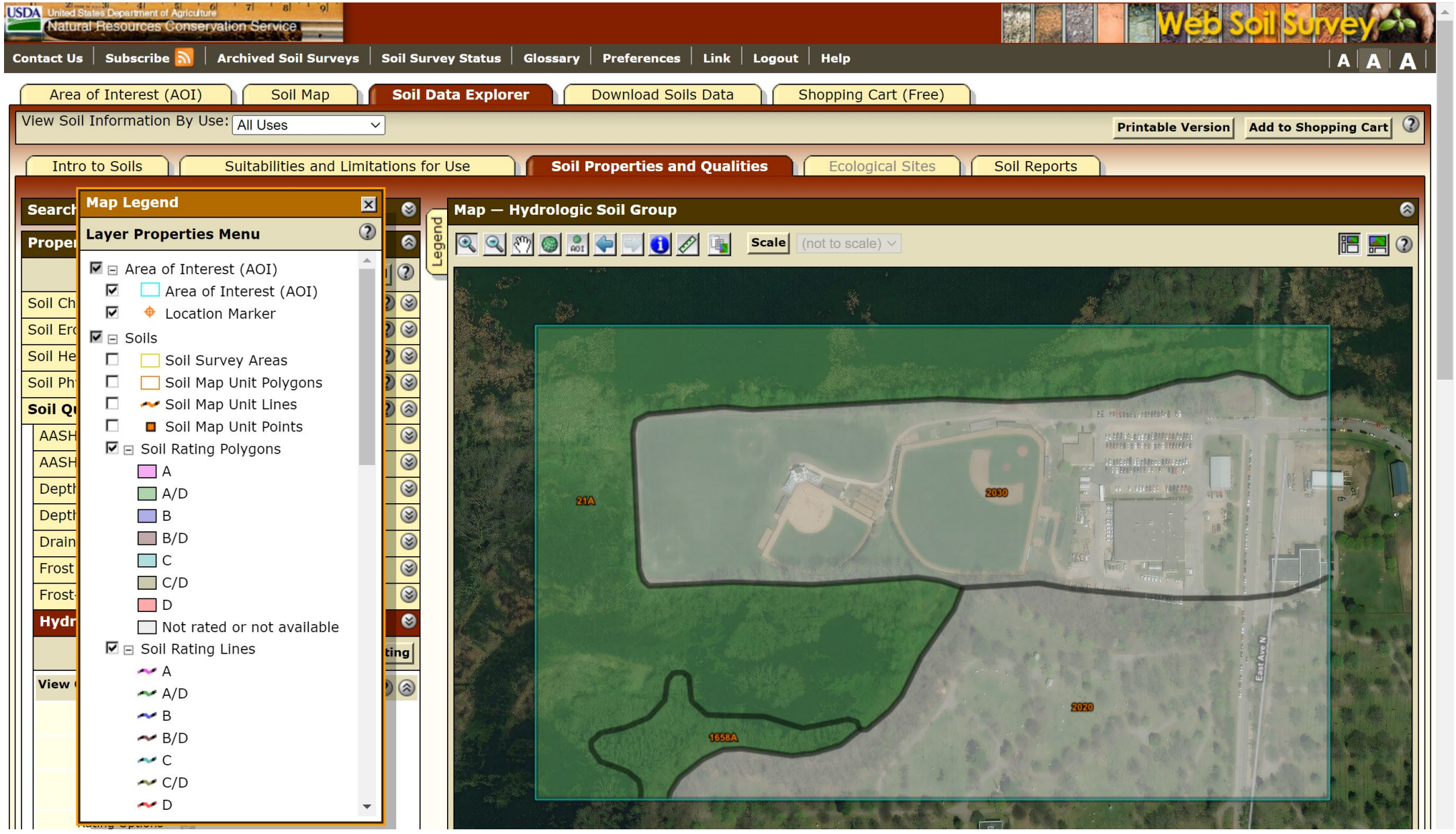
Check depth to groundwater – must be >30 cm



Check depth to bedrock – must be > 50 cm



Check Hydrologic Group – A is GMA



If unsure about groundwater status

- If you know that the area is not in a surface water management area, but are unsure of groundwater status:
  - Design a fertility plan with > 50% Slow-release N fertilizers

Next Steps

- Fertilizer Response Plan (included in template)
- General Application Schedule (not exact, subject to change)
- Actual Record Keeping for Applications
- Calibration table (optional)
- Narrative Description
- Checklist

General Fertilizer Application Schedule
2008

Statement about equipment calibration.
All fertilizer application equipment is calibrated (annually/twice per season, etc).

Establishment Plan
Few sentences on how establishment is carried out. How and when overseeding occurs, how divots are repaired, etc.

General Nutrient Application Schedule – Nitrogen/Phosphorus (lbs/1000 ft^2)

Location	April	May	June	July	Aug	Sept	Oct	Nov	Total
Greens	0/0	1/0	0.5/0	0.5/0	0.5/0	1/0	1/0	0/0	4.5/0
Tees	0/0	1/0	0/0	0/0	1/0	1/0	1/0	0/0	4/0
Fairways	0/0	2/0	0/0	0/0	0/0	0/0	2/0	0/0	4/0
Fertilized Roughs and Clubhouse Lawns	0/0	1/0	0/0	0/0	1/0	1/0	0/0	1/0	4/0
Etc									

Actual Application Record Keeping

ACTUAL FERTILIZER APPLICATION INFORMATION

Area_____

Date	Applied to	N rate (lbs/M)	P_2O_5 rate (lbs/M)	Fertilizer Grade	N source	SRN (%)	Liquid/Granular	Applicator

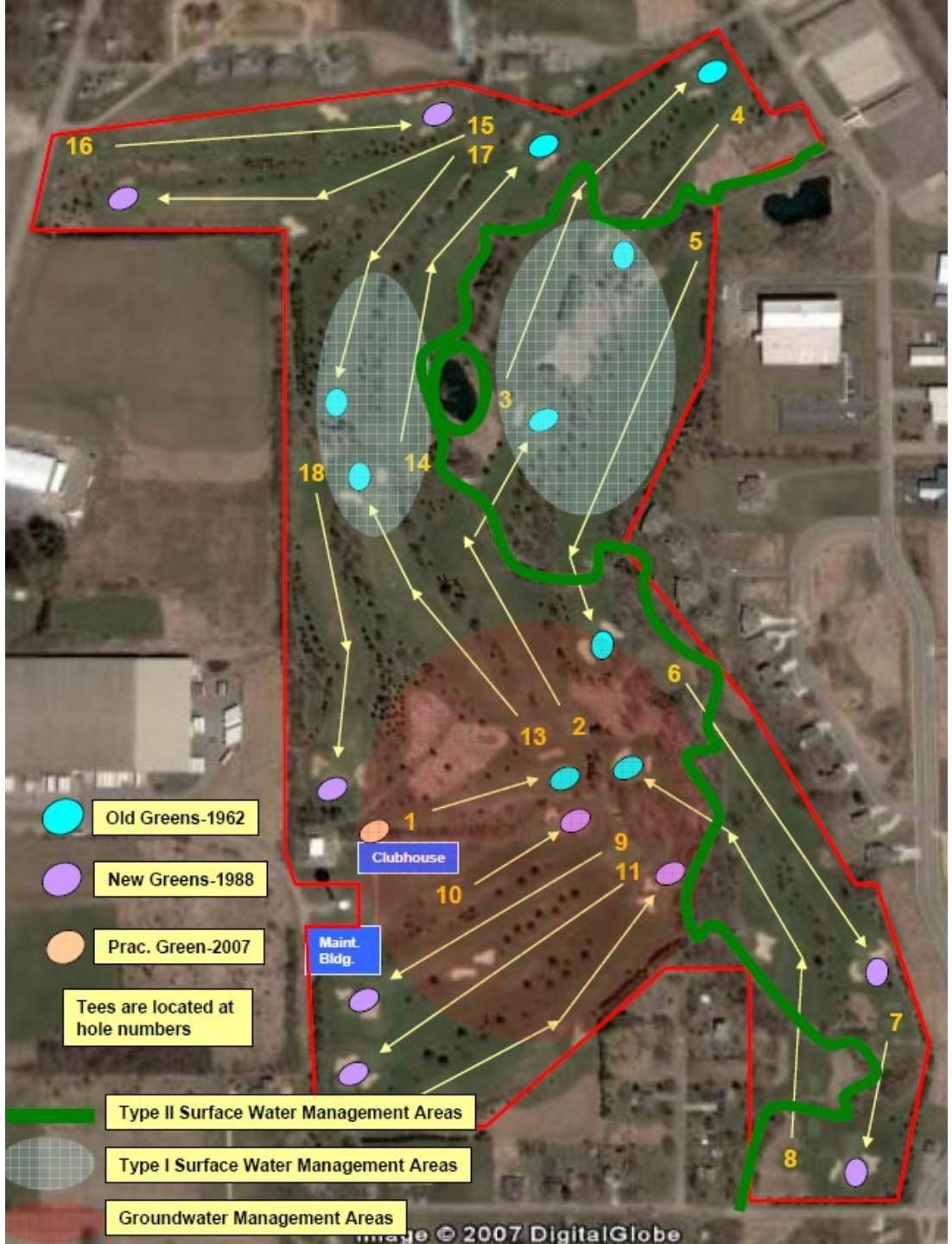
Narrative Description

- Describe site (golf course, athletic field, university, school, etc) and location in WI
- How many acres are fertilized?
- Soils are generally (sandy, silt loams, clay)
- Grasses are (KBG, bentgrass, perennial ryegrass)
- Describe size and extent of water bodies
- Types of restricted areas (Groundwater, surface water management areas)

Example of Narrative Description

The Wisconsin Golf and Country Club (WGCC) is located in the town of Anywhere in eastern Generic County, WI. The WGCC is a private, 18-hole golf course that receives approximately 12,000 rounds per year. The property is 108 acres, with 44 regularly fertilized acres (31 acres of fairways, 2.2 acres of greens, 2.4 acres of tees, 8 acres of rough). The predominant soil type is Briggsville Silt Loam. The course was built in 1934 as a 9-hole public facility. The original 9 tees and greens were constructed with the native silt loam soil. In 1950, construction on the second 9 holes was completed with the native soil used for tees construction and sand for the putting greens. The greens are a mixture of annual bluegrass and creeping bentgrass. Tees and fairways are a mixture of Kentucky bluegrass and perennial ryegrass.

The WGCC has surface water management areas throughout the property near the stream that runs through the course. The property has groundwater management areas in several locations where a seasonally high water table exists (see maps). In addition, 27 surface drains are covered prior to fertilization to prevent direct entry of fertilizer into the drainage system.


16
15
17
4
5
3
18
14
6
13
2
1
Clubhouse
9
11
10
Maint. Bldg.
7
8
Old Greens-1962
New Greens-1988
Prac. Green-2007
Tees are located at hole numbers
Type II Surface Water Management Areas
Type I Surface Water Management Areas
Groundwater Management Areas
Image © 2007 DigitalGlobe

www.turf.wisc.edu for NR-151 resources

UW-MADISON TURFGRASS SCIENCE
ENTOMOLOGY * GENETICS * HORTICULTURE * PLANT PATHOLOGY * SOIL SCIENCE

YOUR UW

HOME ACADEMICS TOOLS AND RESOURCES EVENTS HAVE A TURF PROBLEM?

TOOLS AND RESOURCES

Wisconsin Clipping Tracker Template – Made for golf course superintendents, this clipping volume tracker can be used to track turfgrass growth and estimate the amount of nitrogen removed by mowing.

Wisconsin Turf Pest Control Tool – Select the pest(s) you would like to control and this tool will tell you the most effective chemical control options based on the latest research.

Smith-Kerns Dollar Spot Model – Predict dollar spot disease pressure based on your weather.

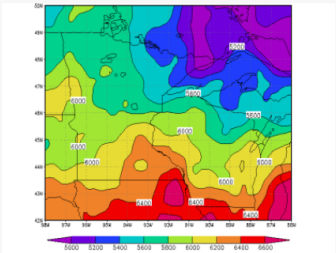
Wisconsin Turf Disease Identification – Use this key to figure out which disease you may have. If you are unsure, submit a sample to the Turf Diagnostic Laboratory.

Wisconsin Weed Identification and Management Tool – If you don't know which weed you have, this tool can help you figure it out.

WISCONSIN NEXRAD RADAR

Visit the NEXRAD radar page at UW-Madison Atmospheric and Oceanic Studies Department.

EVAPOTRANSPIRATION



Click the image to go directly to the full size map

Visit the Estimated ET page

Agricultural Weather page

Assistance for Creating a Nutrient Management Plan

NR-151 is an administrative rule from the Wisconsin Department of Natural Resources that addresses how turfgrass areas over 5 acres in size should be fertilized. Here are some documents and videos designed to help you update or create your nutrient management plan. Please email djsoldat@wisc.edu with any questions.

NR-151 – the administrative rule itself

Technical Standard 1100 – a document that lays out the specifics of a nutrient management plan for turf

Turfgrass Nutrient Management Planning – a UW-Extension publication to help with complying with NR-151

Video 1 – Introduction and overview of NR-151

Video 2 – How to obtain the required maps using Web Soil Survey

Video 3 – Developing a nutrient management plan

Template – A document that you can use to start your nutrient management plan

Using Technical Standard 1100 to Develop a Turfgrass Nutrient Management Plan

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