

# Watertown Sustainable Turf Management

HORT 4063: Turfgrass Science

UNIVERSITY OF MINNESOTA



School Field 2  
(NORTH)

City Field 2  
(NORTH)

School Field 1  
(SOUTH)

City Field 1  
(SOUTH)

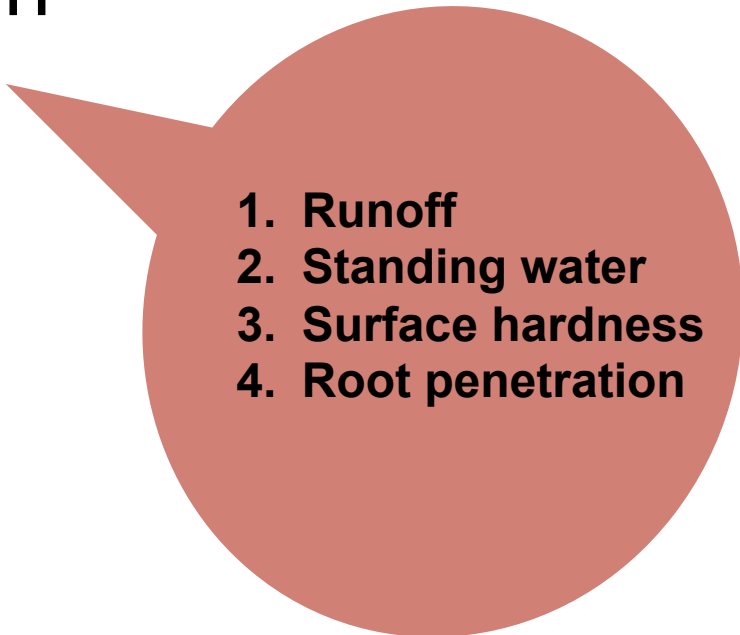
# Report Topics

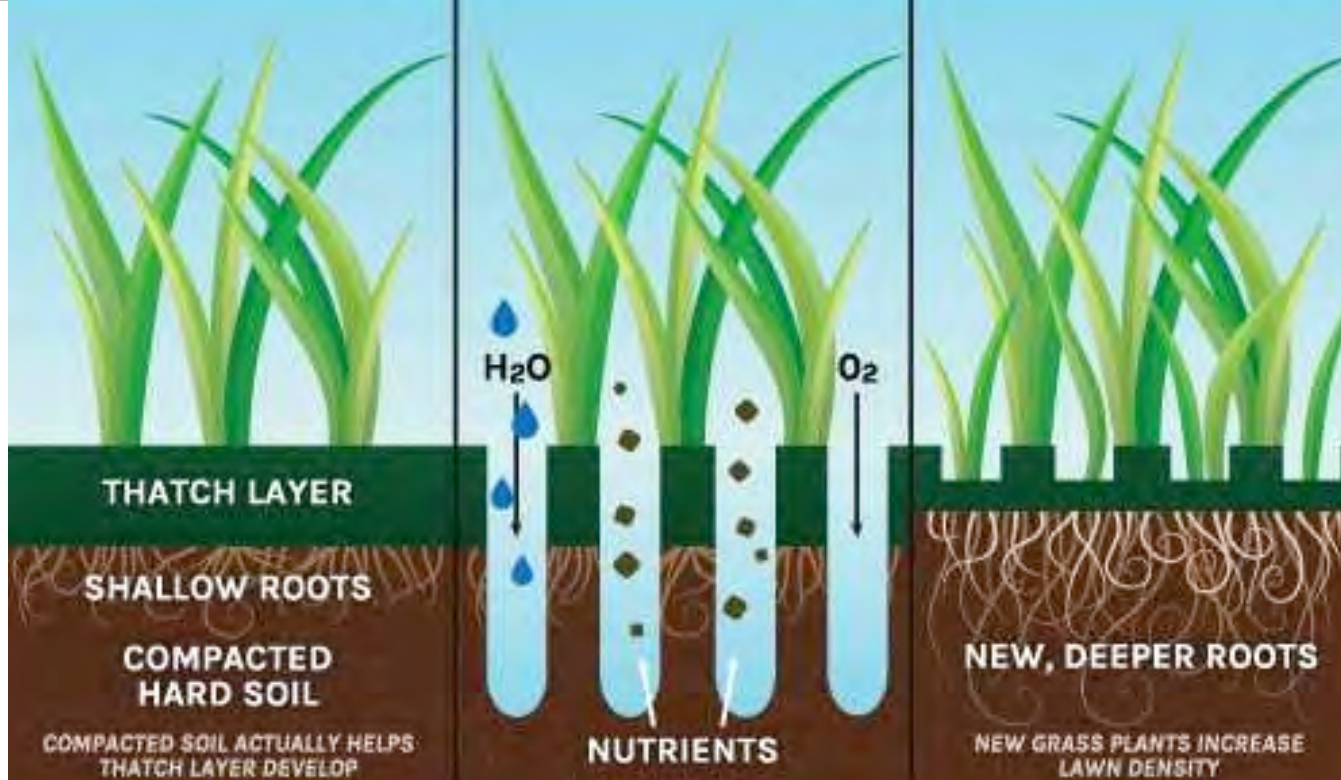
- 1)Aeration
- 2)Irrigation
- 3)Seeding and  
Species Selection
- 4)Fertilization



# What does core aeration do?

- Increases flow of oxygen and water in rootzone
- Increases water infiltration
- Decreases compaction
- Exposes soil for seed
- Reduces thatch

- 
1. Runoff
  2. Standing water
  3. Surface hardness
  4. Root penetration



Minneapolis Lawn Care, 2015



**Healthy soil with pore space  
between particles**



**Compacted soil with greatly  
reduced pore space**

Pineo and Barton, 2009

# Aeration

Current system:

- 1) Fall core aeration
- 2) School Fields 1 and 2 lack water infiltration
- 3) City Fields 1 and 2 are compacted



# School Fields



# City Fields





# Compaction Assessment

- 25 locations on each field
- Penetrometer test
  - Pressure needed to force  $\frac{1}{2}$ " cone 6" deep in rootzone
- Clegg/surface hardness
  - Measures change in acceleration of a weighted missile
  - Impact forces



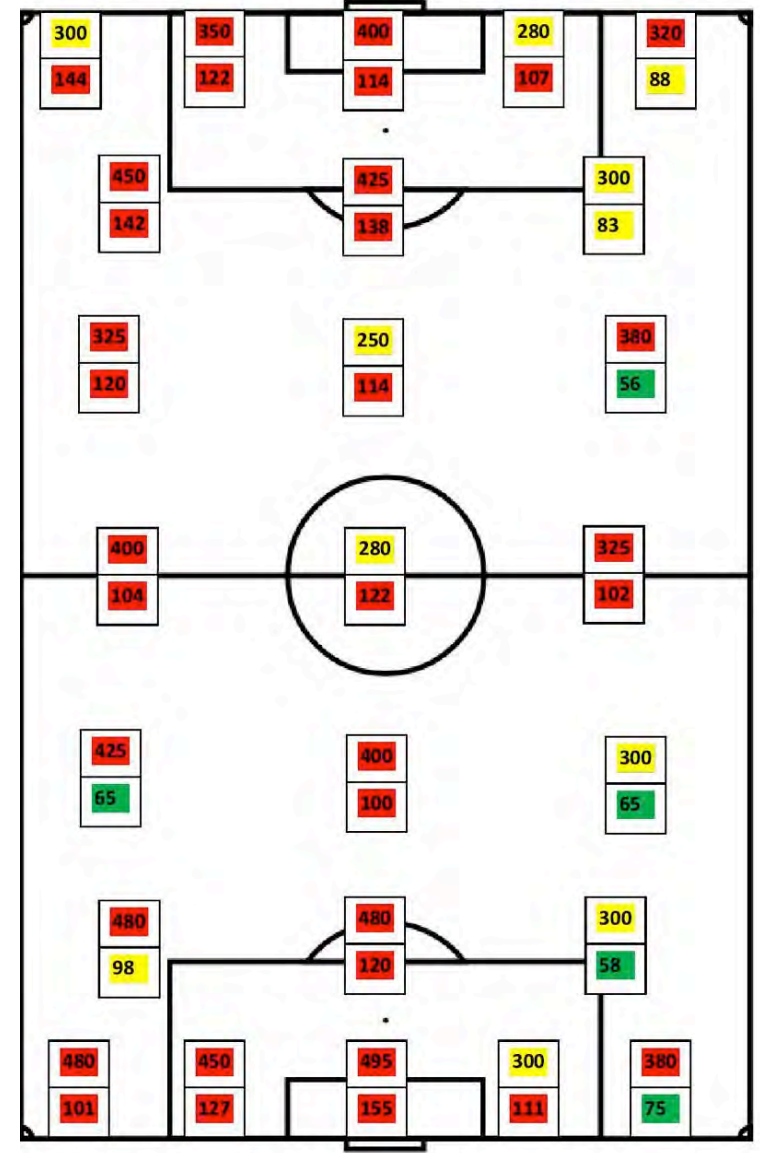
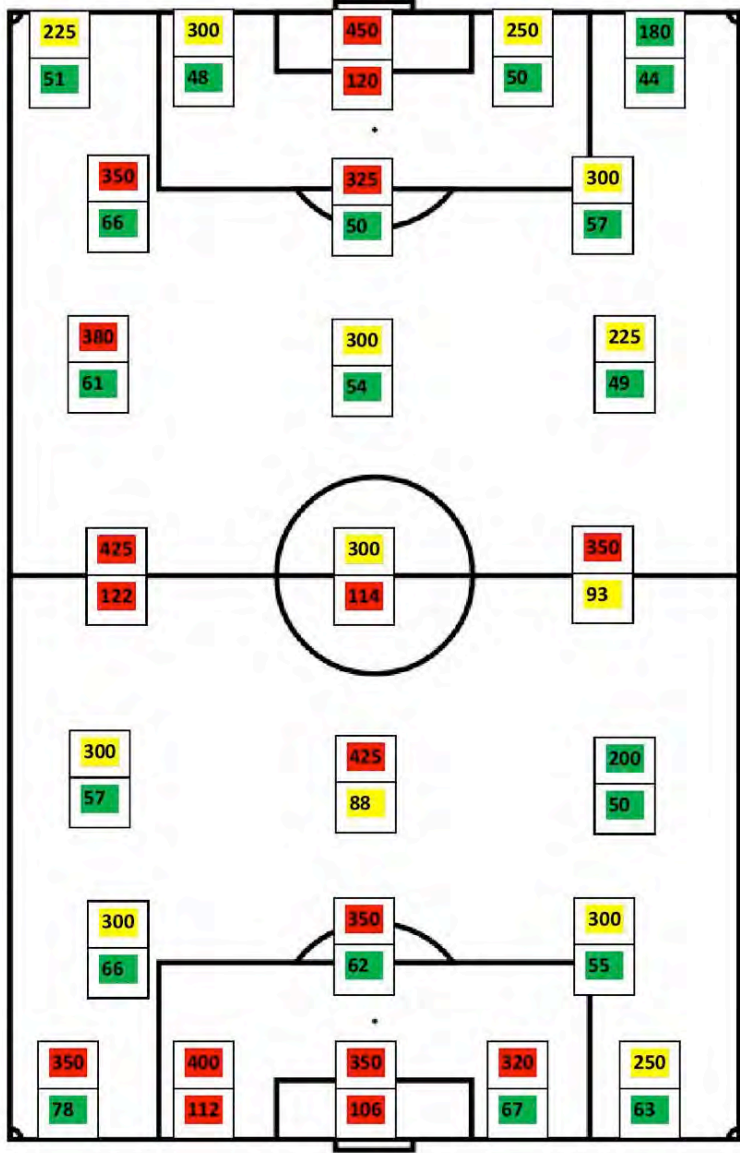
### City Field North

### City Field South

0-200 psi
201-300 psi
>300 psi
0-80 gmax
81-99 gmax
>100 gmax

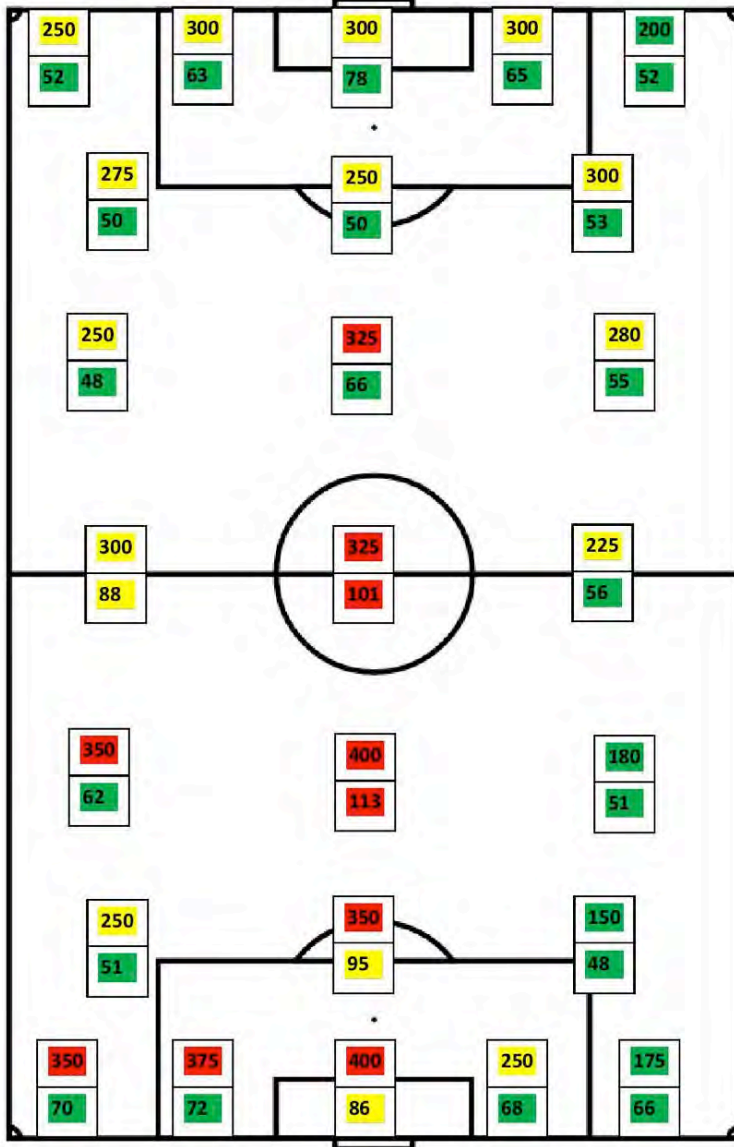
#### Example

225	Penetrometer (psi)
51	Clegg (gmax)

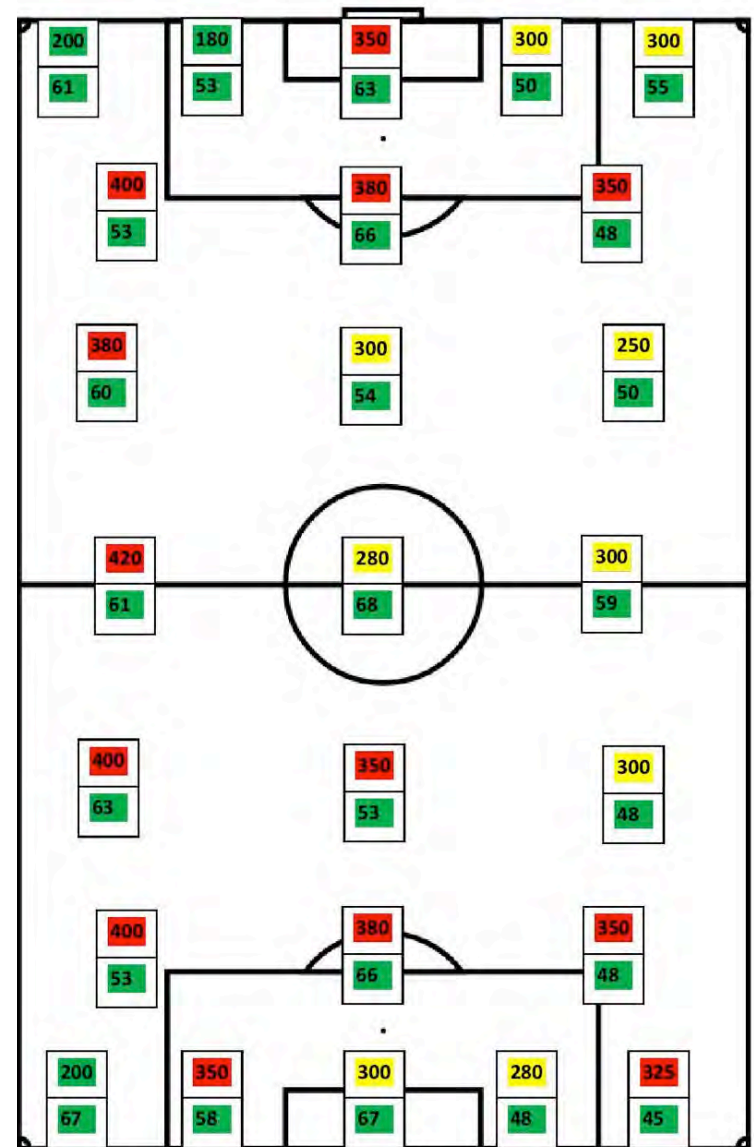


0-200 psi
201-300 psi
>300 psi
0-80 gmax
81-99 gmax
>100 gmax

School Field North



School Field South



# Recommendations

## 1) Increase Aeration

- add spring aeration
- perpendicular aeration
- problem areas
  - localized compaction
  - areas that tend to be wet often

# Recommendations

## 2) Sand Topdress Following Aeration

- Apply USGA sand with large spreader
- Amount needed depends on the size of cores from aeration (24.6-99.6 tons)
- Increase drainage
- Increase micropore space for root penetration



# Recommendations

## 3) Hire 1-time Deep Tine Services in Spring

- Solid tine aeration 6-8 inches deep
- Increase drainage deeper in profile for spring rain events and after snowmelt saturation
- Increase vertical root length going into growing season



# Estimated Costs

Increase core aeration	Additional labor costs
24.61 tons of USGA sand for topdressing (10 holes/ft <sup>2</sup> , 1/2" diameter & 2" deep core)	\$332 + delivery costs & labor for application
99.64 tons of USGA sand for topdressing (12 holes/ft <sup>2</sup> , 3/4" diameter & 3" deep core)	\$1,345 + delivery costs & labor for application
Deep tine contractor	\$800-1200 per field

15016 Oakland Ave.  
Burnsville, MN

952-435-7750

# Deep Tine LLC

Aerification Co.

**Specializing in the deep aerification of green and tees.**

Our goal is to provide professional, high quality service at a fair price using the best deep aerifier on the market; the **Redexim Verti-Drain®**.

With 5 years of deep aerification experience, we continue to strive for individual service.

Some special features we offer Superintendents include:

- **Overnight or daytime aerification**
- **Mid-summer needle-tining**
- **The speed of two Veri-drains**
- **9 and 18 hole price limits**
- **Aerification on short notice**

What **Benefits** will Deep Aerification Give You?

- 1.) **Root development up to 10" deep**
- 2.) **An increase in water infiltration and nutrient uptake**
- 3.) **The ability to modify your soil structure**
- 4.) **The prevention or elimination of black layer problems**
- 5.) **A reduction in water and chemical usage**

Schedule now for spring and fall aerification by contacting

Tom Notch or Tom Stout

**952-435-7750**



# Water Use and Irrigation Practices



<http://lovelandsprinklerandlandscape.com/wp-content/uploads/2014/12/turnkey-irrigation-systems-Loveland.jpg>

# Current System

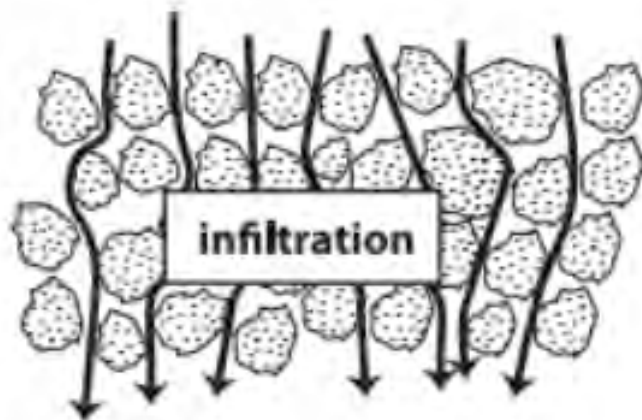
- Run each day 15-30 minutes per zone
- Water from stormwater retention pond
- Top city fields very dry and compact
- Lower school fields soggy, standing water

# Issues

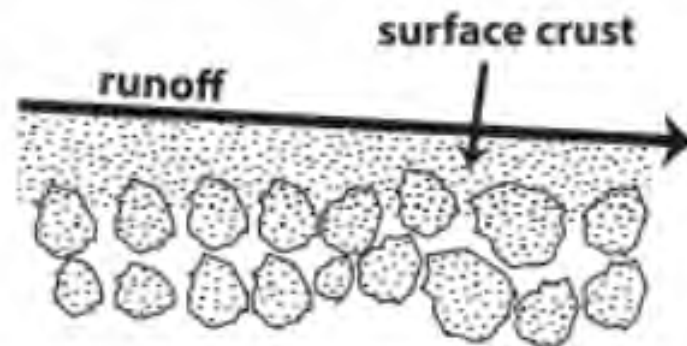
1. Compaction of city fields: creates runoff to lower fields and decreases water infiltration
2. Excess water being put down (everyday): leads to unhealthy turf, runoff, and soggy conditions

# Compaction and runoff

Changes in water flow due to soil crusting/compaction.



a) aggregated soil



b) soil crusts over after aggregates break down

Idowu and Angadi, 2013

# Water use

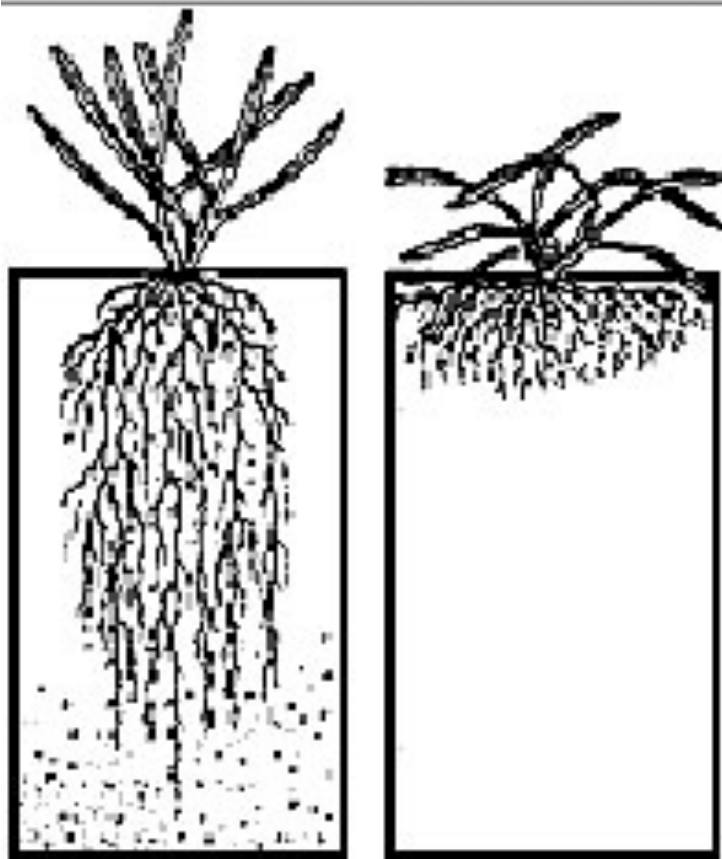
- Unsure of current water use totals, must be tested
- Over watering, soil doesn't have chance to soak it in
- Shallow and frequent

# Recommendations

- More aeration practices
- Reduce water use overall by using deep and infrequent technique
- One inch or less of water per week, including rainfall

# Deep and Infrequent

- Benefits
  - Healthier root system
  - Overall healthier plant
  - More drought avoidant
  - Can reduce water use in half (Fu and Dernoeden, 2009)



UMN extension



# Other Considerations

- System check every spring
- Determine how much water is put down per cycle
- Be conscious of natural rainfall
- Rain sensor or rain gauge
- Running system from off position

# Seeding and species selection

Current System and Issues:

Existing grass is Kentucky bluegrass and perennial ryegrass with weedy-type tall fescue

Existing turf is not suitable for traffic and play



# Seeding and species selection

## Recommendations:

1. Eradicate weedy-type tall fescue
2. Establish new grass

Twin City Seed Tuff Turf Seed Mixture	
Turf-type tall fescue	50%
Creeping red fescue	20%
Kentucky bluegrass	15%
Turf-type perennial ryegrass	15%

• To be completed September 8th with a 24-hour access restriction

# Seeding and species selection

## Why species selection is important

	Heat Tolerance	Stress Tolerance	Traffic Tolerance	Low Maintenance	Quick Establishment	Recovery and Repair
Turf-type tall fescue	x	x	x	x		
Kentucky bluegrass						x
Creeping red fescue		x		x	x	
Perennial ryegrass					x	

# Seeding and species selection

## Other considerations:

1. Repair bare soil areas with topsoil and seed
2. Overseed throughout the year, in combination with aeration

<b>Application</b>	<b>Cost (time and materials)</b>
Glyphosate weedy-type tall fescue	\$250 + tax
Slit-seeding entire soccer fields	\$2500 + tax
Topsoil and rake in seed to bare areas	\$500 + tax
Overseeding with spreader	\$2500 + tax

# Using Fertilizer Application to Maintain Healthy Sport Turf Stands



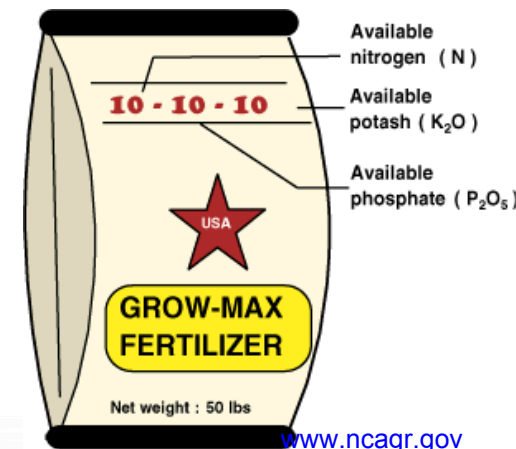
# Nutritions are the Key to Maintain Healthy Turf Stand

1. Turfgrasses require at least 16 nutrients for normal growth and development. **Nitrogen, phosphorus, and potassium** are referred to as primary nutrients and **must be supplied periodically** to turf through fertilizer applications.
2. Deficiencies of nutrients in turfgrass plants can be expressed in numerous ways. The most obvious is a **reddening or yellowing of leaf tissue**. Deficiencies can also appear as a **thinning of the stand, stunted growth, and increased susceptibility to disease**.

# Fertilizer Application

All **fertilizer labels** have three bold numbers. The first number is the amount of nitrogen (N), the second number is the amount of phosphate ( $P_2O_5$ ) and the third number is the amount of potash ( $K_2O$ ). These three numbers represent the primary nutrients (nitrogen(N) - phosphorus(P) - potassium(K)).

Numbers indicate percentage of content. For example: the fertilizer on the right has 10% N, 10%K and 10% P.





# What does N-P-K do?

## 1. Nitrogen:

Affects shoot-root growth, density, color, disease resistance, and stress tolerance.

## 2. Phosphorus

Affects rate of seedling development, maturation, and root growth.

## 3. Potassium

Affects drought tolerance, cold hardiness, and disease resistance.

# Current Fertilization Practice

1. Two fertilizer applications for city soccer field are applied using Lebanon's 19-0-6 (spring) and Lebanon's 18-0-5 (late fall).
2. Around 100 lbs. of fertilizer was applied for each application (two city fields, 245 x 85 yard).

# Current Application Rate

Season of Application	Nitrate Application Rate (lb./1000 sf <sup>2</sup> )	Potassium Application Rate (lb./1000 sf <sup>2</sup> )
Spring Application(April)	0.10	0.032
Fall Application (Late October )	0.09	0.026
Total	0.19	0.058

# Current Situation



School Field 1

City Field 1

# Soil Test Results

Soccer Field	Organic Matter Level	Nitrate Level (ppm)*	Phosphorus Level	Potassium Level
School Field 1	Medium	20.9	Medium-High	Low-Medium
School Field 2	High	19.6	Medium-High	Medium
City Field 1	<b>Low</b>	<b>6.6</b>	Low-Medium	Low-Medium
City Field 2	<b>Low</b>	<b>9.2</b>	Low-Medium	Medium

\*Generally, nitrate level greater than 25 ppm is considered as adequate.

# Recommendation

This recommended fertilizer program is designed to meet minimum nitrogen application required for sport turf and trying to maintain adequate potassium and phosphorus at the same time.

# Recommendation

## Nitrogen

1. Sport turf requires at least 2.5 lbs. per 1000 ft<sup>2</sup> nitrate each year.
2. Nitrate application rate of 1.5 lbs./1000 ft<sup>2</sup> will be applied in the spring and the rest goes to late fall application
3. The 1.5 lbs./1000 ft<sup>2</sup> nitrate for the spring application will need to be divided into two applications to avoid burning the grass -one in early spring and one in late spring.
4. Nitrate application rate of 1 lb./1000 ft<sup>2</sup> for the late fall application should be applied between September and November.

# Recommendation

## Phosphorus

1. Both school fields have medium to high level of phosphorus in the soil. No special applications is needed at this time.
2. Phosphorus is important to the turf health and important to apply within the same year as seedling occurs, so our suggestion would be to choose a type of fertilizer that includes phosphorus for the spring application. Make sure phosphorus application should go new seedings.

## Potassium

1. Choose fertilizer that has higher potassium content



# Fertilizer recommendation by season

Soccer field	Fertilizer ratio (Spring)	Fertilizer ratio (Fall)
School Field 1	15-5-10	15-0-10
School Field 2	15-5-10	15-0-10
City Field 1	20-10-10	20-0-10
City Field 2	20-10-10	20-0-10

# Pricing

Fertilizer	Unit Pricing (30 lbs. Pack)	Total Cost
15-5-10 (School Fields)	\$16.97	\$1069.11 + applicable tax
20-10-10 (City Fields)	\$20.5	\$963.5 + applicable tax
20-0-10 (City Fields)	\$39.75	\$1272+ applicable tax
15-0-10 (School Fields)	\$54.75	\$2299.5 +applicable tax

Price is estimated based on 2.5 lbs. per 1000 sf<sup>2</sup> nitrogen application rate (spring 1.5lbs, fall 1lb.).

# Questions?