

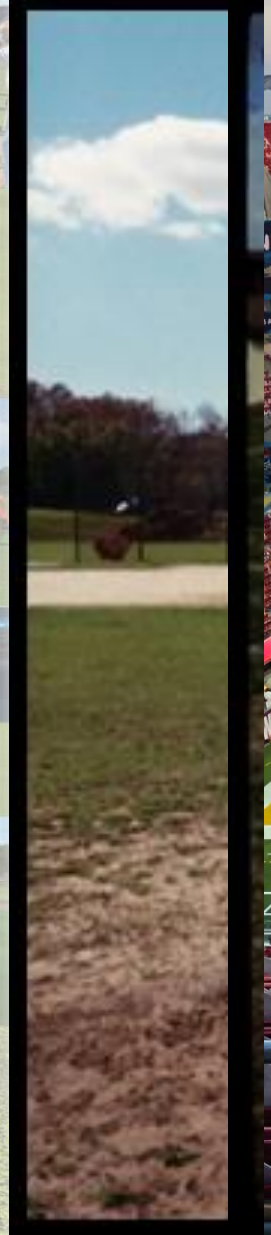


Best Cultural Practices for Sports Fields:

Aerification, Topdressing, Over-seeding, Fertility, and more

Boyd Montgomery, CSFM

What's the Problem?



Where Do You Start?

- "Working with the hand you were dealt"
  - Soil Testing
  - Nutrient Testing
- What are the expectations of your:
  - Customers, BOD, and Management
- Be an advocate for safety and expectations
  - Learn to sell your ideas and concepts
  - Utilize "Best Management Practices" as a guide
  - Network, education, documentation, and photo's

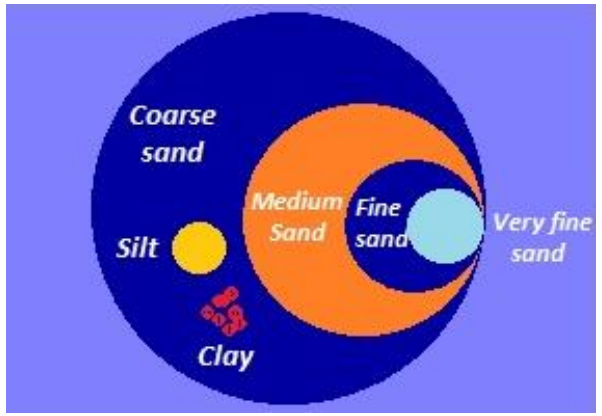
Practical Application

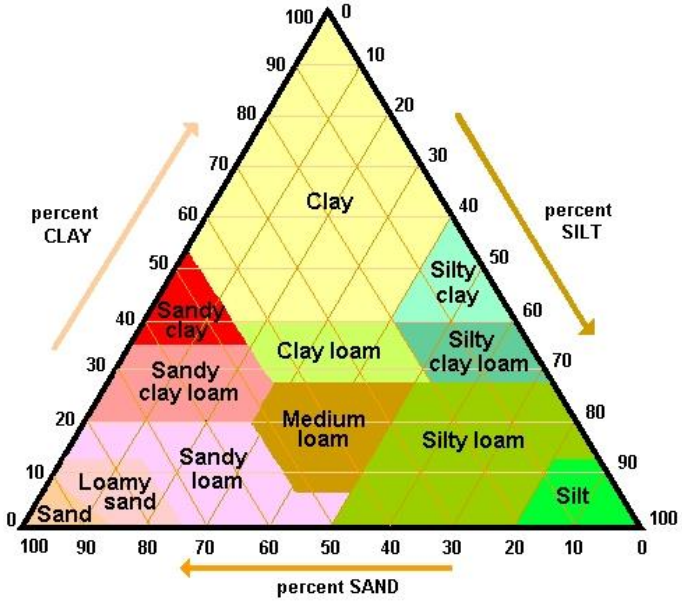
Soil Texture



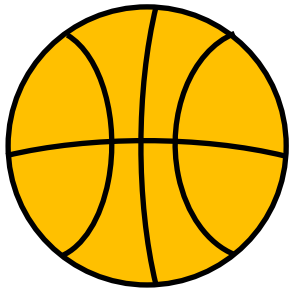


- Soils are made of different sized particles:
  - Gravel: > 2.0mm
  - Very Coarse Sand: 2.0mm to 1.0mm
  - Coarse Sand: 1.0mm to 0.5mm
  - Medium Sand: 0.5mm to 0.25mm
  - Fine Sand: 0.25mm to 0.1mm
  - Very Fine Sand: 0.1 to 0.05mm
  - Silt: 0.05mm to 0.002mm
  - Clay: < 0.002mm



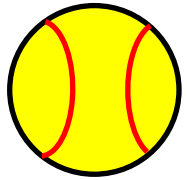


Basic Soils Analogy

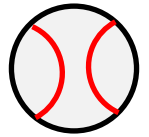


Very Coarse Sand
(2.0mm to 1.0mm)

Coarse Sand
(1.0mm to 0.5mm)



Medium Sand
(0.5mm to 0.25mm)



Fine Sand
(0.25mm to 0.1mm)

Very Fine Sand
(0.1mm to 0.05mm)

Silt
(0.05mm to 0.002mm)

Clay
(< 0.002mm)

Aerification

One of the best ways to improve your consistency of your surface!

- Relieves Compaction
- Exchanges Air
- Helps Infiltration
- Stimulates Growth
- Reduces Thatch
- Seedbed Prep.

Relieves Compaction

Six Aerifications

Goal – 15 to 30% of surface area per year

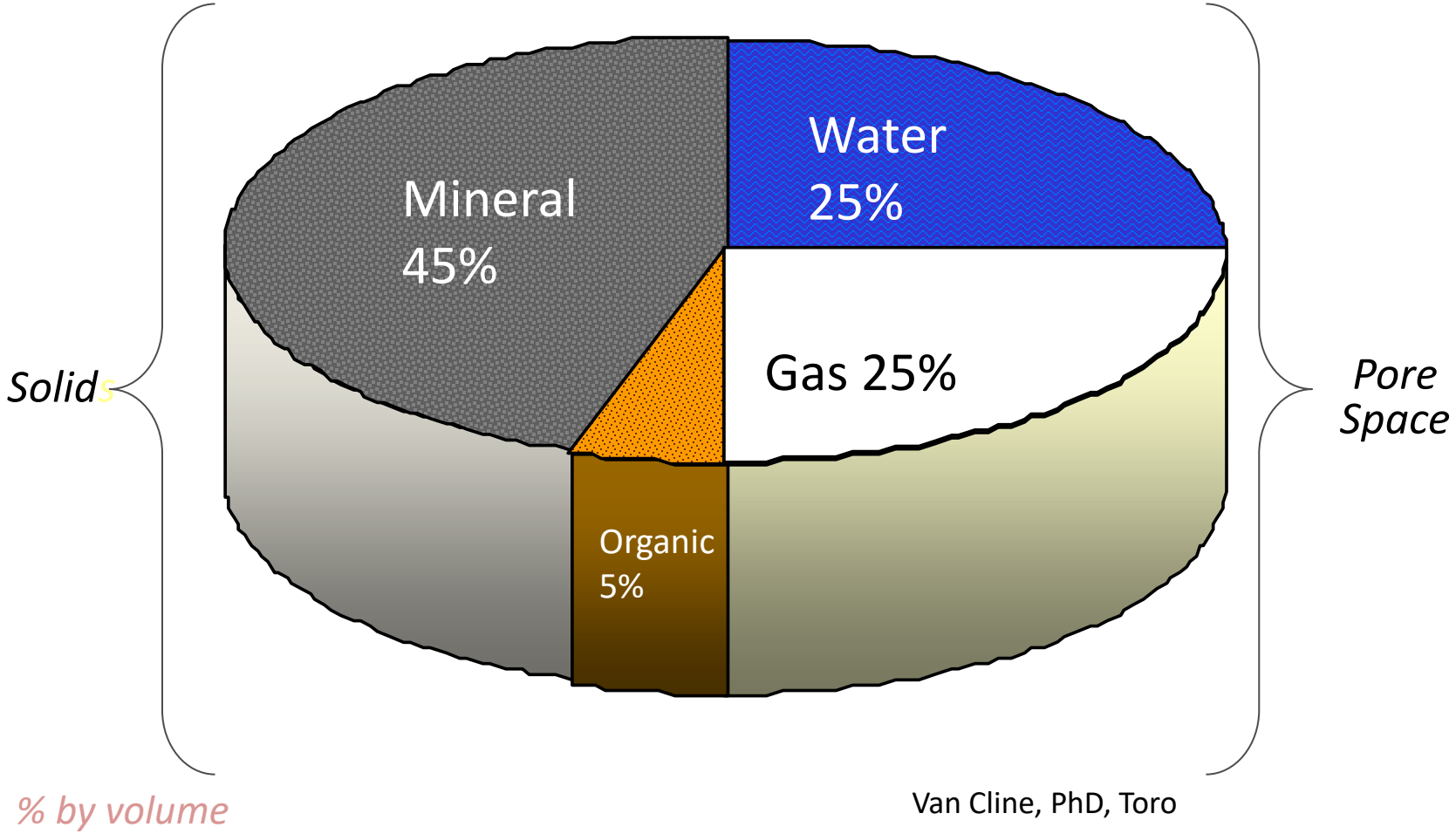
How Many Times?

The impact of tine size and spacing on the amount of surface area impacted by core aerification and dethatching

Tine Size Diameter (inches)	*Spacing (inches)*	*Number of Holes per Square Foot*	*Surface Area Impacted by One Tine (square inches)*	*Percent Surface Area Impacted*	*Number of Aerifications Needed to Reach 20% of Surface Area Impacted*
¼	1 × 1	144	0.049	4.91%	4.1
¼	1 × 2	72	0.049	2.45%	8.1
¼	2 × 2	36	0.049	1.23%	16.3
⅜	1 × 1	144	0.110	11.04%	1.8
⅜	1 × 2	72	0.110	5.52%	3.6
⅜	2 × 2	36	0.110	2.76%	7.2
½	1 × 1	144	0.196	19.63%	1.0
½	1 × 2	72	0.196	9.82%	2.0
½	2 × 2	36	0.196	4.91%	4.1
⅝	1 × 1	144	0.307	30.68%	0.7
⅝	1 × 2	72	0.307	15.34%	1.3
⅝	2 × 2	36	0.307	7.67%	2.6
Dethatching Machine* 9/64" Blades	1 × 1	NA	NA	14.10%	1.4
Dethatching Machine* 5/64" Blades	1 × 1	NA	NA	7.8%	2.6

Root Zone Gas

Composition of an ideal soil

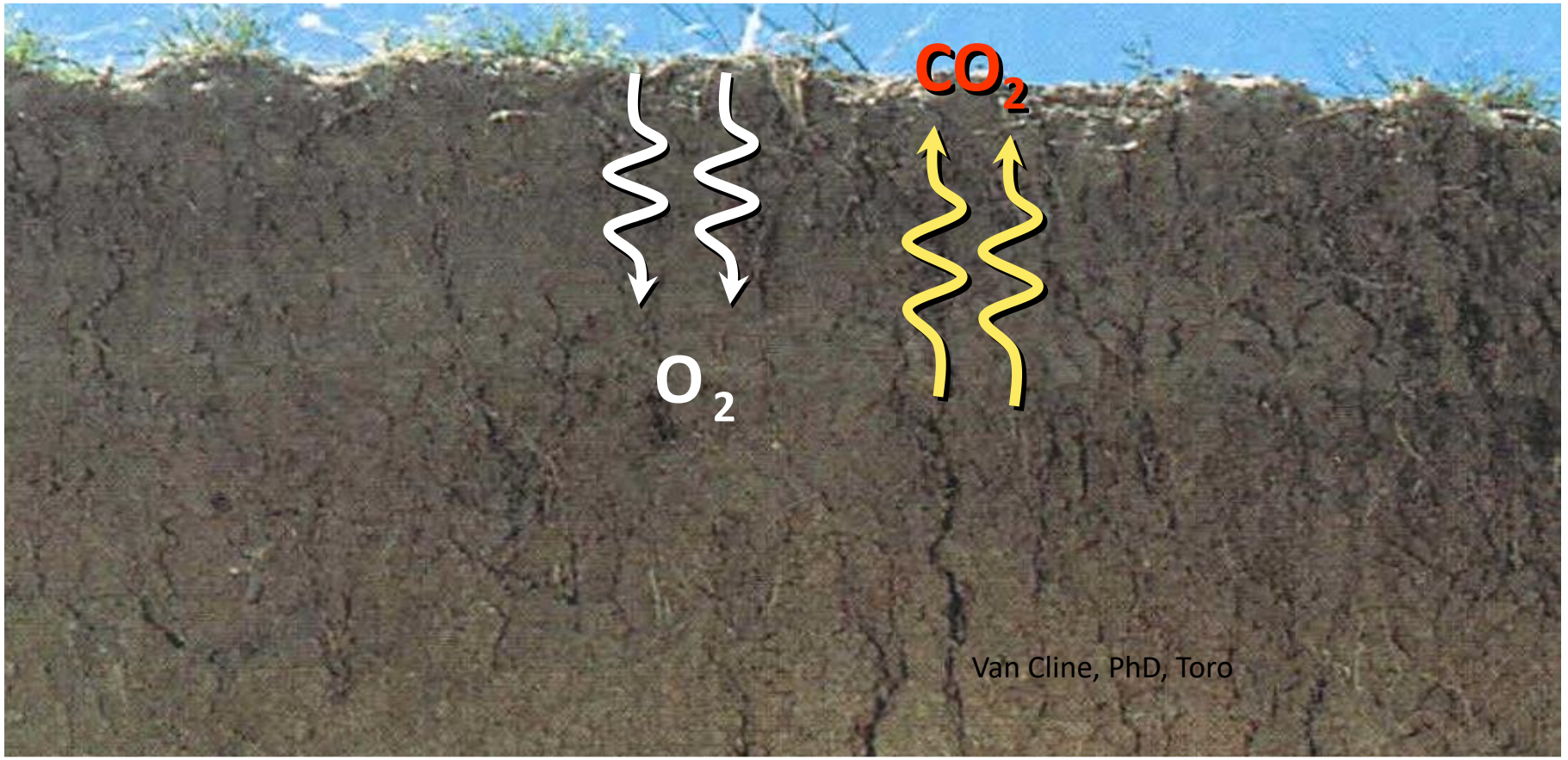


% by volume

Van Cline, PhD, Toro

Aerification

Air Exchange occurs by diffusion into and through the soil from the surface. Anything that plugs pore space restricts aeration and limits root respiration.



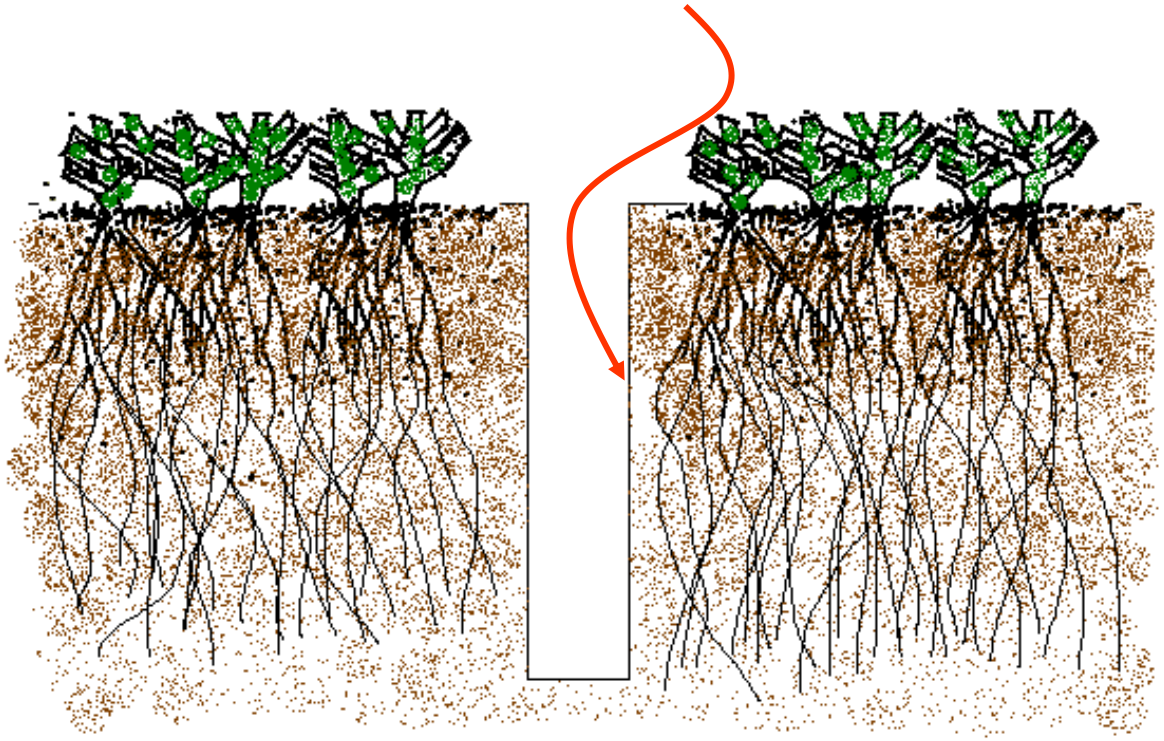
Aerification

Air

Water

Improves H2O Infiltration

To increase infiltration you must break through an area of greater density into a layer of lesser density



Practical Application

Controls Thatch & Stimulates Growth

Aerification Types

- Hollow Tine
- Solid Tine
- Deep Tine

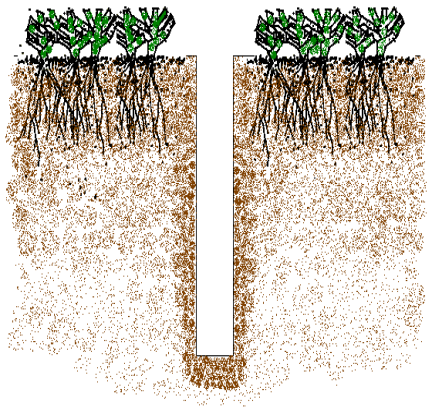
Hollow tine aeration

Benefits

+ Best method of relieving compaction
+ Contributes to thatch reduction & control (mixes soil with thatch, speeds decomposition)
+ Increases surface drainage (infiltration & percolation)
+ Allows modification of profile over time (removes cores of soil that can be removed and replaced)
+ Reinvigorates turf

Drawbacks

- Results in turf damage, and is itself a source of stress; timing is critical as a result
- Labor intensive & disruptive to play (as a result, may be done 1-2 times per season or only as needed)
- May encourage *Poa annua* & other weeds
- May result in "cultivation pan"



Solid tine aeration

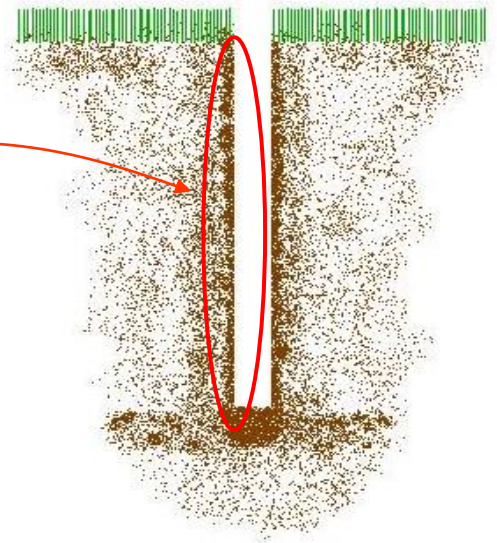
Benefits

+Temporarily improves aeration (relieves compaction???)

+ Can be done during stress periods

+ Increases surface drainage (infiltration & percolation)

+ Requires less manpower



Drawbacks

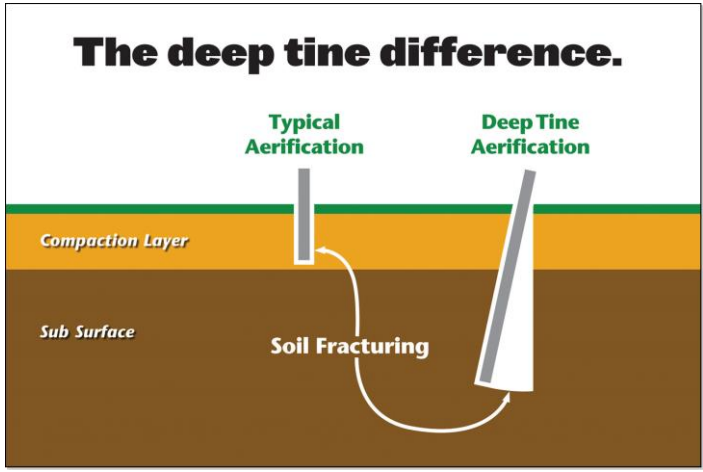
- May increase soil bulk density in area of hole
- Results in turf damage, and is itself a source of stress;
- Disruptive to play but less than hollow tine
- Is more of a short-term fix

Deep tine aerification

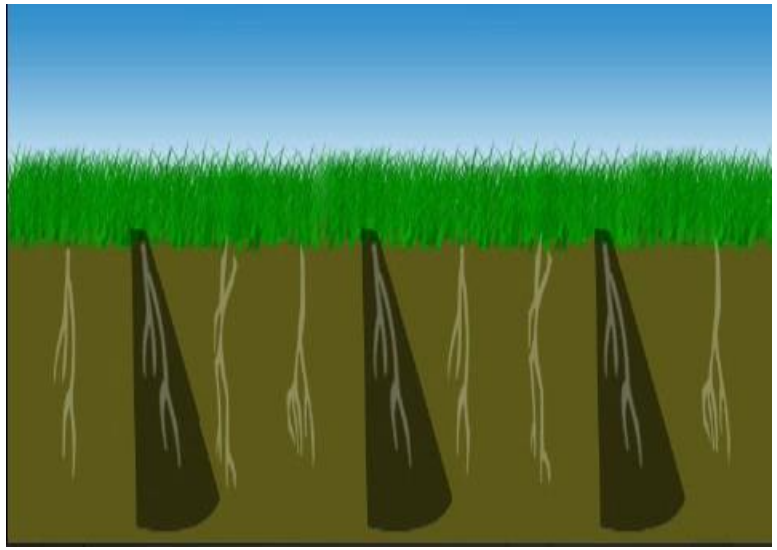
Deep tine aerification

Consistent shallow aeration can cause cultivation pan.

Cultivation pan limits:
-Water infiltration
-Root growth
-Gas exchange



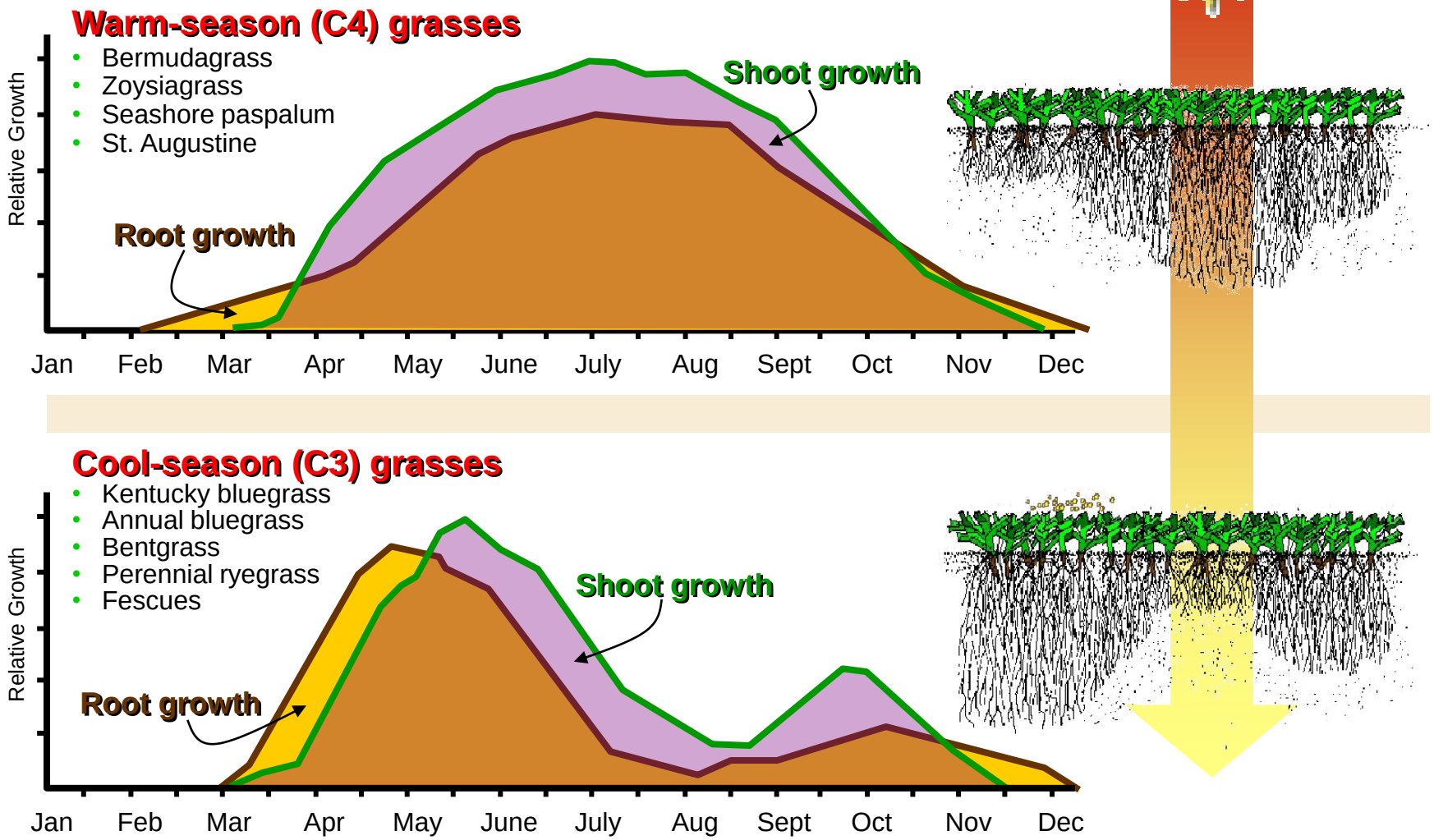
Deep tine aeration shatters cultivation pan, allowing for deep water, air, nutrients flow → healthier root structure, healthier turf.



Aerification Timing

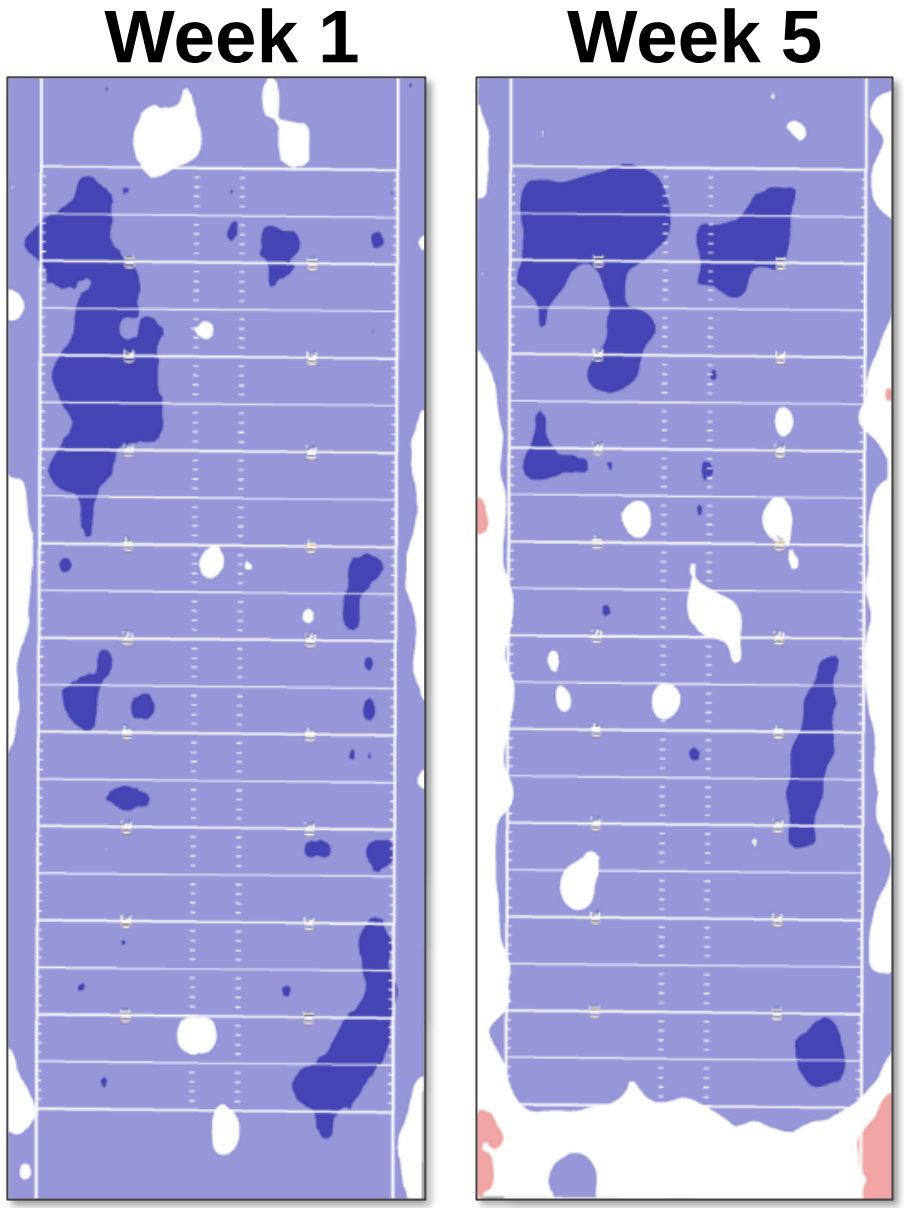
Considerations for determining the best time for core aerification:

- Vigor for recovery - quicker the better



Data Driven Management

Gmax Hardness Test



Actions

- ✓ Aerify, Aerify, Aerify…… when in doubt – Aerify again!
- ✓ Proper topdressing material is needed
- ✓ Overseed when possible
- ✓ Use proper mowing equipment that matches your desired outcome & level of maintenance
- ✓ Always use sharp blades

Topdressing

- Increases sand component in rooting zone
- Used to permanently modify soil in native soil sport fields improving aeration and drainage
- Smooth playing surface
- Stimulates rooting
- Contributes to thatch decomposition & control
- Requires dragging to incorporate into turf which causes damage and stress
- Labor intensive
- Can be applied up to 1/4” at a time
- Should be avoided during periods of high stress
- Sand most commonly used material
- Common practice on all sport fields - particularly in the heavy wear areas

Topdressing





- Soil analysis test to determine the topdressing compatibility with the existing rootzone mix.
- **Remember** – that topdressing with sand on native soil fields will not improve soil structure and drainage. You must reach ***60-70 percent in the top three to four inches before topdressing with sand will help drainage and infiltration characteristics***.
- To eliminate the possibility of layering, make sure a constant supply of your topdressing material is available.

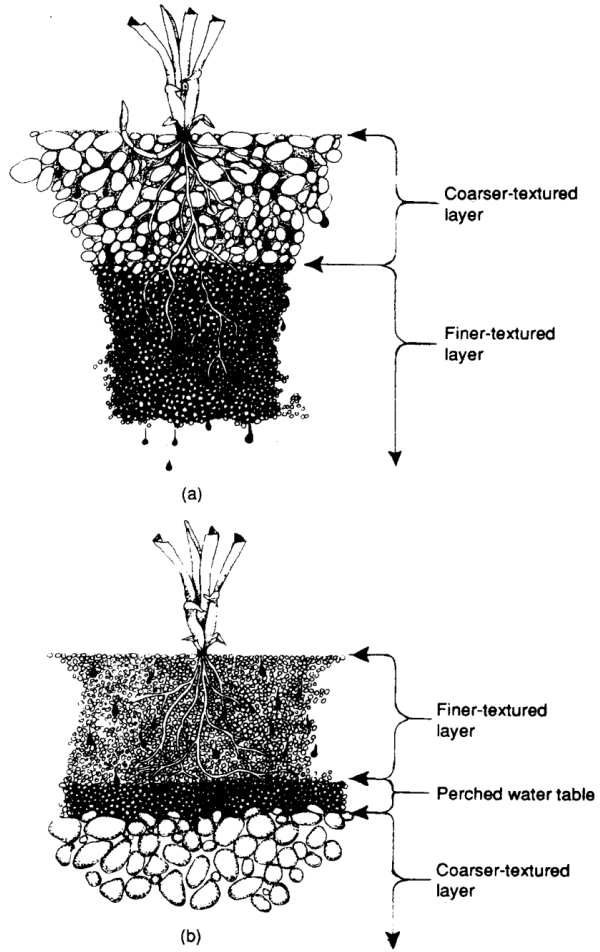
The most common raw rock types used in cement production are:

- Limestone (supplies the bulk of the lime)
- Clay, marl or shale (supplies the bulk of the silica, alumina and ferric oxide)
- Other supplementary **materials** such as sand, fly ash/pulverised fuel ash (PFA), or ironstone to achieve the desired bulk composition.

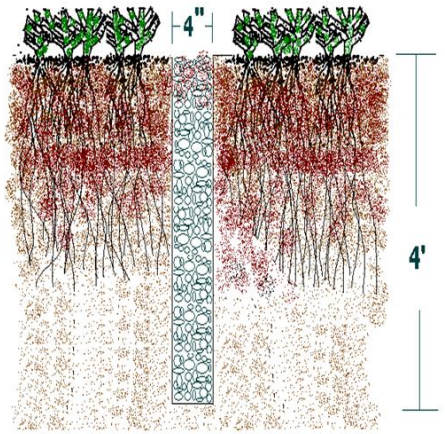
Topdressing__

- Soil particle size testing should be done to prohibit layering

- Fine textured soils over coarse texture soils will create a “perched” water table



Overseeding



- Aerification & Overseeding
- Slit or Cut Seeding
- Broadcast and “Cleat” in

- Late Summer
- Dormant Seeding
- Spring
- “In Season”

The Blue/Rye Dilemma_

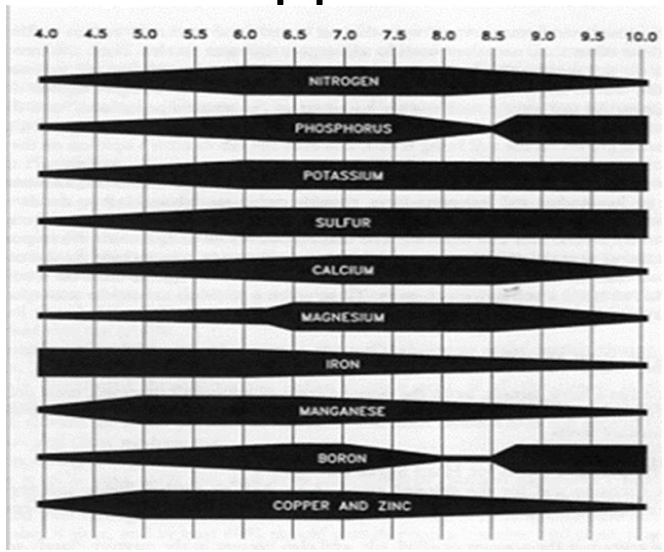
- Bluegrass
  - Slow to Germinate and Mature
  - Weak Juvenile Plant
  - Good Wear Tolerance
  - Recuperates with Rhizomes
  - P 105
- Ryegrass
  - Quick to Germinate and Mature
  - Strong Juvenile Plant
  - Shadows and Outcompetes Bluegrass

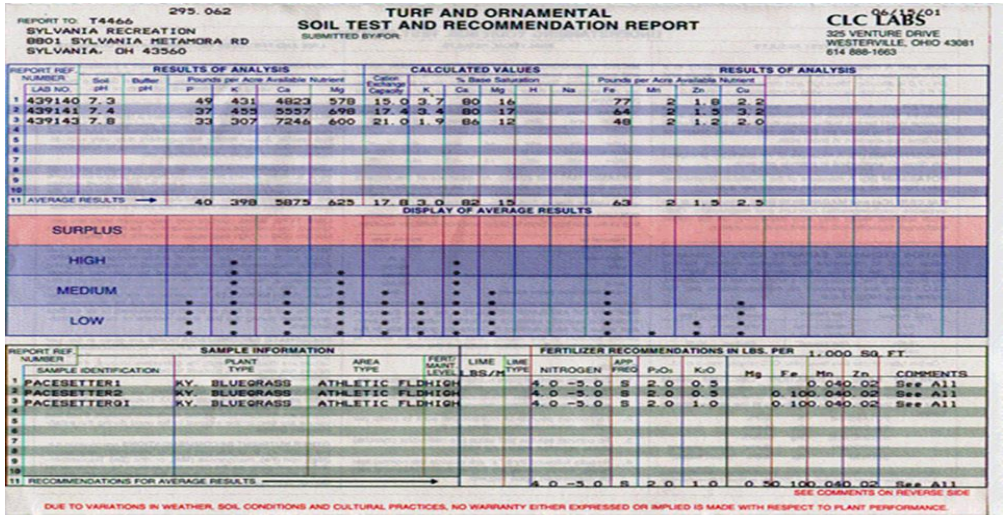
Seed Labeling

Item	Preferred Range
Purity	> 90%
Germination	> 80%
Crop	< 0.5%
Weed	< 0.3%
Noxious Weed	0%
Inert Ingredients	< 8%
Date Tested	Last Nine Months

Fertility

- Establish through testing of the soil & plant
- Monitor your PH level & macro and micro nutrient levels.
- Good quality grade fertilizer
- Use poly coated, sulfur coated urea when possible.
- Adjust as needed.
- Late fall application of liquid iron can be used for additional color.





Mowing

Mowing

Mowing is a stress
Grass plants do not benefit from cutting (defoliation)

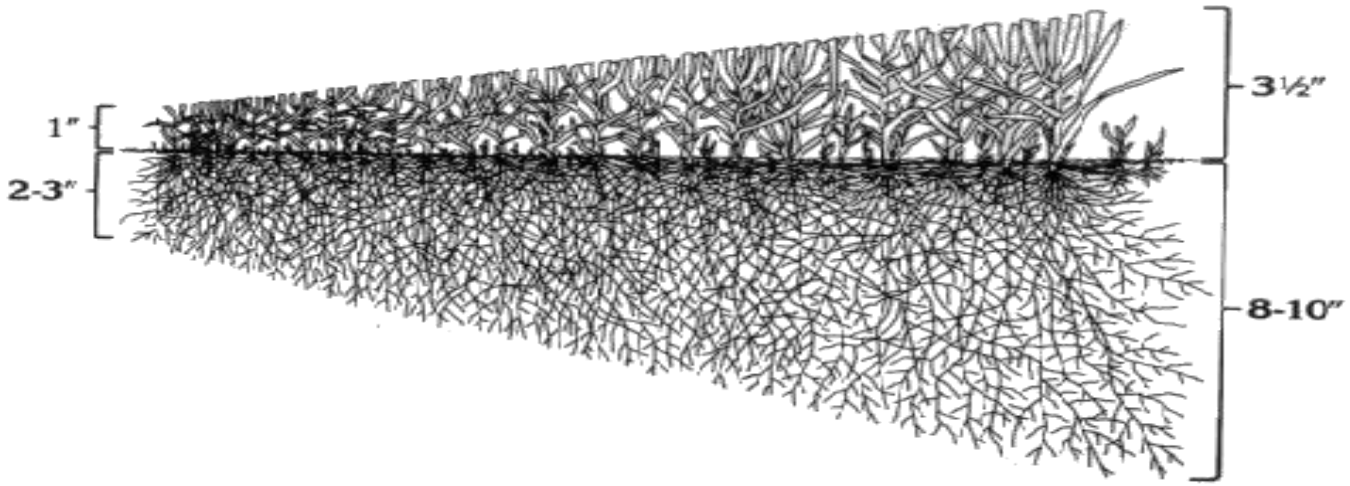
- Reduces photosynthesis by removing leaf tissue which leads to:
  - reduced carbohydrate synthesis & storage
  - increased shoot growth (plant response to inc. photosynthetic area)
- Reduces root mass & depth of rooting
  - Carbohydrates produced allocated to top growth (recovery)
  - Root growth regulators may be produced in leaves
- Wounds tissue leading to dehydration, infection site for fungi.

+ Increases plant density (adaptation to inc. photosynthetic surface area)
+ Reduces leaf width creating finer textured turf

- Too much tissue removed at one time (infrequent mowing)
- *Removal of more than 40% leaf tissue at one time can stop root growth from 6 days to 2 weeks depending on the amount of tissue removed. Why???*
- Dull blades, poor reel to bedknife adjustment (increased leaf damage)
- Increased environmental stress in combination with mowing

Mowing

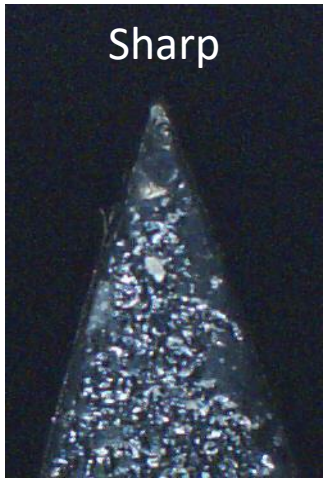
- **Stress increases w/lower heights of cut**
  - **cutting height has greatest effect on rooting depth**
  - **very low h.o.c.’s reduce rhizome and stolon production**
  - **increase susceptibility to environmental stresses**
  - **reduced wear tolerance**
  - **increased disease (dollar spot, leaf spot, rust)**
  - **provides less temperature buffering for soil & protection of crown**

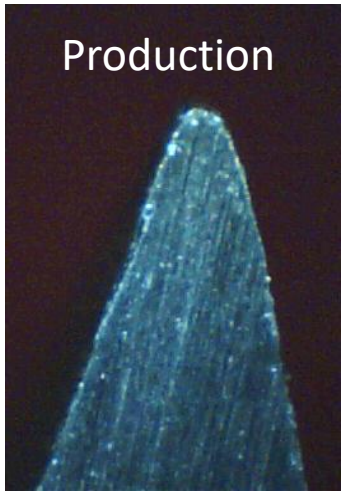


Mowing Injury - Rotary

The three rotary blade edge radii:

- Very sharp ~0.0” radius
- Production 0.015” radius
- Dulled 0.0625” radius





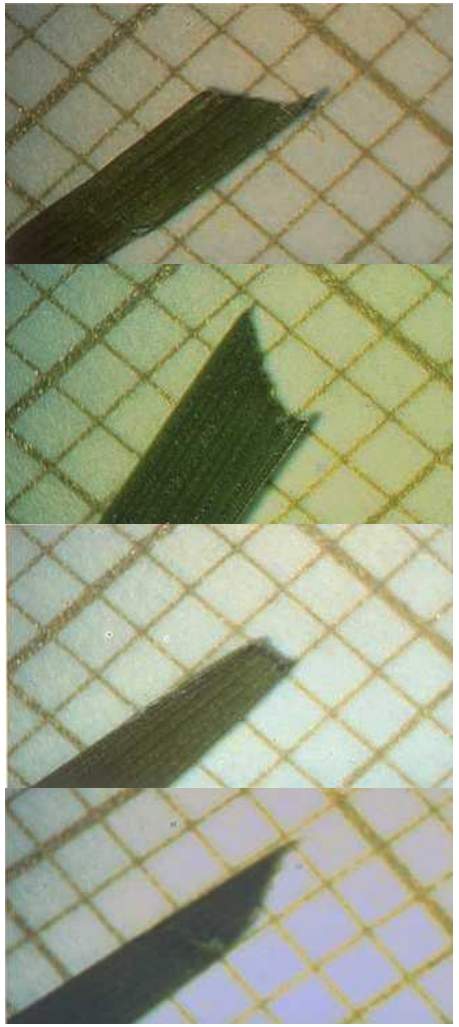
2880 RPM

Collected clippings

2.5” mow height

Riverside, CA

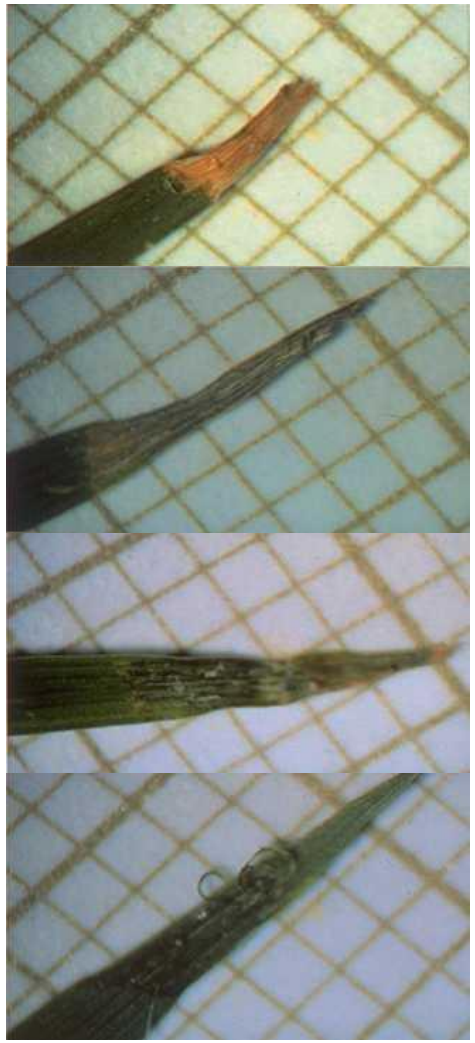
Mowing Injury - Reel



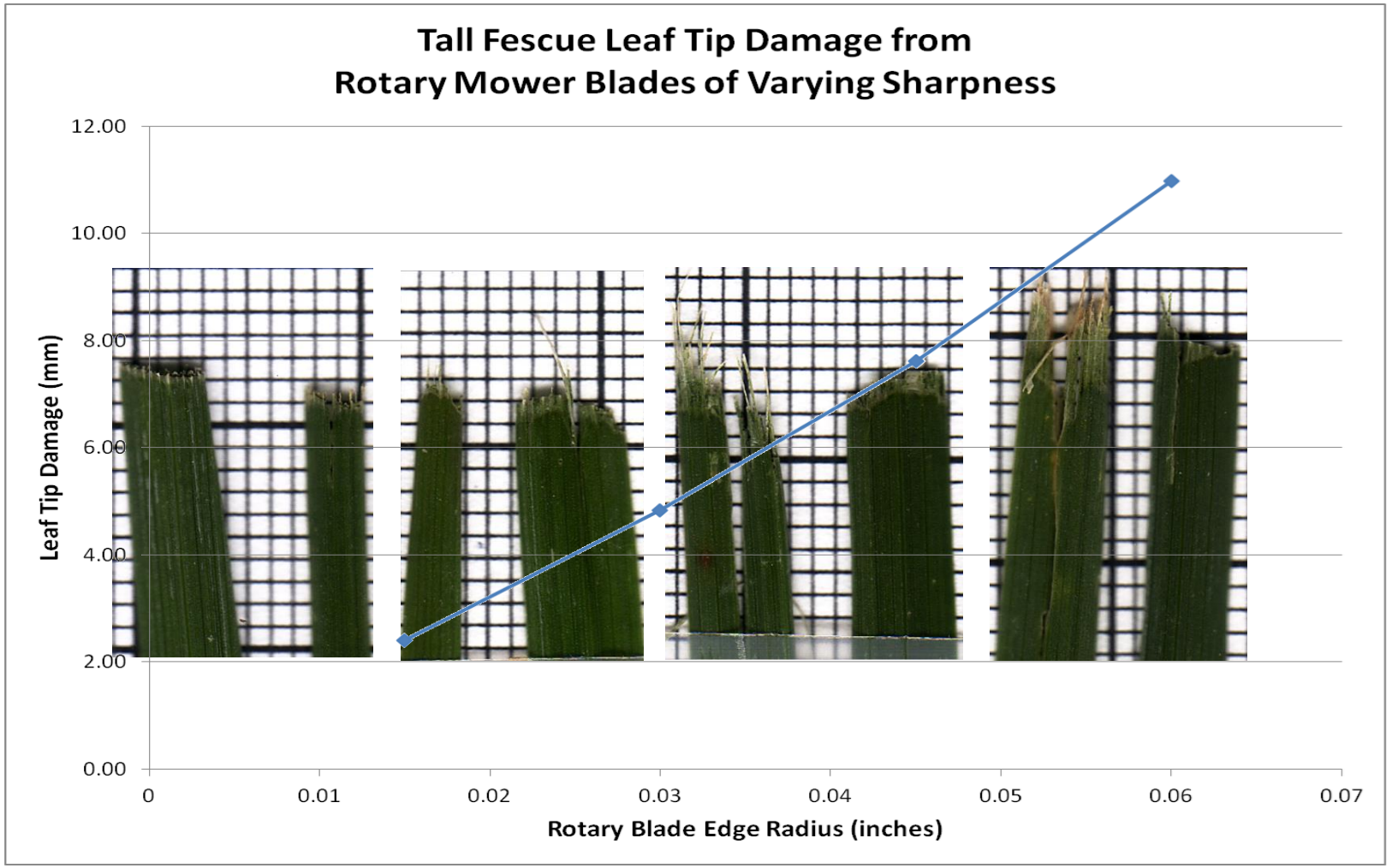
Study at Iowa State University by Nick Christians and Mark Howeison

Leaf tip damage resulting from mower setup with reel to bedknife contact;

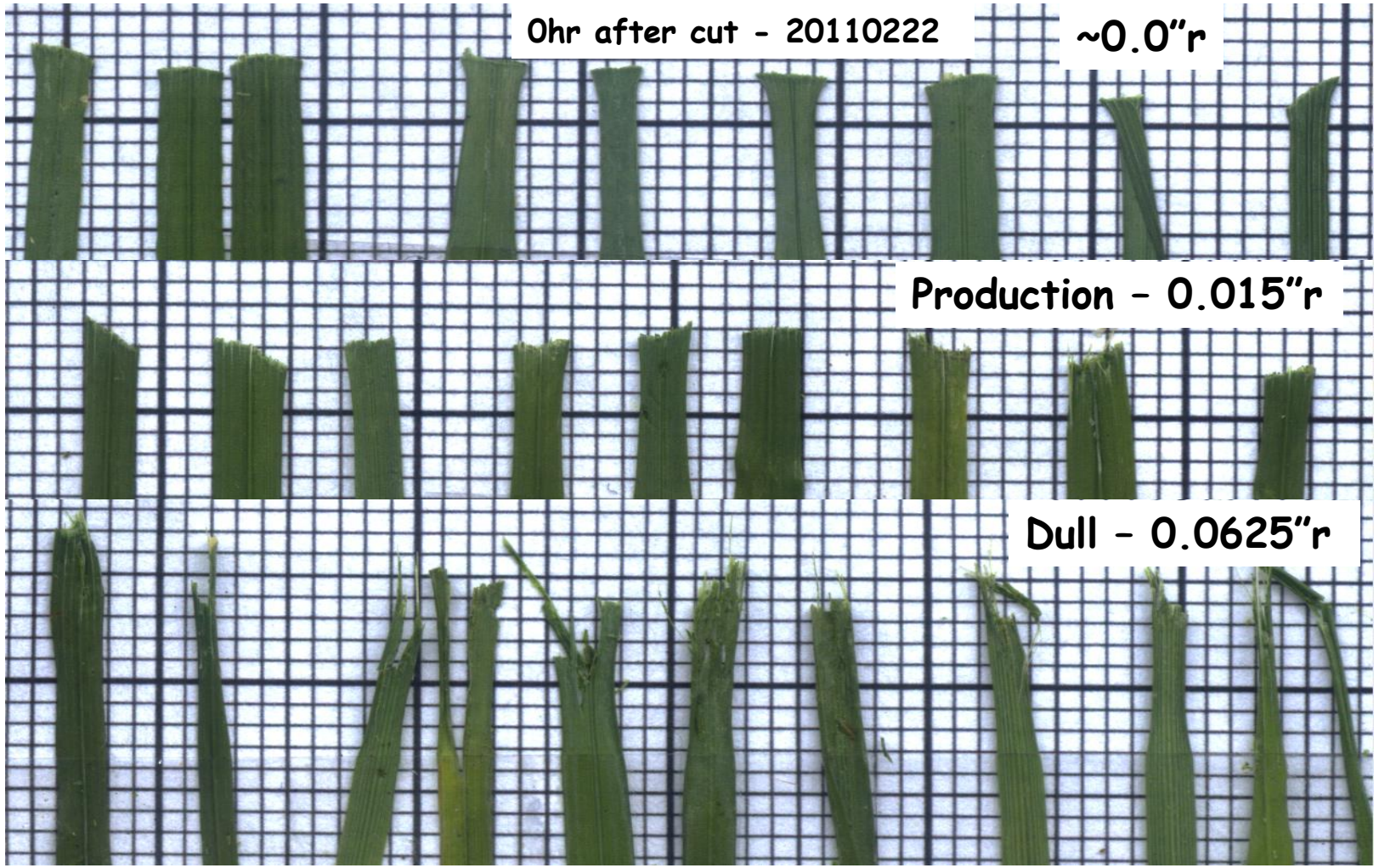
bentgrass, fairway height



Tall Fescue


Tall Fescue Leaf Tip Damage from
Rotary Mower Blades of Varying Sharpness
Leaf Tip Damage (mm)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
Rotary Blade Edge Radius (inches)

Perennial Ryegrass



Height of Cut

1 1/2” to 2 1/2” Cool
<1” Warm Season
Do Not Vary
Cut Often – 1/3 Rule

Divots more pronounced at low heights of cut





Thank You

Contact Information:

boyd.montgomery@toro.com

or 952-412-2220