Simple Steps Towards Organic Lawn Care

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Presented by

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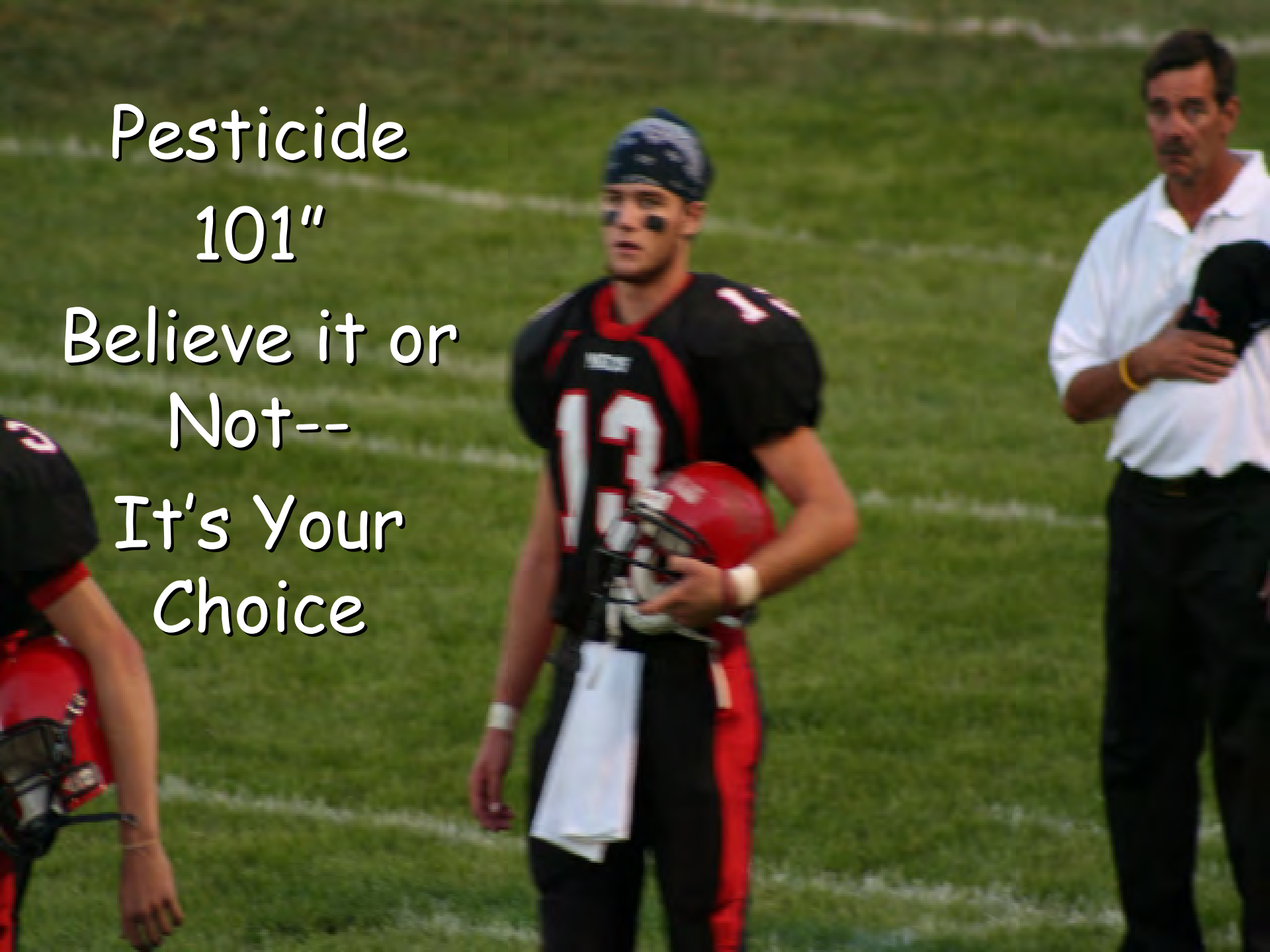
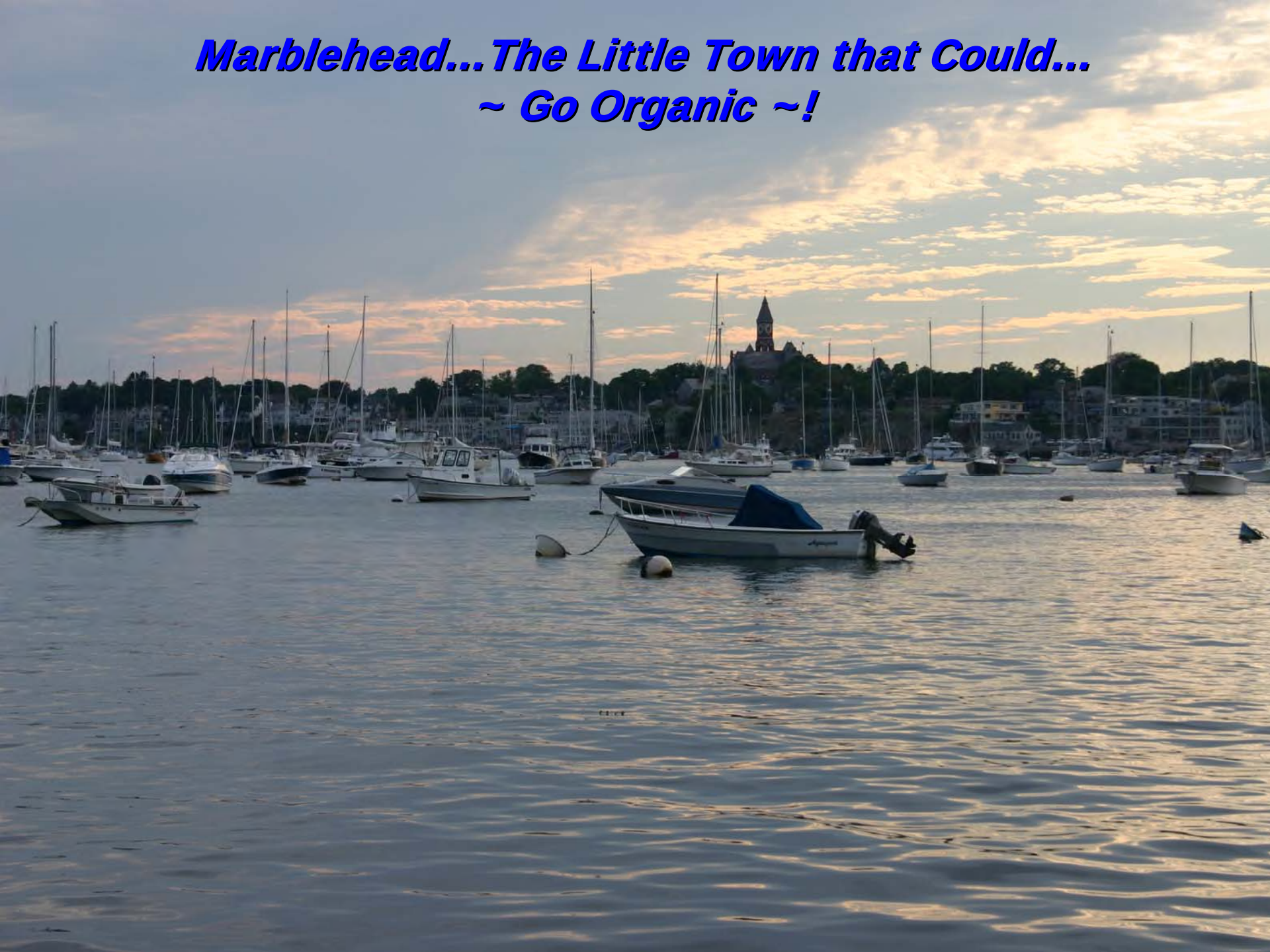
The "*Simple Steps* "
program for
Natural Lawn Care
is designed to incorporate
the use of natural,
organic products and a basic understanding of soil biology
with sound
cultural practices

As Landscape Contractors and Designers, Municipal Officials, and Turf managers we need to be aware that things are changing

and

There are alternatives that work


Pesticide
101"
Believe it or
Not--
It's Your
Choice


Marblehead...The Little Town that Could...
~ Go Organic ~!

MPAC's *Awareness through Education* campaign

- Begun in 1997
- Partnerships with Town Departments
- Partnership with League of Women Voters
- Educational conferences for local landscapers
- Outreach to schools, garden clubs, homeowners &other communities
- *"Living Lawn"* Organic Demonstration Project
- Homeowner classes on organic lawn care

Town of Marblehead
Board of Health

Adopts
Organic Pest Management
Policy
for all
Town-owned Land
(including Athletic/Playing
Fields) in 2001.

Policy becomes regulation
December 2005.


Many municipalities, school districts, and universities are having these discussions


Reasons for these discussions
Public Health
Children's Health
Water Quality
Storm Water Runoff
Different Reasons-Same Goal
Pesticide Reduction

Whether or not we all agree about the use of synthetics---

The fact is that homeowners, parents, citizens are beginning to ask about and request a non-toxic approach

THE MARKET IS CHANGING

The goal of an Organic Lawn Care program

Turf Roots after 1 year on an Organic Program

Difference between Conventional and Natural Lawn and Turf Management

Conventional

- Synthetic Fertilizers
- Chemical Pesticides
- Quick Fix
- Product approach

- Treats Symptoms
- Applications based on calendar
- Multiple “preventative” applications
- Generally low mowing heights

Natural

- Natural, organic product
- Soil Testing as a basis for all inputs
- Product use is based on sustained benefit

- Does not treat symptoms
- Solves problems
- Objective is to create and establish healthy soil

Systems approach not Product approach

- Three-fold

  1 Proper understanding of the soil

  2 Use of natural, organic product as indicated by soil testing

  3 Proper Cultural Practices

- By following a Systems Approach we are putting practices into action that will assist in preventing serious pest problems
  - –Insects
  - –Weeds
  - –Disease

The Basics of an Organic Lawn Care Program

- Soil Testing—Soil Biology
- Use of Compost Tea Sprays
- Top-dressing with Compost for OM
- Use of Natural, Organic Fertilizer
- Aggressive Seeding and Over-seeding
- Proper Aerating; De-thatching
- Proper Mowing, Irrigation


Improving Soil
Health and Quality
Is
Our Number One Goal

Three categories of soil qualities

- Physical (structural):
  - *tilth, infiltration, porosity, bulk density, aggregation*, texture
- Chemical:
  - *nutrient content, salinity, pH, organic matter*, mineral content (parent material)
- Biological:
  - *biomass, biodiversity, biological activity, disease suppressiveness*

Definitions

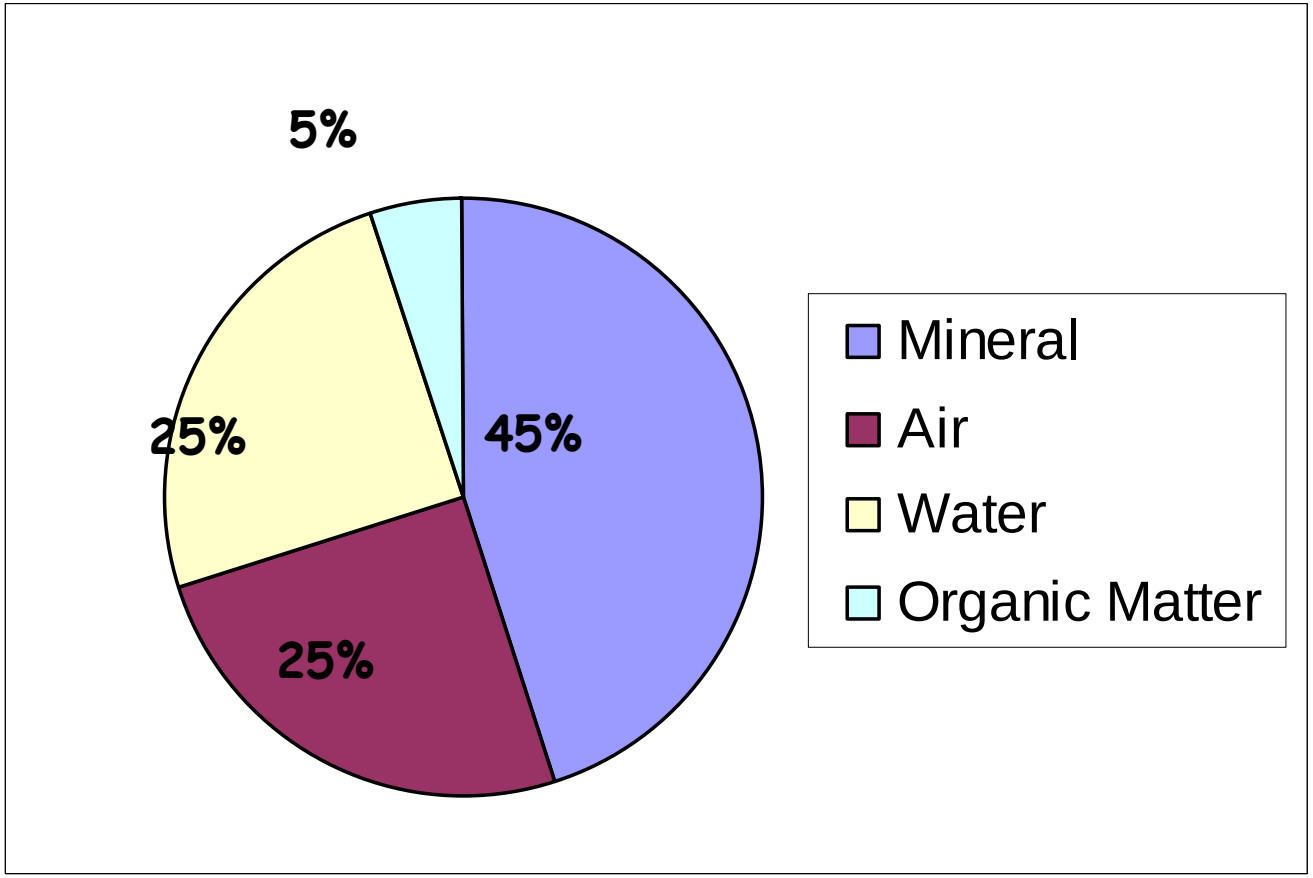
- Soil:

  an ecological system consisting of inorganic minerals, decomposing organic matter, living organisms, and growing plants

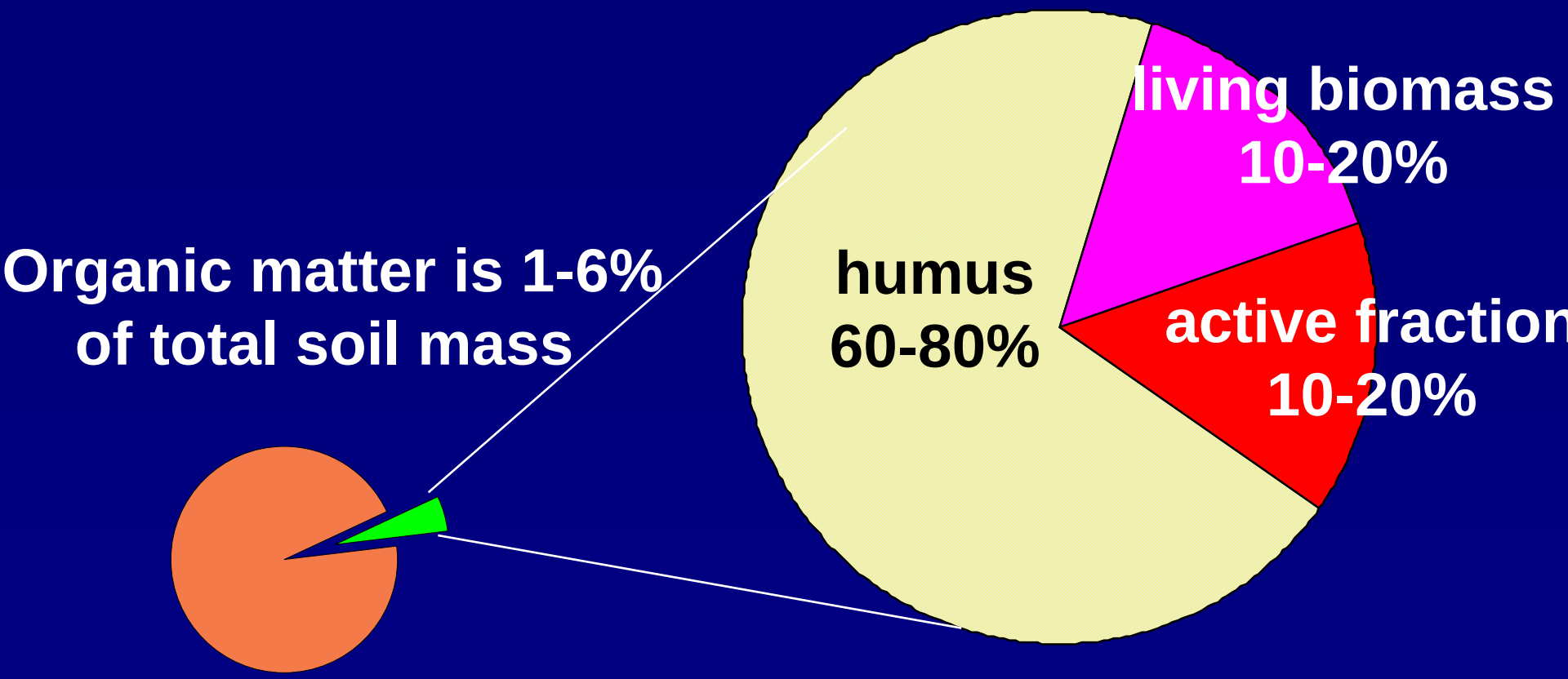
- Soil health or soil quality:

  a general term that describes the ability of a soil to *function*

Typical Non-Forest Soil



Soil organic matter



Role of soil organic matter

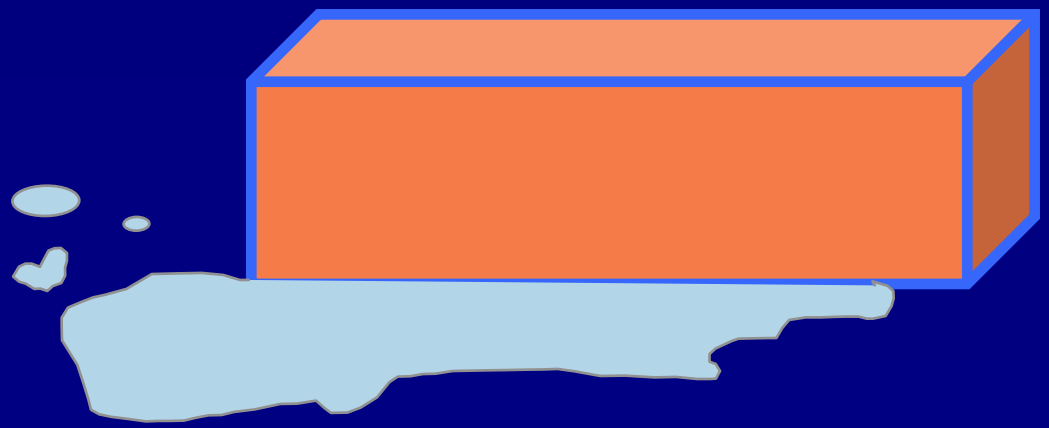
Two major components:

- Effects of the organic matter itself
  - soil structure, chelation of micronutrients, pH buffering capacity
- Effects of decomposition of organic residues
  - aggregation, nutrient release, biological activity, disease suppression

Soil Structure:

Water holding capacity

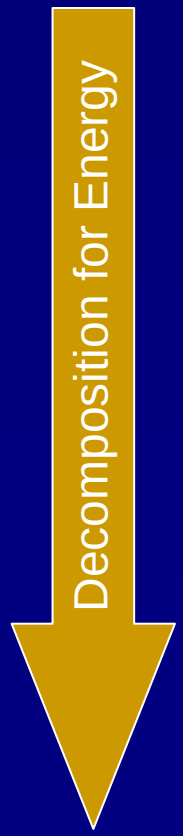
- Organic particles can hold more water than mineral particles




SOIL
COMPOST
700
600
500
400
300
200
100

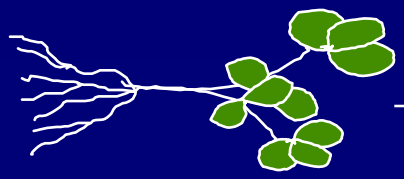
Soil Organic Matter

- Residue of life
  - Living
    - » Roots
    - » Earthworms and insects
    - » Microorganisms
  - Dead
    - » Fresh plant residues
    - » Recently deceased soil organisms
    - » Active organic matter
  - Very Dead
    - » Well decomposed organic materials
    - » Humus



Effects of OM additions

Add organic matter



Increase biological activity (& diversity?)

May reduce soil-borne disease

Decomposition

Pore structure improved

Aggregation increased

Humus formed

Nutrients released

Improved tilth

HEALTHY PLANTS

Part II: Measuring Soil Health

Why?

- Identify problem soils
- Evaluate new practices
- Achieve long-term sustainability

Short-term effects:

- Increased biological activity
- Increase in transient/temporary aggregation
- Some improvements in soil structure and tilth
- Increased nutrient availability

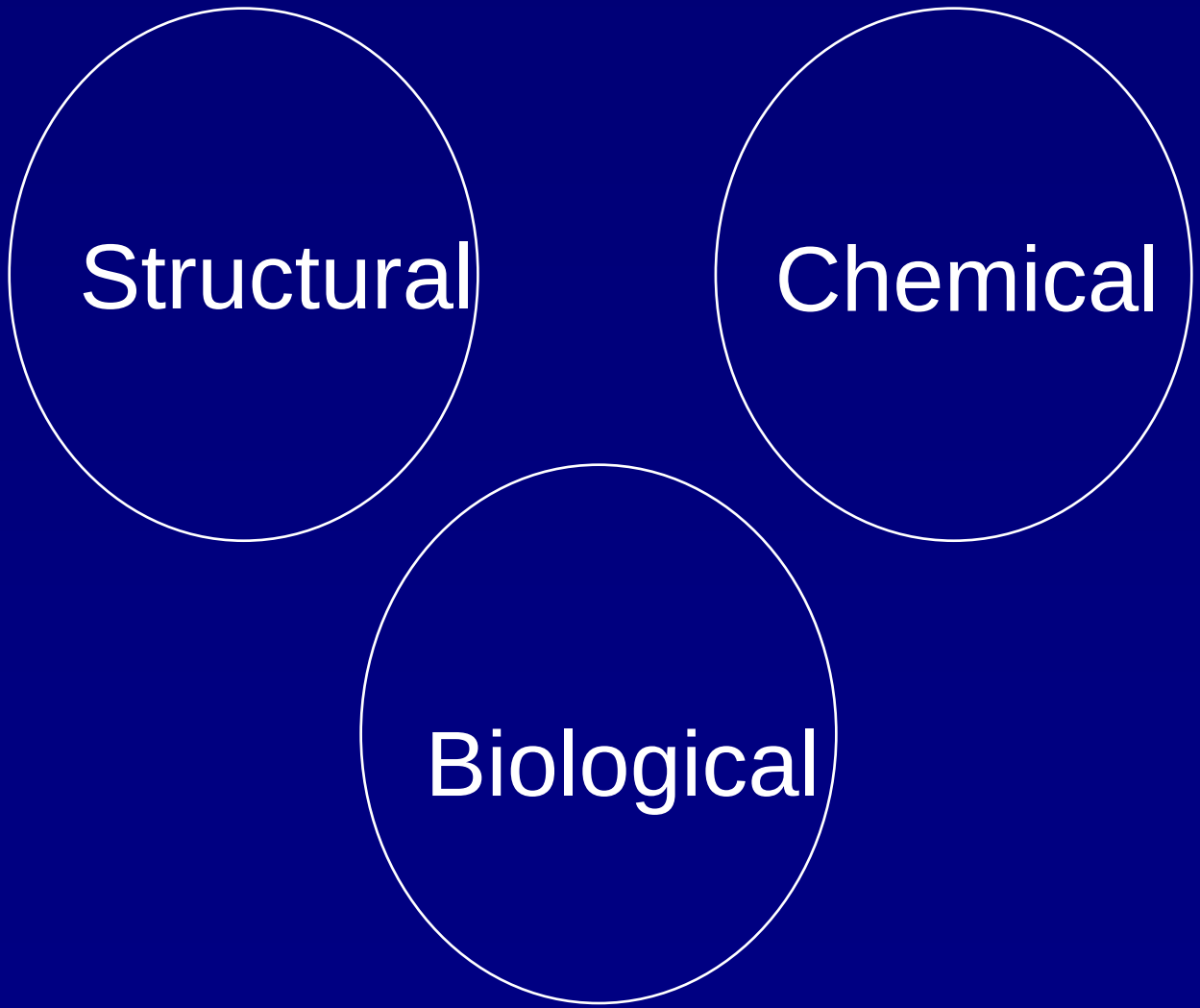
Long-term effects:

- Increased biological activity, (and often increased diversity)
- Increases in total organic matter / active fraction
- Increase in persistent aggregation
- Improved soil tilth: water holding capacity, infiltration, aeration, ease of tillage
- Other improvements associated with soil organic matter levels; i.e. CEC, buffering capacity, nutrient availability

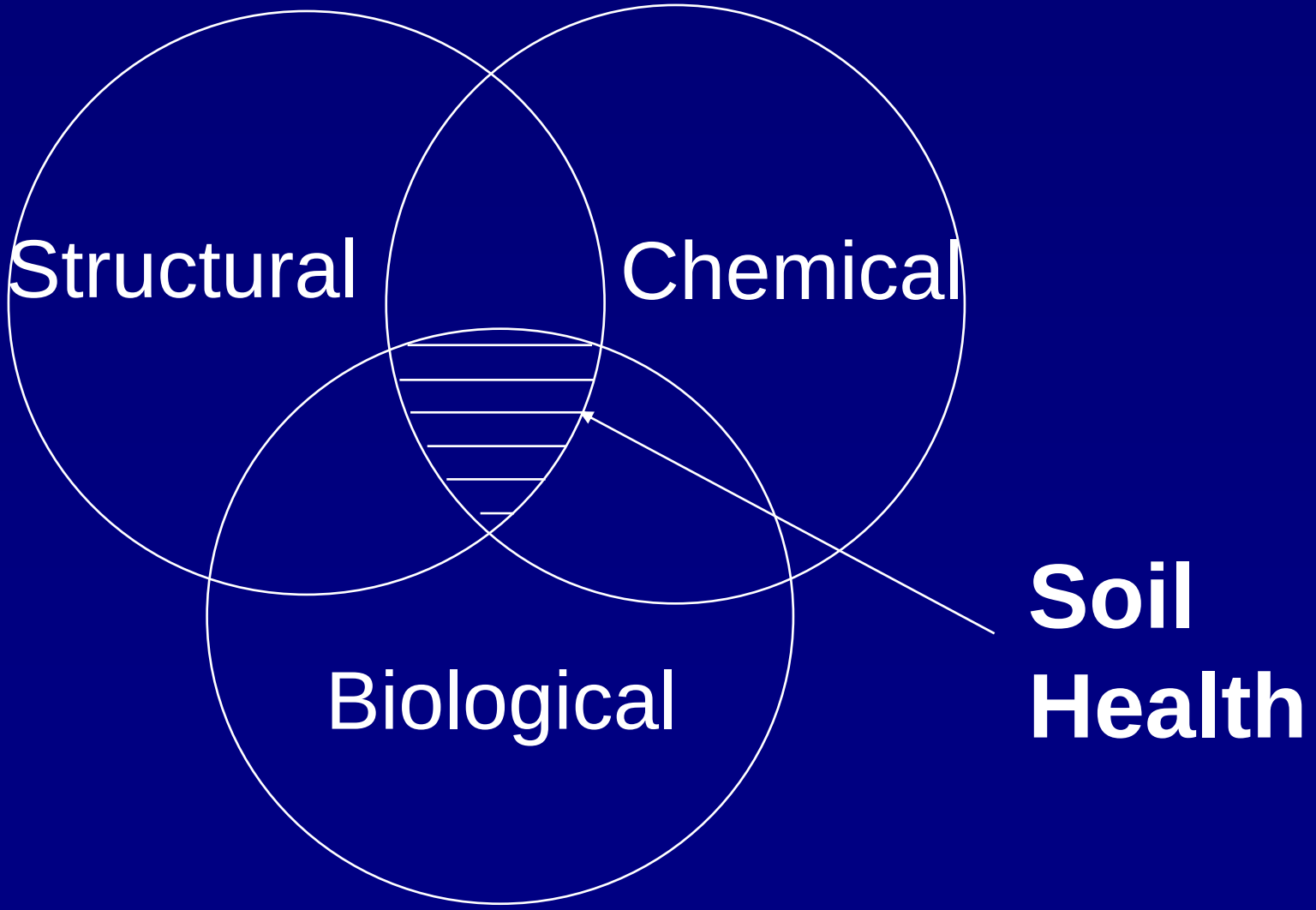
Conclusion

- Soil health is an important and evolving concept
- Looks at the soil holistically: Interaction of physical, chemical and biological factors
- Challenge is to integrate the turf management practices we use with these new concepts to get the most benefit for people and the environment.

Conventional view of soil



Emerging view of soil health



Conclusion

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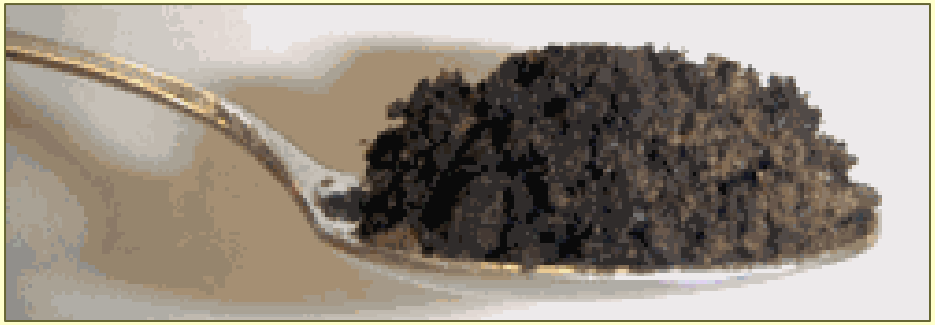
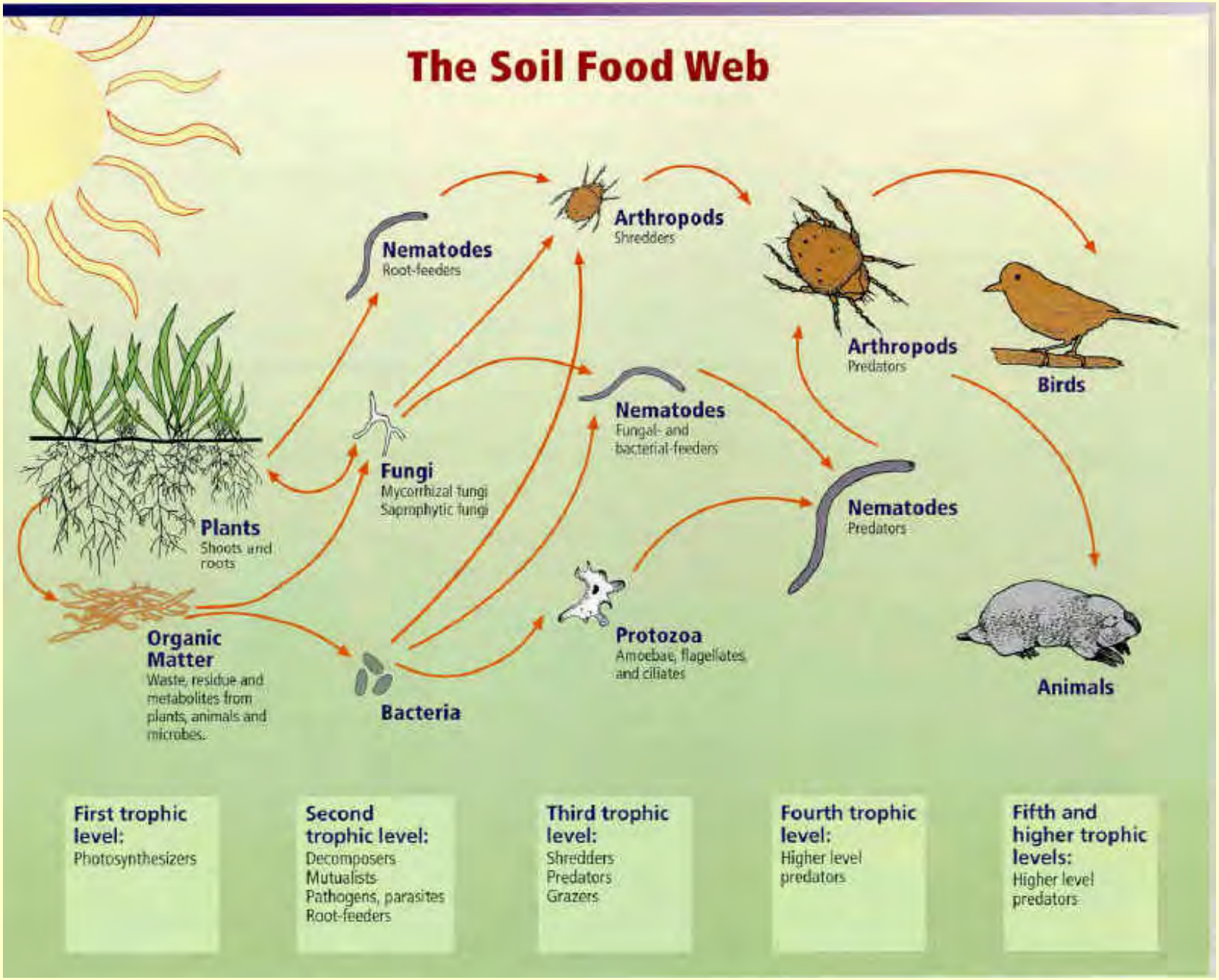
In 1 teaspoon of agricultural soil there are…

❖ **Bacteria**	**100 million to 1 billion**
❖ **Fungi**	**6-9 ft fungal strands put end to end**
❖ **Protozoa**	**Several thousand flagellates & amoeba** **One to several hundred ciliates**
❖ **Nematodes**	**10 to 20 bacterial feeders and a few fungal feeders**
❖ **Arthropods**	**Up to 100**
❖ **Earthworms & potworms (enchytraeids)**	**5 or more**



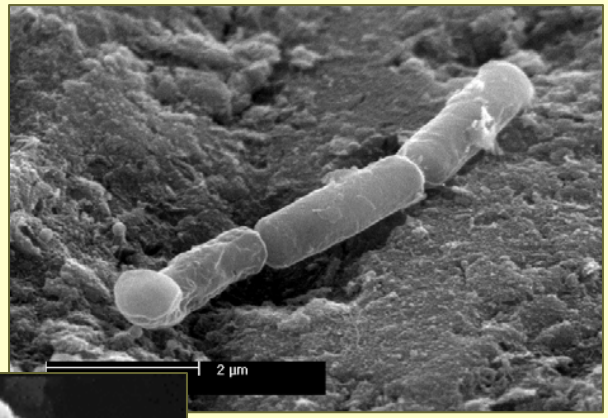
Ecosystem Services Provided by Organisms

- Decomposition and nutrient cycling
- Carbon sequestration
- Maintenance of plant diversity
- Bioremediation
- Biological control of pests

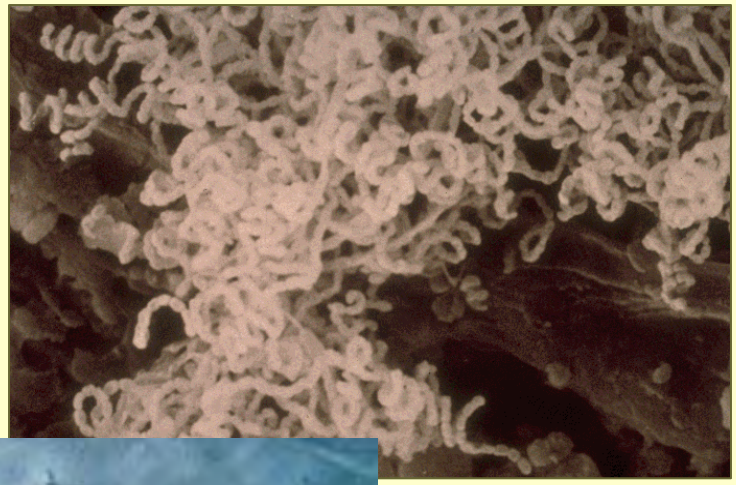

The Soil Food Web
Nematodes
Root-feeders
Arthropods
Shredders
Arthropods
Predators
Birds
Nematodes
Fungal- and bacterial-feeders
Fungi
Mycorrhizal fungi
Saprophytic fungi
Plants
Shoots and roots
Nematodes
Predators
Organic Matter
Waste, residue and metabolites from plants, animals and microbes.
Protozoa
Amoebae, flagellates and ciliates
Bacteria
Animals
First trophic level:
Photosynthesizers
Second trophic level:
Decomposers
Mutualists
Pathogens, parasites
Root-feeders
Third trophic level:
Shredders
Predators
Grazers
Fourth trophic level:
Higher level predators
Fifth and higher trophic levels:
Higher level predators

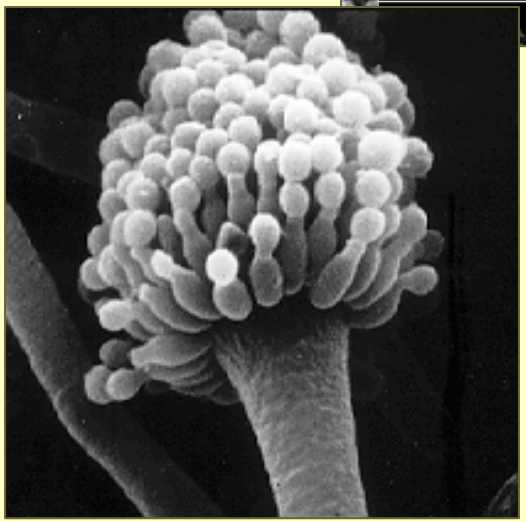
Microorganisms in Soil

Bacteria



Actinomycetes





Fungi

Mycorrhizae

Soil Environment

- Thousands of different organisms
- Competing for survival, chance to reproduce
- If soil is poor or has little food or other resources or has been damaged by a chemical application
- All organisms can't survive

- If pathogenic organisms survive and beneficial population is reduced
- Soil is “diseased”
- Most soil resources linked with OM
- % of OM in soil is small, but is responsible for the largest amount of benefits

Pesticide Use
The Unseen Damage

- Largest contributor to the fostering of turf diseases by soil borne pathogens
- Pesticides are Biocides
- Bio means life
- Cide means to kill
- Purpose of pesticides is to kill biological life that causes injury or damage to cultivated plant material

- Pesticides do not discriminate
- Much beneficial life is destroyed
- Can alter soil system enough to cause stress within the desired plant material
- Doesn't matter what kind of pesticide or chemical based, water soluble fertilizer is used—there is evidence many non-pest organisms that contribute to the health of the soil are destroyed

If soil is low in OM and does not have sufficient resources

- OR

If soil is extremely compacted and anaerobic (no oxygen)

Microbial life will not survive in large amounts

Enrich the Soil

- The more we can enrich the soil and raise OM %
- Begin to create a soil that has ability to fight pathogens
- As the optimum soil profile is created
- Beneficials in the soil out number pathogens and disease can be suppressed

Transition Period

When a turf management program changes from a conventional approach to a natural approach there is a period of time referred to as a Transition Period

The length of time is directly related to the intensity of current and past synthetic management practices and overall turf quality

Important to address the soil and the biomass

Adopt products and cultural practices that support biomass and turf

Biggest issue is to move fertility from a conventional program to a natural approach that addresses soil health and microbial life

Conventional fertility programs-- synthetic– water-soluble--high salt

Compromises and bypasses biomass

We strive to restore soil health so that the natural process of fertility will take over and produce healthy turf

When we move to a natural program we do not expect to see a deterioration in in the turf

Transition process must involve the whole system

Soil microbiology

Natural product

Cultural practices

- Costs of a natural program should remain constant for three to four years and then decline in some areas

- Sustainability and revisiting product inputs

The 4 P’s

- Plan
- Protocol
- Procedure
- Prioritize

The Plan

Important to develop a sound management plan based on a natural approach

Protocol

Establish a management protocol that involves products, practices, labor, and education

Procedure

Put a procedure in place that employees or our-sourced labor can follow

Prioritize

Create levels of management for fields that helps to allocate budget dollars


Managing Lawns and Turf naturally is about reducing and eliminating turfgrass stresses

Turfgrass Stresses

Environmental

temperature, water, air, etc.

Mechanical

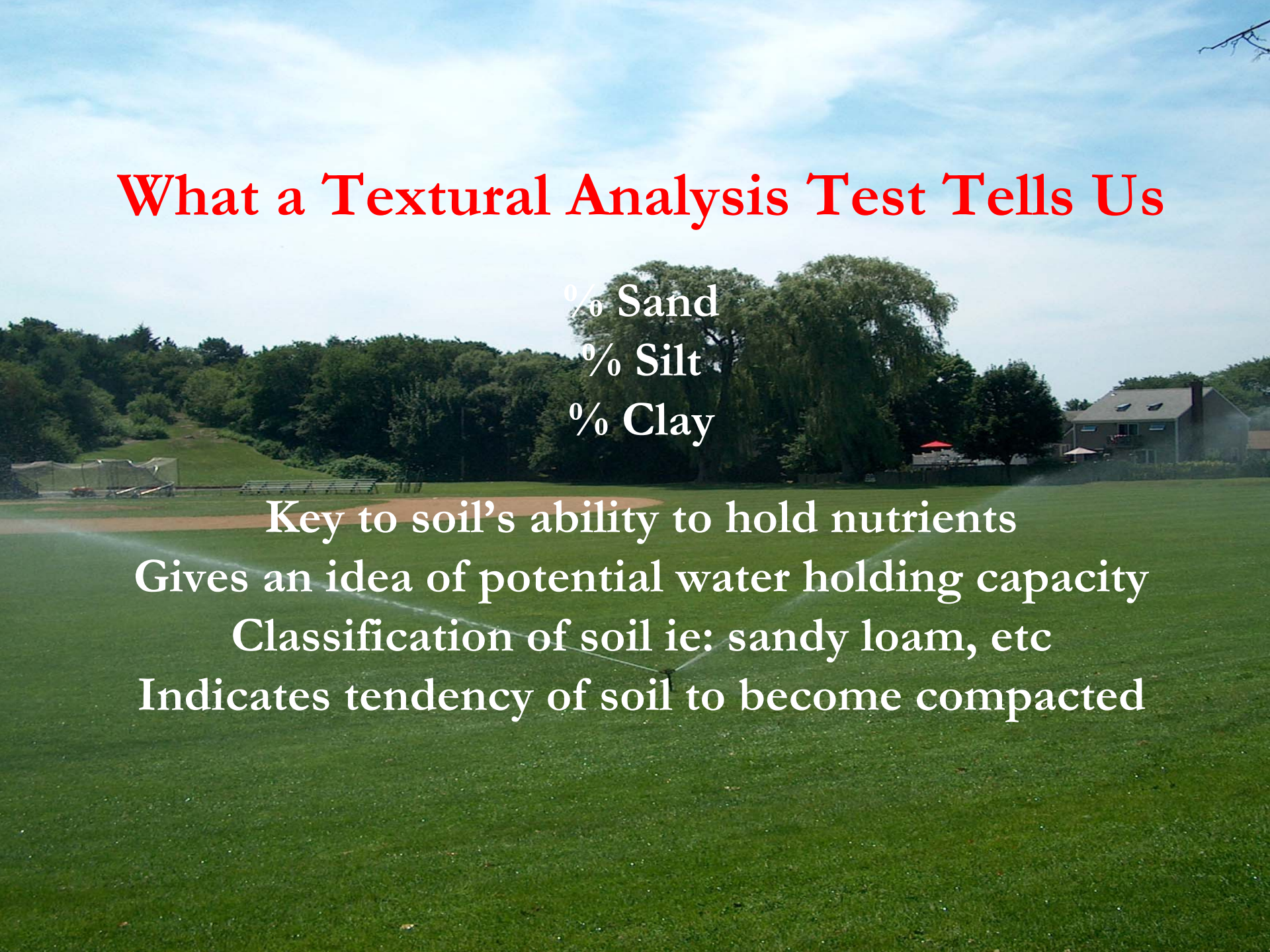
foot traffic, mowing, tractor tires and maintenance equipment

Pests

weeds, insects, and disease, among others

How to Take a Soil Test

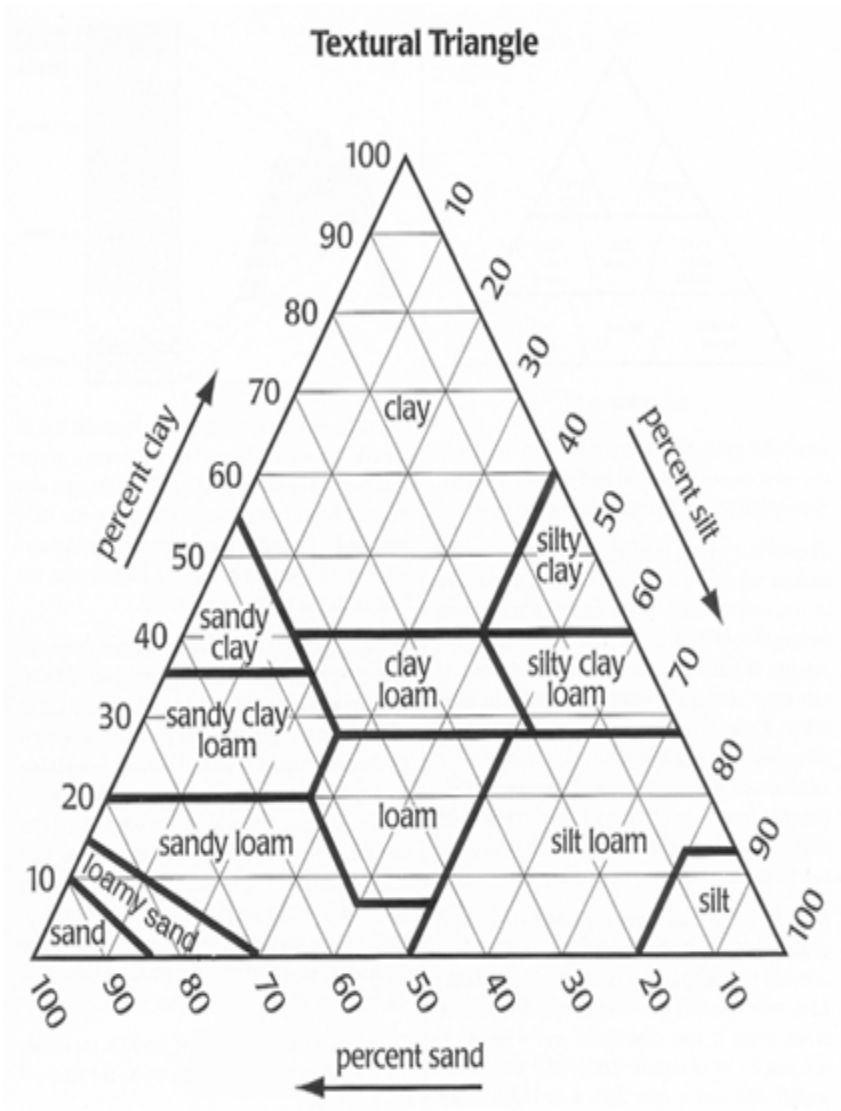
- Use a soil probe
- Insert the probe about 3-4 inches into the soil
- Take multiple cores for each property or field
- Mix these cores together, remove grass roots, blades, and plant and dry overnight
- Put about one dry cup measure in a zip-lock bag. Label with property name/address/location



What a Textural Analysis Test Tells Us

% Sand
% Silt
% Clay

Key to soil's ability to hold nutrients
Gives an idea of potential water holding capacity
Classification of soil ie: sandy loam, etc
Indicates tendency of soil to become compacted


Textural Triangle
100
90
80
70
60
50
40
30
20
10
percent clay
clay
silty clay
sandy clay
clay loam
silty clay loam
sandy clay loam
loam
silt loam
sandy loam
loamy sand
sand
silt
percent silt
percent sand


Soil Food Web Analysis
Bio-Assay of beneficial
soil micro-organisms
Indicator of life in the soil
and
how much is working for us

What a Nutrient Analysis Soil Test Reveals

- pH – C3 or Cool-season grasses thrive in 6.5 to 7.0 variable regionally
- Organic Matter (OM) content - 5-8% optimum--regionally variability
- Calcium-Magnesium ratio – 8:1 best –Key to type of lime used.
- N P K Nitrogen, Phosphorus, Potassium
- CEC

Chemical/Fertility Aspects of Soil Quality

Key Chemical Indicators

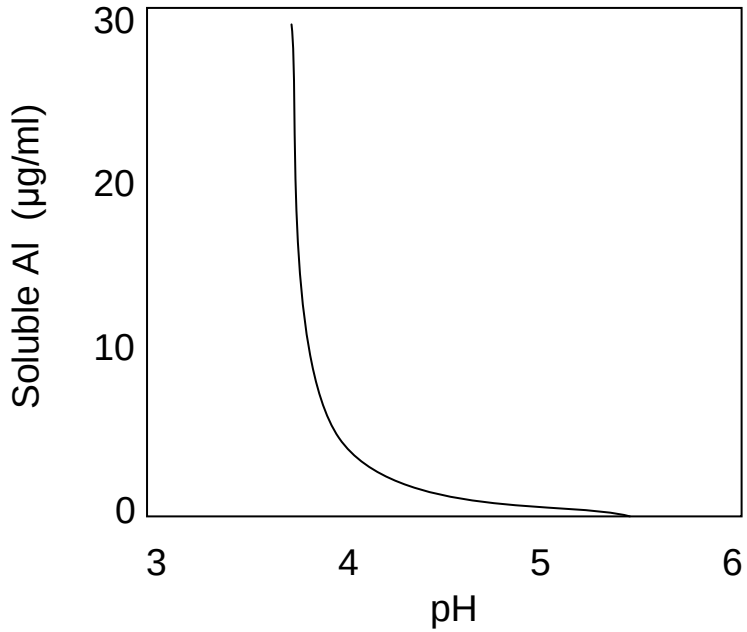
- pH
- Cation Exchange Capacity (CEC)
- Organic Matter
- Nutrient Soil Tests

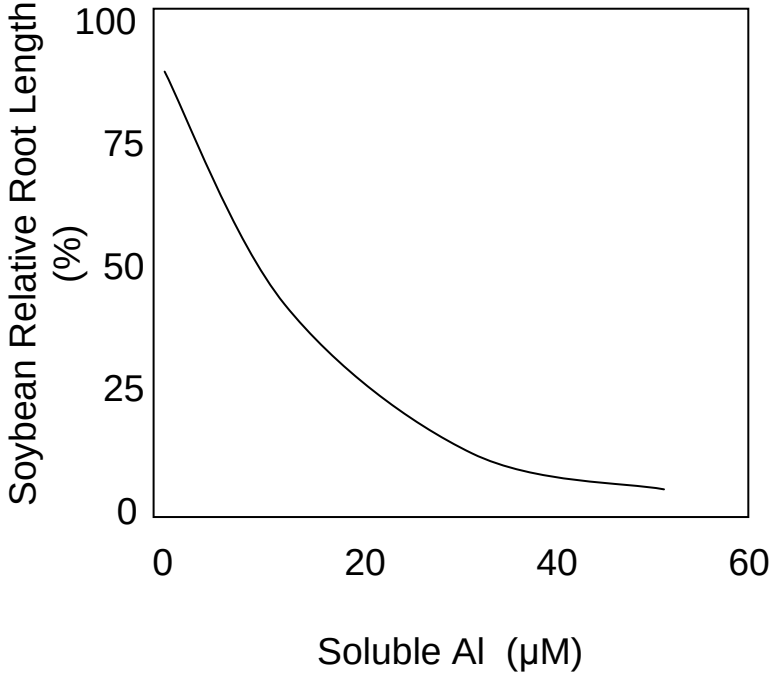
Soil Acidity and pH

- Soil acidity is probably the single most important factor affecting the chemistry and biology of the soil.
  - Root Growth
  - Nutrient Availability
  - Microbial Activity
  - Pesticide Activity

Soil Acidity and pH

- Aluminum toxicity reduces root growth
- Significant soluble Al below pH 5.5





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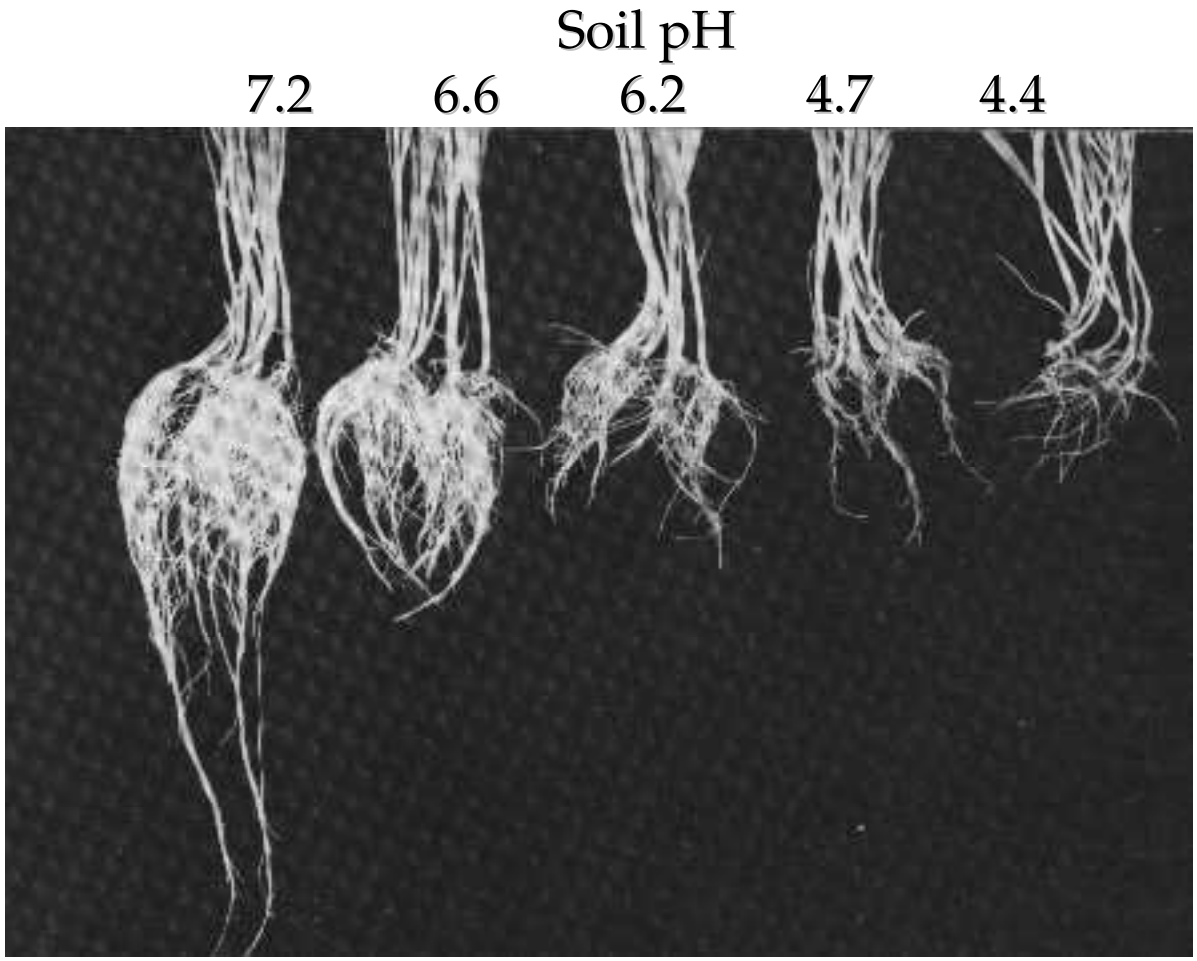
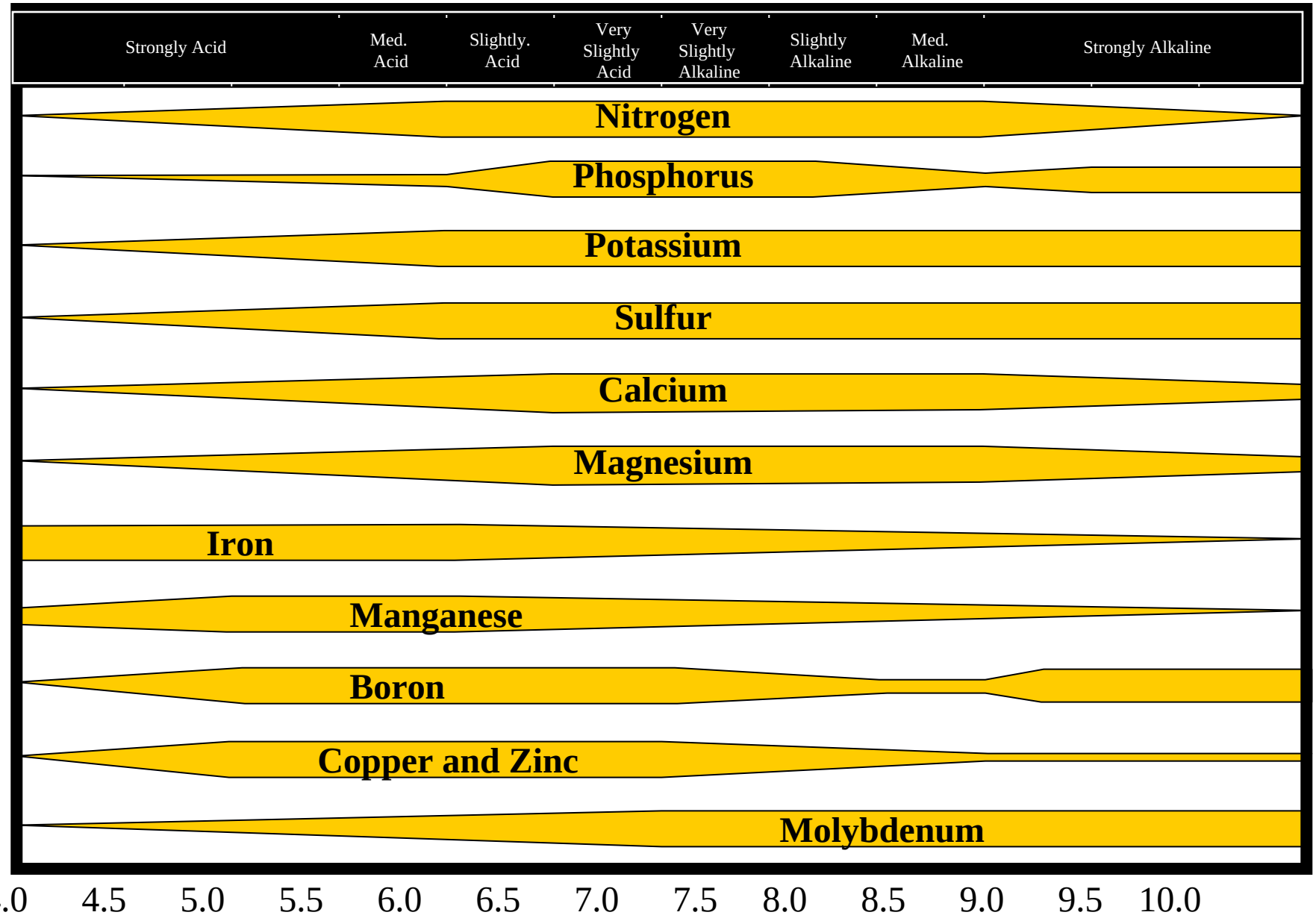


Barley Roots

pH vs Availability of Nutrients



It's all about the soil

We take a "Feed the Soil" approach as opposed to feed the plant

Remember Nutrient Availability vs. pH to get maximum benefit of fertilizer applications---Liming, if needed is the critical first step

Amend the Soil--Lime

Remember pH varies in different regions of the country

To raise soil pH –only if indicated by soil test. C3 Grasses prefers 6.5-7.0

Calcium/Magnesium ratio determines type of lime to use: Calcitic lime if Ca levels low; Dolomitic if Magnesium is low

Ideally, apply in Fall, but can be applied early Spring

50 lbs. per 1000 ft maximum rate in 1 application…may have to do a split application.

Lime can take 100 days to breakdown and effect a change in pH of soil.

- Never apply lime indiscriminately—if pH is above 7 lime will cause problems
- Liming materials contain Ca, Mg, or a combination of the two
- Calcium carbonate is the standard liming material---liming materials are based on a calcium carbonate equivalent

Liming material replaces H ion on CEC sites

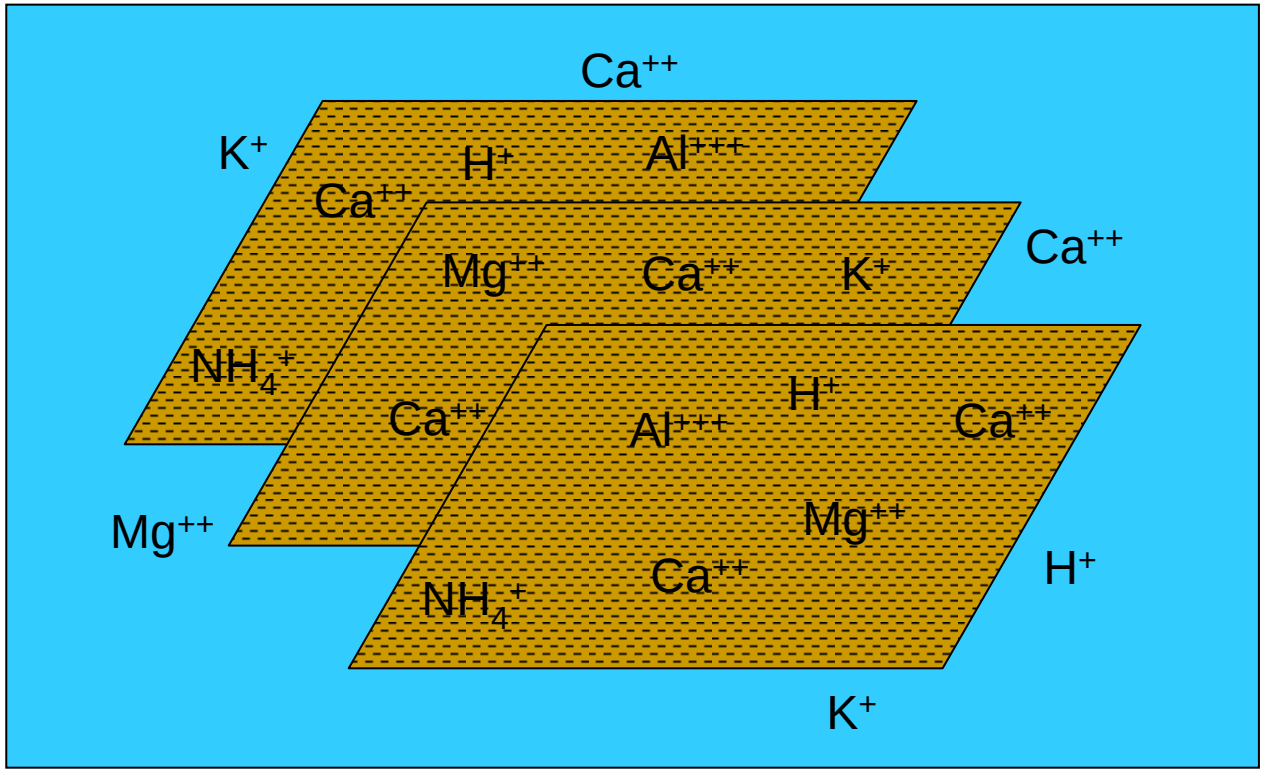
Buffer pH is a measure of the soil's resistance to change

This value gives the lab the information
to calculate amount of lime needed

pH of two soils may be exactly the same—sandy soil less lime—soils high in OM will require more lime

Cation Exchange Capacity (CEC)

- Negative charge on soil particles that can hold positively charged ions (cations) by electrostatic attraction



Cation Exchange Capacity (CEC)

- Organic Matter
  - This are very important source of CEC
  - Charge in these minerals does not arise from isomorphous substitution like in the clay minerals.
  - Charge develops through ionization of the carboxyl and phenol groups in the OM.
  - This charge is highly pH dependent.
  - Pure OM has a very high CEC (100-300 meq/100g)
  - Remember OM levels in most soils is only a few %

Fertilizer
and
Nutrient Amendments

Routine Management or Adjustment
as dictated by soil testing

Difference
Between
Conventional Fertilizer
and
Natural, Organic Fertilizer

Conventional

N=urea	Synthetic, Inorganic
Water-soluble	Quick release
Fast green-up	Rapid uptake
Encapsulation	Feed the plant
Multiple apps	Leaves soil quickly
Was inexpensive	Cost increases

Natural, Organic

N=plant, animal, mineral based

WIN water-insoluble N

Broken down by microbes

Sustained benefit

Measured growth

Slow release

Feed the Soil

Organic N

Cost effective

It is important to understand plants can only use Inorganic N

That is why synthetics work so fast

Microbes covert organic N from natural fertilizers to inorganic (plant available N)

How to Tell the Difference in Fertilizers by N % in analysis

Natural, organic	3%-13% N
Bridge product	14%-18% N
Synthetic	19%-30%+ N

Nutrient Budget

We set Nutrient Budgets based on N

Conventional thought = lbs N/1000 sq ft

Athletic fields 3lbs-5lbs N annually

Not all N from fertilizer (2-3 lbs only)

Creative approach to nutrient management to help stretch budgets

Sources of N

Traditional	Non-traditional
Granular fertilizer	Compost topdress
	Compost tea
	Liquid fertilizer
	Clippings returned
	Microbial inoculants

Managing Fertility

Applications timed to coincide with growth patterns of grasses (C3 or C4)

Spring	substantial shoot growth
	moderate root growth
Fall	substantial root growth
	moderate shoot growth

GENETICS

The Real Trick

The key to the successful management of fertility is to deliver enough N in the spring to achieve optimum shoot growth without excess at the expense of root growth and to deliver enough N in the fall to address the aggressive root growth

Application Times and Rates Governed by Textural Analyses and CEC

Soil Texture--specifically clay% and sand % governs frequency of fertilizer applications

2 X annually vs. spoon feed

Higher rate less frequent

Lower rate more frequent

To deliver 1 lb N Granular

4-2-3 formulation 50 lbs. covers 2000 sq ft

5-3-4 formulation 50 lbs. covers 2500 sq ft

6-0-6 formulation 50 lbs. covers 3000 sq ft (important in low phosphorus situations)

8-1-9 formulation 50 lbs. covers 4000 sq ft

10-0-0 formulation 50 lbs. covers 5000 sq ft

Fertilizer Calculations

lbs N / 1000 sq ft

Conventional Thought

6-0-6

6lbsN--100lbs fertilizer

3lbsN—50 lbs fertilizer

16lbs fertilizer=1lbN/1000 sq ft

50lbs covers 3000sq ft

Liquid Fish Fertilizers

Fish Emulsion

Old

Process with heat

Catch of day/remnants

Offensive odor

NPK

Fish Hydrolysate

New

Cold process

Whole same fish

Odor-free

NPK plus

enzymes, amino acids, proteins

Inexpensive-use at low rates .2 to .4lbsN

Nutrient Cycling

As we move through the transition process and bring Soil Chemistry and Soil Biology to approach optimum levels, we are going to see the benefits of good *Soil Health*.

In a healthy soil we experience *Nutrient Cycling* whereby the microbes can make available up to 2.5 lbs N every 30 days through natural processes

Top-dress with Compost

Compost is "Black Gold"

- Microbial life in the soil is the key to a healthy lawn
- Compost is the best source of OM and beneficial micro-organisms
- OM is the major energy source for plant life
- Millions of beneficials each handful
- Compost nurtures the development of the soil system
- Bagged, organic is best for lawns/veggies.
- Home-made: needs to be well-matured.

Compost by Definition

Compost is the product of an aerobic process whereby microorganisms break down and decompose various forms of organic matter. The organic matter is referred to as feedstock or substrate and can be made up of a variety of materials. The feedstock can be random materials or specific materials can be chosen to meet a particular recipe.

More than just watching a pile of material turn into a soil-like substance

It is an exacting science

Recipe 20:1 to 30:1 C:N Ratio

Organisms use the substrate as a food source

They produce heat, CO2, water vapor, and humus

Humus is a highly stable by-product of decomposition process

Nutrients and pH (near neutral) are stabilized

Finished compost is rich in nutrients and microbial life

High % humus and OM

Ideal soil conditioner and turfgrass topdress

Compost Quality

No national criteria, standards, guidelines

Need to rely on testing or own assessment

Quality determined by several criteria

No offensive odor

No remnants

Looks like quality soil

Should be mature

Maturity best determined by bio-assay

4 Phases of Composting

Mesophilic
Thermophilic
Second Mesophilic
Maturation

Heat and Microbes change with phases
Need to reach 137°F for 72 hrs
Kills weed seed, pathogens

Immature Compost

Wants to finish

Pulls N from soil

Damaging to turf

Causes turf to yellow

Chlorophyll decreases

Photosynthesis reduced

Carbohydrate production drops

Turf weakens

Rate of Application

3/4 to 1 cubic yard / 1000 square feet

1/4” to 3/8” depth—1/2” too thick

Dehydrated Compost

Moisture removed

Fine texture

Cost effective

Increases OM %

Low rates

Excellent seed bed

Dormant biology


HOME
GUEST
DOWN
TO GO
BALL ON
QTR


NEW HOLLAND
4665
TURBO

Products that address soil biology

Compost tea

Mycorrhizal fungi

Microbial inoculants

Seaweed

Humates

Compost Tea

It will be one of the foundations of a complete natural program
In the future

Compost—
address OM and soil biology

Compost Tea—
soil biology

As OM reaches target levels topdress reduced

CT only

Liquid extract of high grade compost or vermicompost

¾ : 1 to 1:1 Fungal to Bacterial ratio for turfgrass

Extraction and brewing process

Source of soil and foliar nutrients
Compete with disease causing organisms
Produce essential plant growth hormones
Fix N
Mineralize plant available nutrients

Create biologically active soil

Benefits in nutritional area
Health and quality of turf is improved
Increased ability to retain N, P, K, Ca

Improve soil structure
Water and nutrient infiltration
Oxygen diffusion

There was a time when spray equipment in the hands of the turf Manager meant that a pesticide application was imminent

Mycorrhizal Innoculents

Inocculate soil
Mycorrhizae colonize root of plants
Assist in nutrient transfer
Increase plant’s ability to get nutrients

Apply with tractor pulled sprayer 50-200 gal capacity

Backpack sprayer

Spray tank with long hose

Be gentle—living organisms

- Compost Tea
- Liquid Extract high quality compost
- $\frac{3}{4}$:1 Fungal-Bacterial Ratio
- Rate 15-25 gal / acre
- "Certification" Issue

Mycorrhizal fungi

Mycorrhizae colonize plant roots

They assist in nutrient and moisture transfer from the soil to the roots

Inoculate the soil with liquid or dry product

Improves the efficacy of organic fertilizers

Humates

Apply to turf as a soil amendment to directly address soil health and quality

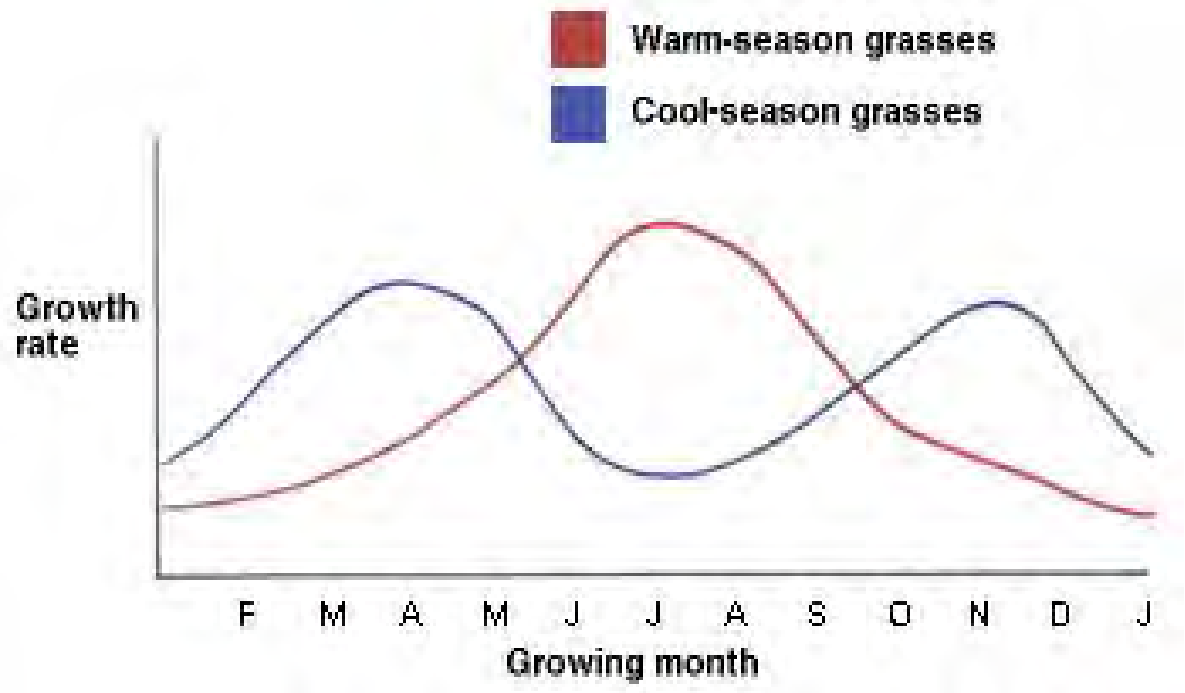
Liquid or granular humic acid

Humus is a key component of soil OM-all soil functions interact at some level with humus

Response of turf is evident


Scheduling inputs to match growth
pattern of grasses
C3 Cool season grasses

- Growth Pattern of C3 and C4 Grasses



C3 C4 Grasses

What is the difference?

C3 Cool-season grasses

Optimum air temps 65°-75°F soil temps 55°-65°F

Emerge from dormancy-rapid shoot growth, moderate root growth in spring

Intolerant of mid-summer heat stress-root and shoot growth slows

Growth increases in the fall, moderate shoot growth and vigorous root growth

Maintain green color well into fall

C4 Warm-season grasses

Optimum air temps 75°-85°F soil temps 65°-75°F

Emerge from dormancy more slowly, they do not reach maximum growth rate until mid-summer

Growth rate slows in fall

C4 goes into dormancy in regions where soil temps go below 50°F

Lose chlorophyll as they go dormant stay green in continually warm temps

Physiological differences C3 and C4 not just temperature

Based on the way they photosynthesize (photosynthetic system)

C3-begins photosynthesis with a 3 carbon compound

C4-begins photosynthesis with a 4 carbon compound

C3 grasses are not as efficient at photosynthesis as C4

Different cell structure

Practical differences

Rooting depth-C3 12”-18” C4 24+”

Deeper root system of C4 makes them

Better adapted to drought-they require less irrigation

Differences in nutrient and cultural management

Endophytically Enhanced Seed

- Naturally occurring fungi / symbiotic relationship with seed / both benefit
- Endophyte resides in veins of sheath, not in root
- In exchange for carbohydrates from plant it gives the plant alkaloids and other chemicals that have beneficial and protective effects on the grass

- Alkaloids have been shown to act as insecticide—controlling surface grazing insects
- Studies have shown that insects may be able to detect endophytes and selectively feed on other plants
- Endophytes may promote drought hardiness and resistance to some diseases (Dollar Spot)
- Not in root—no protection against grubs
- In most new cultivars-perennial ryes and fescues

Perennial ryegrass

Rapid germination 7-10 days and establishment

Rapid rate of shoot growth, especially in spring

Useful for quick repairs on athletic fields

Mixes well with Kentucky bluegrass

Fertile well-drained soil-moderate fertilization

Endophytes-fungus that forms symbiotic relationship with grass. Grass get resistance to insects from alkaloids and fungus gets carbohydrates

Good wear potential

Does not mow well-poor cold tolerance

Not often used alone -bunch type growth

Fescues

450 species <10 used for turf

Two groups coarse and fine

Most newer cultivars contain endophytes

Fine

Fine leaf texture-sheep, creeping red, Chewings, hard

Adapted to shade, low N requirements

Mix with Kentucky blue and fine fescue dominates in shade-KB in sun

Do not like excessive moisture, high heat, drought

Coarse

Tall fescue-heat, wear, and drought tolerant, adapted to shade

Poor cold tolerance, bunch grass, forms coarse clumps-weedy look when mixed with fine

Athletic fields-excellent wear tolerance

Turf-type tall fescue finer blades-high water u

Kentucky bluegrass

Most widely used C3 in United States

Reproduces with rhizomes, knits well, repairs itself, excellent recuperative and reproductive capacity

Dark green color, mows easily

Good cold tolerance

Very competitive with weeds when mown at 2 ½” to 3”

Good disease tolerance when properly managed

Disadvantages

Shallow roots, high water requirements, needs frequent irrigation, high fertility needs


• Our Goal is to reduce inputs over time
• Sustainability
• Nutrient Cycling

Cultural Practices

- Mowing
- Irrigation
- Aeration / De-thatching
- Seeding and Over-seeding

An Organic Approach vs. IPM

- There is a problem with the concept of IPM: it is centered around "pests", as though their management were somehow a goal of the horticulture industry. A more useful frame of reference for the management of lawns, estates, and sports turf, is to think about establishing a soil profile and employing cultural practices that create a stress-free system that will naturally prevent pest problems.

1. Assess The Lawn

Note seasonal stresses.

- Each lawn is a unique eco-system.
- All requirements are site-specific.
- Identify sun and shade areas.
- Where is it doing poorly? Why?
- Don't force grass where it doesn't belong – *the right plant in the right place.*

Mow Properly

- Keep mower blades sharp throughout the season
- Never cut more than 1/3 at a time
- Use mulching mower
- Leave grass clippings on turf except on game day cut

Seasonal Mowing Heights

- First spring mowing – 2 inches to remove any over-wintering fungus. Remove these clippings.
- During growing season: gradually raise height to 3-3.5 inches when possible
- Keep it HIGH through summer.
- In the fall, gradually reduce height of your cut to allow for sun on seed.
- Final cut in fall – back down to 2 inches.

Leave Clippings on the Turf

Clippings do NOT cause thatch.

Broken down quickly by saprophytic fungi (saprophytes are the decomposers)

Valuable source of OM

Leaving clippings will give you 1# N / 1000 square feet a year

Mowing High – the best "Herbicide"

- Mow high 3"-4"
- Think "lush"

Avoid "scalping" = major stress to grass plant

- Longer grass blade = deeper root system & > photosynthesis
- Deep roots = drought resistance

Height Effects of Turfgrass on Weed Pressure

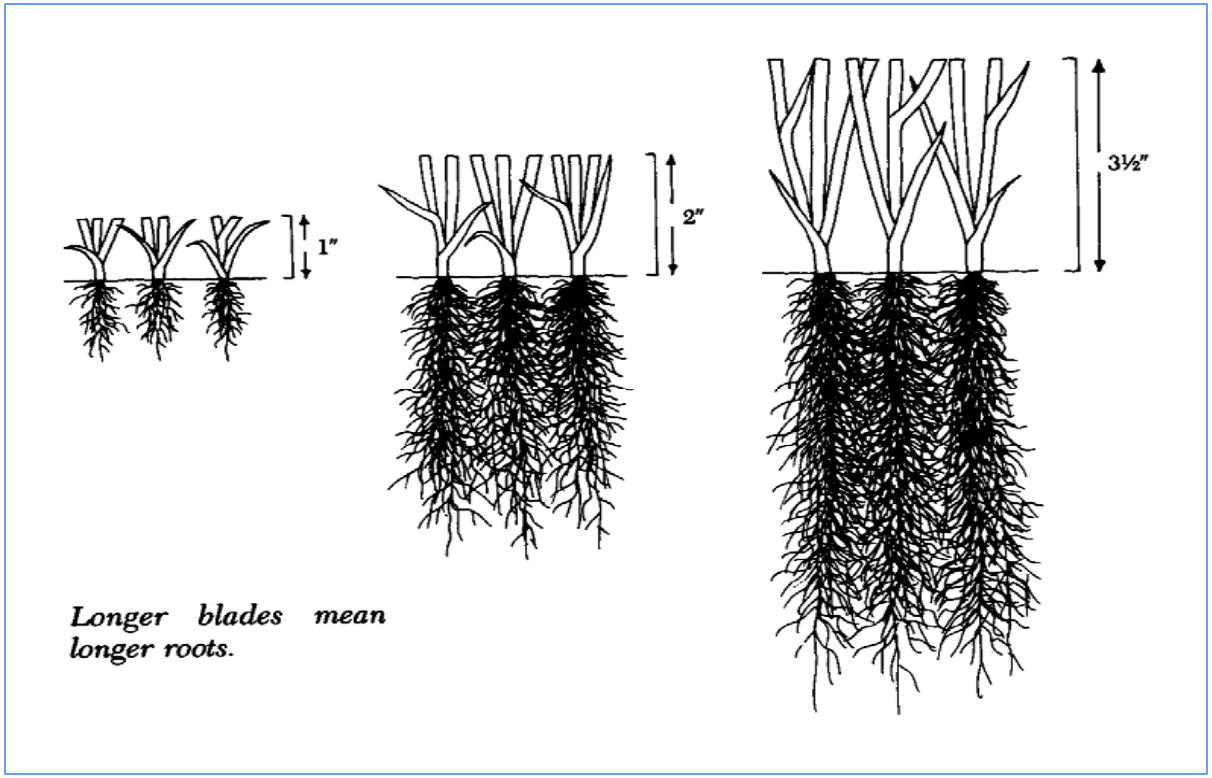
Blade Length	1.5”	2.5”	4”
Weed Infestation %			
Bluegrass	55	25	7
Fescue	45	23	2

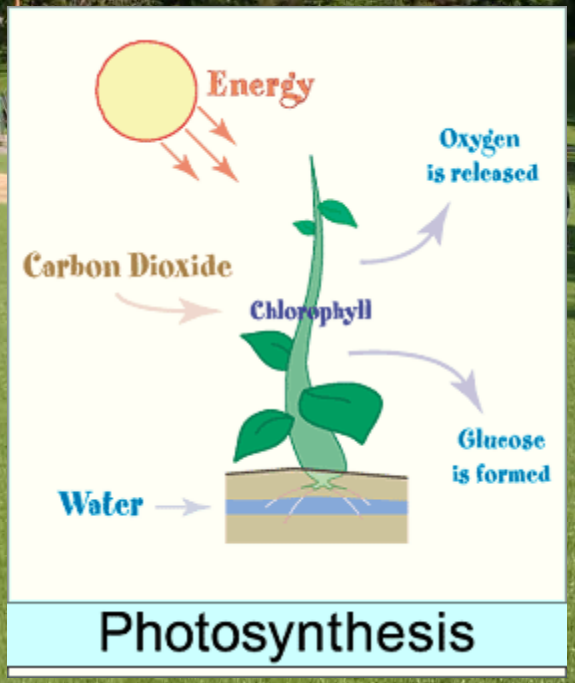
Mowing Height: Key to Drought Tolerance & Better Photosynthesis

Close mowing reduces the amount of leaf area available for photosynthesis, reducing plant vigor.

"Roots to shoots"

Longer grass blade = deeper/denser root system




Energy
Oxygen is released
Carbon Dioxide
Chlorophyll
Glucose is formed
Water
Photosynthesis

Kentucky Bluegrass Rhizome Development

- Mowing Heights
- 1” 1.75” 2.5”

- Mg by weight of Rhizomes
- 1.0 64 656

E.E. Deal 1967

Height Effects on Leaf Area and Photosynthesis Capacity

- Mowing Height
- 1” 2” 3”

- Relative Change % in Photosynthesis
- 1.0 240 5760

Roberts 1992

- Compaction greatest enemy of turfgrass-grass and most plants need oxygen in the soil
- It is a condition that occurs with heavy use or traffic—air around soil particles is simply squeezed out
- Aerate any time turf is actively growing to re-introduce air to the system
- Re-establishes a good aerobic soil profile
- Different types of equipment


Where do turfgrass roots grow?

Aeration

Aerate when turf is ACTIVELY GROWING and only when needed to relieve compaction

Athletic turf suffers from constant use and is aerated regularly.

Ways to aerate: core aerators, slice seeding, seed-a-vator (shattering of soil) ~ and beneficial organisms in soil.

Thatch: Buildup of dead grass, roots, and stems

- Heavy thatch indicates soils void of healthy microbial life
- Bluegrasses high thatch producers

The Thatch Layer

- Builds up over time
- "Barrier" created
- Dead blades of grass (not clippings) crowns, rhizomes, stolons, roots begin to grow horizontally
- Nutrients (fertilizer) and moisture downward movement is restricted

- **Microbial life minimal from conventional management**
- **Saprophytes that decompose thatch are absent or diminished**
- **Layer thickens**
- **Crowns get smothered**
- **Air-flow decreases**
- **Turf diseases can increase**
- **Turf quality decreases**

Water: Too Much or Too Little of a Good Thing

Adopt Sensible and Sustainable Irrigation Practices

- 2” of water weekly—1” will suffice
- Deep thorough irrigations preferred
- Frequent shallow irrigations do not promote healthy turf
- Apply enough water to soak the root zone
- Shallow watering promotes shallow root growth

- **1” of water will penetrate**

- **Sand to the depth of 12”**
- **Sandy loam to the depth of 8”-10”**
- **Clay loam to the depth of 6”**

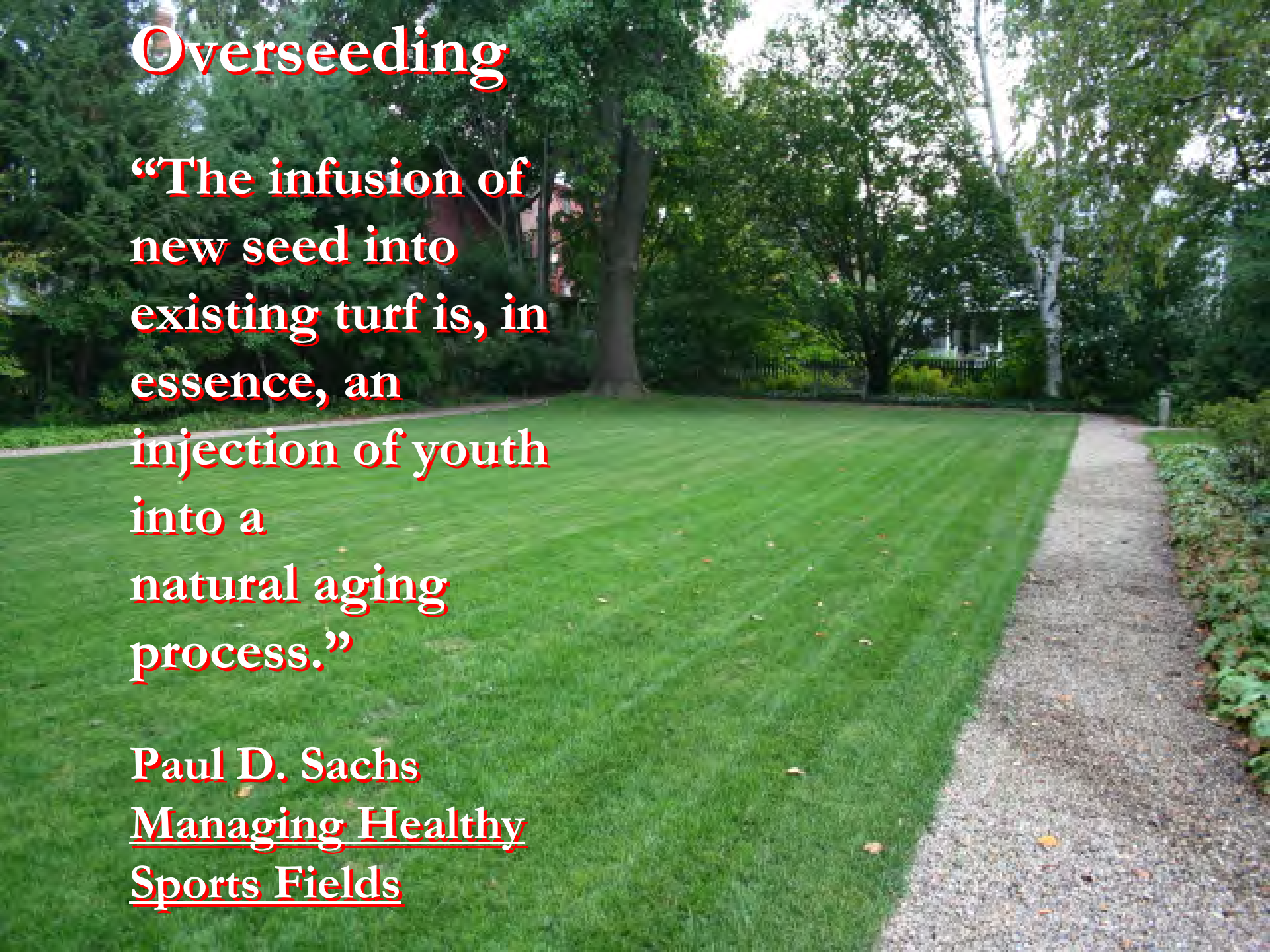
- **Irrigation systems 2X weekly-not every other day for 15-20 minutes a zone**

- **Over-watering fosters turf diseases**

Overseeding

"The infusion of new seed into existing turf is, in essence, an injection of youth into a natural aging process."

Paul D. Sachs
Managing Healthy Sports Fields



Re-Seed / Over-Seed Heavily

- **Rake well, scratch well, or aerate and de-thatch first if necessary.**
- **Spread 1/4 ” to 3/8 ” of compost either mixed with or to lightly cover seed**
- **Apply seed by spreader or hand-broadcast**
- **Lightly tamp or press seed into compost to ensure good SEED-TO-SOIL CONTACT.**
- **Water it in and keep moist, but not soaked.**

Fall is the Best Time for Lawn Renovation

- **Long, hot days = GOOD FOR WEEDS!**
- **Short, cool days = GOOD FOR GRASS SEED!**
- **Mid-August to the end of September is best time for seeding a lawn**

- **Fall should be the *only* time for <u>new</u> construction**
- **No weed pressure, days shorter and cooler**

- **Purchase good seed, native to our area ~ C3 cool-season grasses**

- **Endophytically-enhanced newer cultivars Fescues and Perennial Ryes**

- **Bluegrass for durability**
- **Perennial rye for fast germination**

- **Nurse crop: Annual Perennial rye for fast, temporary fill in Spring if needed to stop crabgrass. Re-seed in fall.**

Pests of Turfgrass

Weeds

Insects

Fungal Disease

Crabgrass: An annual pest

Crabgrass

- An annual weed that Nature uses for erosion control
- Fills in any bare/thin spots in the lawn
- Likes dry, sunny conditions
- High mowing shades out crabgrass seed
- Crabgrass dies after the first frost
- One plant can produce 50,000 seeds

Crabgrass

- Seeds lay dormant over winter
- Germinate about 3rd week of April
- Needs proper light, moisture, and temperature for germination
- Germination stops about 3rd week of August as day length decreases
- Likes high N, so chemical-based, water-soluble fertilizers encourage it.

Corn Gluten

- Recommended applications
- Spring-Fall-Spring or
- Fall-Spring-Fall
- Can't seed or over-seed for about 100 days
- Needs to be done before the 3rd week of April
- Once crabgrass is under control you can omit this step.

Clover

Legume Family-Perennial broadleaf

Flowers throughout the summer

Fixes N

Difficult to manage-coexists with turf

Not drought tolerant

Aerate, over-seed, fertilize

Dandelions

- Taproot brings nutrients to roots of grass
- Monitor pH – likes acidic soil
- Corn Gluten in Early Spring
- Mow high to choke out
- Hand dig as much as possible to weaken
- Try the "Weed-Hound"

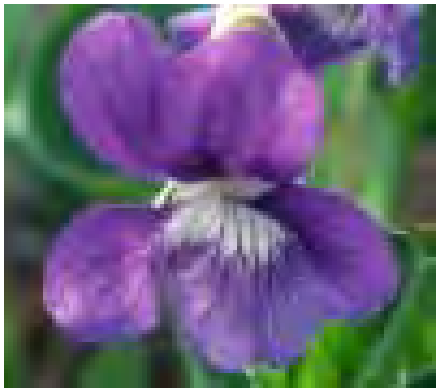
Dandelion Root – 8 inches!

Dandelions will grow progressively smaller with manual removal of even part of the root.

Mowing high shades them out.

Dense turf will eventually crowd them out.

Turf grass is a "pest" in the fields of "gourmet greens"(dandelions!) growers.



Violets

- Prefer a shady, cool spot with moist soil
- Mow low in areas of substantial pressure
- Improve drainage
- Reduce irrigation
- Aerate

MOSS

- Usually occurs in neglected lawns where cultural conditions enable it to out-compete turf.
- Moss encroachment generally is associated with thin turf, low fertility, highly acidic soils, shade, wet soils, and turf injury from insects, diseases, chemicals, or cultural practices.

Euryhnchium praelongum in lawn

Ground Ivy

Shallow rooted-roots at nodes

Difficult to control

Hand removal and over-seed

Late season verti-mowing

Broadleaf Plantain

Compaction

Nutrient rich, moist soils

Tolerates low mowing

Remove seed heads

Aerate

Over-seed

Grubs: Not as Bad as they Look

Prevention is the Cure

Grubs

- Larval stage of various beetles, usually June Bugs, Japanese and Masked Chafer Beetles
- Note: Experts say Japanese beetle not the pest it once was…European Chafer a bigger problem (night feeder)
- Eggs laid by the beetle at the end of July
- Develop August-September and begin feeding on turf roots
- Dormant during Winter
- Emerge in Spring and actively feed in May and June. Develop to adult in July.

Grubs

Prevention

- Healthy soil-----beneficials

Indicators

- turf rolls back like sod
- raccoons/crows/skunk damage (feeding)

Control

- check extent of your problem by cutting a sq.ft.patch of lawn; >8 grubs=indication to treat - organically!
- Latest research recommends nematodes over Milky Spore

Beneficial Nematodes

- Microscopic – comes on a sponge you dip in water and apply through sprayer
- Must apply when grubs are present
- Do not apply in full sun
- Must keep soil moist for a few days after application
- Do not purchase off the shelf – may be dead;
- Better to special order from insectiary or nursery that carries beneficials.

Insects

- Organic turf - with proper pH, and a healthy root system growing in bio-diverse soil can control threshold levels of insect populations.
- When soil is out of balance,one or another type of insect can dominate.
- There are many good bugs = beneficials

Beneficials: Partners in Organic Lawn Care

Examples

- Big-eyed bugs, green lacewings, ladybugs, spiders, dragonflies, plus birds, skunks, raccoons, bats, hummingbirds, toads and frogs & the plants that feed and shelter them.
- All are adversely affected by pesticides use.
- If beneficial insects are killed, door is open for damaging insects.

Turfgrass and Disease

- Turf resistance lowered by cultural practices that cause stress within the plant
- They are:
- Improper mowing (short blade length reduced plant's ability to photosynthesize)
- Too much lime
- Improper fertilization
- The use of pesticides

Lawn Disease

- Organic lawns, high in OM, seldom have disease problems
- Microbial-rich soil usually won't let one organism get out of control
- Cornell study warns that soils with low OM that are managed by pesticides are *more* susceptible to destructive turf diseases
- Some diseases like hot, wet conditions and others prefer cool, wet conditions

Red Thread

- Red thread-like structure grows from upper portion of infected blades
- Large and easily observed fungal structures (hyphae)
- Perennial rye one of most susceptible, also found on fescues and bluegrass
- Turf under stress due to N deficiency

  most susceptible
- Low nitrogen disease-fertilize with N to reduce infestation—increase K helpful

Dollar Spot

- Silver dollar to softball sized blighted areas that may expand
- Hour-glass shaped lesion-middle of blade
- Infects most varieties
- Most prevalent on N deficient turf
- Fertilizing one of cultural practices that can reduce severity
- Excess thatch / drought stress contributing factors-proper irrigation

Leaf Spot

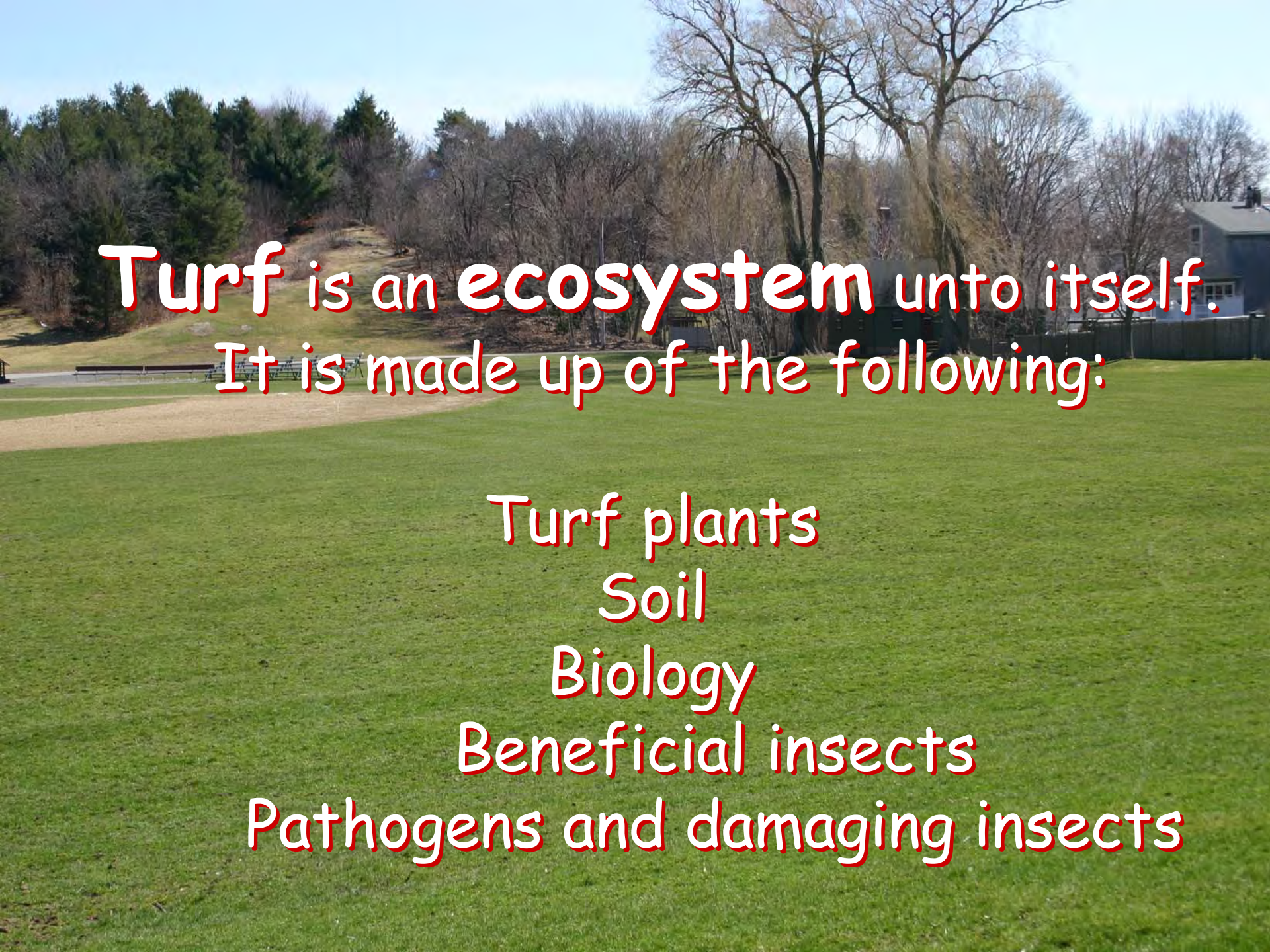
- Attacks most grasses--Kentucky bluegrass in particular
- Lesions begin as elongated spots-tan center-purple to black border
- Cultural steps to reduce leaf spot include proper mowing height, control of excess thatch, irrigation to avoid stress
- Avoid excessive N, particularly in the spring

Brown Patch

- Caused by Rhizoctonia—blights the blade from tip down, spreading to sheath and crown
- Blighted areas from a few inches to several feet- gray to black mycelium
- Generally occurs during periods of high temp and humidity
- Cultural steps include moderate N during spring and early summer—reduce thatch

Snow Mold

- Develops when turf is wet and cold-late fall-winter, particularly when turf not hardened off
- Does not require, but may be very destructive under snow cover
- Damage will usually recover as temps increase and growth resumes
- Raking and removing debris helps
- Avoid excessive N in fall as grass is hardening off


Turf is an ecosystem unto itself.
It is made up of the following:
Turf plants
Soil
Biology
Beneficial insects
Pathogens and damaging insects

Cultural Intensity

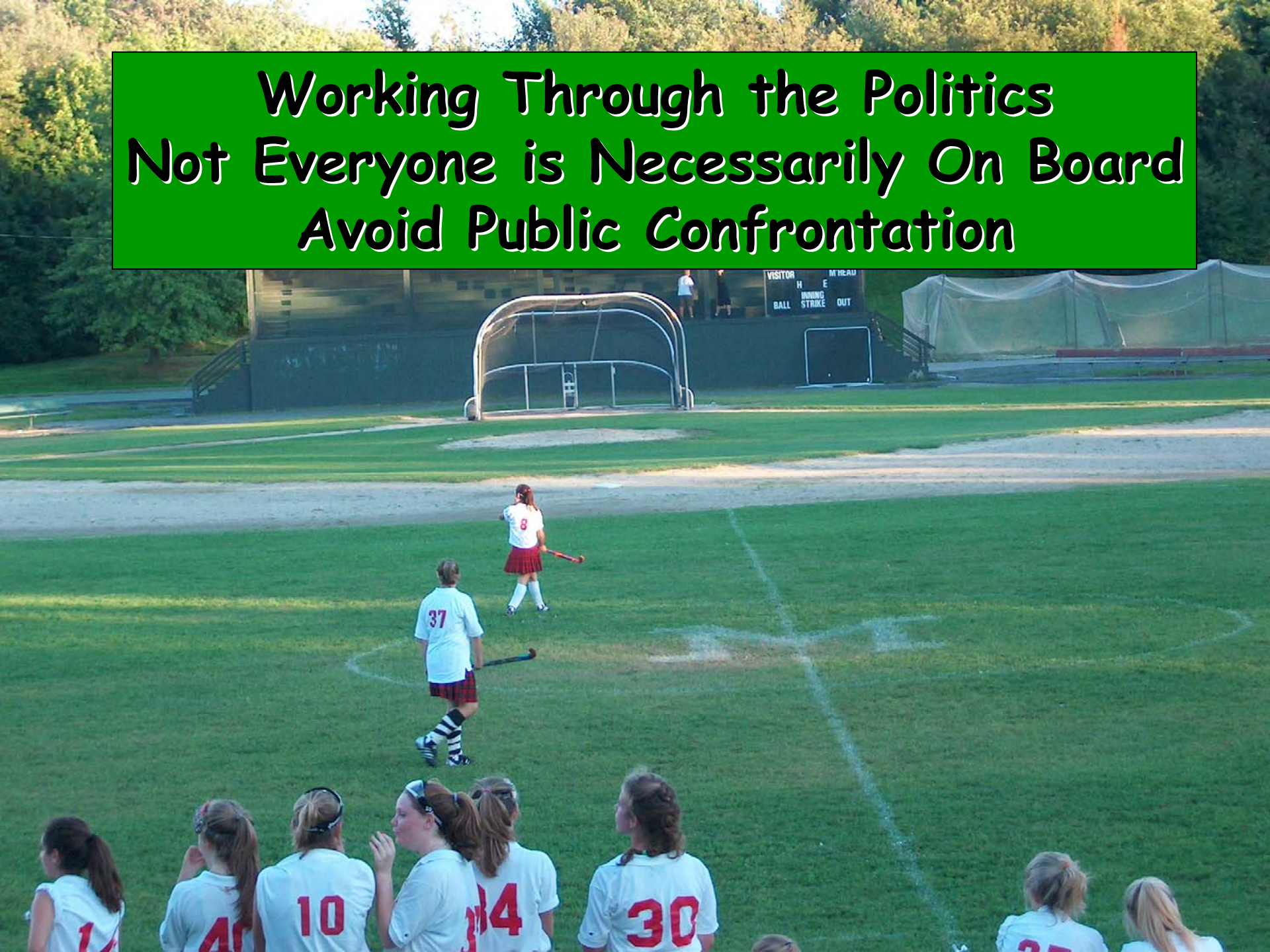
Amount of food, water, aeration, and over-seeding that needs to be done on annual basis

Relates directly to amount of inputs and time required to keep lawns and turf in a condition to satisfy expectations


DETERMINE EXPECTATIONS
SATISFY EXPECTATIONS
BE HONEST WITH ASSESSMEMTS
Low level inputs=low cost yields low expectations
High level inputs=higher cost yields high expectations


Piper Field
Marblehead High School
Marblehead Massachusetts
2002-2005


Built Partnerships with
Youth Sports Groups
in Town, amongst others


Working Through the Politics
Not Everyone is Necessarily On Board
Avoid Public Confrontation

Developed Sound Chemical-Free Field Management Plan


Backed our Cultural Plan with
Detailed Soil Biology
and Proper Soil Profiles


Approached Fin-Com with Sound Biology
and Good Numbers
Cost Reductions at Five Year Point

Why go organic on athletic fields and public lands?

Because it can be done ~

~ and because our kids and athletes need protection from exposure to pesticides.


The Living Lawn Project
Marblehead, MA

The Living Lawn Project ~ 2005


February 20, 2005
The spring "green up" begins under the snow in an organic lawn!


Renovation due to fungal problems caused by improper horticultural response to weather ~ August 2004
'HUMAN ERROR'


September 2004
Re-growth after renovation


October 2004

Results of Organic Remediation of Fungal Problems November 3, 2004


A Quick Look at Chip's Pet Landscaping Peeve!

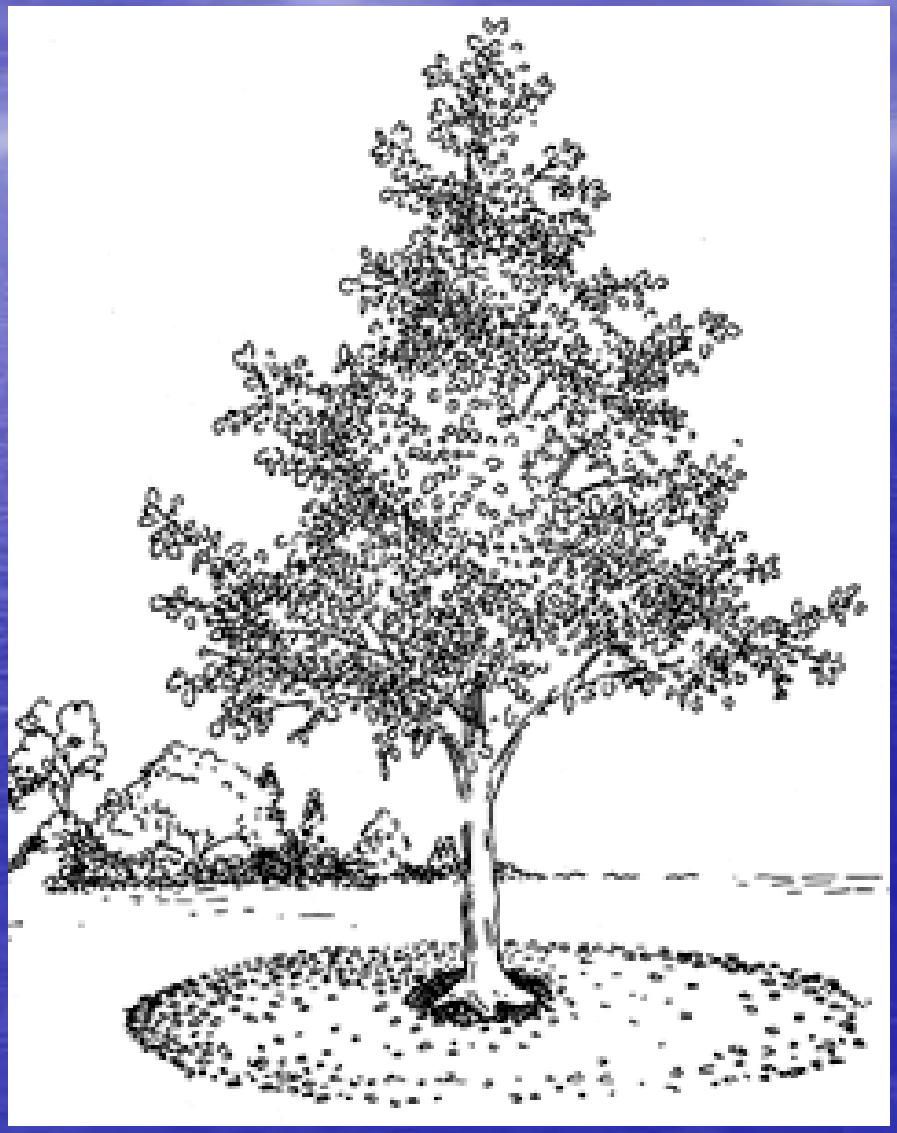

Mulch Madness!!!


Factory

"Mulch volcanoes" can cause many problems for trees.


Tree bark starts to put out roots when mulched improperly

Mulch wide, not deep



“In our every deliberation, we should consider the impact of our decisions on the next seven generations.”