

Extension Gardener Class 3

Sustainable Lawns



Carolina Lawns

*A Guide to Maintaining
Quality Turf in the Landscape*



Download the updated version:

<http://www.turffiles.ncsu.edu/Guides.aspx#004175>

Also be sure to
download **lawn
maintenance
calendar** for
your turf type!

Today's Class

- The Right Place for Lawns
- Lawn Alternatives
- The Right Turf for Your Lawn
- Lawn Maintenance
 - Mowing
 - Weeding
 - Fertilizing
 - Pests and Diseases



What Are Grasses?

- “Primary Invaders” – one of first plants to move into disturbed landscapes
- Grasslands dominant low rainfall areas – cover ~24% earth’s surface

Prairie in Badlands National Park, SD

"Cumulus Clouds over Yellow Prairie2" by Wing-Chi Poon,
Source: [Wikipedia](#)



Grasses

- Over 10,000 species, including:
 - Wheat, rye, barley
 - Oats, millet, rice
 - Sugar cane, corn
 - Bamboo

Wheat



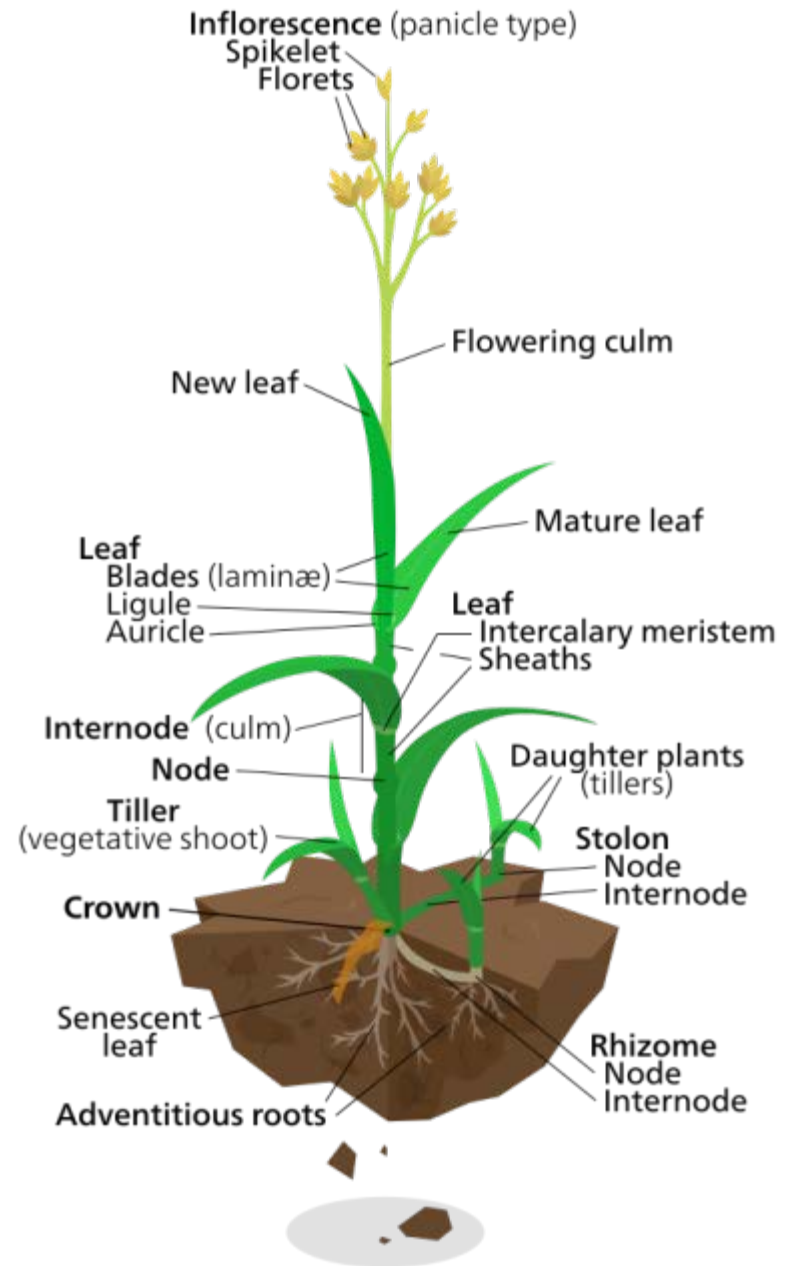
Rice



What Are Grasses?

Common Characteristics:

- Narrow leaves
- Wind pollinated flowers
- **New blades grow from base NOT tips**
 - Adaption to tolerate grazing and mowing



Grasses in NC

- Over 100 native species
 - Broomsedges (Andropogon)
 - Bluestems (Schizachyrium)
 - Switch Grasses (Panicum)
 - Muhly Grass (Muhlenbergia)
- **None are adapted to widespread turf use**
- Some are grown as ornamental grasses – deer don't eat them!



Northwind Switchgrass

Grasses

- Only ~ 50 species worldwide adapted to use as turf
 - Tolerate wear and frequent, low mowing
- 9 common lawn species in NC
- No single species adapted to all areas of the state!

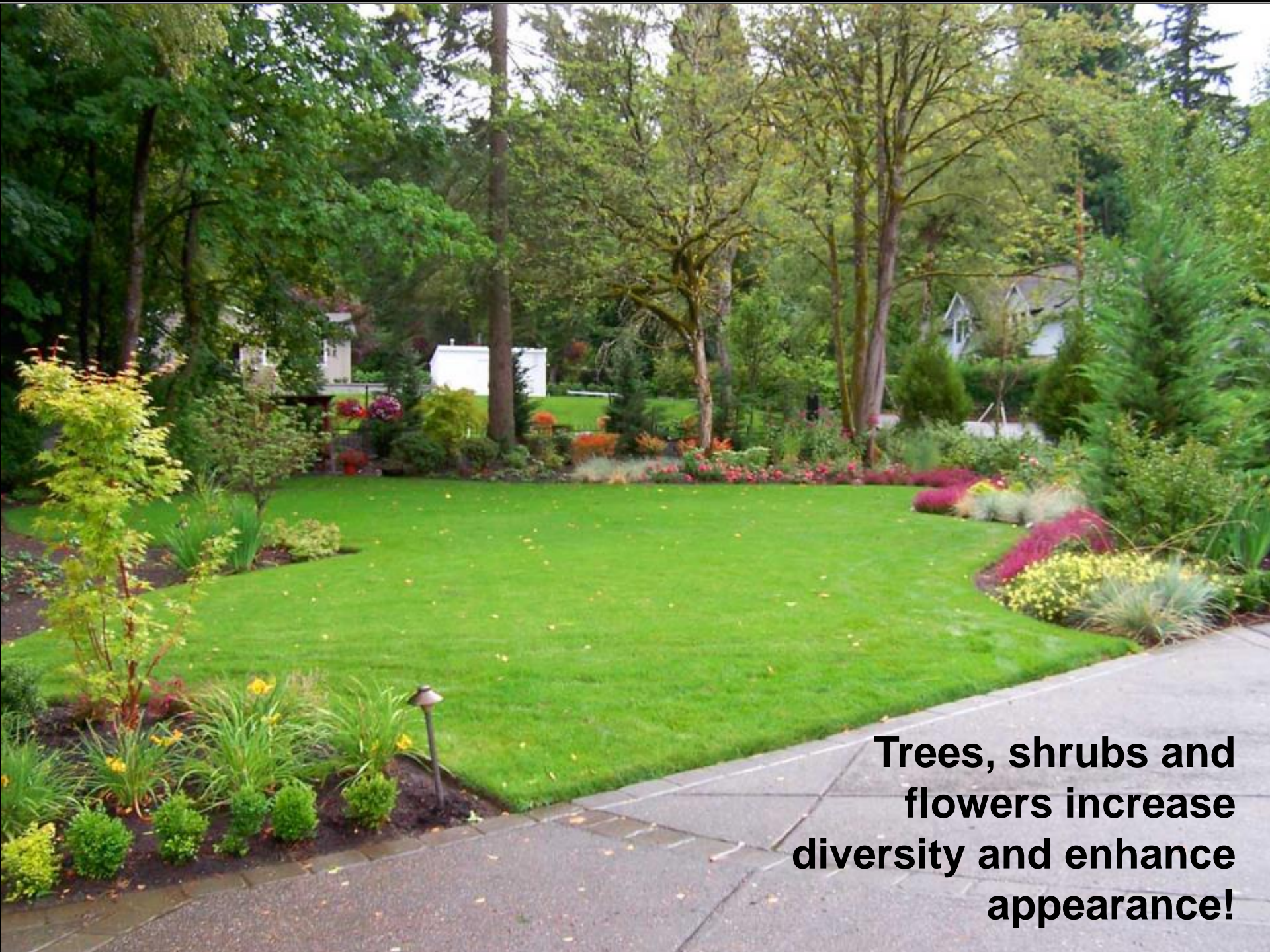


Bermuda is used for golf and sports fields – highest wear tolerance

Lawns

- Monoculture of a single species or a few select species growing together
- Very low diversity, high inputs
- Increase sustainability of your landscape by **minimizing lawn to areas:**
 - Best suited for usage
 - Best suited for site conditions





**Trees, shrubs and
flowers increase
diversity and enhance
appearance!**

The Right Place for Lawns

- **Where you need a wear tolerant surface**
 - Recreation
 - Typically back of home/back yard
- **Where you need a low surface**
 - Safety – line of site
 - Preserve/enhance view
 - Typically front of home/front yard
- **Where you need to maintain an access route**



**Provide
Access**

**Enhance
View**



The Wrong Place for Lawns

- Covering acres
- On steep slopes – cannot maintain
- Hard to mow/irrigate/fertilize strips
- Narrow areas with frequent concentrated traffic
- Deep shade
- Poorly drained, wet areas



Difficult to maintain!

Turf Should Not Be a Default!



Alternative: Meadow

Mow or burn in
winter

Seed sources:

- Mellow Marsh
Farm
- Ernst
Conservation
Seed



Steep Slope

- Trees are the best option on slopes too steep to mow
- Shrubs and ornamental grasses also work – not as long term



Concentrated Traffic

- Add a path!
- Gravel, mulch, stepping stones



Shady

- Over 50% shade, no turf will grow well – but moss will!
- Alternative: groundcover with path OR let moss grow!





Pennsylvania Sedge
Carex pensylvanica

Wet

- Poor drainage = disease problems!
- Plant moisture tolerant trees
 - River birch
 - Willow oak
 - Bald cypress



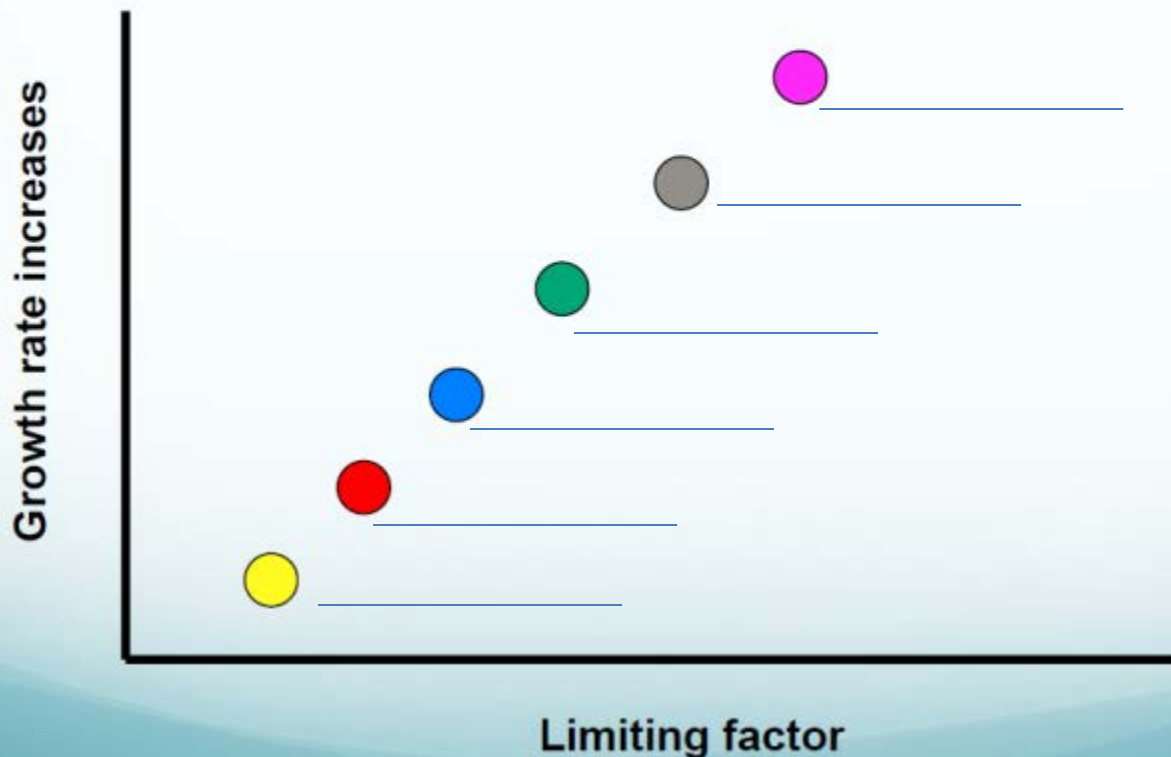
Reducing Your Lawn Area

- **Cut out problem areas**
 - Wet and/or shady areas
 - Constant, heavy traffic areas
 - Difficult to maintain areas
- **Expand mulched area** around trees and beds
- **Add or expand beds** on perimeter and side yard

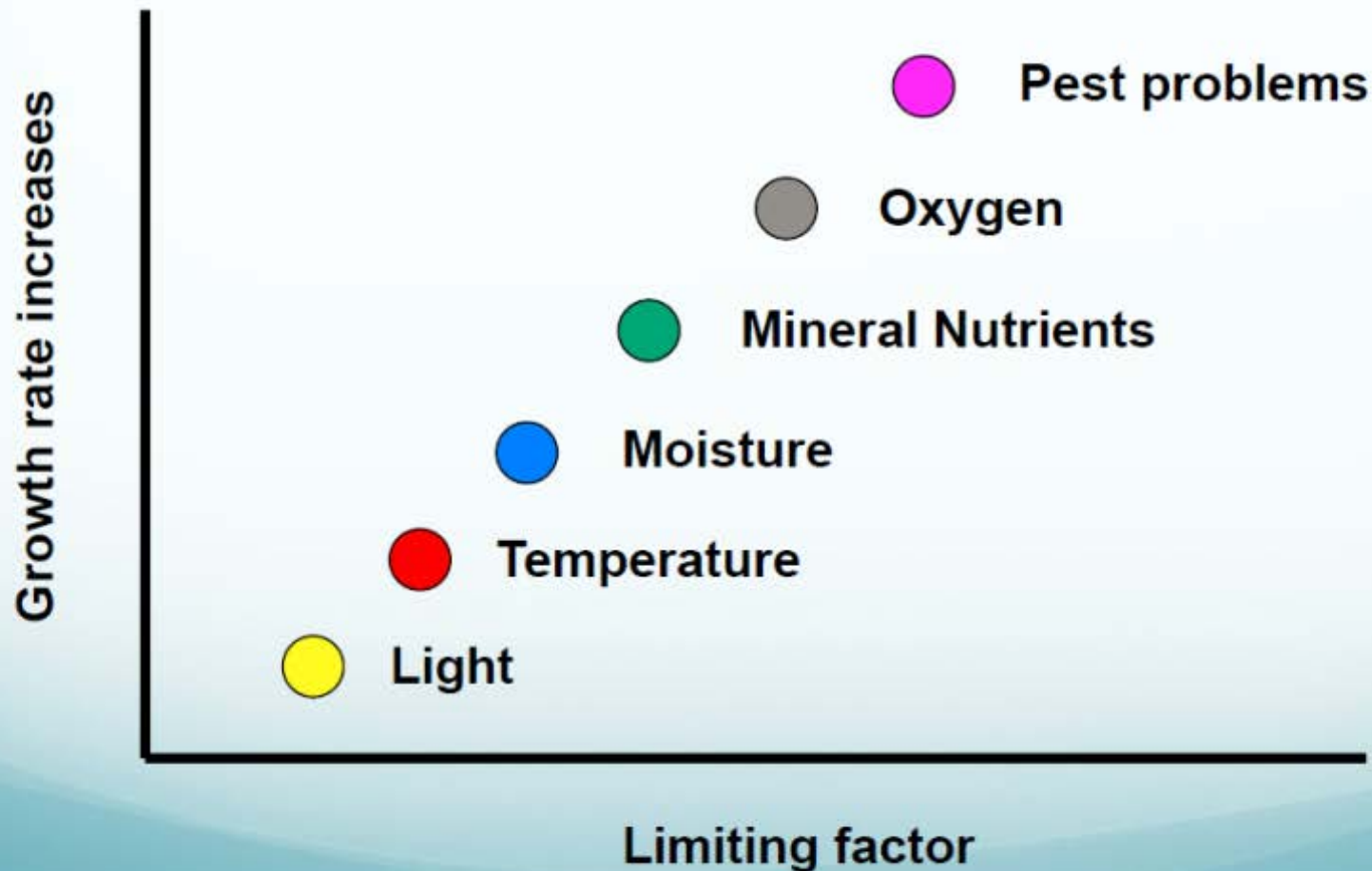


“Problem lawns” often result of trying to grow grass where it is not adapted!

LIMITING FACTORS IN TURF GROWTH



LIMITING FACTORS IN TURF GROWTH



The Right Turf for Your Lawn

Depends on:

- Climate
- Site conditions: SUN!
- Need for wear tolerance
- Maintenance you can provide
- Budget
- Aesthetic preferences
 - Shade of green
 - Green winter or summer



‘Empire’ Zoysia

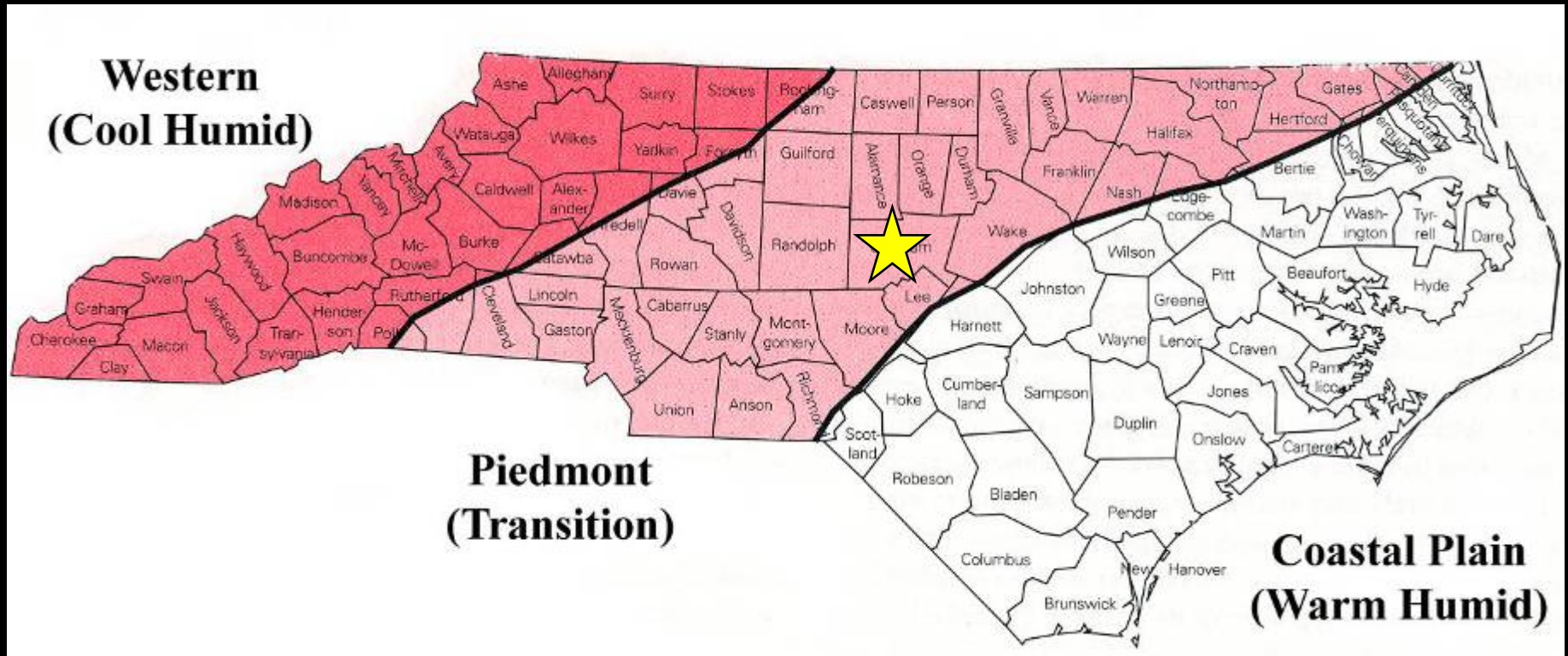
Climate

Will you grow:

- **Cool season grass**
 - Green in winter, not so happy in summer
- **Warm season grass**
 - Brown in winter, love summer



Piedmont = Transition Zone



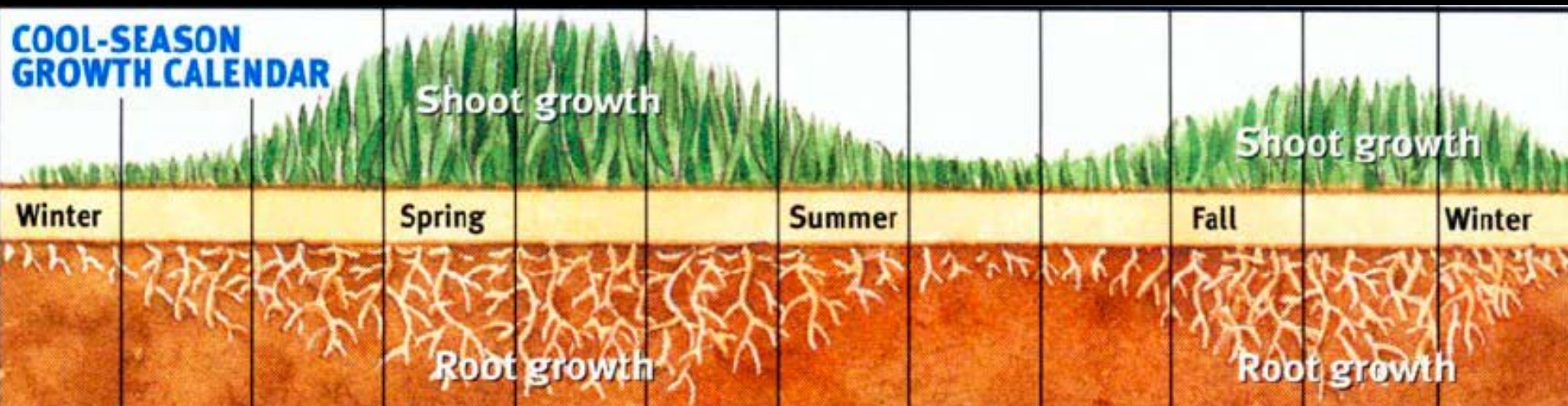
West:
Cool Season Only

Piedmont:
Warm & Cool Season

Coastal Plain:
Warm Season Only

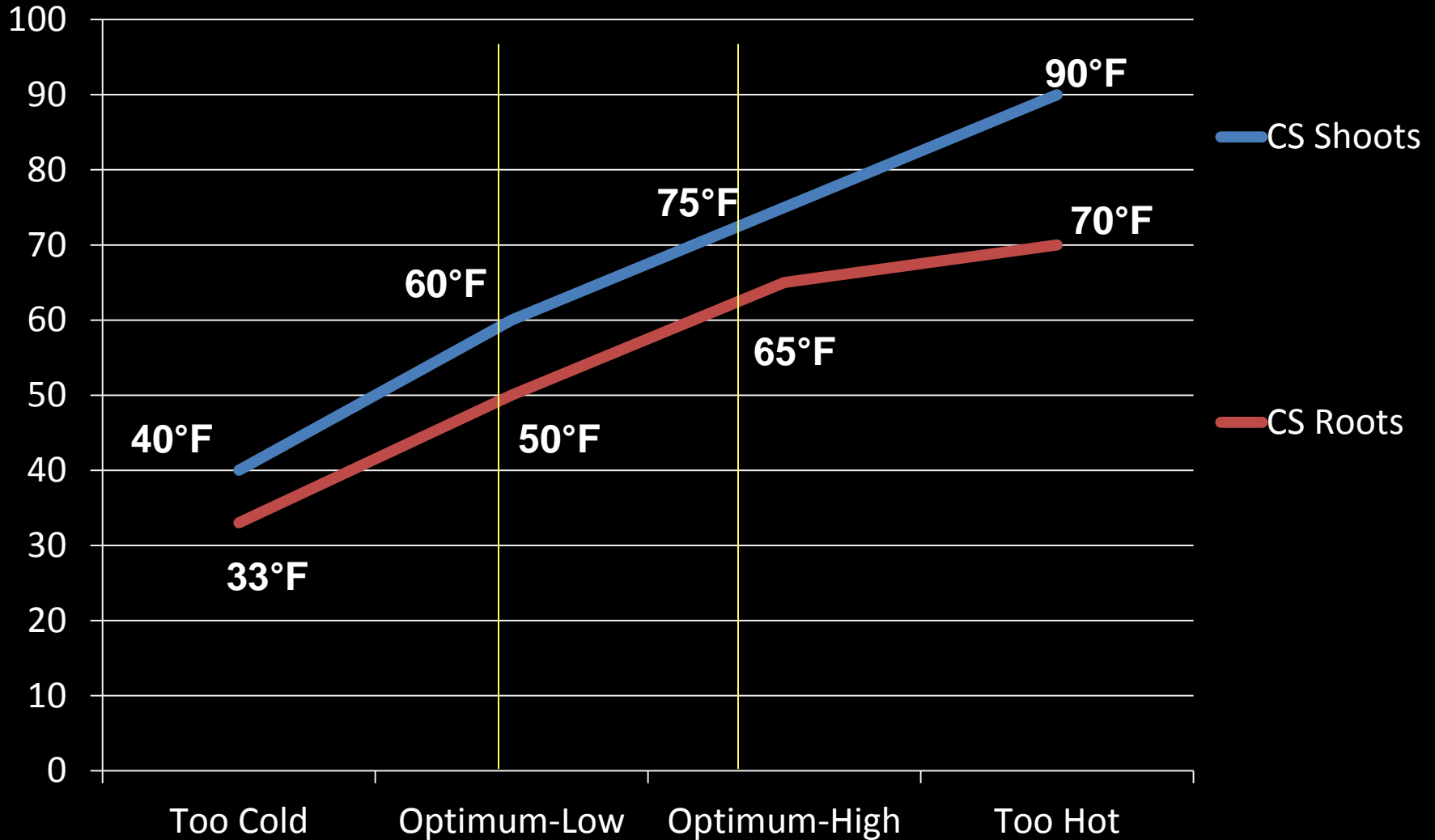
Cool Season Grasses

- Grow during cool times of year: Spring & Fall
- Struggle during heat of summer
- Best adapted to western half of state
- **Tall fescue**, Kentucky bluegrass, fine fescues, perennial ryegrass



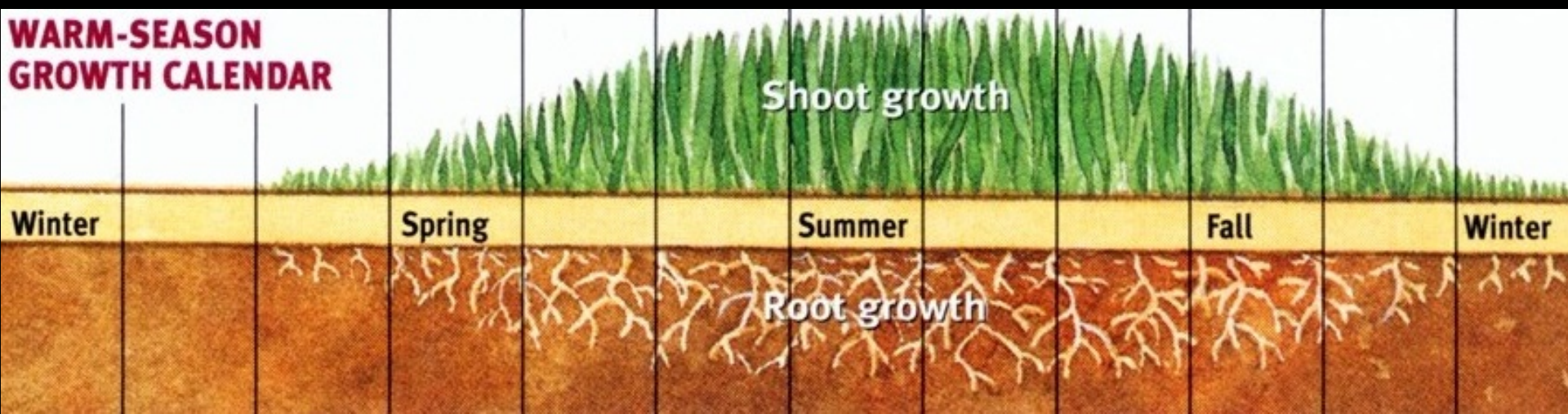
Root and Shoot Growth

Degrees F



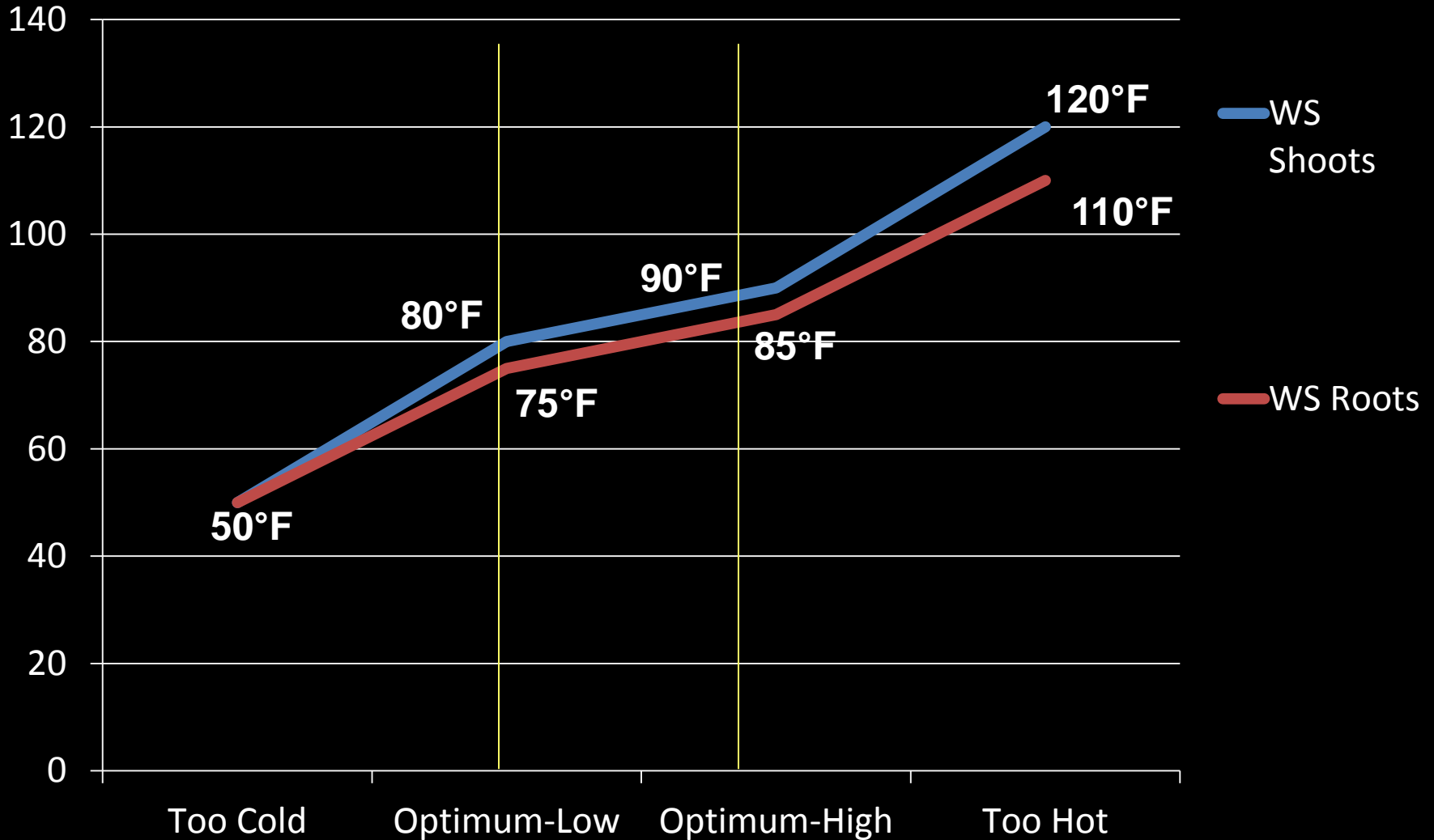
Warm Season Grasses

- Grow during warm season: Spring-Fall
- Dormant in winter (brown), cold sensitive
- Best adapted to eastern half of NC
- **Bermuda**, **Zoysia**, Centipede, Carpetgrass, St. Augustine

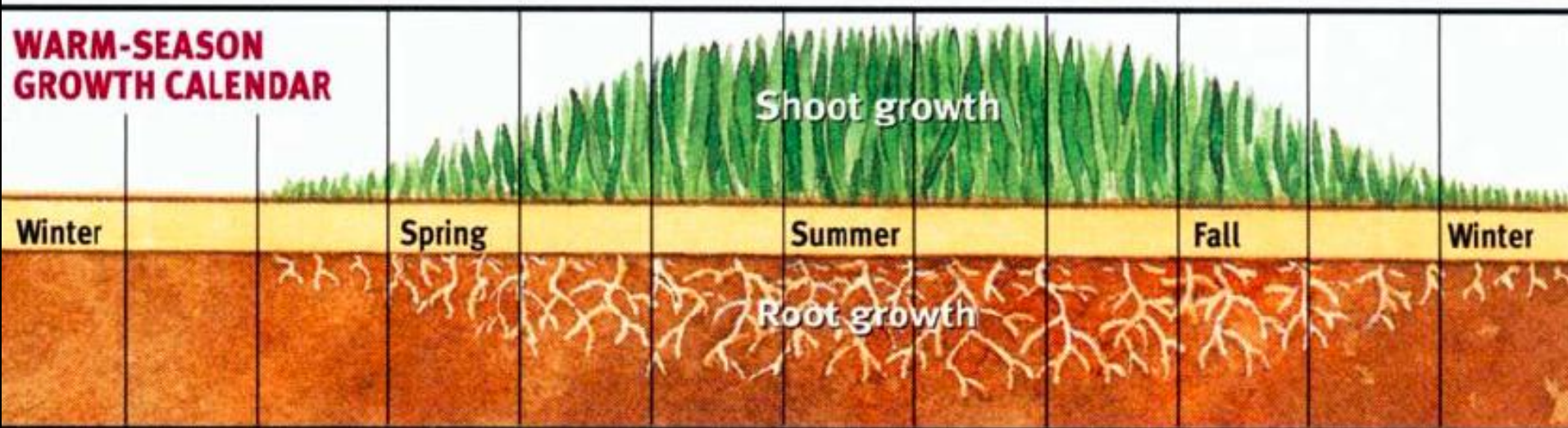
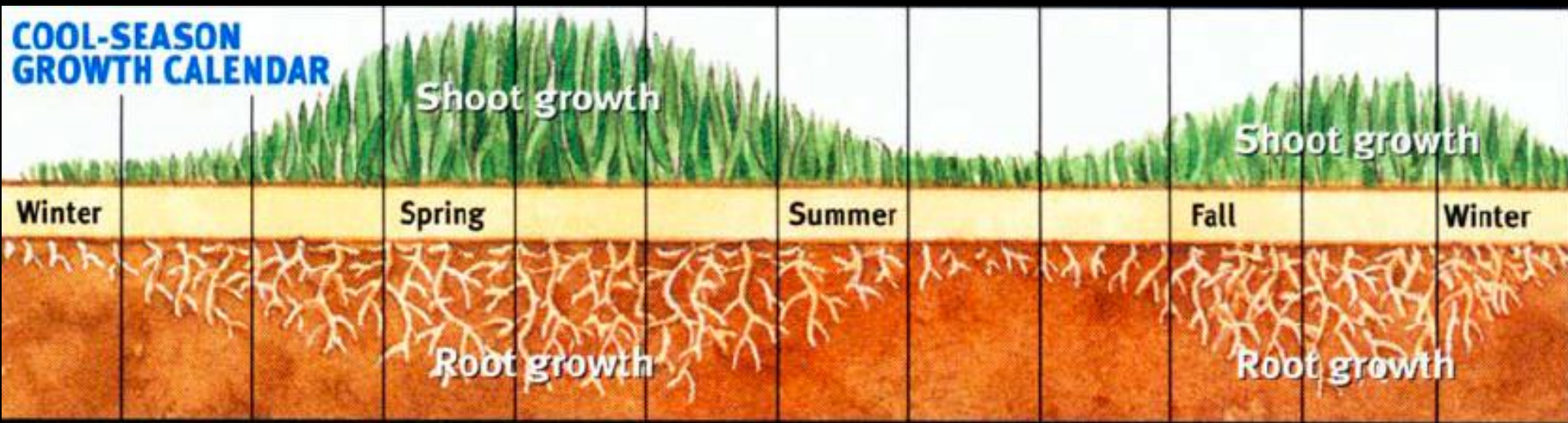


Root and Shoot Growth

Degrees F



Influences when to establish, when to fertilize, when diseases most damaging



You Can't Have Both!

- Warm and cool season lawns don't mix
- If have mix, **select preferred species and manage for that species**
- **Healthy, sustainable lawn begins with knowing your turf type**
 - Is it green now? Cool Season
 - Is it brown now? Warm Season



Overseeding with Rye?

- Very damaging!
- Bermuda is the only warm season turf that can recover from annual overseeding
 - Still not recommended!
- **Centipede will decline rapidly**
- Rye grass is allelopathic
 - Roots produce natural herbicides



Site Conditions

- How much sun?
- Most shade tolerant:
 - Tall and fine fescue/KY Bluegrass blends
 - St. Augustine
- No turf likes poor drainage
- No turf will grow on concrete!



Wear Tolerance

- All grasses have their limit!
- Most wear tolerant:
 - Bermuda
 - Tall Fescue
- Least wear tolerant:
 - Centipede
 - St. Augustine

**Large dog, small yard
= poor turf**



Maintenance

- How much time and money do you want to spend maintaining your lawn?
 - Mowing, edging, fertilizing, spraying
- **Maintenance, high-low:**
 - Bermuda
 - Tall fescue
 - St. Augustine
 - Zoysia
 - Centipede



Budget

- How much can you spend to establish your lawn?
- By seed – cheapest
 - Tall fescue, quick, high quality
 - Bermuda – quick, lower quality
 - Centipede, zoysia – slow, lower quality
- By sod – expensive
 - Better quality varieties of all except tall fescue



Carolina Lawns,

Page 8

	Can Be Seeded?	Tolerance Ratings				
		Shade	Heat	Cold	Drought	Wear
Bermudagrass (common)	Yes	1	5	1	6	6
Bermudagrass (hybrid)	No	1	5	2	6	6
Bahiagrass	Yes	4	4	2	6	4
Centipedegrass	Yes	4	4	2	4	1
Kentucky bluegrass/tall fescue mix	Yes	4	4	5	5	5
Kentucky bluegrass/tall fescue/ fine fescue mix	Yes	5	4	5	5	5
St. Augustinegrass	No	5	5	2	4	1
Tall fescue	Yes	4	4	5	5	5
Zoysiagrass	Yes	4	5	4	6	4

Aesthetic Preferences

- How important is green grass in winter?
- Do you like taller turf or shorter turf?
- Wide blade (coarse texture) or narrow blade (fine texture)
- Shade of green



Cool Season Grasses

- Green through winter – most years!
- Grow most vigorously in spring and fall
- Struggle during summer
- Bunch grasses – established by seed



**Each plant is
individual clump**

Tall Fescue

- Most heat tolerant cool season grass
- Sun-medium shade
- Mow at 3", never shorter than 2.5"
- Wide blade = coarse texture
- Dark green
- Damaged/bare areas = reseed in fall
- Irrigation needed in summer



Buying Seed

- Buy mix of 2+ varieties recommended for NC
 - Carolina Lawns, page 9
 - Kentucky 31 is NOT
- Sometimes mixed with Kentucky bluegrass and fine fescues – okay if less than 10% each
 - Better for partially shaded areas



**Turf-type tall fescue with
Kentucky bluegrass**

[Redacted] Tall Fescue Mixture

LOT

12B447STT

02142783

Pure Seed

Germination/Origin/Tested

33.09 % Mystix Tall Fescue

85 % OR 7/13

32.50 % Legitimate Tall Fescue

85 % OR 7/13

32.41 % Arisotle Tall Fescue

85 % OR 7/13

0.25 % Other Crop Seed

* variety not stated

1.50 % Inert Matter

Net Weight: 20 lbs (9.07 kgs)

0.25 % Weed Seed

Noxious weed seeds : none

Sell by Date: DE 7/14

PA,NJ,VT,NY,NH,OH,MD,VA 10/14

All other states 4/14



0 53571 50560 3

If It Sounds To Good To Be True...

- Many blends include unknown varieties and/or non adapted species
- AVOID!

Breakthrough • Patent Pending

The Science of Grass!

grassology[™]

Developed by Pearl's Premium

Ultra Low Maintenance
Grass Seed
Great for Sun & Shade!

Here's The Difference!

Slow Grow, Less Mow!

Ordinary Grass | **grassology**

Up To **4X** DEEPER!
Deep roots mean increased water and nutrient

NO MORE...

- High **WATERING** Bills!
- Weekly **MOWING!**
- Ongoing **FERTILIZING!**
- Constant **WEEDING!**

grassology[™] is Ultra Low Maintenance PLUS....

- Protects Against Disease, Weeds & Insects
- Guaranteed To Grow

Net Weight 3 lbs. (1.36 kg)

SEEDS UP TO **750** SQ. FT!

AMERICAN BLENDED

grassology^(TM) Grass Seed Mixture

PURITY	VARIETY/KIND	GERM	ORIGIN
27.13%	CREeping RED FESCUE*	80.00%	OR/CN
20.05%	TALL FESCUE*	85.00%	OR
16.91%	PERENNIAL RYEGRASS*	85.00%	OR/DK
9.91%	KENTUCKY BLUEGRASS*	85.00%	OR/WA
9.70%	SHEEPS FESCUE*	80.00%	OR
8.95%	HARD FESCUE*	80.00%	OR
5.36%	CHEWINGS FESCUE*	80.00%	OR
0.08%	OTHER CROP	80.00%	OR
1.85%	INERT MATTER		
0.05%	WEED SEED		

NOXIOUS WEED SEEDS: NONE FOUND

Date Tested 02/02/14, Sell By 11/02/14

In FL Sell By 09/02/14

In MT, SD, and WY Sell By 02/02/15

In AK, AZ, CA, CO, CT, DE, ID, IL, IN, MD, MN, NC, NE, ND, NH, NJ, NY, OH, OR, PA, SC, UT, VA, VT, WA, WI, and DC Sell By 05/02/15

LOT NO. L68-14-0127

NET WEIGHT 3 LBS (1.36 kg.)

Variety Not Stated*

Telebrands
One Telebrands Plaza
Fairfield, NJ 07004

AMS 68

NOTICE: ARBITRATION/CONCILIATION/MEDIATION REQUIRED BY SEVERAL STATES
Under the seed laws of several states, arbitration, mediation or conciliation is required as a prerequisite to
filing a legal action based upon the failure of seed to which this notice is attached to produce as
represented. The consumer shall file a complaint (sworn for AR, FL, IN, MS, MT, SC, TX, WA; signed only CA,
A, ID, ND, SD) along with the required fee (where applicable) with the Commissioner Director/Secretary of
Agriculture, Seed Commissioner (NS), or Chief Agricultural Officer within such time as to permit inspection of
the crops, plants or trees by the designated agency and the seedman from whom the seed was purchased.
A copy of the complaint shall be sent to the seller by certified or registered mail or as otherwise provided
by state statute.

Site Preparation

- SOIL TEST!!!
 - Lime and phosphorous should be tilled in
- Alleviate compaction
- Incorporate organic matter – compost
- Never 2-3" of topsoil!



Hard work but worth it!

You only get one chance to do it right

Amend Before Planting!



Compacted Clay Soil

Amended
Soil

Site Preparation

- Remove weeds and debris
- Eliminate difficult to mow areas
- Grade – rake level
- Sow September 1-15, NOT Spring
- 6 lbs. per 1000 sq. ft.



Bunch Grass

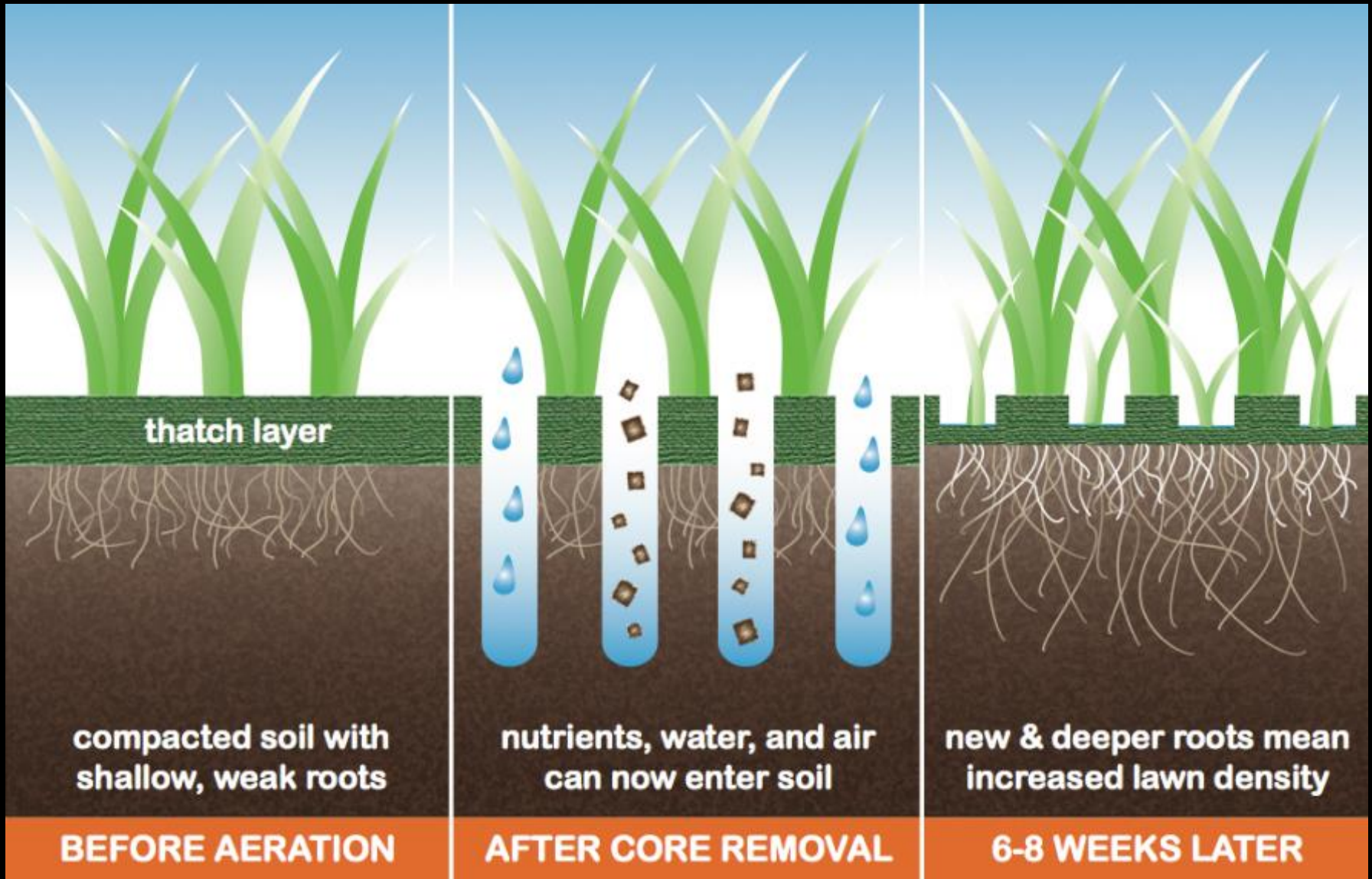


Renovate In Fall

- Bare areas
- Following drought
- September
- Core Aerate
- Seed
- Fertilize



Core Aeration



Warm Season Grasses

- Dormant in winter
- Actively grow spring-fall
- Compared to tall fescue:
 - More heat tolerant
 - More drought tolerant
 - More wear tolerant
- Many varieties must be sodded



Winter Color

How Warm Season Grasses Grow

- **Stolons** - above ground stems
- **Rhizomes** -below ground stems
- Allows grasses to **spread** into new areas and **recover from wear**

- **Stolons only:**

- Centipede, St. Augustine,
- Less wear tolerant

- **Stolons and Rhizomes:**

- Bermuda, Zoysia
- More difficult to keep out of beds



Bermuda Rhizome



Centipede Stolon

Propagation/Establishment

- **Seed, Plugs:** April – July
- **Sod:** April - September
- **Good soil prep essential!**
 - Cultivate and level
 - Incorporate lime and nutrients (soil test)
- **Water!**
 - 2-3 day for 5-15 minutes first 2-3 weeks
- No herbicides until mow at least 3 times!



Seed
Plugs
Sod



Bermudagrass

- Fine to medium texture, narrow blade
- Gray-green to blue-green color
- **Spreads rapidly**: stolons and rhizomes
 - Quickly spreads into gardens and beds
- **Excellent wear tolerance**
 - High traffic areas
 - Often used on golf courses, sports fields
- **High drought tolerance**



Bermudagrass

- Full sun, not shade tolerant
- Mow at 1"-2" with rotary mower, lower with reel mower
- Mow frequently = 2/week
- High fertilizer requirements
 - 4 applications nitrogen per year
- **HIGH MAINTENANCE**



Bermudagrass

- **Common Bermuda**
 - Coarser texture
 - Seeded – established fast
 - Often considered a weed!
 - Spreads rapidly
- **Hybrid Bermuda**
 - Finer texture
 - Some varieties can be seeded
 - Others must be established from plugs or sod
- See varieties listed in Carolina Lawns publication



Princess is an improved seed strain

Zoysiagrass

- Fine to medium texture, medium- dark green
- Spreads by stolons and rhizomes
 - Not as vigorously as Bermuda
- **Good wear resistance**
- **Very drought tolerant**
- **Tolerant of moderate shade**
- 2 – 3 applications of N/year



'Empire' Zoysia

Zoysiagrass

- Average mowing 1/week
- **Moderate Maintenance**
- Becomes **thatchy** if over fertilized or not mowed frequently enough
- Several varieties, most are sodded
- 'Zenith' and 'Compadre' can be seeded



Zoysiagrass - Older Cultivars

- 'Emerald' and 'Meyer' were the major cultivars used in North Carolina for many years
- **'Emerald'** has fine leaf texture, good winter hardiness
- **'Meyer'** has medium leaf texture and is lighter in color than 'Emerald', but it exhibits excellent cold tolerance.
- VERY SLOW LATERAL GROWTH AND RECOVERY FROM DAMAGE



Zoysiagrass - “Newer” Cultivars

All have Fast Lateral Growth



- **Wider Leaf Blade**

- Crowne
- Empire
- El Toro
- Jamur
- Zenith
- Compadre

Mow 2-3”

- **Finer Texture Leaf Blade**

- Zorro
- Zeon
- Cavalier
- Diamond
- GN-Z

Mow lower

Centipedegrass

- Low maintenance
- Spreads slowly by stolons
- Coarse texture, medium green
- **Low wear tolerance**
- Low fertilizer needs: 1 application/year
- **Slow growing – mow infrequently**
- Mow at 1" – 2"



Centipedegrass

- **Prefers acidic (pH <6) soil**
- Tolerates light shade
- **Sensitive to many herbicides**
- Common centipede establish from seed, sod or plugs
 - Seed takes 2-3 years to establish
- **'Tifblair'** recommended for piedmont – more cold tolerant



Stolons

Centipedegrass



Carpetgrass

- Appearance and care similar to centipede - produces more seed heads
- **Tolerates wet conditions, sun**
- Often sold mixed with centipedegrass seed
- Establishes much faster from seed than centipede
- **Centipede and Carpetgrass are only 2 warm season grasses that can grow together**



St. Augustinegrass

- Broadest bladed grass (coarse texture)
- Medium green
- **Most shade tolerant turf grass**
- Spreads by stolons (above ground) only
- **Not very wear tolerant**
- Annual nitrogen requirement
 - 2 – 3 applications/year



St. Augustinegrass

- Used at coast- high salt tolerance
- **Mow higher** than other warm season grasses, 2" – 3"
- Grows quickly in summer, mow frequently to prevent thatch
- **Must be sodded or plugged**
 - ‘Raleigh’ hardier variety



Turf Maintenance

- Mowing
- Weed control
- Fertilization
- Managing pests and diseases



**Home lawns cannot be
golf courses!**

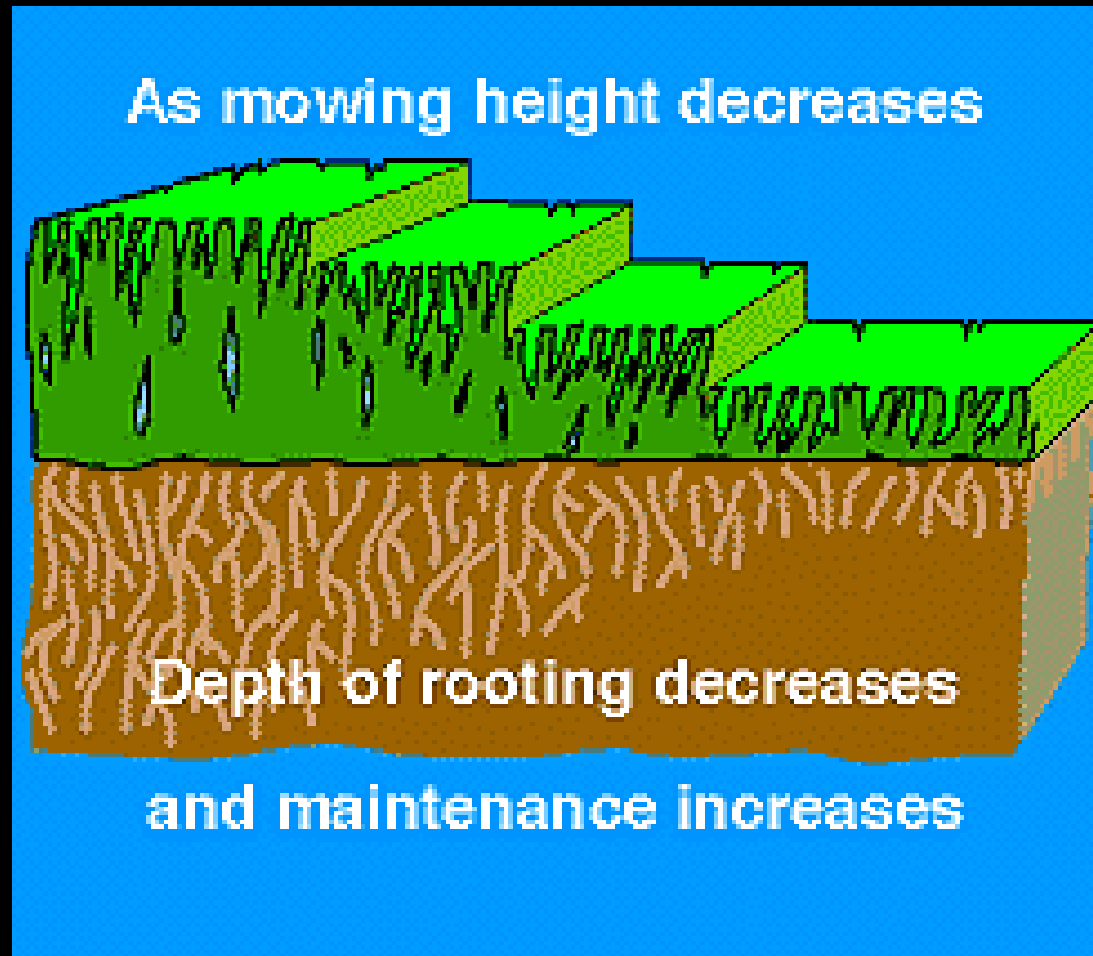
Mowing

- One of the most important things you can do to keep your lawn healthy!



Mowing

- **Mow at correct height and frequency for your turf species**
- Sharp blades
- Don't mow when wet
- **Cut off less than 50% of blade**
 - 1/3 recommended, e.g. if mowing at 2", mow when 3" tall



Scalping



Grasscycle!

- Leave clippings on the lawn to decompose
- **Reduces Nitrogen needs by 25%**
- Does not contribute to thatch when mown at correct height and frequency
- Only remove clippings when mowing delayed or weed seed abundant



What is Thatch?

- A tightly intermingled layer of dead and living stems and roots that develops between the zone of green vegetation and the soil surface.
- Problems:
 - Dry spots
 - Scalping when mow
 - Increased pests
 - Decreased heat, cold, and drought tolerance

Not Caused by leaving clippings on turf!



Causes of Thatch

- Caused when dead organic matter accumulation exceeds the rate of decomposition
 - Vigorous growing turf
 - Acidic conditions
 - Poor aeration
 - Excessive nitrogen levels
 - Infrequent mowing
 - High mowing heights



If thatch extreme in WS lawn, core aerify in late spring-early summer

Weeds!

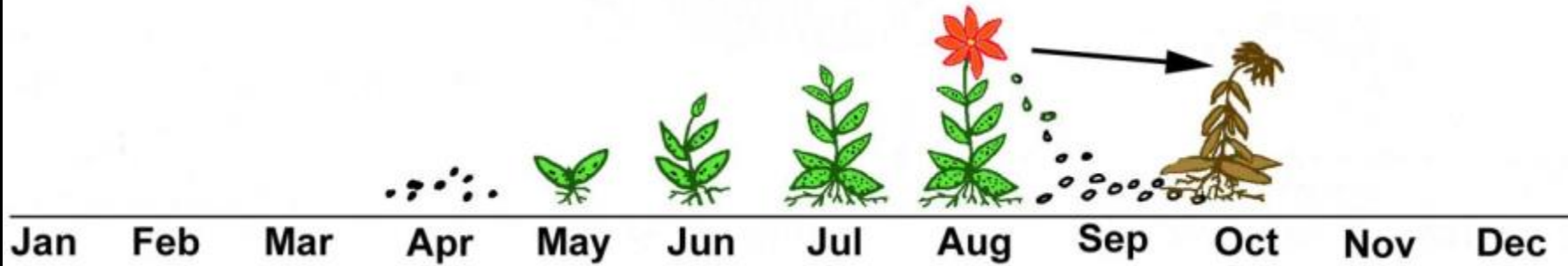
- Opportunistic – take advantage of weak areas
- #1 defense = dense, healthy turf = healthy soil!
- **Perennial weeds more difficult to control**
- Annual weeds are either:
 - Cool Season
 - Warm Season



**White Clover = perennial
Friend or Foe?**

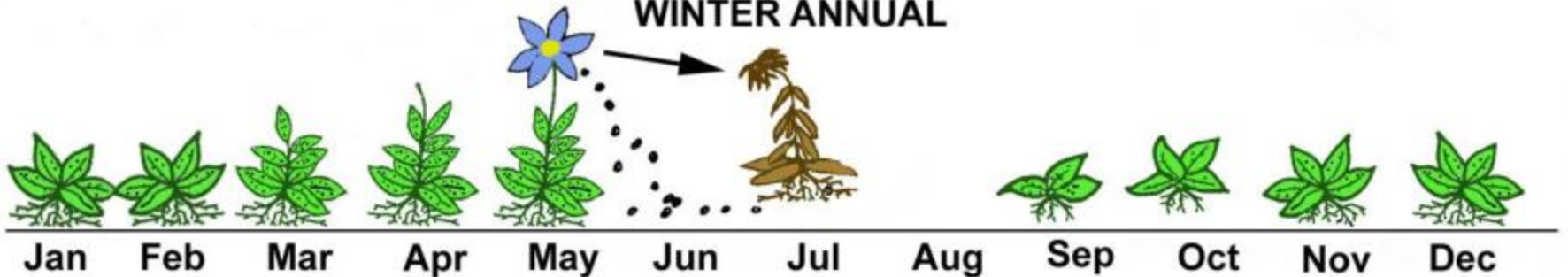
Annual Weeds

SUMMER ANNUAL



Crabgrass, spotted spurge, lespedeza

WINTER ANNUAL



Henbit, chickweed, annual bluegrass

Weeds

- Herbicides are only temporary/short term!
- **Start by identifying weed problems**
 - Broadleaf, grass, sedge/other monocot
 - Annual, Perennial
 - Cool season, warm season
- Nurture dense, healthy turf!
- **Excessive weediness (especially annuals) sign of weak/poor turf!**



**Lespedeza:
summer annual
broadleaf**

Why Is the Turf Weak?

- **Improper turf for area:**
 - not adapted to soil conditions
- **Improper care** (mowing, fertilization)
- **Herbicide damage!**
- **Pest Damage**
 - diseases, insects, nematodes, and animals
- **Environmental Stress**
 - Shade, drought, poor soil, temperature extremes
 - No turf tolerates heavy shade!
 - Irrigation needed in deep sandy soils for dense turf



NO turf thrives in dense shade!



**Large Patch
disease in fall
thins turf and
leads to winter
weed problems**

Weed Prevention

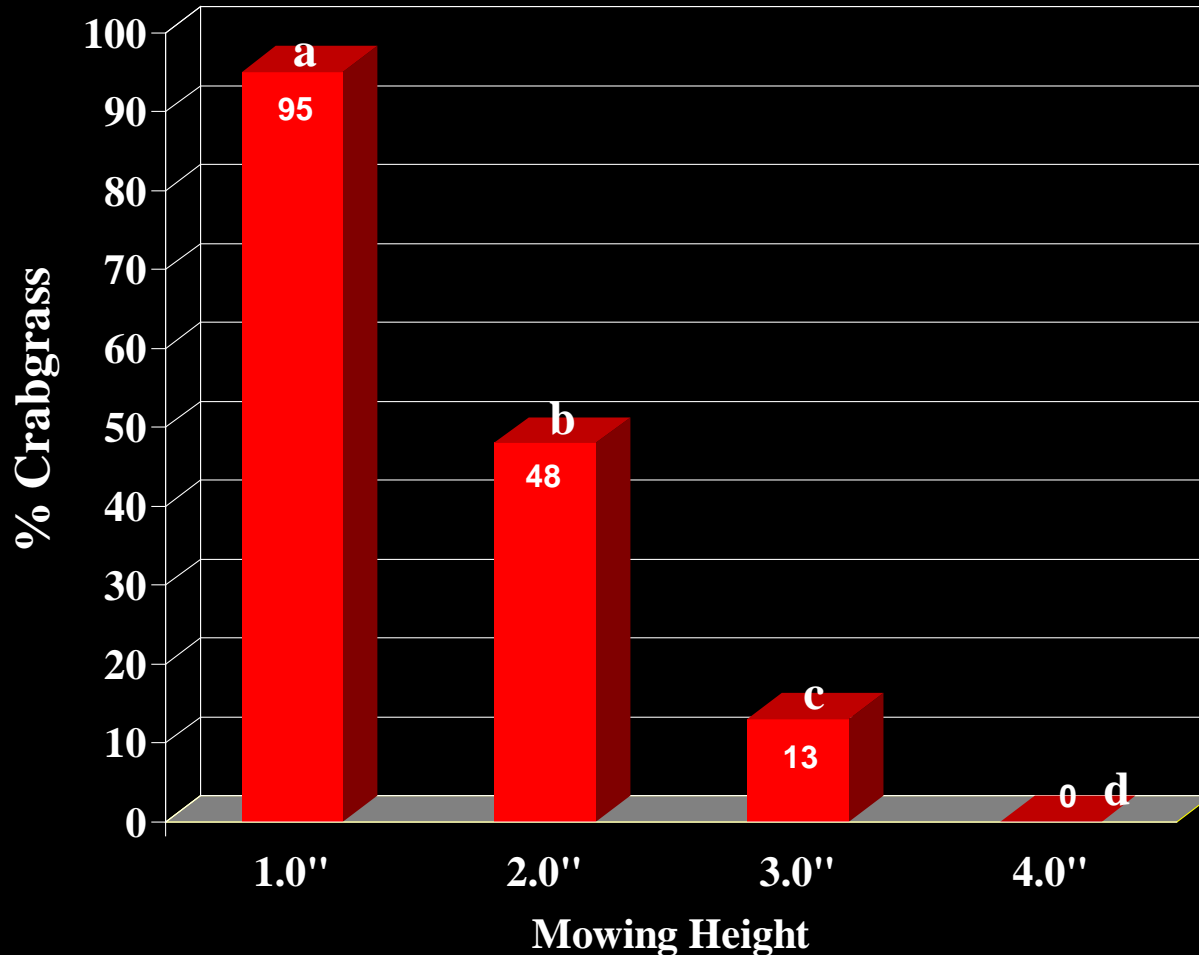
Cultural Practices

- Soil prep BEFORE planting
- Appropriate turfgrass species
- Cutting height and frequency
- Soil fertility and pH level
- Irrigation frequency and intensity
- Disease and insect control
- Core aeration of compacted areas

✓ MOST IMPORTANT

✓ MOST OVER-LOOKED
ASPECT OF TURF
MANAGEMENT

Effect of tall fescue mowing height on large crabgrass incidence



Data Collected: 09-13-07, LSD (P=0.05), Lake Wheeler Research Station, Confederate Fescue

Herbicides in Lawns

- **Weeds are not the end of the world!**
- **Herbicides damage lawns!**
 - Most sensitive during green up
- **Not all turf species are tolerant of all herbicides** – centipede and St. Augustine most sensitive
 - READ LABEL
- **Weeds vary in their susceptibility to herbicides**
 - Broadleaf, grasses, sedges
- **Perpetually weedy lawn**
 - Evaluate soil and cultural conditions



Herbicides in Lawns

- **Pre-Emergent**
 - Applied before weeds germinate
 - **Timing very important**
 - Warm season weeds (crabgrass)
 - March
 - Cool season weeds
 - September
 - Many large seeded weeds are not controlled
 - **Cannot reseed for weeks to months: check label!**



Pre-emergent herbicides do NOT control perennial weeds like nutsedge.

Pre-emergence Herbicides

- Kill young seedlings as they emerge
- Timing critical = must be applied before annual weeds germinate
- For crabgrass, when dogwoods bloom
- DO NOT apply on damaged lawns – stunt recovery



⌘ Corn gluten meal (9-1-0)

Advantages

natural material and is nontoxic
provides 1 to 2 lbs N/1000 sq.ft.

Disadvantages

provides 1 to 2 lbs N/1000 sq.ft.
cost – \$19.45 to \$38.90/1000 sq.ft. just for the material.

How to use:

Apply 10 to 20 lbs/1000 sq.ft.

If no rain for 5 days, apply 0.25 in of water

Lasts for 5 to 6 weeks

Herbicides in Lawns

- **Post Emergent**
 - Applied after weeds come up
 - **For annual weeds, most effective when young and actively growing**
 - Winter weeds: Oct-Nov; Feb
 - Summer Weeds: May-June
 - Must choose right product for weeds and turf
 - NO selective organic turf herbicides



Henbit: CS Annual

Large, flowering weeds will not be well controlled!
Great early forage for bees!

Perennial Weeds

- Eradicate before establish turf!
- **Exact ID more important than with annuals** – some herbicides more effective
- Dense stands, best option may be to treat with glyphosate (RoundUp) and re-establish turf

Wild Onion/Wild Garlic – pull clumps when soil moist OR multiple treatments with 2,4-D



Fertilization

- **Phosphorous and Lime applications based on soil test results**
 - More effective when incorporated
- **Potassium based on soil test results**
- Nitrogen rates and application times depend on grass species



Carolina Lawns, pg. 19

Table 6b. Suggested Maintenance Fertilization for Established Lawns in the Piedmont

Lawn Grass Type	Fertilization	Monthly Application Rate (lb N/1,000 sq ft)												Total lb N Per 1,000 sq ft/yr
		J	F	M	A	M	J	J	A	S	O	N	D	
Bermudagrass	Basic					1		1		1				3
	High				1	1	1	1	1	1				6
Centipedegrass	Basic					1								1
	High					1			1					2
St. Augustinegrass	Basic					1			1					2
	High					1		1		1				3
Zoysiagrass (Emerald and Meyer cultivars)	Basic					1								1
	High				1			1						2
Zoysiagrass (other cultivars)	Basic					1		1						2
	High				1		1		1					3
Kentucky bluegrass/ tall fescue mix	Basic		0.5							1		0.5		2
	High		1	0.5						1	1	0.5		4
Tall fescue	Basic		0.5							1		0.5		2
	High		1	0.5						1	1	0.5		4

How to Determine Nitrogen Fertilizer Requirements

- **To apply 1lb. of Nitrogen per 1000 sq. ft.**
 - Divide 100 by first number on the bag to determine how many lbs of product to use
 - Eg. 16-4-8 : $100/16 = 6.25$, apply 6.25 lbs of fertilizer per 1000 sq.ft.
- **To apply 0.5 lb of Nitrogen per 1000 sq.ft.**
 - Divide 50 by first number on bag
 - Eg. 5-0-15, $50/5 = 10$, apply 10 lbs of fertilizer per 1000 sq. ft.

NATURAL ORGANIC MATERIALS

<u>SOURCE</u>	<u>% N</u>
Blood meal	13
Bone meal	4
Animal tankage	7
Processed manures	3 to 6
Soybean meal	7
Feather meal	16

**Divide this number into 100 to
calculate # lbs fertilizer per 1000
square feet**

Irrigation

- **Is it necessary?**
 - Depend on turf type, weather, and SOIL and ROOT DEPTH
- **How often – depends on soil type**
 - Let grass indicate when rather than timer
 - Rule of thumb: $\frac{1}{2}$ " twice a week during growing season



Root Depth Matters!

- A shallow root system is like a small cup, whereas a deep root system is like a tall glass. More water is held in the tall glass – and more water is available to a deep root system



Drought Symptoms

- Curling of leaves in some species
- Gray or blue color develops
- Footprinting
- Wilting



- ✓ **Allowing warm season grasses to go dormant during drought is an option!**
- ✓ **Unrealistic to keep tall fescue alive through extended drought – renovate in fall**

Irrigation

- **How long – depends on water pressure**
 - Generally 1" of water will soak top 6"-8"
 - Use rain gauge to measure
 - Please have a rain sensor!!
- **Remember to turn irrigation off in September**



Time of Day To Water

- Wet grass = disease opportunity!
- Dew point should not be extended
– grass must dry out...
- Best time to water is just before or at sunrise...



Pests and Diseases

- Must identify before deciding how and if to treat!!!
- **Brown patch** = most common disease
 - Too wet, thatch, over fertilization!!!



Large Patch Brown Patch

Causal Agent:

Rhizoctonia solani

Time of year: Fall and
spring on warm season
grasses, especially
centipedegrass and
zoysiagrass;

Summer on tall fescue



**Large Patch
Centipedegrass**



**Large Patch
Zoysiagrass**



Large Patch/Brown Patch

Conditions Favoring Disease

- **Wet weather**
- **Nitrogen applications after Sept 1 or before June 1 for warm season; After March 15 for tall fescue**
- **Excessive thatch, poor soil drainage, low air movement, over-watering**

Difficult to control but proper cultural practices can prevent this disease!

For cultural and chemical control options see:

- Large Patch Fact Sheet:

http://www.turffiles.ncsu.edu/Diseases/Large_Patch.aspx

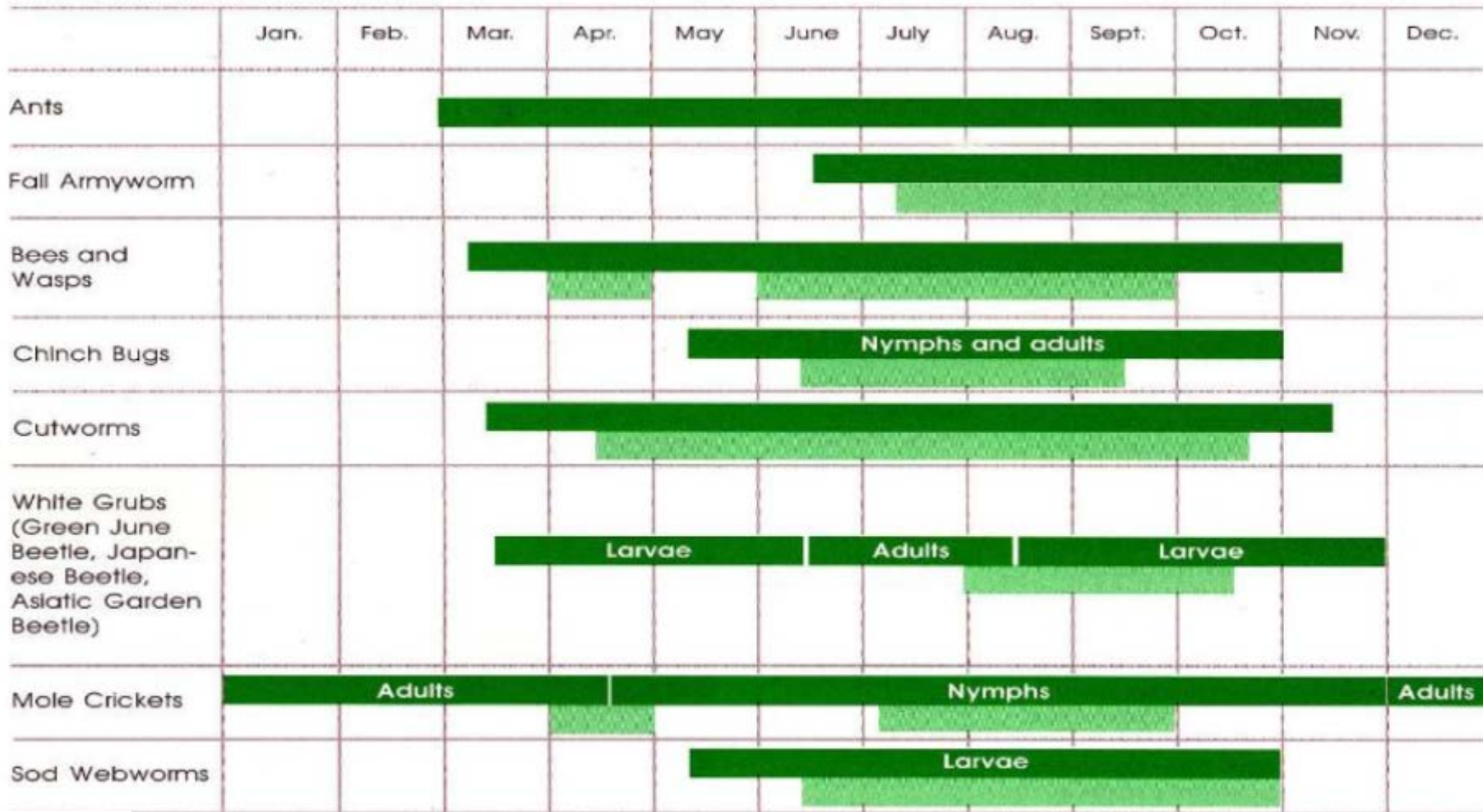
- Brown Patch Fact Sheet:

http://www.turffiles.ncsu.edu/Diseases/Brown_Patch.aspx

Fungicide	Efficacy ⁽¹⁾	Resistance Risk ⁽²⁾	Class ⁽³⁾	Products ⁽⁴⁾
flutolanil + thiophanate-methyl	++++	4	benzimidazole + carboxamide	SysStar
flutolanil	++++	4	carboxamide	ProStar
triadimefon	++++	4	DMI	Bayleton, Granular Turf Fungicide, Systemic Fungicide
azoxystrobin + propiconazole	++++	6	DMI + QoI	Headway
triadimefon + trifloxystrobin	++++	4	DMI + QoI	Armada, Tartan
propiconazole	+++	4	DMI	Banner MAXX, Kestrel, Kestrel MEX, ProPensity, Propiconazole, Propiconazole G-Pro, Propiconazole Pro, Sawvi, Spectator, Strider
chlorothalonil + propiconazole**	+++	4	DMI + nitrile	Concert
chlorothalonil + propiconazole + fludioxonil**	+++	4	DMI + nitrile + phenylpyrrole	Instrata
azoxystrobin	+++	6	QoI	Heritage

Insects

Periods of Insect Activity and Treatment Timing Chart for North Carolina



[Solid Green Bar] = Insect present

[Dotted Green Bar] = Periods when control most likely needed and most effective.

Note: Periods of activity will vary up to three weeks from the mountains to the coast.

Soapy Water Flush

2 tsp of dish detergent in 2 gallons of water poured over 1 sq. yd.

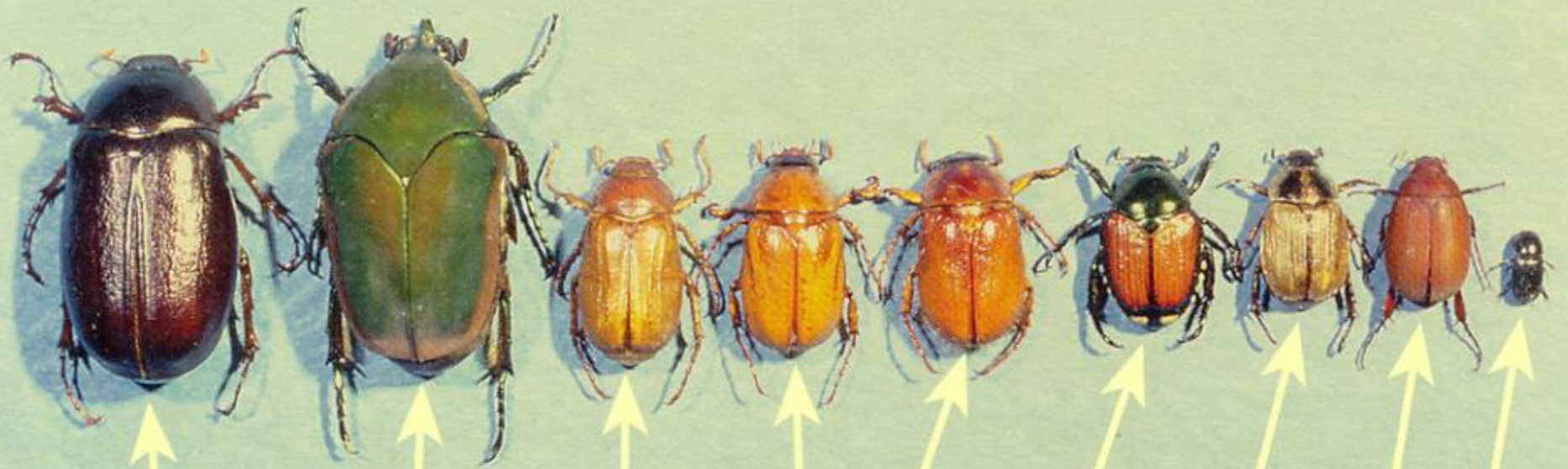
Soil dwelling insects will come to the surface



White Grubs



- Creamy white larva of various beetles with brown head, curled into C-shape
- Size 1/4 - 1 1/2 inches
- One year life cycle
- **Most of life in ground**
- 1-3 inches below ground, typically
- Japanese Beetle is most common species
- **Rarely damage warm season turf unless over 10/sq. ft**
- Heavy root damage may cause spongy turf
- **Usually worse in irrigated turf**



May/June Beetle

Green June Beetle

Eur. Chafer

Masked Chafer

Japanese Beetle

Oriental Beetle

Asiatic Garden Beetle

Black Turfgrass Aetaenius



**Control only necessary if over
10 grubs per square foot**



Target treatment to life stage:

- Merit (imidaclopyrid) in June
- Other insecticides in August while grubs small and near surface
- Milky spore disease – long term
- Learn more: http://www.turffiles.ncsu.edu/Insects/White_Grubs.aspx



<http://www.turffiles.ncsu.edu>

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Center for Turfgrass Environmental Research & Education
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2009 North Carolina Turfgrass Conference & Show
PRESENTATIONS
Dates: January 26 - 29, 2009

Water Quality

- C. Peacock : BMPs for Water Conservation in Turf
- C. Peacock : The Environmental Benefits of Turfgrasses
- C. Peacock : Utilizing The Turfgrass Irrigation Management System
- D. Bowman : Water Use in Warm season vs Cool season Turfgrasses
- D. Bowman : Physiology of Turfgrass Drought Response


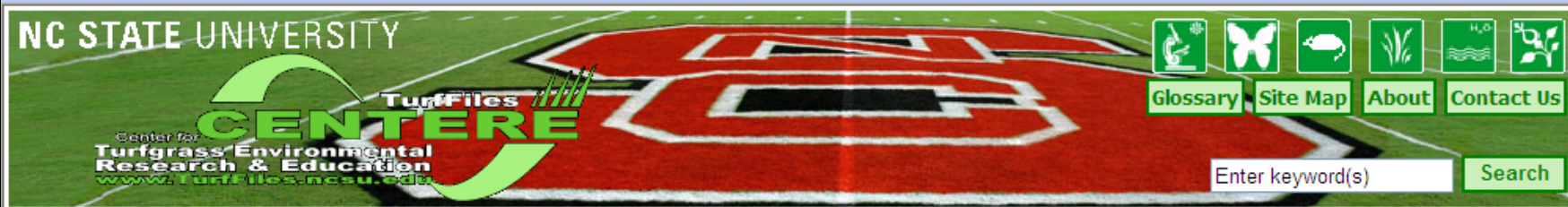

Turfgrass Information

Alerts News Presentations Careers Internships

Disease Aids Turf/Weed Aids Water Aids

NEW FEATURE!!!
Sign up for Turf ALERTS

Disease Identification
Many diseases occur on the turfgrasses that are used



Sustainable Lawns

- Begin by choosing right location for turf, then choose best adapted species for location
- Soil preparation is essential!
- Fertilize and lime based on soil test results
- Mowing = most important maintenance task
- Identify all weeds and problems before treating!



Questions?



Next Class

NO class next week –

Happy Easter!

Next class: Vegetables
and Culinary Herbs

- Evening, **Wednesday,
April 15, 6:00-8:30**
- Morning, **Thursday,
April 16, 9:30-12:00**

**Return Soil Sample and
Forms by April 16!**

