

THE UNIVERSITY OF GEORGIA  
**COOPERATIVE EXTENSION**  
 Colleges of Agricultural and Environmental Sciences & Family and Consumer Sciences

## Turfgrass IPM Strategies

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Prevention  
 Cultural/Sanitation  
 Physical/Mechanical  
 Biological

## Practical Turfgrass Areas

- Turfgrass benefits:
  - Reduces erosion and stormwater runoff
  - Provides aesthetic appeal
  - Absorbs pollutants from air and water
  - Provides recreational space
- However turfgrass disadvantages include:
  - More maintenance than most plants
  - Misconceptions about irrigation needs, which results in wasted water and thus water restrictions

\*The amount of lawn area should be minimized in areas that are not used much! Does your lawn have a practical purpose?

## Your Idea of The Perfect Lawn?

## The Perfect Lawn?

- No weeds
- No insects
- No diseases
- No fertilizer
- No watering
- No mowing
- Green 365 days a year

## The Perfect Lawn?

## Top 5 Lawn Problems

1. People/Abiotic Disorders (70%)
2. Fungal Diseases (15%)
3. Weeds (10%)
4. Insects (5%)
5. Nematodes (<1%)

Source: these numbers were pulled out of thin air (based on experience)

## Turfgrass Integrated Pest Management (IPM)

- Most insects, diseases, and weeds that affect lawns can be minimized or avoided just by simply managing your grass properly!

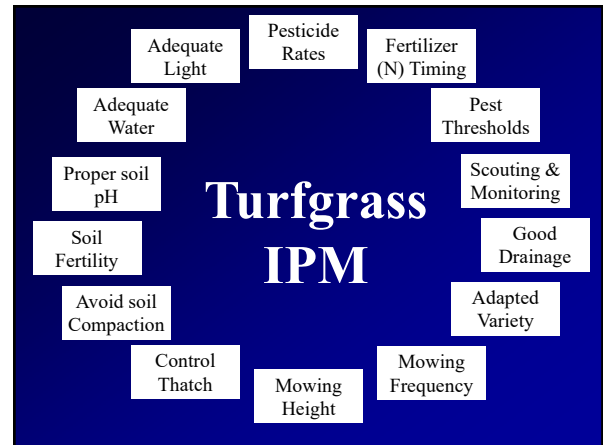
## You biggest enemies...

1. Bare spots
  2. Excess moisture
  3. Improper fertilization
  4. Soil compaction
  5. Shade
- Weeds
  - Insects
  - Diseases

The real problem is not the pest, but the underlying cultural issue that allowed that pest to thrive...

## Abiotic Turfgrass Disorders

- Pesticides – especially herbicides
- Animal urine – “dog-on-it” problems
- Excess fertilizer
- Soil pH and Nutrient Deficiencies
- Chemical spills i.e. soaps, fuel, cleaners
- Soil compaction
- Excess thatch
- Temperature – heat stress & winter kill
- Shade and tree root competition
- Scalping & mower injury – dull blades
- Abrasive Injury - heavy use i.e. ball fields & dog runs
- Septic tank & drain fields
- Water stress – drought, over watering, poor drainage



## Common Lawn Question:

- My grass is turning brown, what should I do?
  - a) Tell the client to spray insecticide
  - b) Tell the client to spray fungicide
  - c) Tell the client to soil test/fertilize
  - d) Ask the client what type of grass

## What type of grass?

- If the client doesn't even know what kind of lawn they have, there's a good chance they caused the problem!
- Affects fertilizer and herbicide selection, mowing height, water decisions...

## Turfgrass IPM in 10 Easy Steps

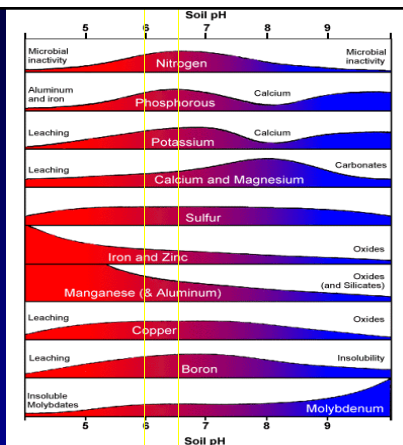


## Step 1: Prepare Soil Properly

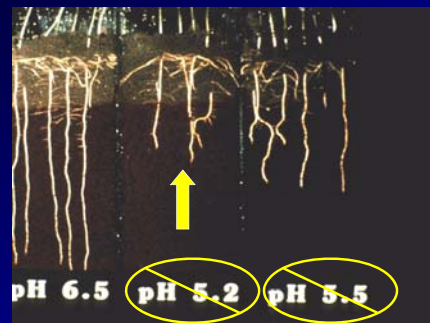
- Remove debris i.e. rocks, wood, stumps
- Proper drainage and grading
- Replace topsoil + organic matter
- Soil Testing: "Thou Shalt Soil Test!"
  - pH levels = lime needs?
  - Nutrient levels = fertilizer needs?
  - Poor fertility = poor establishment, poor drought tolerance, poor persistence, poor disease resistance, more weeds



- How pH affects Nutrient Availability



## Low Soil pH = Add Lime



## Turfgrass Fertility Considerations

- Application amount
- Application timing
- Desired Growth rate/quality
- Fall fertility?
- Fertilizer source (quick-release vs. slow-release vs. organic)
- Nitrogen (N)
- Phosphorous (P)
- Potassium (K)
- Turf species...

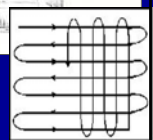
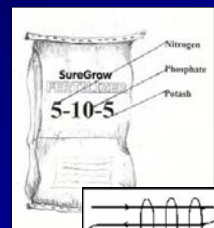


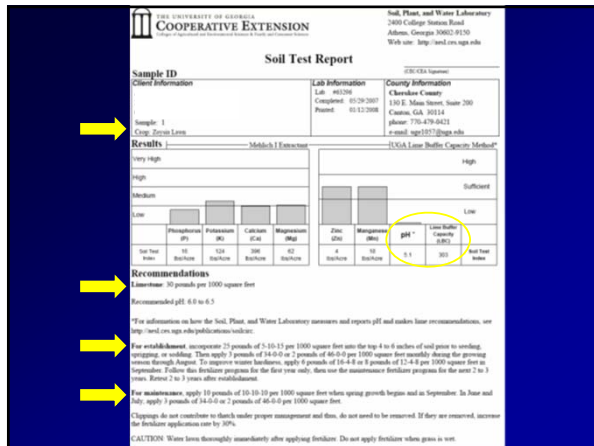
Turfgrass	Annual Nitrogen (lb./1000 sq ft.)	Turfgrass	Annual Nitrogen (lb./1000 sq ft.)
Bermuda	4 to 5	St Augustinegrass	2 to 5
Centipede	1 to 2	Zoysia	2 to 4
Tall fescue	2 to 5		

\* Changes do not contribute to thatch under proper management and do not need to be removed. If they are removed, increase fertilizer application rate by 50%.

## The Fertilizer Bag

- Numbers refer to percent N-P-K in the bag
- Example: 16-4-8 has:
  - 16% Nitrogen (or 8 lbs. N in a 50 lb. bag)
  - 4% Phosphorus
  - 8% K (Potassium)
- Nutrient sources also listed





## Fertility Under Drought Conditions

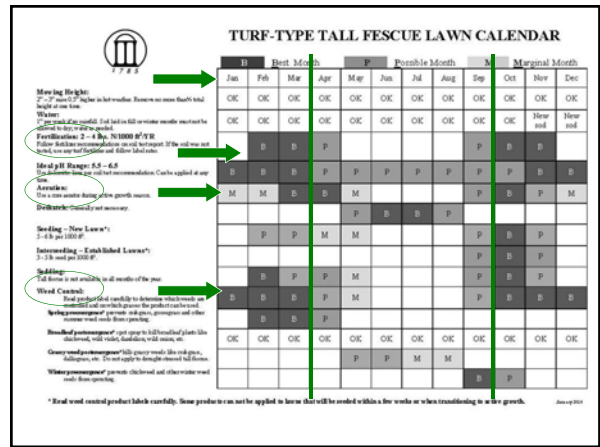
- Grass growth is reduced during drought
- You don't want to try and push growth on drought-stressed grass, so fertilizer needs should be reduced
- Best to postpone fertilization or reduce amount applied
- Slow-release N is better, as it will provide more regulated growth
- Irrigate after applying fertilizers

## Step 2: Plant A Locally Adapted Turfgrass

- Cool Season Grasses;
- Fescue and Bluegrass
- Best time to establish in Fall; Spring is marginal
- No winter dormancy
- Suffer during extreme summer temperatures (above 90F)
- Most established by seed

	Fine Fescue*	Kentucky Bluegrass*	Tall Fescue*
Region Best Adapted:	Mountains & Piedmont	Mountains	Mountains & Piedmont
Adaptation			
Heat hardness	P - F	P - F	G
Cold hardness	VG	VG	VG
Drought resistance	G	F - G	G
Sun tolerance	P - G	VG	F - G
Shade tolerance*	VG	G	G
Soil tolerance	P	P	F
Wear tolerance	F - G	G	G
Establishment	Fast	Medium	Fast rate**
Optimal soil pH	4.5-7.6	5.5-7.6	5.4-8.0

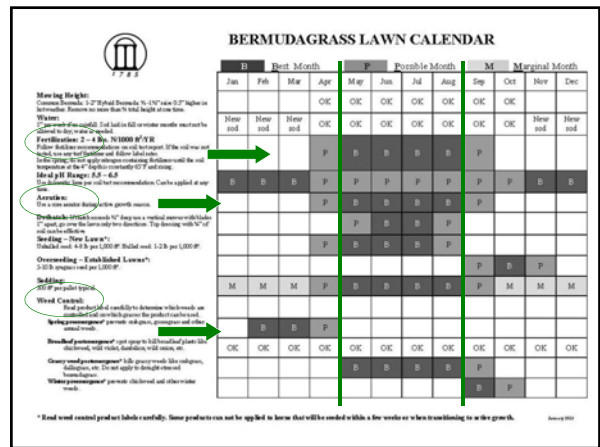
Key: E = Excellent, VG = Very Good, G = Good, F = Fair, P = Poor, VP = Very Poor  
 \* Can be seeded  
 \*\* Vegetatively propagated  
 \*\*\* Turfgrasses need at least 4 hours of direct sunlight per day.  
 \*\*\*\* Establishment rate depends on planting date, seeding rate and environmental conditions.



## •Warm Season Grasses

	Bahiagrass*	Bermudagrass (common)*	Bermudagrass (hybrid)*	Carpetgrass*	Centipedegrass*	St. Augustine*	St. Augustine*	Zoysiagrass*
Region Best Adapted:	Statewide, excluding mountains	Statewide	Statewide	Coastal Plain	Statewide	Coastal Plain	Coastal Plain	Statewide
Adaptation								
Heat hardness	VG	E	E	E	G	E	E	E
Cold hardness	F	P	F	VP	F	P	P	VG
Drought resistance	E	E	E	P	G	E	G	G
Sun tolerance	VG	E	E	G	VG	E	VG	VG
Shade tolerance*	G	VP	VP	P	G	P	VG	G
Soil tolerance	P	G	G	P	P	E	VG	G
Wear tolerance	E	E	E	P	P	G	P	G
Establishment	Slow to medium	Fast	Fast	Slow	Slow	Fast	Medium	Very slow
Optimal soil pH	6.5-7.6	5.1-7.1	5.1-7.1	4.7-7.1	4.0-6.1	5.5-7.5	6.1-8.1	4.6-7.6

Key: E = Excellent, VG = Very Good, G = Good, F = Fair, P = Poor, VP = Very Poor  
 \* Can be seeded  
 \*\* Vegetatively propagated  
 \*\*\* Turfgrasses need at least 4 hours of direct sunlight per day.  
 \*\*\*\* Establishment rate depends on planting date, establishment rate and environmental conditions.



### Step 3: Purchase High Quality Seed or Sod from reputable dealers

- Blue Tag Certified Sod
  - Inspected for varietal purity
- Certified Seed
  - Tested for freedom from weed seeds
  - [www.certifiedseed.org](http://www.certifiedseed.org)
- Avoid future insects, diseases, & weeds by starting with a clean source!
- Purchase from reputable, licensed growers/dealers
- National Turf Evaluation Program
  - [www.NTEP.org](http://www.NTEP.org)



### Step 4: Mow at the Recommended Cutting Height

- Mow no more than 1/3 of grass height at a single cutting
- Raise mowing height during high stress periods:

- Heat/Cold
- Drought
- Shade

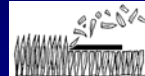


Table 5-6. Mowing height – lawn grasses in Georgia.

Grass	Mower	Height (inches)	Frequency (days)
Bermudagrass			
Common	Rotary or reel	1-2	5-7
Hybrid		0.5-1.5	3-4
Centipedegrass	Either	1-2	5-10
St. Augustinegrass	Rotary	2-3	5-7
Seashore Paspalum	Either	1-2	5-7
Zoysiagrass	Reel	0.5-2	3-7
Tall Fescue	Rotary	1.5-3	5-7

### Mowing Tips



- ✓ Don't mow grass when wet
- ✓ Keep mower blades sharp!
- ✓ Change mowing patterns

### Step 5: Irrigate Properly

- Most important practice!!!!
- Apply water only when grass shows stress symptoms:
  - Dull bluish-green color
  - Leaf blade rolling/folding
  - Foot prints
- Apply enough water to soak soil 6 to 8" inches deep:
  - Approx. 1" of water every 7 to 10 days

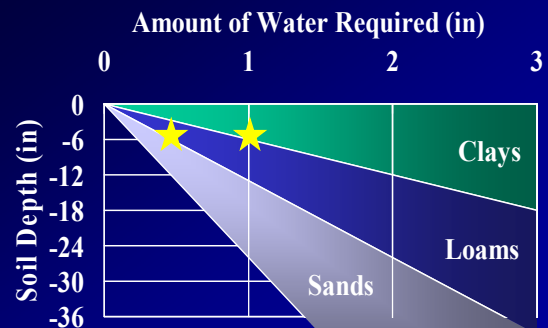


Short, frequent irrigations:

Longer, less frequent irrigations:



### Water to Wet to a Depth of 6-8" inches



## 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...



## Irrigation System Efficiency

- One of the most important things to do during a drought is to check the efficiency of your irrigation system.
- Make sure it is applying water uniformly to the turf areas and that all heads are working properly.
- A rain sensor is an excellent investment- it will tell the system not to come on if there has been rainfall.
- Don't water sidewalks!!!



## Step 6: Minimize Soil Compaction

- Compaction prevents water, nutrient, and air uptake by grass roots
- Avoid driving over turf grass
- Cultivation Practices:
  - Core aeration when grass is actively growing



## Benefits of Core Aerification

- Loosens compacted soil
- Enhances oxygen levels in the soil
- Stimulates production of new shoots and roots
- Helps increase the density of the turf
- Reduces water runoff
- Increases the lawn's drought tolerance

## Core Aerification

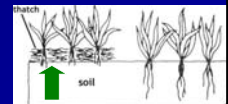
### How often?

- As often as needed
- Depends on traffic and compaction



## Step 7: Remove Excess Thatch

- Thatch encourages insect and disease problems
- Thatch accumulates only if lawns are not mowed, irrigated, or fertilized properly!
- Short clippings do not cause thatch:
  - Can actually save on fertilizer cost!
- Dethatch or vertical mow only if thatch layer is thicker than 1/2" inch



## Disadvantages of Thatch

### Greater than ½ inch

- Harbors insects & disease
- Limits root penetration
- Reduces water infiltration
- Limits seed establishment
- Affects field performance

## Advantages of Thatch

### Up to Approx. ½ inch

- Adds resiliency to the turf
- Increases wear tolerance
- Increases impact absorption

## Thatching of Common Grasses

Thatching Tendency	Turfgrass
Moderate to Heavy	Bermudagrass Zoysiagrass
Low to Moderate	Kentucky Bluegrass Buffalograss Creeping Red Fescue
Low (or nonthatching)	Tall Fescue Perennial Ryegrass

Puhalla et al., 1999

## Topdressing

### Reasons

- ★ Thatch management
- ★ Surface leveling
- ★ Soil amendment
- ★ Improve drainage
- ★ Assist in overseeding

## Topdressing

### Procedures

- ★ Light & frequent
  - ★ 1/16 to 3/8"
- ★ Reaching soil surface
  - ★ mow turf low
  - ★ broom or rub-in



## Topdressing

### Material

- ★ Similar to existing
  - ★ Chemically
  - ★ Physically
- ★ Prevent layering
- ★ 2:1 Native soil/humus



## Step 8: Allow for Adequate Light and Air Movement

- Shade creates an environment for diseases to spread.
- Prune trees limbs up to reduce humidity and increase light and air circulation.
- Increase mowing height to allow grass to absorb more light
- Reduce fertilizer amounts by 20-50% in shady areas.



## Influence of tree roots and shade on turfgrass stress.

- Grass and Trees do not get along!!!



## About Shady Situations....

- ✓ Mow at highest recommended height
- ✓ Less irrigation required
- ✓ Less fertilizer required
- ✓ Watch other stresses (traffic, insects, diseases, excess water)
- ✓ Potassium may help turf resist diseases better



## Step 9: Follow Insect, Disease, and Weed IPM Practices

- ✓ Chemicals are not the answer to every pest problem!
- ✓ Proper cultural practices can reduce most pest issues.
- ✓ Maintain a healthy, stress-free turfgrass!
- ✓ If pesticides are necessary, always read and follow the label!
- ✓ Catch weeds/insects while small and immature!
- ✓ Know what you are trying to control!

## Common Turf Insects

1. Armyworms
2. Chinch bugs
3. Spittlebugs
4. White Grubs
5. Fire Ants
6. Digger Wasps
7. Mole Crickets



## Turfgrass Insect Categories

- Insects that feed below ground include:
  - mole crickets, white grubs and billbugs.
- Insects that chew turf foliage include:
  - armyworms, cutworms and sod webworms.
- Insects that extract plant sap include:
  - aphids, chinch bugs and spittle bugs.
- Other (nuisance) pests are:
  - fire ants, cicada killers, digger bees



## Nature of Turf Damage & IPM

- **Soil-Inhabitants:**
  - Feeding by white grubs, billbugs, and mole crickets usually shows up as wilted, dead or dying grass. Sod may be disturbed in areas where wildlife or pets dig up soil-inhabiting pests.
- **Thatch-inhabitants:**
  - Damage by sod webworms, armyworms and cutworms is apparent when grass is cut off or chewed close to the ground.
  - Damage by chinch bugs and spittlebugs (sap feeders), is similar to damage caused by soil inhabitants. Irregular spots of yellowish turf and dead spots may occur when uncontrolled.

## General Insect Thresholds

- Armyworms: 3-5 per sq. ft.
- Chinch bugs: 20-24 per sq. ft.
- Cutworms: 3-8 per sq. ft.
- Sod webworms: 15+ per sq. yd.
- Spittle bugs: “squishy grass”
- White grubs: 5-10 grubs per sq. ft.  
> 20 grubs in highly maintained/irrigated turf



## Early Detection - IPM

- This is the weakest link in pest management programs for lawns.
- Most insects go unnoticed until after their damage is observed.
- Two techniques useful in detection and monitoring insects in turf grasses include floatation and irritation.



## Floatation Method for Monitoring

- Floatation uses water to detect the presence of chinch bugs. Remove the bottom from an oil can, coffee can, or similar container. Push the can 2 to 3 inches into the turf in an area of suspected chinch bug infestation.
- Fill the can with water and hold the water level above the grass by adding additional water for about 5 minutes.
- If chinch bugs are present, they will float to the top.



## Irritation Method for Monitoring

- The irritation method is particularly useful in detection and monitoring of mole crickets, cutworms, armyworms or sod webworm infestations.
- Mix 2 tbs. dish detergent with 2 gal. water and pour over a turfgrass area.
- The detergent irritates sensitive pests causing them to quickly come to the surface.
- Use 1 gallon of water to sample a one square yard area of turfgrass via sprinkling can
- Pyrethrin is also a good flushing agent when used at 1-3% concentration in water.



## Sampling for White Grubs

- Use a spade to cut 1 foot square piece of sod and hinge
- Go 2-3” in. deep
- Count grubs
- Sample several spots and avg.



## Lawn Insecticide Tips

- Avoid broadcast applications over the entire lawn with insecticides unless you know you have a widespread infestation.
- Broadcast applications should be limited to “bait” products that target a specific problem such as fire ants.
- Many insecticides work better if lawns are watered before and/or after application – read and follow the label.
- Treat when insects are most active
- Monitor frequently and catch insect issues early
- ALWAYS look up chemical recommendations in pest control handbook

## Common Turf Diseases

1. Dollar Spot
2. Take-All Root Rot
3. Brown Patch
4. Rust
5. Leaf Spot/Melting Out
6. Pythium Root Rot
7. Fairy Ring
8. Anthracnose



## Root Diseases vs. Leaf Diseases

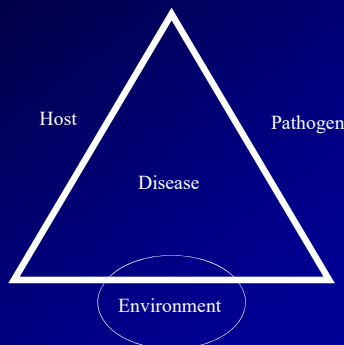
- Root diseases cause more permanent damage to lawns.
  - Lawns often take longer to recover from root diseases.
  - Fescue lawns often have to be re-seeded or re-sodded after a root disease
- Leaf diseases can recover more quickly IF turfgrass has a healthy root system.
  - Many leaf diseases are weak pathogens or secondary diseases (affecting mostly stressed grass)

## Turfgrass Disease Calendar

Georgia Turfgrass Disease Calendar (Warm and Cool Season Grasses)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anthracnose												
Fairy Ring												
Take-all Root Rot												
Gray Leaf Spot												
Dollar Spot												
Brown Patch												
Large Patch												
Leaf Spot/Melting Out												
Slime molds												
Pythium Root Rot												
Pythium Blight												

## Turf Disease Management Tips



## Turf Disease Prevention (Review)

- Use an adequate level of nitrogen, particularly in the spring and early summer.
- Avoid high nitrogen fertilizers when diseases are active.
- Check potassium and phosphorus levels with a soil test every few years.
- Mow grass at regular intervals.
- Mow grass at highest recommended height
- Reduce thatch by vertical cutting.
- Aerate soil (when grass is actively growing)
- Reduce shade and Increase air circulation.
- Irrigate turf deeply and as infrequently as possible to avoid drought stress. Avoid frequent and shallow irrigation schedules
- Improve drainage of turfgrass.
- Remove dew from the turf early in the day (drag hose over the turf).
- Irrigate turf early in the day.
- Apply lime if pH is less than 6.5
- Reduce turf stress by using lightweight equipment and decrease foot traffic.
- Plant disease resistant varieties.
- Fungicides are available to help manage certain diseases.
- Avoid using herbicides when disease is active

## Turfgrass Fungicide Tips

- Apply fungicides preventatively:
  - When weather conditions favor disease
  - When turfgrass is stressed
  - Grass varieties in “marginal” situations
  - First sign of disease activity
- Most fungicides have to be reapplied every 7-14 days – read the label.
- Spring and Fall applications are most effective at preventing many diseases
- Always look up fungicide recommendations

## Turfgrass Nematodes



- Rarely a problem in home lawns
  - More common in lawns placed in old farm fields where corn or soybeans were grown
  - Sandy soils are more vulnerable to nematodes
- Soil testing for nematodes should be recommended only when all other issues have been ruled out first
- Options for nematode control in home lawns are limited – Chitin? Try different grass?

## Common Turf Weed Categories

- Broadleaf weeds:



- Grass weeds:



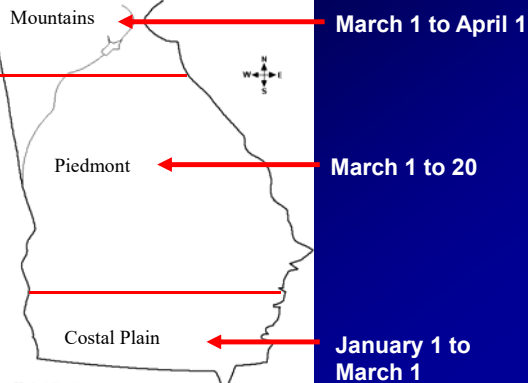
- Sedges, Wild Onions, Garlic:



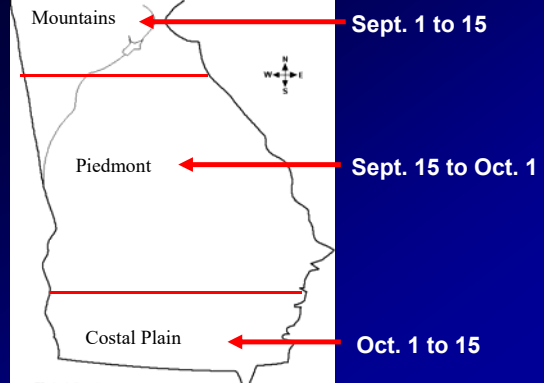
## Managing Annual Lawn Weeds

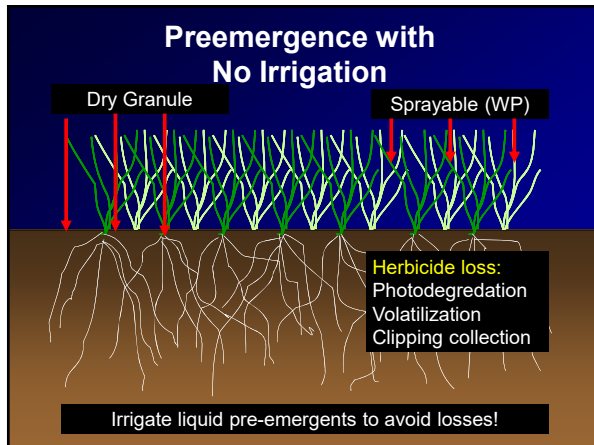
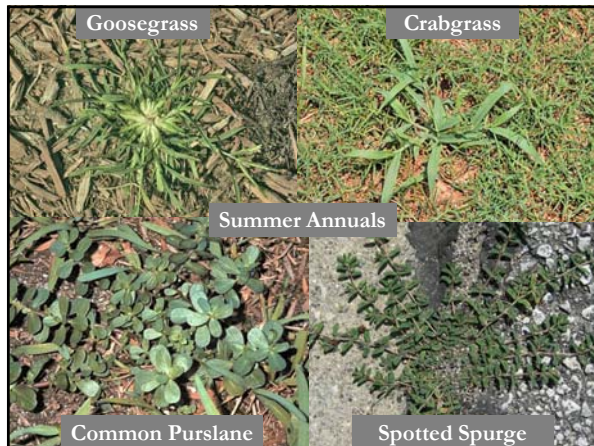
- Examples: crabgrass, bluegrass (*Poa*), henbit, chickweed, pigweed, smartweed, hop clovers, spurge
- Pre-emergents are the cornerstone of good ANNUAL weed management.
  - Apply pre-emergent herbicides in spring and fall ON TIME!
  - Water-in pre-emergent herbicides to activate them (according to the label) as soon as possible.
- Apply selective post-emergent herbicides sparingly. Spot-spray as needed.

### SPRING Pre-emergent Application



### FALL Pre-emergent Application





**Managing Perennial Lawn Weeds**

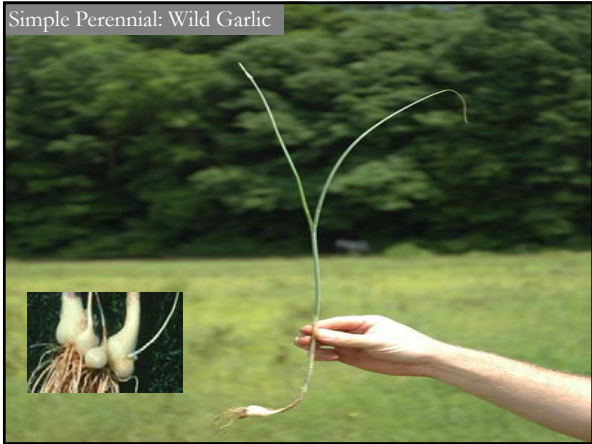
- Examples: dallisgrass, nutsedges, garlic, onions, dandelion, horsetail, VA buttonweed, plantains, yellow woodsorrel, clover
- Pre-emergents don't control perennial grasses or broadleaf weeds that are already established.
- Apply selective post-emergent herbicides sparingly. Spot-spray as needed.



**Know Your Weeds**

- **Perennial Weeds**
  - Simple perennials: primarily reproduce and spread by seed.
  - Will re-grow from a fleshy taproot (broadleaves) or crown (grasses)
- **Management Implications**
  - Partial control with hand-pulling and digging.
  - Preemergence herbicides may help stop the spread from seed but may not be reliable.

Simple Perennial: Wild Garlic



## Know Your Weeds

- Perennial Weeds
  - Complex perennials: primarily reproduce and spread by asexual reproduction (rhizomes and stolons)
  - Examples: White clover, Canada thistle, ground ivy, bermudagrass
- Management Implications
  - Hand pulling and digging is not a long-term control solution.
  - Weeds tend to grow in patches.
  - If spot treating/renovating area, treat a larger area surrounding the patch.

Complex Perennial: Ground Ivy



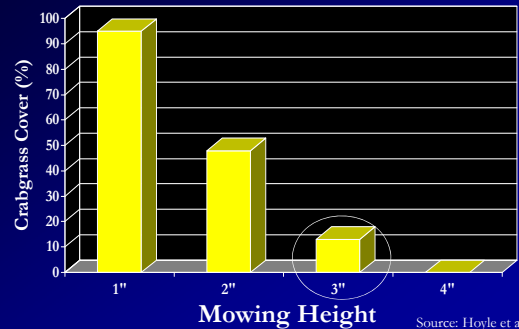
Complex Perennial: Bermudagrass



## Turf Weed Management Tips

- Keep grass thick and healthy!!
- Don't fertilize the weeds when your grass is dormant!!
- Use Weed & Feed combination herbicides/fertilizers with CAUTION!
- Avoid applying post herbicides during spring/fall transition.
- Control weeds while they are small and before they go to seed!
- Look up herbicide recommendations for weeds

## Mowing Height Effect on Smooth Crabgrass Incidence in Tall Fescue

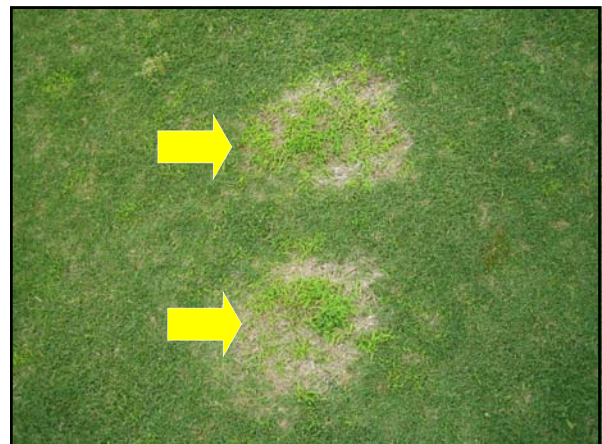


## Mowing Practices Influence Weeds

- Mowers and other machinery may spread weeds
  - Clean equipment after use
  - Use sharp blades
- Clipping Collection
  - Clipping return may help replenish soil with seeds from seedheads
  - Summer: Crabgrass and Goosegrass
  - Winter and Spring: *Poa annua*

## Cultural Weed Control

- Soil factors
  - Poor drainage, improper pH, or excessive compaction limit turf growth
  - Wet soil
    - Sedges - purple nutsedge, green kyllinga, Rashes, Annual bluegrass, Mosses
  - Compacted soil
    - Annual bluegrass, Goosegrass, Prostrate knotweed, Common lespedeza, Path rush



## Important Tips for Herbicide Use

1. Always read the label and make sure that the crop or site that you are spraying is *explicitly* stated on the label.

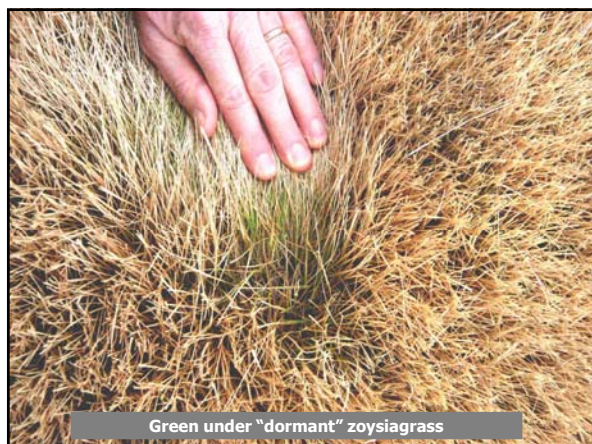
**NEVER** assume that if a product is labeled for one type of lawn that it will be okay to use on all lawns!

## More Tips for Herbicide Use

2. Never apply at a higher rate or more often than allowed on the label.
3. You only need to spray a weed long enough to make contact with the leaves.
4. Always wear safety equipment or follow safety precautions on the label.
5. Know what weed(s) you are trying to control.
6. If you have a recurring weed problem, there may be a cultural reason why.

## Non-Selective Herbicides in Lawns?

- In general, non-selective herbicides should only be recommended as a LAST resort.
  - Make sure all selective options have been considered first on the particular weed issues.
- Can be used over the top of dormant lawns i.e. North of Atlanta in January
- May cause delay in spring green-up
- Should use lowest effective rate
- Wipe-on or sponge applications can be effective
- Sometimes used as a “liquid edger” with extreme caution



## Step 10: Submit Turfgrass Samples for Troubleshooting

- 4”x4” square piece of sod
  - Go at least 4” deep with roots and soil
  - Include healthy/dead areas (margin)
  - Keep sample cool and dry
- Collect sample same day it is submitted
- Provide a completed sample submission form with details of problem and cultural information
- Include pictures with sample



## Lawn Renovation Tips

1. Eliminate weeds & thatch
2. Cultivate
3. Correct pH
4. Fertilize
5. Overseed or sprig
6. Water, fertilize, mow at 1.5 times normal height

## Moss & Algae

### Causes

- Poor soil fertility
- Low soil pH (acid soils)
- Heavy shade
- Excessive moisture
- Shallow compacted soils

### Remedy

- Soil test –Lime and fertilizer
- Reduce shade
- Improve soil drainage
- Core Aerate
- Choose adapted turf

## Books for Weed ID



Call UGA Office of Communications to order books at 706-542-2956 or online at <http://t.uga.edu/22e>



## References/Photo Credits

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Extension Turf Disease Specialist  
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- Kris Braman, Ph.D.  
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## Questions?

