“Lawn Care Best Management Practices”

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Turfgrass

Learning Objectives

At the end of this unit, you will be able to articulate and explain:

- Terms associated with turfgrass identification;
- Turf species grown in Maryland;
- Lawn establishment practices – seeding, sod, and site preparation;
- Cultural practices – fertilizing, mowing, watering, thatch control, aeration, and liming;
- Common lawn problems including, weeds, insect pests, diseases, and abiotic disorders.

Introduction

Lawns are an integral part of Maryland landscapes. In addition to enhancing the landscape, lawns provide practical benefits. A healthy lawn increases property values, controls soil erosion, filters pollution from runoff, moderates summer ground temperatures, and adds oxygen to the air. On the other hand, misapplication of pesticides and fertilizers greatly contributes to pollution of the Chesapeake Bay. Proper timing, selection, and correct application rates of these products can greatly reduce the negative impact the improper use of these products have on the health of the Bay. Proper cultural practices that encourage a healthy lawn are also essential.

Turfgrass Identification

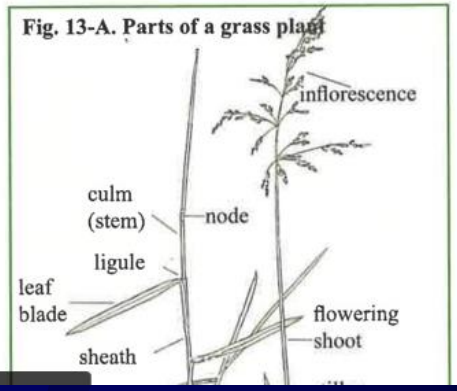
Turfgrass terminology

Vegetative parts of a grass plant (Fig. 13-A) are useful for identifying a grass. Also consider:

- Leaf blade;
- Leaf sheath;
- Vernation;
- Collar;
- Ligule;
- Auricles; and
- Growth habit.

Figures 13-B to 13-H illustrate each of these and give hints on what to look for when

Fig. 13-A. Parts of a grass plant



Turfgrass Maintenance Practices

- Variety Selection
- Mowing
- Watering
- Fertilizing
- Aerating/Thatching
- Pest Management

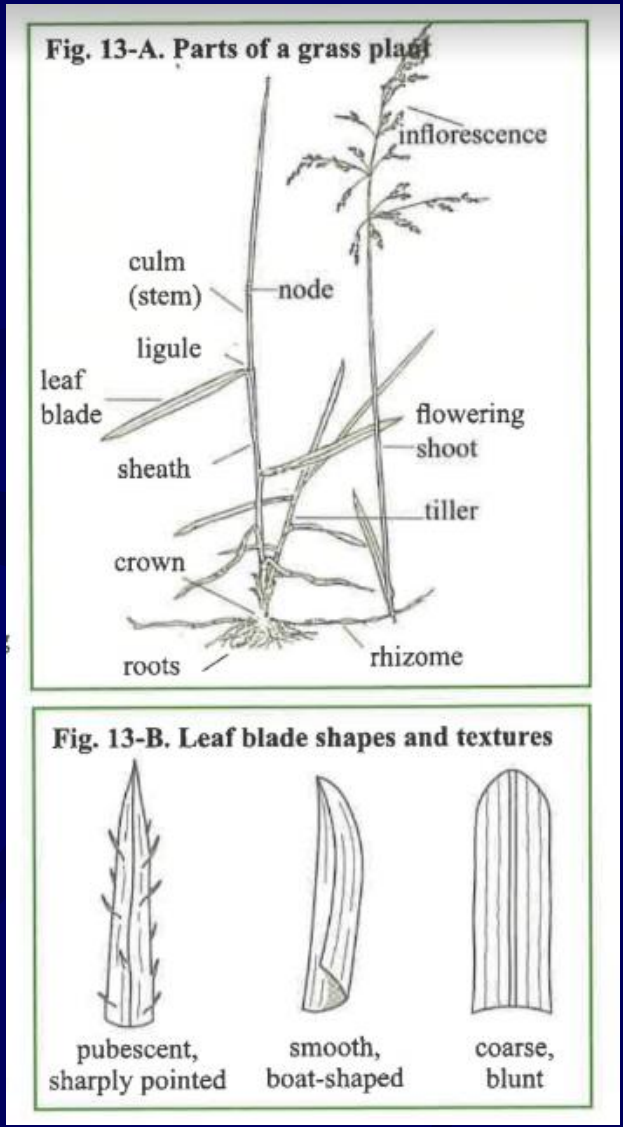
Site Evaluation

- Shade/Sun
- Slope/Aspect
- Wet/dry
- Soil texture and nutrients
- Species present
- Use/traffic
- Functionality within the landscape

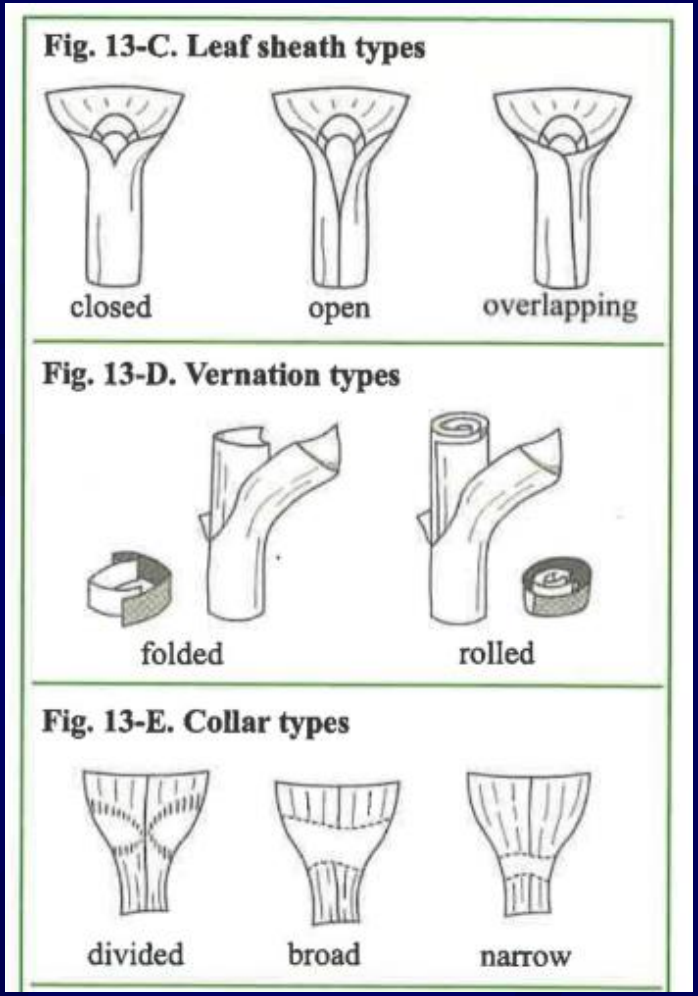
Turfgrass Quality Components

- Density
- Drought tolerance
- Persistence
- Pest Tolerance
- Color
- Uniformity
- Wear Tolerance

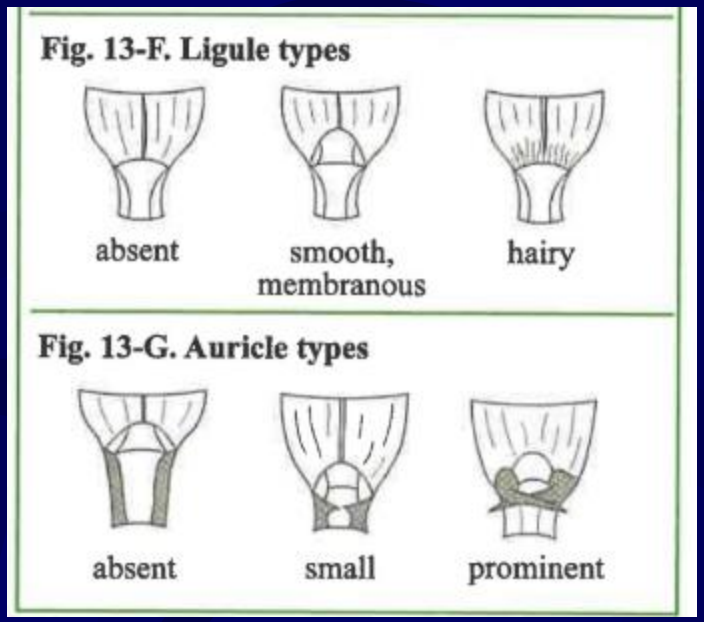
Turfgrass Identification



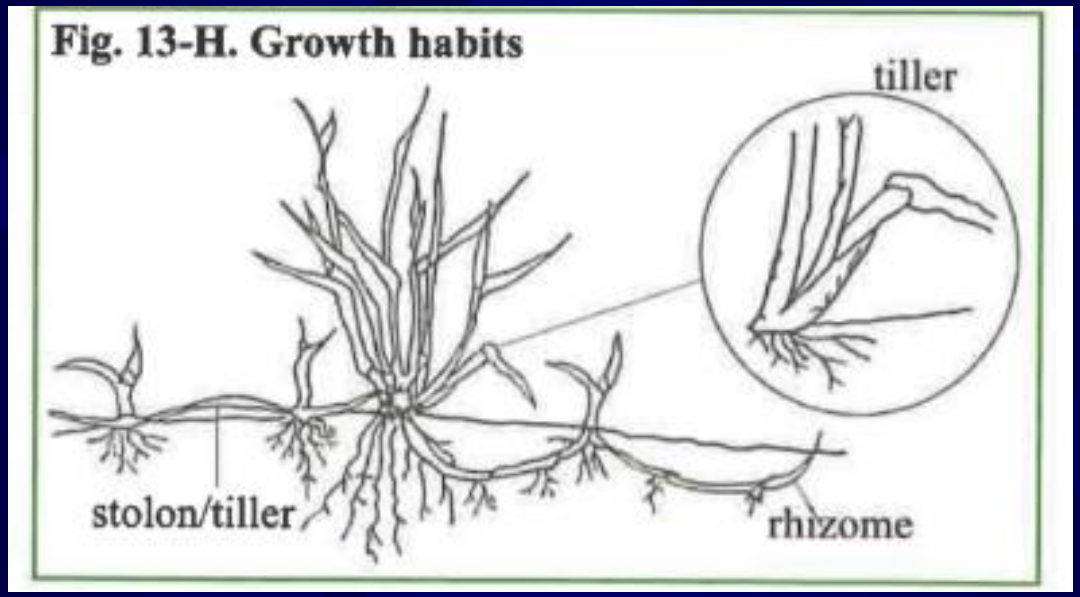
Turfgrass Identification



Turfgrass Identification



Turfgrass Growth Habit



Common Lawn Grasses of the Mid-Atlantic

- Tall Fescue

- Fine Fescue

- Zoysiagrass

Turfgrass Transition Zone

Cortesy of Sodsolutions.com

Mid-Atlantic Common Turfgrasses

- Tall fescue-
  - "Turf-type tall fescue"
  - Sunny areas, not shady areas
  - A "bunch-type" grass
    - Overseed thin areas for density

Mid-Atlantic Common Turfgrasses

- Fine fescue (ex. hard, chewings, creeping red)
  - Fine leaf blade
  - More shade tolerant
  - Available in “Shady Mix”

Mid Atlantic Common Turfgrasses

- - Zoysiagrass
  - Warm-season grass
  - Established by plugs or sprigs
  - Spreads
    - Stolons- above ground
    - Rhizomes -below ground

Other MD turfgrasses

- Bermudagrass- Typically used in athletic field or home lawns on Eastern Shore
- Kentucky bluegrass- Typically used on high-end athletic fields or in mixtures with tall fescue
- Perennial ryegrass- Typically used on golf courses

Table 13-A. Characteristics of turfgrass species						
Species	**Drought tolerance**	**Full sun**	**Shade**	**High traffic tolerance**	**Insect and disease resistance**	**Days to seed germ-ination**
Turf-type tall fescue	Excellent	Excellent	Fair	Good	Good	7-14
Kentucky bluegrass	Good	Excellent	Fair - poor	Excellent	Poor	14-21
Fine fes-cue	Good - fair	Good - fair	Excellent - good	Poor	Good	7-14
Perennial ryegrass	Poor	Excellent	Fair - poor	Good	Poor (fair if seeds contain endophytes*)	5-10
Zoysia-grass	Excellent	Excellent	Poor	Good	Good	N/A
Bermuda-grass	Excellent	Excellent	Poor	Excellent	Good	N/A

**Endophytes are beneficial fungi or bacteria that live within plant tissue. Perennial ryegrass and fescue turf with high endophyte levels are more drought resistant and less prone to damage from sod webworm and chinch bugs.*

How do you pick the best variety?

- University of Maryland Turfgrass Variety Recommendations

- Sod- Must be a good performing cultivar in MD/VA

RECOMMENDED TURFGRASS CULTIVARS FOR CERTIFIED SOD PRODUCTION AND SEED MIXTURES IN MARYLAND

University of Maryland Turfgrass Technical Update T T - 7 7 July 2023

Numerous new turfgrass cultivars continue to be developed and released by turfgrass breeders. However, while many of these cultivars are adapted to the environmental conditions that prevail in other regions of the country, many are not adapted to the difficult environmental conditions that occur in the transition zone, which includes Maryland and Virginia. Thus, to identify cultivars that will perform well in this region, extensive cultivar trials are evaluated each year at the University of Maryland and Virginia Polytechnic Institute and State University.

The cultivar performance data obtained at various locations in Maryland and Virginia are reviewed annually in a joint meeting of university researchers and representatives of the Departments of Agriculture of both states. The use of recommended cultivars usually results in a turfgrass stand of higher quality and density, greater stress tolerance, lower nutrient requirements, less water usage, and fewer pest problems. Also, the use of recommended cultivars generally has the benefits of a reduction in the need for pesticide applications, greater water infiltration, reduced water runoff, and the enhancement of the environmental benefits of properly managed turfgrass.

There has been extensive interest in recent years regarding turfgrass species that have reduced nutrient requirements, especially nitrogen. The two recommended turfgrass species with the lowest nitrogen requirements are the fine fescues and zoysiagrass, while turf-type tall fescue and bermudagrass have intermediate requirements. Although Kentucky bluegrass generally has the highest nitrogen requirements, research is currently ongoing to identify Kentucky bluegrass cultivars that provide good quality under reduced nitrogen fertility and other maintenance inputs.

The following lists of recommended cultivars consist of two groups. "Proven" cultivars represent those that have been performing well in trials in both states over multiple years, and have had certified seed tested by the MD and/or VA Departments of Agriculture. "Promising" cultivars, listed in *green italics*, have shown good performance, but may have been tested in Maryland or Virginia for only 2 years, or may be difficult to find due to limited seed availability.

Proven Turf-type Tall Fescue Cultivars

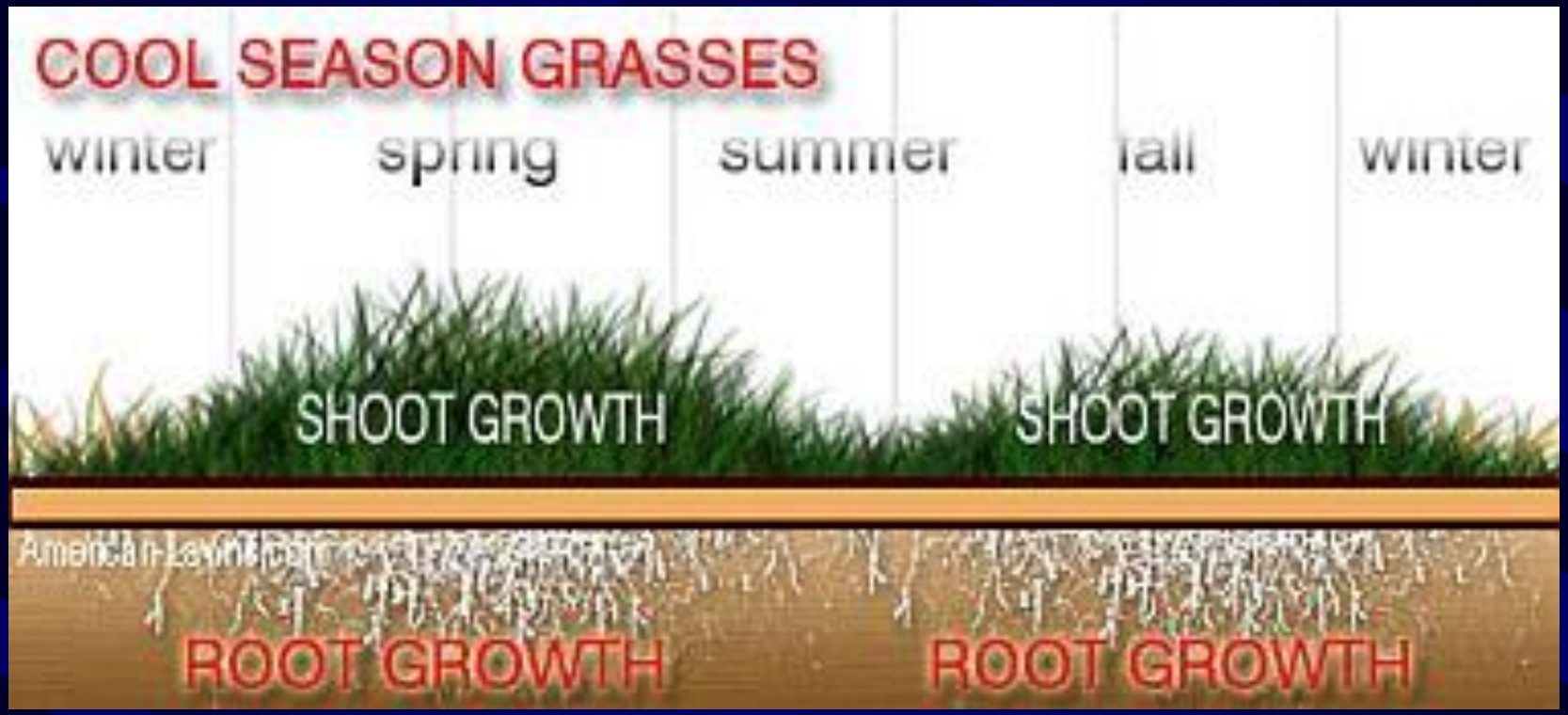
Annapolis	Firecracker SLS	Moondance GLX	Spyder LS[4]
Avenger II[4]	Firehawk SLT	Mustang 4[4]	Spyder 2 LS
Avenger III	Firewall[4]	Paramount	SR 8650
Birmingham[1]	Firenza II	Penn RK4[4]	Standout[4]
Black Tail	4th Millennium SRP	Pro Gold	Sunset Gold[4]
Bloodhound[4]	Gazelle II[4]	Raptor LS	Supersonic
Bullseye[1]	Gold Medallion[4]	Raptor III	Symphony
Bullseye LTZ	Grande 3	Rebel IV[4]	Talledega II
Catalyst	GTO	Rebel V[4]	Technique
Crossfire 4	Guardian 41	Rebel XLR[4]	Temple
Daybreak	Hemi	Rebounder[4]	Thor
Degas	Houndog 8[4]	Reflection	Titanium G-LS
Dragster	Inferno[4]	Regenerate	Titanium 2LS
Dynamite G-LS	Integrity[4]	Rendition RX[4]	Trinity
Fantasia	Justice[4]	Rockwell	Turbo[4]
Fastlane	Lifeguard	Rowdy[4]	Turbo RZ[4]
Fayette	Maestro	Saltillo[4]	Valkyrie LS
Firebird 2	Michelangelo	Screamer LS	Witchita
Firecracker G-LS	Monument	Serenade	Xtreme Green[4]

Where to buy quality seed?*

- Site One Landscape Supply
- Newsom Seed
- Chesapeake Valley Seed
- Homestead Gardens
- Bowen's Farm Supply

*-Mention of companies does not imply endorsement of said organizations

Cool-Season Grass Growth



Warm-Season Grass Growth

Mowing

- Crown- Turfgrass growing point is at the bottom of the plant.
- Height – Different grasses, different heights
- Cool-season- Higher height in summer
- Warm-season- Higher height in spring/fall

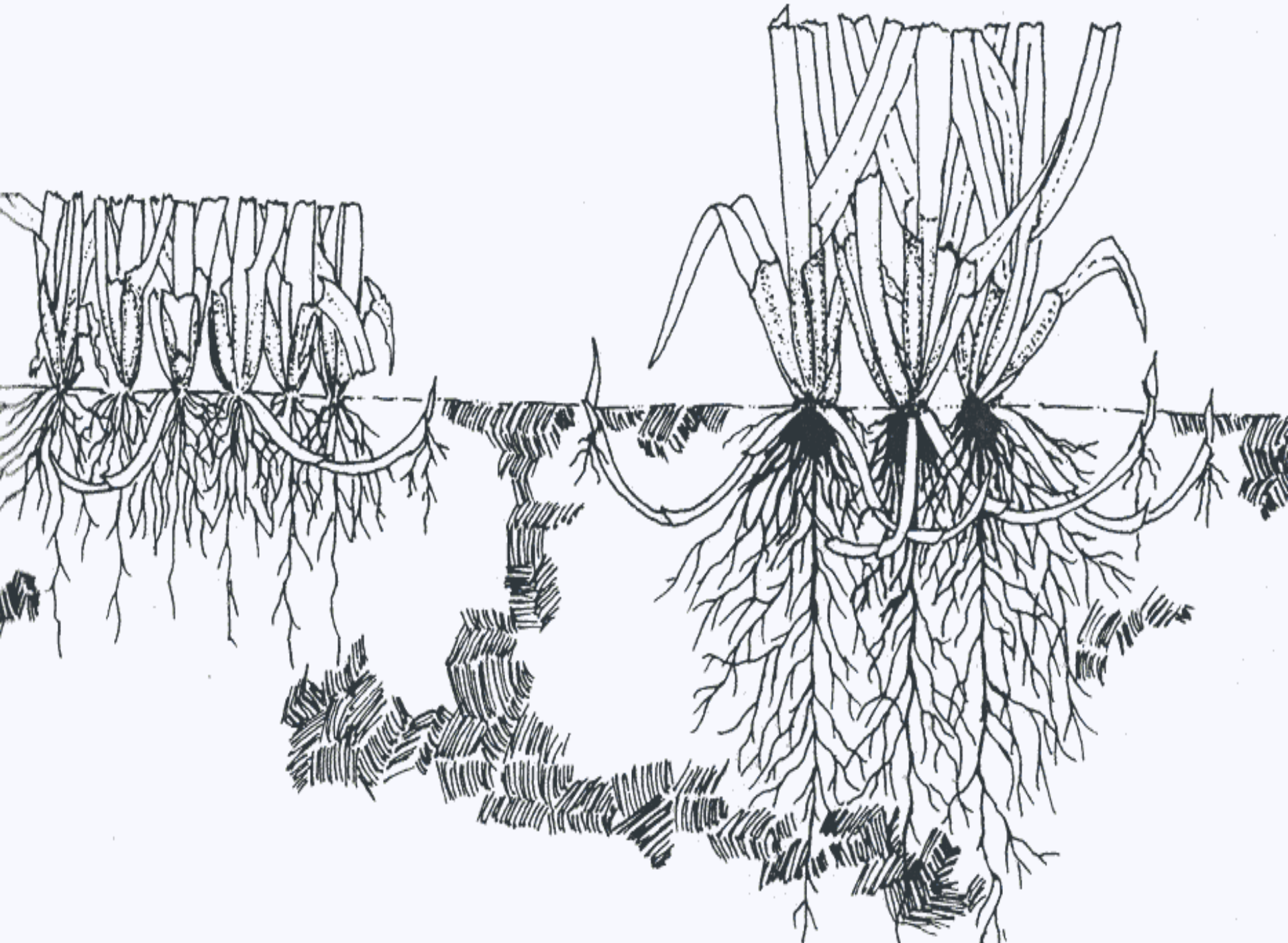
Mowing Height

- Tall fescue – 3”- 3 ½ ”
- Zoysiagrass- 1 ½” -3”
- Fine fescue- 3”- 4 ”

- Why mow high?
  - Greater traffic tolerance
  - Deeper root growth
  - Water conservation

Rotary blade mower

Reel blade mower



Mulch mowing– “Grasscycling”

- Mulch mow clippings
  - Consider a mulching mower
  - Use a “mulching blade” OR insert return plug in grass chute

Courtesy of www.turf.msu.edu/dealing-with-leaves

Mulch mowing- Why discard free fertilizer?

- Free fertilizer for your lawn
  - ~30% of seasonal needs
- Returning clippings – environmentally responsible
- Clippings DO NOT contribute to thatch development

Courtesy of www.turf.msu.edu/dealing-with-leaves

Mowing Tips

- Don’t remove more than one-third of leaf blade
  - If grass is too high, mow high, then lower next time

- Sharp blades = Clean cut = Less disease potential and better appearance
  - Sharpen blades in winter, consider sharpening again in mid-summer

Protecting Water Quality

- Sweep clippings and fertilizer back into lawn, not the street
- Wash mower on lawn, not the driveway or sidewalk
- Minimize chemical and fertilizer storage and be sure container is sealed/secure
- Always follow label directions

Lawn Watering

- 1” water / week in June, July, August
  - Remember, this is rainfall + irrigation
  - Measure with rain gauges or shallow cans
- Water deeply without creating puddles or runoff
- Water indicators: -Footprinting - Gray-blue color

Watering

- If needed, water in morning
- Use a water timer

Automatic irrigation systems

- Assess water schedule regularly
- Inspect the system monthly
- Install a rain shutoff device

Aerifying/De-Thatching

- Cool-season grasses: Fall or Spring

- Warm-season grasses: May-August

Aerating

- Aerating (Coring)
  - Aerating- Relieves compaction to allow for infiltration of water, fertilizer
  - Reduces water runoff
  - Increases oxygen levels
  - Should be done during ‘primary windows of opportunity’

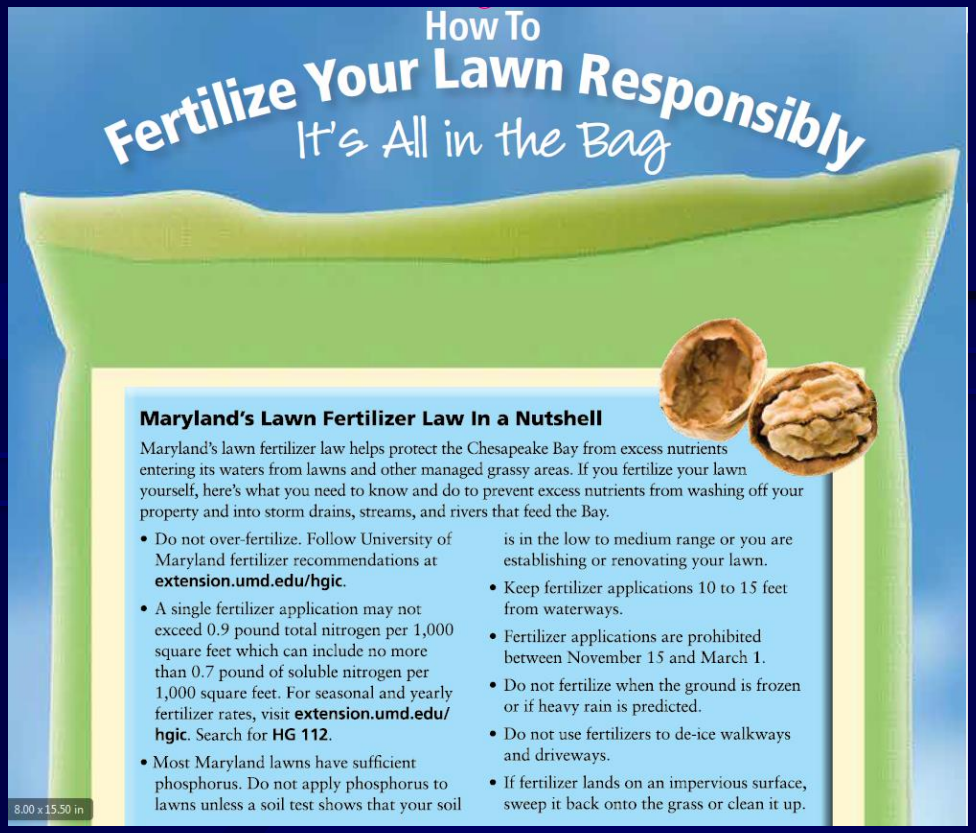
De-thatching

- De-thatching
  - Physically removes thatch
  - Reduces water runoff
  - Increases oxygen levels
  - Should be done during ‘primary windows of opportunity’

Thatch layer

Lawn Fertilization

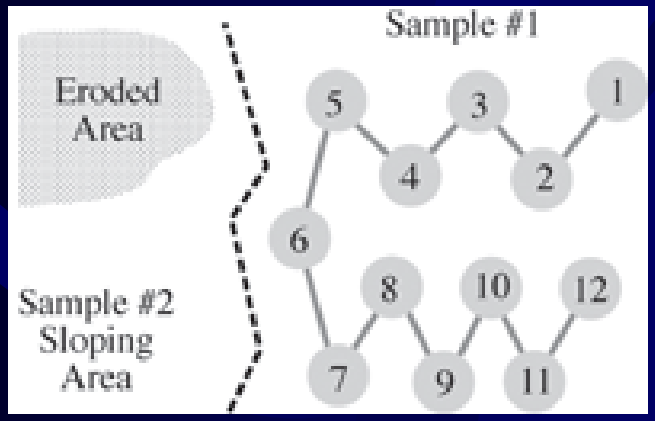
Maryland Fertilizer Law



From Maryland Department of Agriculture
"How to Fertilize Your Lawn Responsibly"

Soil testing

- Best to soil test every 3 years for nutrient needs
  - Shows levels of major and minor nutrients, pH, organic matter content
  - Test will provide nutrient and lime recommendations



Courtesy of Virginia Tech (www. ext.vt.edu/pubs/compost/452-129/takingsample.html)

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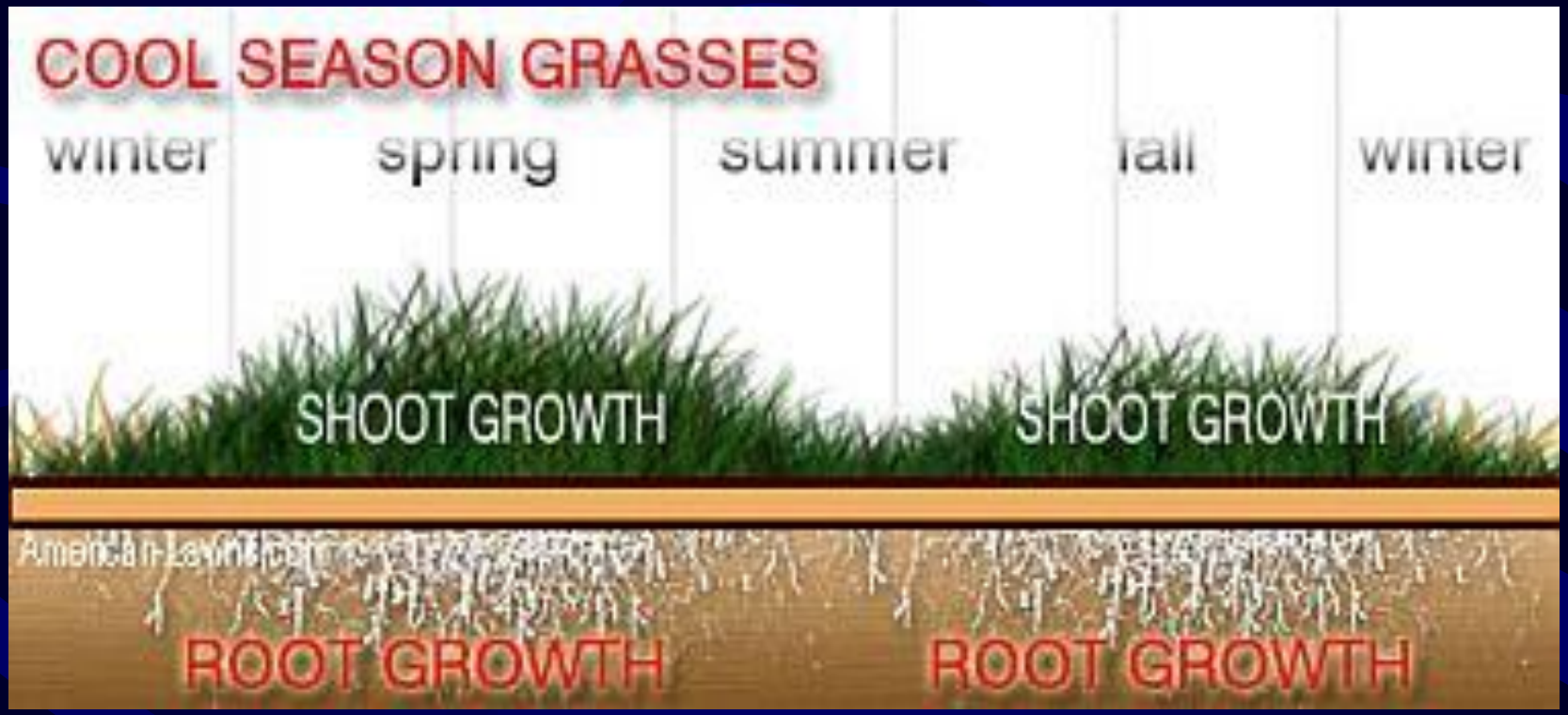
Cool-Season Grass Growth



Warm-Season Grass Growth

What do the numbers on the bag mean?

N-P-K

Nitrogen for top growth
("Up")

Phosphorus for root growth
("Down")

Potassium for overall stress tolerance
("All around")

Secondary Elements

- Sulfur (S)
- Calcium (Ca)
- Magnesium (Mg)

Micronutrients

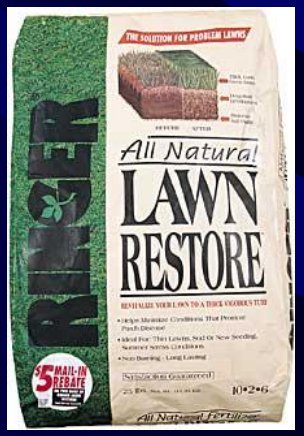
- Needed in small amounts, but still “needed”
- Usually adequate in medium-heavy soils and acidic pH
- Sandy soil- more prone to deficiencies
- Soil test will indicate levels and recommendations, if needed

Micronutrients

- Iron (Fe)
- Manganese (Mn)
- Sodium (Na)
- Nickel (Ni)
- Cobalt (Co)
- Boron (B)
- Zinc (Zn)
- Chlorine (Cl)
- Copper (Cu)
- Molybdenum (Mo)
- Silicon (Si)
- Aluminum (Al)

Lawn Fertilization

- Choose products with at least 50 % of N available as “slow release” or “water insoluble” for longer, sustained feeding and safety to turfgrass
- Avoid high P fertilizers if soil test indicates P is adequate
- “Water in” fertilizer to move it off the leaf blade into the soil
- Avoid fertilizing before a heavy rain
- Sweep fertilizer off hard surfaces!!!



Lawn Fertilization-How Much?

Tall Fescue	Fine Fescue
0.9 lb. N/ 1000 ft^2	0.5 lb. N/ 1000 ft^2
	May/Early June
May/Early June	
September	0.9 lb. N/ 1000 ft^2
October	October

Apply 0.9 lb. N/ 1000 ft^2/ application
Emphasize fall fertilization

Lawn Fertilization-How Much?

Zoysiagrass

0.9 lbs. N/ 1000 ft^2

June

July/August (optional)

Apply 0.9 lb. N/ 1000 ft^2/ application
Emphasize summer fertilization

Lawn Fertilization- How Much?

Fertilize at the Right Time

To prevent runoff, fertilizer should only be applied to lawns when the grass is actively growing. Fertilize warm season grasses (Bermudagrass and Zoysiagrass) in late spring or summer and cool season grasses (fescues, bluegrass) in fall, based on soil test results. Do not exceed single and yearly application limits.

Nitrogen Fertilizer Guide by Turf Type							
Grass	September	October	Late May	Early June	July	August	Maximum Yearly
Tall fescue	0.9 lb	0.9 lb	0.5-0.9 lb *if needed*		—	—	2.7 lbs
Kentucky bluegrass	0.9 lb	0.9 lb	0.5-0.9 lb *if needed*		—	—	2.7 lbs
Fine fescue	—	0.9 lb	0.5 lb	—	—	—	1.4 lbs
Bermudagrass	—	—	—	0.9 lb	0.5-0.9 lb *if needed*		2.7 lbs
Zoysiagrass	—	—	—	0.9 lb	0.5-0.9 lb *if needed*		1.8 lbs

From Maryland Department of Agriculture
"How to Fertilize Your Lawn Responsibly"

Reading a fertilizer label

Guaranteed Analysis

Total Nitrogen	10%
1.9% Nitrate Nitrogen	
0.5% Other Water Soluble Nitrogen	
7.6% Water Insoluble Nitrogen	
Soluble Potash (K2O)	6%

Derived from: hydrolyzed poultry feather meal, nitrate of soda, potassium sulfate, bone meal and soybean meal.

Spreader Calibration

1) Calculate how much product is needed for 1,000 ft^2
2) For even coverage, fertilize in two different directions at half rate.

Example: 0.9 lb. of N using 10-0-6 on a 2,000 ft^2 lawn

0.9 / 10% = 9 lb. product for 0.9 lb. N on 1,000 ft^2

9 lb. product per 1,000 ft^2 x 2 = 18 lb. product for 2,000 ft^2

Fertilizer Application

- Use drop spreaders in narrow spaces
- Sweep sidewalks and driveways!!!

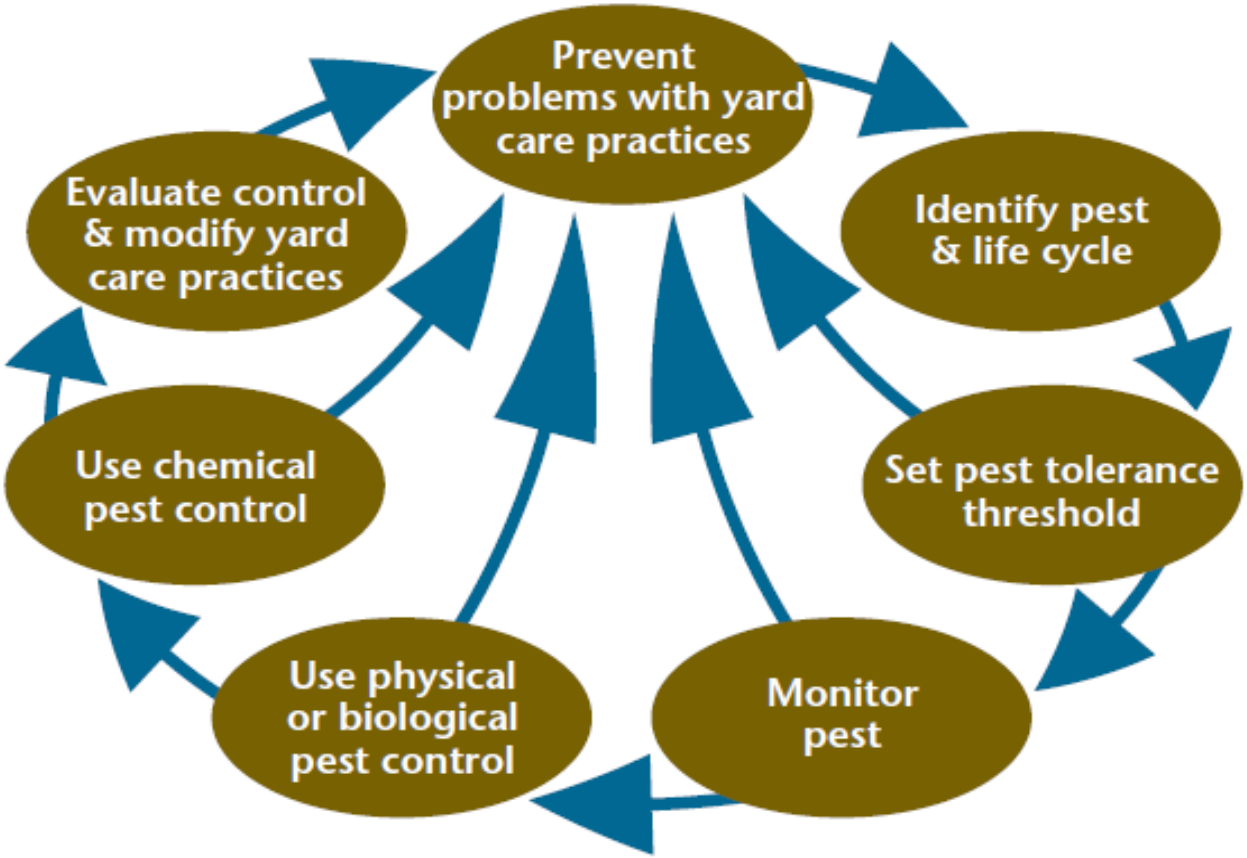
Be Careful !!!

IPM

What is IPM?

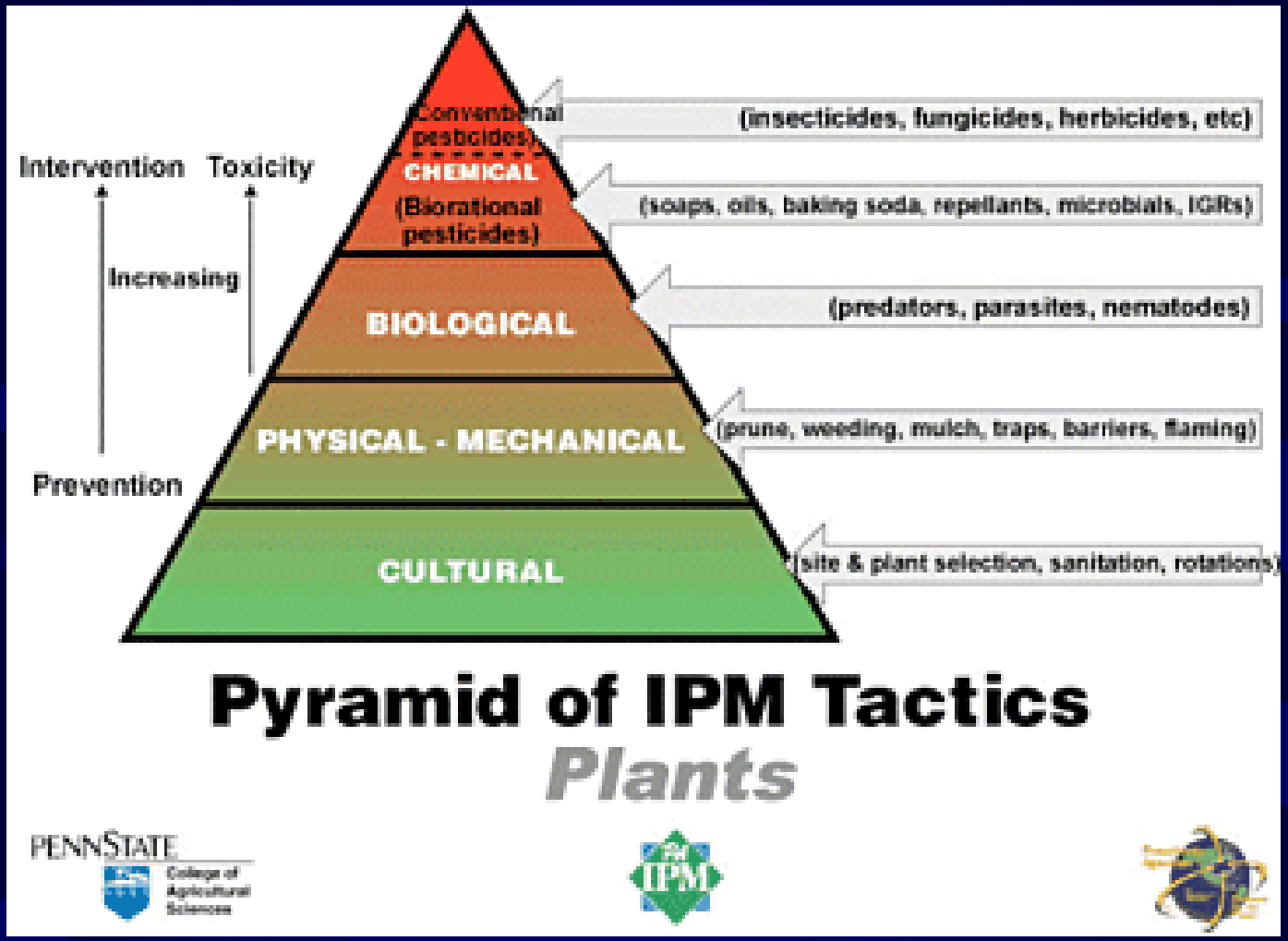
How do we use it in lawn care?

The IPM Process



Integrated Pest Management

- Host tolerance/resistance (“Right grass, right place”)
- Cultural controls (Fertilizing, Watering, Mowing, Aerating)
- Sanitation (Wash mower after each use)
- Biological controls (Example: Milky spore for grubs)
- Mechanical controls (Example: Handpicking weeds)
- Chemical controls (Select less toxic and biocontrols first!)

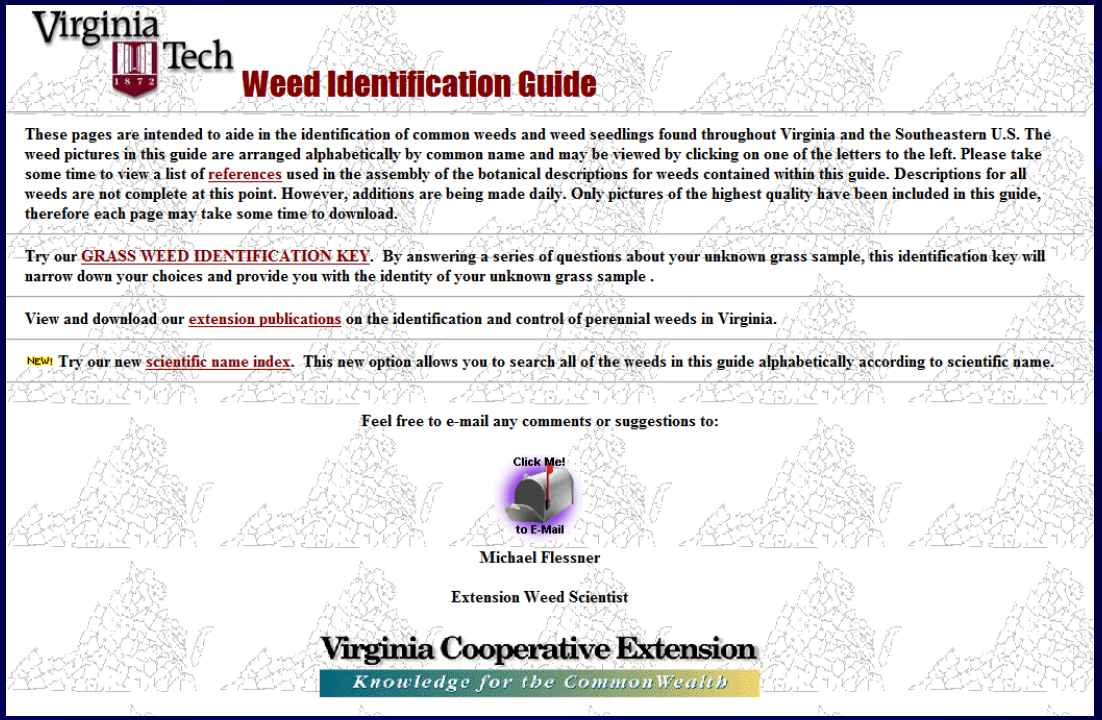

Intervention
Toxicity
Increasing
Prevention
Conventional pesticides
CHEMICAL
(Biorational pesticides)
BIOLOGICAL
PHYSICAL - MECHANICAL
CULTURAL
(insecticides, fungicides, herbicides, etc)
(soaps, oils, baking soda, repellants, microbials, IGRs)
(predators, parasites, nematodes)
(prune, weeding, mulch, traps, barriers, flaming)
(site & plant selection, sanitation, rotations)
Pyramid of IPM Tactics
Plants
PENNSTATE
College of Agricultural Sciences
IPM

Applying Pesticides Safely

- Identify the pest
- Choose the correct product
- Read the label
- Wear protective clothing

Weed Identification

- Virginia Tech Weed Identification Guide
- Michigan State - Msuturfweeds.net



Weed Growth Habit

- Rosette – Dandelion, Carrot, Plantain
- Creeping – Clover, ground ivy
  - Stolons- Above-ground runners
  - Rhizomes- Below-ground runners

Weed Life Cycle/Biology

- Perennials – Live over multiple years
- Annuals- Complete life cycle in one year or less
- Biennials- Vegetative growth 1st year, flower during 2nd year

Weed Life Cycle/Biology

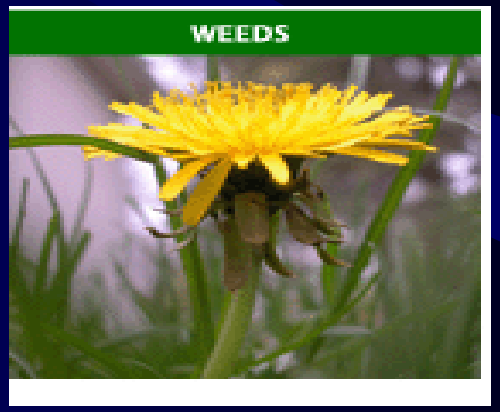
- Perennials (Examples: Dandelion, buckhorn plantain, white clover)
- Summer Annual grasses (Examples: Large and smooth crabgrass, goosegrass)
- Summer Annual broadleaves (Examples: Lambsquarter, spurge)
- Winter Annual grasses (Example: Annual bluegrass)
- Winter Annual broadleaves (Examples: Henbit, chickweed, purple deadnettle)

Weed Life Cycle/Biology

- Summer Annual grasses (Examples: Large and smooth crabgrass, goosegrass)
- Summer Annual broadleaves (Examples: Lambsquarter, spurge)
- Winter Annual grasses (Example: Annual bluegrass)
- Winter Annual broadleaves (Examples: Henbit, chickweed, purple deadnettle)

Weed control strategies

- Weeds are often symptoms of cultural problems
- Establish tolerance levels
- Think twice before using pesticides and ALWAYS read and follow label directions
- As last resort, spot spray- Don't "blanket spray"
- Avoid broadcast spraying or "weed 'n' feeding"
- Overseed with seed/soil mix to fill in open and thin areas



Weeds as Indicators

http://www.purdue.edu/envirosoft/lawn/src/pest/indicators2.htm

- **Acid soils**-bentgrass, red sorrel
- **Compacted soils-** annual bluegrass, common chickweed, prostrate knotweed, mouse-ear chickweed, prostrate spurge
- **Dry soils-**black medic, red sorrel
- **Dry and infertile soils-** yarrow
- **Low fertility soils-** plantains, red sorrel, smooth brome, bentgrass
- **Low mowing height-** annual bluegrass, bentgrass
- **Moist or poorly drained soils-** annual bluegrass, bentgrass, common chickweed, ground ivy, mouse-ear chickweed, speedwells, violets, yellow nutsedge
- **Moist infertile soil**- white clover
- **Moist shade**- annual bluegrass, rough bluegrass, violets
- **Shade-** annual bluegrass, common chickweed, moss, ground ivy, mouse-ear chickweed, violets

Weeds as Indicators

University of Illinois Extension

http://web.extension.illinois.edu/cfiv/homeowners/980411.html

- **Acid soils** (bentgrass, red sorrel)
- **Compacted soils** (annual bluegrass, bermuda grass, common chickweed, goosegrass, knotweed, mouse-ear chickweed, prostrate spurge)
- **Dry soils** (black medic, carpetweed, red sorrel, sandbur)
- **Dry and infertile soils** (yarrow)
- **High fertility soil** (annual bluegrass, bentgrass, bermudagrass, crabgrass, mallow, purslane)
- **Low fertility soils** (plantains, red sorrel, smooth brome, timothy)
- **Low mowing height** (annual bluegrass, bentgrass, bermudagrass, crabgrass, white clover)
- **Moist or poorly drained soils** (annual bluegrass, bentgrass, common chickweed, crabgrass, goosegrass, ground ivy, mouse-ear chickweed, speedwells, violets, yellow nutsedge)
- **Moist fertile soils** (curly dock, henbit, yellow wood sorrel)
- **Moist infertile soil** (white clover)
- **Moist shade** (annual bluegrass, nimblewill, rough bluegrass, violets)
- **New seedings** (barnyard grass, crabgrass, henbit, purslane, yellow foxtail)
- **Shade** (annual bluegrass, common chickweed, ground ivy, mouse-ear chickweed, nimblewill, violets)

Weed Identification

Mechanical Weed Control

- Can be a viable option with small populations of non-creeping weeds
- Hand/Weed Tool Weeding

- Raking or de-thatching- weak rooted annuals.

Mechanical Weed Control

- Weed Hound
- Screwdriver
- Flame

Courtesy of gardeners.com

Types of Herbicides

- Pre-emergence
- Post-emergence
- Non-Selective
- Selective
  - Broadleaf
  - Grass

Courtesy: Engage Agro

Soil Temps For Weed Germination At 4 Inch Depth

Crabgrass	53-58 F
Goosegrass	60-65 F
Barnyardgrass	60 F
Foxtails	65 F

From Managing Turfgrass Pests, Watschke et al.and Best Golf Course Management Practices, McCarty

2014 Mowing Height Study at UMD on a Tall Fescue Turf

Table 4. The effect of mowing height on annual grass encroachment in turf-type tall fescue (no annual grass herbicides applied).

Mowing Height	Annual Grass Coverage
	% coverage (July 23, 2014)
1 inch	85%
2 inch	45%
3 inch	10%
4 inch	1%

2022 Products compatible with Montgomery County's Pesticide Law

The County does not endorse active ingredients or specific products or brands for use in lawns or landscapes. The list below is intended to assist with requests, and is not comprehensive.

Products allowed under Montgomery County's pesticide law must be listed by the National Organics Standards Board or designated as a minimum risk pesticide under FIFRA 25(b).

Products must also be registered for use by the Maryland State's Chemist Office, and the registered list changes annually. As a distributer, retailer, or applicator you must ensure products are registered. Registered products are posted at mda.maryland.gov/plants-pests/Pages/state_chemist_reports.aspx

HERBICIDES—ACTIVE INGREDIENTS	Examples of Product Names (2022 APPROVED FOR USE BY MARYLAND STATE CHEMIST)
Acetic Acid	• Energen Vinegar Weed & Grass Killer • Green Gobbler 20% Vinegar Weed Killer • Harris since 1922 20% Vinegar Weed Killer • Nature's Wisdom 20% Vinegar Herbicide • Vinagreen
Ammonium nonanoate	• AXXE • Biosafe Weed and Grass Killer • Ortho Groundclear Weed and Grass Killer • Suerte
Ammonium soap of fatty acids	• Final-San-O • Finalsan Herbicidal Soap • Garden Safe Brand Weed and Grass Killer • Natria Grass and Weed Control with Root Kill • Natural Guard by Ferti-Lome Grass and Weed Killer • NGB Grass and Weed Killer • Pulverize Weed and Grass Killer • Pulverize Weed Brush and Vine Killer • Sunday Weed Warrior

Corn Gluten	• Bonide Maize Weed Preventer Ready to Spray • Espoma Organic Weed Preventer 9-0-0 • SaferPlay 10-0-2 Lawn Food with Crabgrass Prevention

HERBICIDES—ACTIVE INGREDIENTS—continued	• **Examples of Product Names (2022 APPROVED FOR USE BY MARYLAND STATE CHEMIST)**
Iron (Ferric)	• Bonide Weed Beater Fe • Captain Jack's Lawnweed Brew • Dandelion Doom • Fiesta Turf Weed Killer • Natria Lawn Weed Control • NGB Lawn Weed Killer Selective • Pulverize Weed Killer • Weed Beater Fe • Rachio Weed Watcher • Whitney Farms Weed & Grass Control
Potassium soaps or salt of fatty acids	• Safer Brand Fast-Acting Weed & Grass Killer
Sodium chloride/vinegar/soap	• Earth's Ally
Sodium lauryl sulfate	• EcoSmart Weed and Grass Killer
Vinegar/Saltwater/Soap Combination	• Doctor Kirchner Natural Weed Killer

Main Lawn Diseases in the Mid-Atlantic

- Brown Patch
- Red Thread
- Summer Patch
- Rust

Courtesy Dr. Lane Tredway, NC State

Lawn Diseases- Cultural Controls

- Fertility
- Irrigation
- Mowing Height
- Air Movement
- Sanitation

Brown Patch

- Major problem of tall fescue, perennial ryegrass, and creeping bentgrass in Mid-Atlantic

- Daytime temps 80's, Night time temps- upper 60's
  - 8-10 hours of high humidity
  - > 6 hours leaf wetness (especially in rainy weather!)

Brown Patch

- Large, irregular shaped areas
- Light brown to straw colored surrounded by dark brown- gray
- Leaf blighting
- Mycelium look “cob-webby” in the morning

Courtesy NC State University

Red Thread

- Fall or Spring disease in cooler weather
- Perennial ryegrass, Fine fescues, Tall fescues
- Presence of pink/red mycelium with red sclerotia at leaf tips→ eventually straw colored
- Patches start out circular then become irregular

Red Thread

- Cooler temps in May-June and September-early November
- Symptoms are most noticeable under low fertility conditions
- Favored by periods of high humidity, extended leaf wetness
- Will remain as sclerotia and fungal threads in leaf litter when fungus is not active

Courtesy NC State University

Rust Diseases of Grasses

- **Rust Diseases: Stem Rust, Stripe Rust, and Leaf Rusts**
- **Favored Host Plants: perennial ryegrass, tall fescue, Kentucky bluegrass, and Zoysiagrass**
- **Conditions Favoring Disease:**
- **1) Low Nitrogen Fertility**
- **2) Overcast and cool moist conditions in the Fall and Spring**

Symptoms and Signs

- Early symptoms are light yellow spots on leaves which will eventually lengthen
- Spores (urediopores) are produced inside the leaf lesion and eventually rupture the leaf resulting in orange pustules
- Heavily infected turf will appear thin and weak
- When teliospores (overwintering spores) are produced the lesion areas will turn black in color

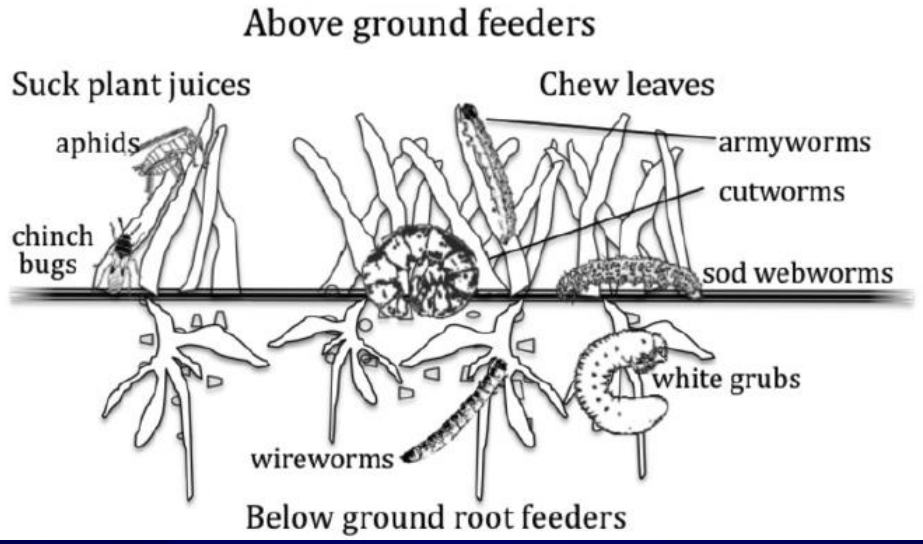
FUNGICIDES—ACTIVE INGREDIENTS	Examples of Product Names (2022 APPROVED FOR USE BY MARYLAND STATE CHEMIST)
Bacillus subtilis, Bacillus amyloliquefaciens	• Bioworks Cease • Double Nickle 55 • Jazz • Minuet • Monterey Complete Disease Control • PA 2030 Red Biofungicide • PPCT 2012 Red Biofungicide • PPCT 2013 Purple Biofungicide • PPST 2030 G Biofungicide • Pro-Mix Biofungicide • Revitalize Biofungicide • RevRhapsody, Serenade • Serifel NG Biological Fungicide • Vault IP
Eugenol and Essential Oils	• *None found*
Gliocladium	• Lalstop • Prestop • Soilgard
Potassium bicarbonate	• Bi-Carb old fashioned fungicide • Carb-o-nator • Kaligreen • Milstop • Organocide organic fungicide
Streptomyces lydicus	• Actinovate Lawn and Garden Biological Fungicide

FUNGICIDES—ACTIVE INGREDIENTS—continued	• Examples of Product Names (2022 APPROVED FOR USE BY MARYLAND STATE CHEMIST)
Trichoderma	• Bio-Tam 2.0 • Obtego Fungicide • Rootshield Plus • Rootshield WP • Tenet WP • Trianum P Biological Fungicide

Lawn Insect Pests

Lawn Insects

Curt Laub, Research Associate, Entomology, Virginia Tech



White Grub Damage

Lawn Grub Control

VT publication

"Beetlemania- White Grub Control in Lawns"

Figure 13. A soap flush is used to aid in the identification of surface insect pests.

Figure 14. A white grubworm is the larval stage of many forms of beetles that feed on turfgrass roots.

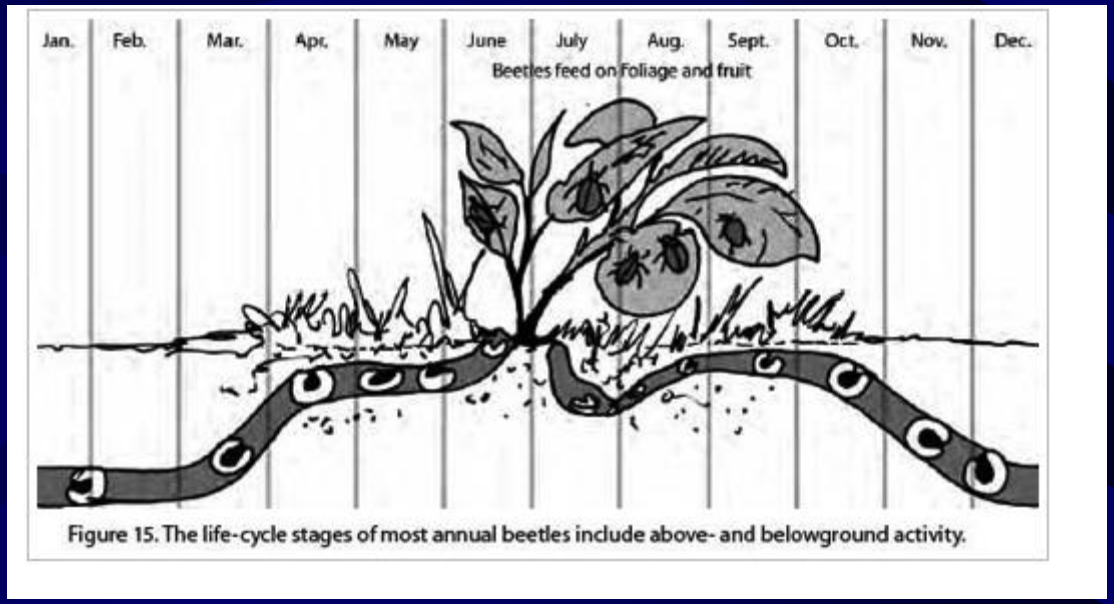


Figure 15. The life-cycle stages of most annual beetles include above- and belowground activity.

GRUB CONTROL—ACTIVE INGREDIENTS	Examples of Product Names (2022 APPROVED FOR USE BY MARYLAND STATE CHEMIST)
Azadirachtin	• Azaguard • AzaMax • Azasol • Ecozin Plus 1.2% • Gordon's Pro Turf Azatrol • Molt-X • Neemix 4.5
Bacillus subtilis	• Double Nickle LC • Ethos 3D • Ethos XB • Monterey Complete Disease Control • Revitalize Biofungicide • Triathalon Biofungicide
Bacillus thuringinesis	• Grub Gone! • Beetle Gone! • Lawn Box Grub Out • The Andersons Organic Grub Control
Beauveria bassiana	• Botanigard • Mycotrol

GRUB CONTROL—ACTIVE INGREDIENTS—continued	• Examples of Product Names (2022 APPROVED FOR USE BY MARYLAND STATE CHEMIST)
Diatomaceous Earth/Silicon dioxide	• Bonide Diatomaceous Earth • Ecologic Diatomaceous Earth • Celite 610 • Desect Diatomaceous Earth • Garden Safe Brand Diatomaceous Earth • Natural Guard Brand Diatomaceous Earth • Perma-Guard Crawling Insect Control • Pure Defense Diatomaceous Earth • Safer Brand Diatomaceous Earth
Eugenol and Essential Oils	• Purely Organic PureDefense Grub Shield • SaferPlay Grub Shield
Garlic	• Garlic Barrier AG
Milky Spore (Bacillus popilliae)	• St. Gabriel Organics Milky Spore
Metarhizium anisopliae	• Met 52 • Tick-Ex EC
Nematodes	(State Chemist approval not needed)

Lawn Grubs- Biological Control

- Milky Spore Disease- Slow acting, mixed results

- *Beauveria bassiana*- Insect pathogen

- Entomopathogenic nematodes-
  - Apply only when pest is present
  - Apply later in the day to minimize photodegradation
  - Water before and after application
  - Avoid *Steinernema carpocapsae*

Entomopathogenic Nematodes

- Apply only when pest is present
- Apply when soil temps are above 60º F
- Apply later in the day to minimize photodegradation
- Use *Steinernema riobrave* or *Heterohabditis*

Lawn Grubs- Cultural control

- Tall fescue vs. Ky. Bluegrass
- Balanced fertility
- Drier conditions in very late summer-early fall

Lawn Renovation/Rejuvenation

Table 13-D. Seeding: advantages and disadvantages	
Advantages	**Disadvantages**
Lower initial cost.	Limited time-period for establishment. Seed needs to be sown in late summer to early fall for greatest success rate.
Desired cultivars of turfgrass can be sown.	Daily watering is necessary, sometimes twice a day, depending on weather conditions during initial establishment period.
Less labor and time is required.	Takes a longer time for lawn to become established. Seeded areas need to be restricted from use for up to two months.
Greater flexibility in planting a mixture for specific site conditions (e.g., mixture that performs better in the shade or on high traffic areas can be sown).	Greater chance of weed encroachment during establishment.
	Heavy rain can wash seed away.

Site Preparation

Site preparation is the same for seeding and laying sod. The following steps are crucial for successful lawn establishment. After the lawn is established it is difficult and costly to try to improve the soil.

1. **Test soil**
2. **Rough grade**. Rough grading involves removing all debris, including large stones or wood left by construction work. Where topsoil is to be replaced or brought in, grade the area to the contour of the desired finished grade to facilitate uniform distribution of topsoil. Slope the soil away from buildings to prevent water problems. Steep slopes should be terraced, contained with a retaining wall, or planted with a low-maintenance ground cover.
3. **Lime according to soil test results**. Grass growth will be unsatisfactory if soil pH is not in the 6.0 to 6.8 range. If the soil is too acidic as indicated by a soil test, broadcast

Lawn Renovation

When to Renovate:

- Lawn is >30-40% weeds
- Thatch accumulation = 2”+
- Lawn has been extensively damaged by insects or disease
- Lawn is otherwise an unsalvageable mess

Establishment Timing

- Seeding
  - Optimal window for cool-season:
    Late summer- early fall
- Sod
  - Optimal window for cool-season:
    Late summer- early fall
    Spring is 2nd choice
  -- Warm-season: May-mid-July

Sod vs. Seed

Table 13-C. Sod: advantages and disadvantages	
Advantages	**Disadvantages**
Can be installed any time of the year as long as the ground is not frozen and daytime temperatures are below 95 degrees.	Higher initial cost.
Immediate results are obtained and establishment is faster.	Limited choice of turf cultivars.
Quicker erosion control. Can be used successfully in areas prone to soil erosion such as steep banks or culverts.	More labor required for installation.
Fewer problems with weed encroachment.	Not always readily available.

Table 13-D. Seeding: advantages and disadvantages	
Advantages	**Disadvantages**
Lower initial cost.	Limited time-period for establishment. Seed needs to be sown in late summer to early fall for greatest success rate.
Desired cultivars of turfgrass can be sown.	Daily watering is necessary, sometimes twice a day, depending on weather conditions during initial establishment period.
Less labor and time is required.	Takes a longer time for lawn to become established. Seeded areas need to be restricted from use for up to two months.
Greater flexibility in planting a mixture for specific site conditions (e.g., mixture that performs better in the shade or on high traffic areas can be sown).	Greater chance of weed encroachment during establishment.
	Heavy rain can wash seed away.

Lawn Renovation Steps

- Soil test
- Rough grade
- Lime and basic fertilizer as per soil test
- Incorporate organic matter (rototill)
- Finish grade
- Fertilize with ½ lb. P
- Seed
- Rake lightly
- Topdress with compost
- Keep damp through germination

Lawn Renovation

- Mow as short as possible, then de-thatch, roto-till, or cut sod
  - Work in 10-15% compost. Lime, if needed, based on soil test recommendations.
- Grade/level with topsoil and roll to smooth surface
- Pre-seeding starter fertilizer application must be based on soil test
- Seed, rake in lightly, and mulch with compost to keep moisture in
- Seed– Tall fescue- 6-8 lbs./1,000 ft^2

  Fine fescue (creeping red or hard fescue)- 3-4 lbs./1,000 ft^2

Lawn Renovation

- Topdress using compost to ¼”- ½” depth to reduce seedbed water evaporation
- Water lightly and frequently to keep the soil surface moist for 10-14 days for germination

Renovation Scalping

Thatch Removal

Seeding Rates for Lawn Establishment

- Tall fescue 6-8 lbs/1000 ft^2
- Kentucky bluegrass 2-3 lbs/1000 ft^2
- Fine fescue 4-5 lbs/1000 ft^2

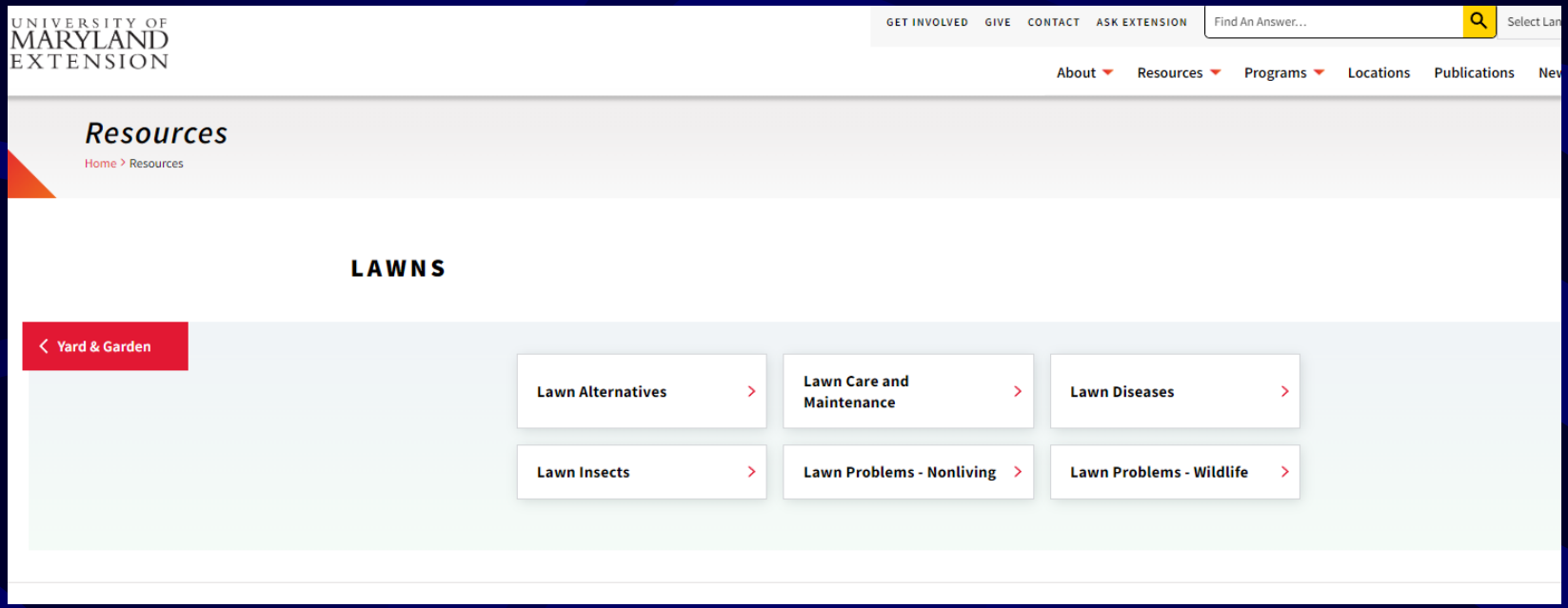
Diagnosing problems “remotely”

- Sun or shade?
- Type of grass?
- Approximate age of lawn?
- When did problem first start? (Weather conditions, etc.)
- Fertilizer regime?

Diagnosing Problems “Remotely”

- Soil type and conditions?
- Disease- stand pattern + leaf signs/symptoms
- Root depth?

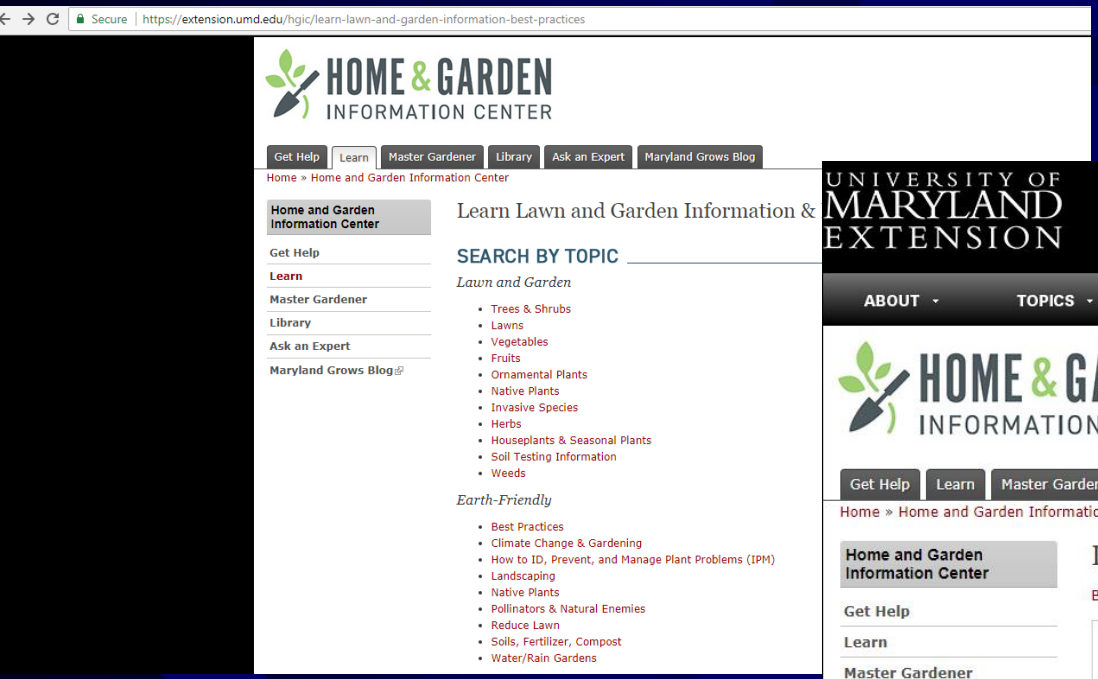
UMD Extension Lawn Resources

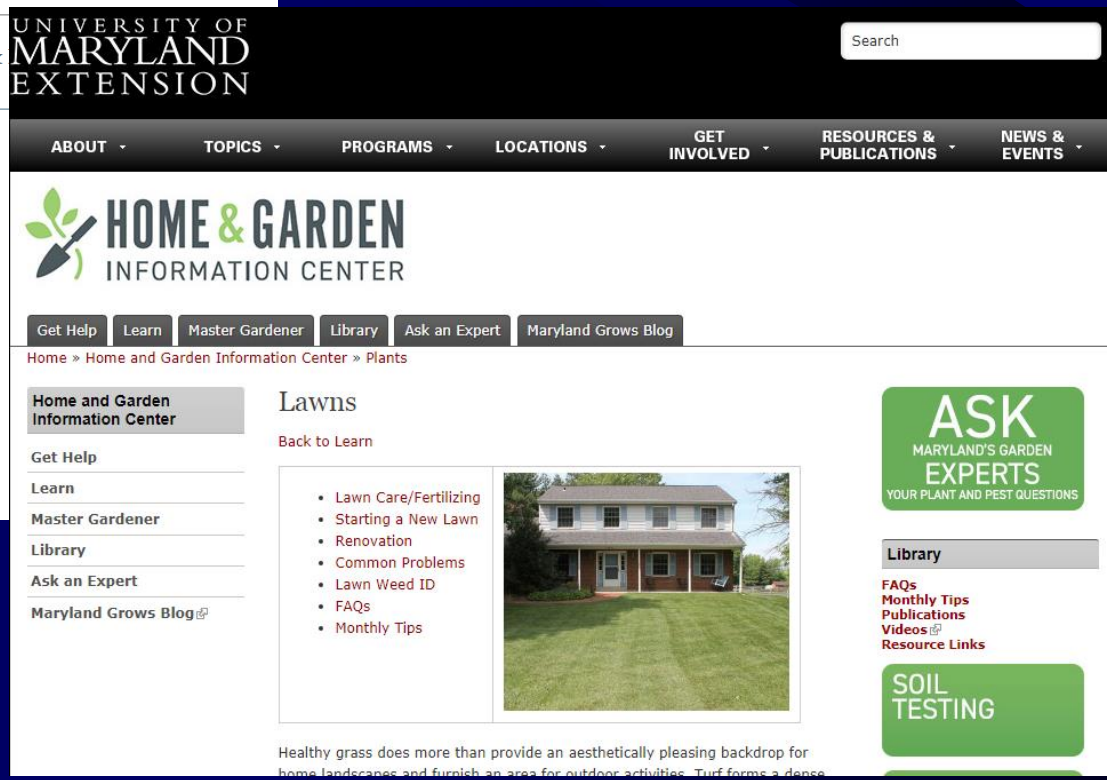


https://extension.umd.edu/resources/#!/category/3/subcategory/858

Home and Garden Information Center Website

https://extension.umd.edu/hgic/learn-lawn-and-garden-information-best-practices





Maryland Turfgrass Council Website

http://www.mdturfcouncil.org/maryland-resources-and-technical-bulletins

Maryland Extension Publications and Resources

The Turfgrass Technical Updates (TT-Bulletins) of the University of Maryland's Department of Natural Resource Science and Landscape Architecture are featured here. These are the most current versions of the publications.

New/ Updated

TT 116 Nutrient Management Guidelines for Turfgrass Seeding and Sod Installation.pdf

Establishment of Lawns With Compost and Microclover In The Chesapeake Bay Watershed.pdf

TT-121 Microclover Tall Fescue Lawns in the Mid-Atlantic.pdf

TT-120 Amending Soil With Compost to Reduce Stormwater Runoff and Lawn Fertilizer Use.pdf

TT-119 Nutrient Management For Athletic Fields.pdf

TT-77 Recommended Turfgrass Cultivars For Certified Sod Production And Seed Mixtures In Maryland.pdf

Turfgrass Fertility

TT-83 Gypsum Use on Turfgrass.pdf

TT-115 Fertilizer Recomendations for Comercially Maintained Lawns in Maryland.pdf

Thank You!

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