



Lawn Care

Pamela J. Sherratt
The Ohio State University

Terminology – it's confusing!

Organic, natural, sustainable

- Pesticide
- Biopesticide
- Organic pesticide

Chemical (118 elements, compounds etc.)

Fertilizer (natural and synthetic – organic?)



It's a Personal Choice
- Not Mandated in OH -



Both of these lawns are pesticide-free!



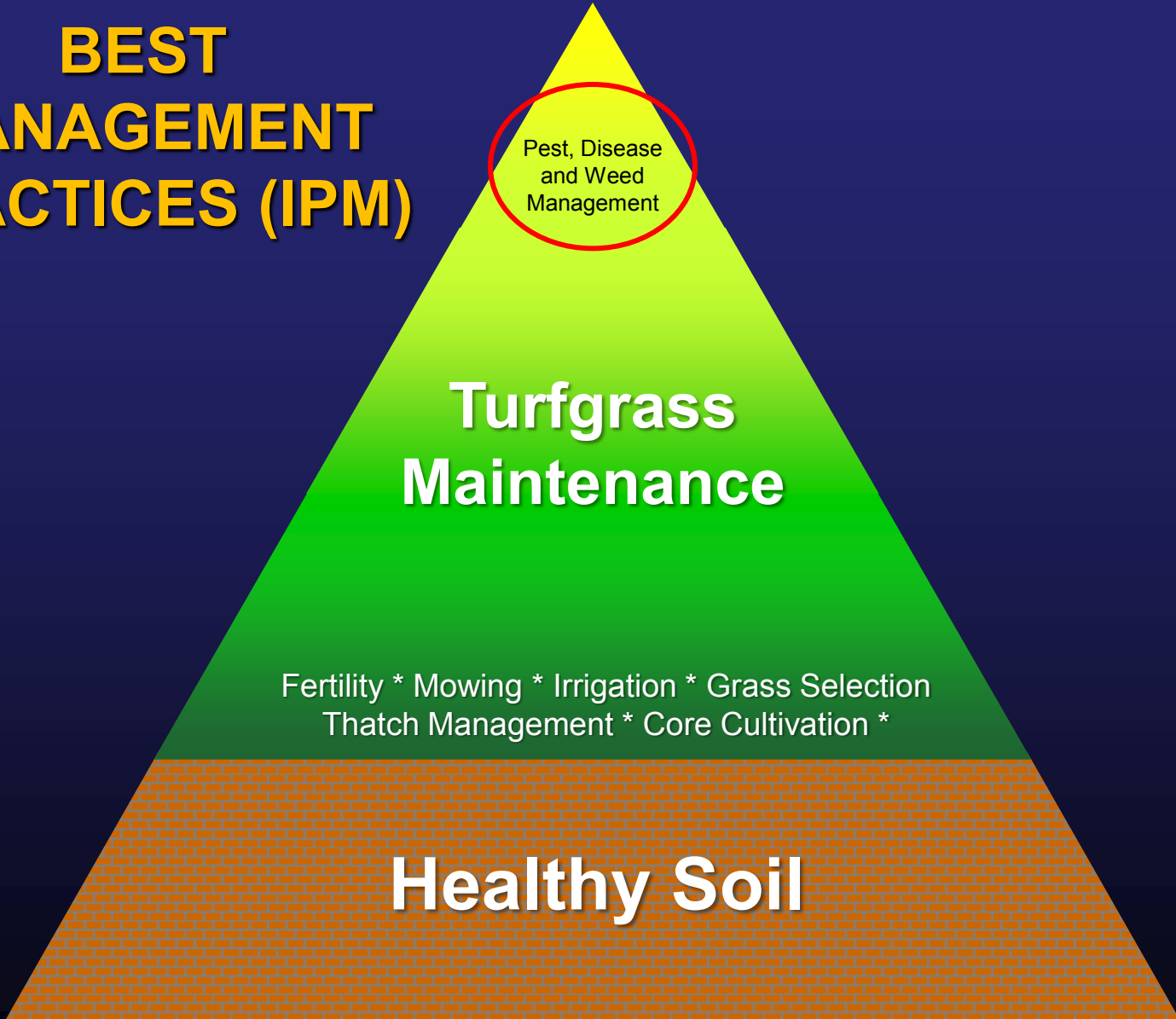
BEST MANAGEMENT PRACTICES (IPM)

Pest, Disease
and Weed
Management

Turfgrass Maintenance

Fertility * Mowing * Irrigation * Grass Selection
Thatch Management * Core Cultivation *

Healthy Soil






IMPROVING SOIL HEALTH

Soil Tests

- Measurement of plant available nutrient status of the soil
 - Identifies nutrient deficiencies
 - Predicts nutrient requirements
- Can detect nutrient imbalances, excess salts
- Other factors (CEC, OM level, pH)

When to Sample

- Perform every 2-3 years on soil
 - Perform yearly on high sand (>85%)
 - Be consistent with sampling procedure
- Timing - spring or fall
 - Prior to fertilization
 - Sample at same time of year



**Grass won't grow in poor,
compacted soil**

Aeration



DANGER



ALWAYS WEAR YOUR SAFETY GEAR
AND USE ALL ATTACHED SAFETY DEVICES AT ALL TIMES

TO AERATE

1. Release Tines With Left Control Lever
2. Begin Forward Motion of Aerator Manually
3. Engage Right Drive Lever With Operator Standing in Motion.

TARGET = 12 – 15 holes per sq.ft.



Thatch Control



- Topdressing - Filling in holes & undulations

- Topsoil
- Compost & topsoil
- 0.25" – 3/8" depth, or as needed



Composts

- Yard waste
- Biosolid
- Spent mushroom compost
- Manures
- Food waste
- www.findacomposter.com



Choosing a compost, physical & chemical properties

Color	Brown to black
Odor	Like earth
Particle size for topdressing	¼ to 3/8 inch
Moisture content	30 to 50%
Organic matter	Greater than 30%
Ash content	less than 70%
c/n ratio	Below or equal to 30:1
Nitrogen	0.5 to 3%
Phosphorus	Greater than 0.2%
pH	6.0-7.0
Metals	Determined by state or federal agencies
Soluble salts	Depending on turf species, type of salt, concentration, and application method

Ref: Penn State Plant Science, Using Composts to Improve Turf Performance



Application of biosolid compost topdressing @ 0.25" depth







Renovation: Killing the lawn & starting again

- Soil cultivation
- Using covers



The main advantages to renovation:

- Better grass selection
- Soil amendment & re-grading
- Nutrient status correction



A photograph showing a modern, two-story house with large windows and a balcony, partially hidden behind several large, mature trees with dense green foliage. In the foreground, a large, dark brown pile of compost is spread out on a light-colored, sandy or dirt-covered area. A concrete curb runs along the bottom of the frame, and a paved road is visible in the lower-left corner. The text "Adding Compost" is overlaid in yellow font on the right side of the compost pile.

Adding Compost



A close-up photograph of a person's hand holding a clump of grass with its roots. The grass is green and appears to be a mix of different species. The background is a blurred green lawn. A semi-transparent text box is overlaid on the center of the image.

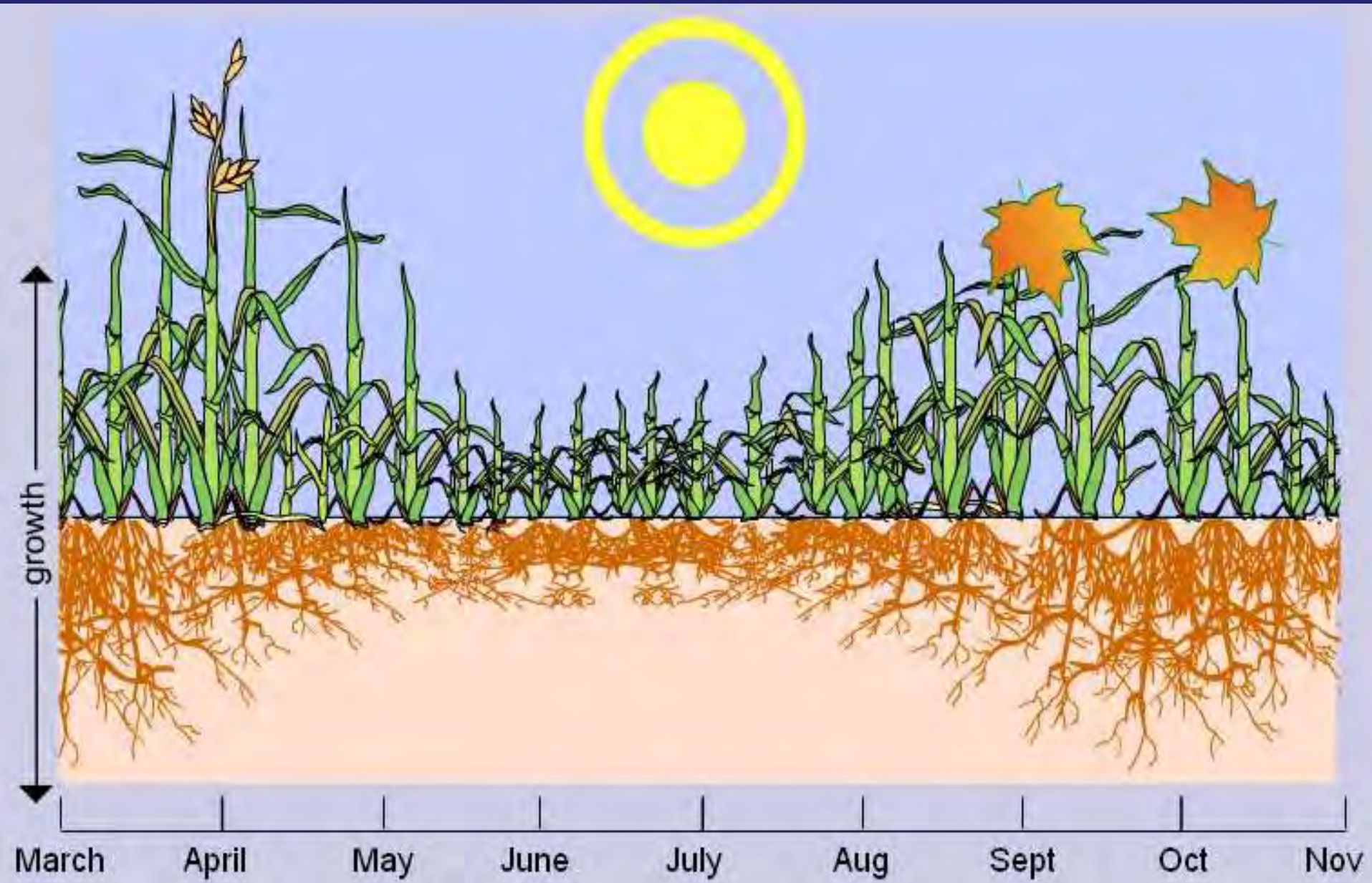
Right Grass, Right Place

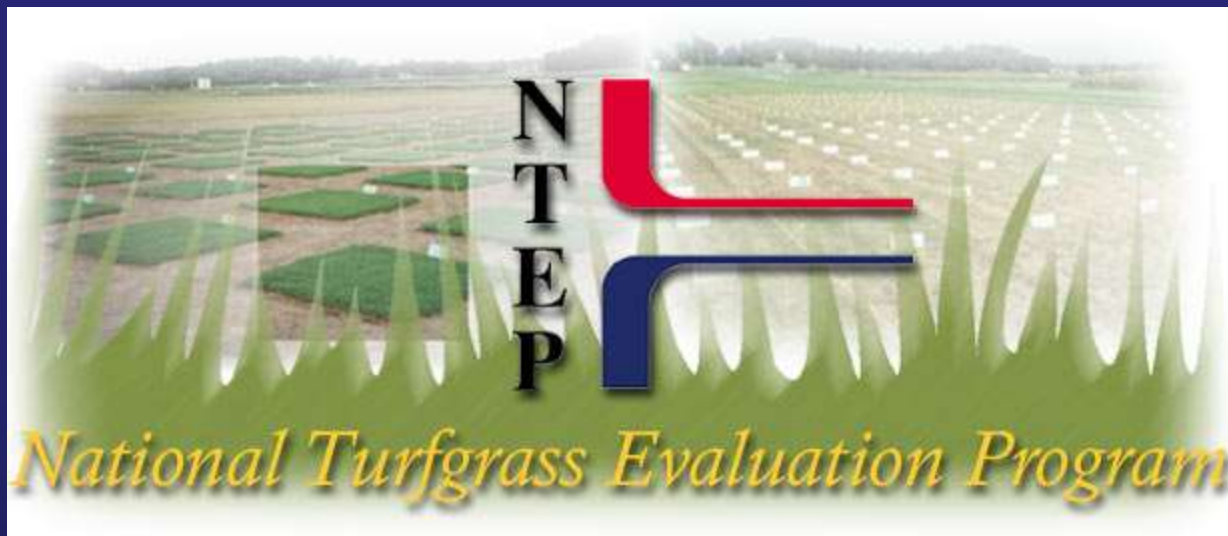
Tall & fine fescues

Kentucky bluegrass

Perennial ryegrass







www.ntep.org

NAME	GENETIC COLOR	SPRING GREENUP	PERCENT COVER				QUALITY RATINGS					MEAN
			FALL	MAR	APR	MAY	JUN	JUL	AUG	SEP		
COURTYARD	8.3	7	60	7	5.3	5.7	7.3	6.7	5.7	4	6	
PST-161	8.3	7.3	33.3	7.3	6.7	6.7	7	5.3	5	4	6	
SKYE	7.7	6.7	33.3	6.7	7	6.7	6.7	6	6	3.3	6	
CABERNET	7.7	7.3	46.7	7.3	6.7	6.3	6.3	6	5	3.7	5.9	
EXCURSION	7.7	6.7	35	6.7	5.7	6	7.3	6	5.7	3.7	5.9	
RAMBO	7.7	7.7	43.3	7.7	6.7	6	6.3	5.7	5.3	3.3	5.9	
BARONETTE	8.3	7.3	21.7	7.3	6	6	6.7	5.7	6	3	5.8	
BARRISTER	7.7	6.7	50	6.7	5.7	6	7	6	5	4	5.8	
DLF	7	6.3	40	6.3	6.3	5.3	6.7	6.3	5.3	4.3	5.8	
IMPACT	8.3	7	43.3	7	6	5.3	7.7	6	4.7	3.7	5.8	
TOTAL ECLIPSE	7.3	7	16.7	7	5.3	6.3	7	6	5.3	3.3	5.8	
A96-739	7.3	7.7	10	7.7	6.3	6.7	6	5	5.7	2.3	5.7	
AWARD	7.7	6.7	33.3	6.7	5.3	5.7	7.3	5.7	5	4	5.7	
JEFFERSON	7.3	7.3	28.3	7.3	6.7	5.7	6.7	5.3	5.3	3	5.7	
ARCADIA	7.3	6.7	18.3	6.7	5.3	5.3	7.3	6	5.7	3	5.6	

A photograph of a residential lawn. In the background, a white house with horizontal siding and a black metal railing on the steps is visible. A flower bed with red, pink, and purple flowers sits between the house and the lawn. A flag is flying on a pole to the right. The foreground shows a concrete sidewalk and a strip of grass.

Tall Fescue (*Festuca arundinacea*)

OLD type – “Kentucky 31”



IMPROVED/TURF-TYPE TALL FESCUE





HIGH

WEAR TOLERANCE

Tall fescue

Perennial ryegrass

Kentucky bluegrass

Fine fescue

Creeping bentgrass

Colonial bentgrass

Rough bluegrass

Zoysiagrass

Bermudagrass

Seashore paspalum

Buffalograss

Bahiagrass

St. Augustinegrass

Centipedegrass

LOW



- Wear tolerant
- Drought resistant
- Endophytes
- Low maintenance



Best in Shade



Best for Low Input Lawns

Kentucky Bluegrass

Tall Fescue



Best in Drought



Brown Patch Disease (*Rhizoctonia solani*)



Fine Fescue (*Festuca sp.*)



**Tolerates, poor soils, poor
fertility, & shade**



Poor wear tolerance
Dormancy in hot weather
Susceptible to some diseases



Kentucky Bluegrass (*Poa pratensis*)



Rhizome





Kentucky bluegrass dormancy during drought



NOT SHADE TOLERANT

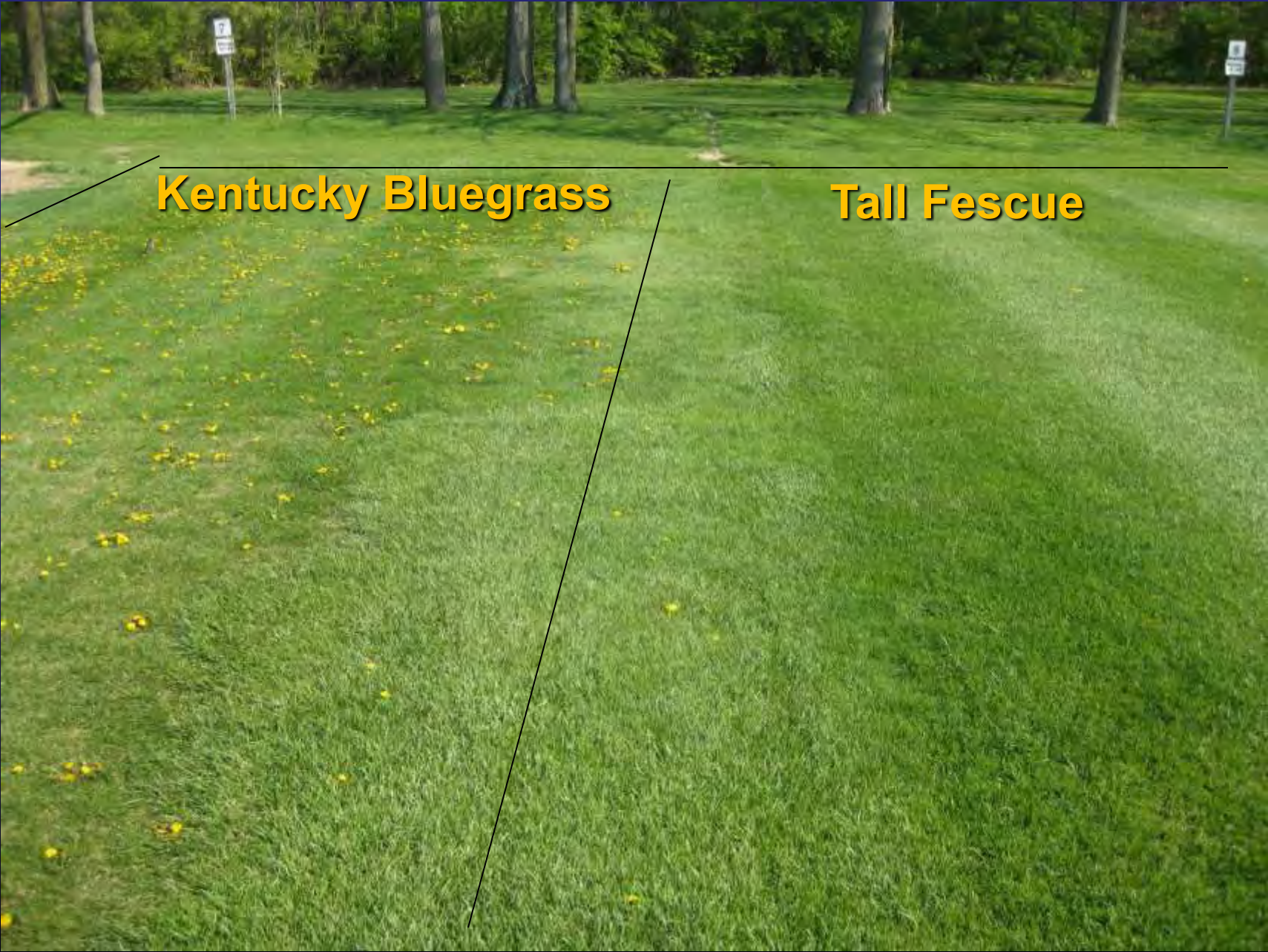


KENTUCKY BLUEGRASS

Can survive 6-8
week drought

Hydrated crown?



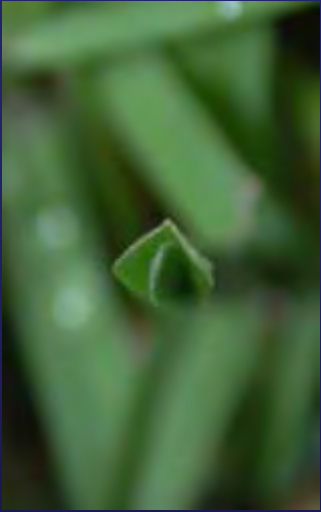


Kentucky Bluegrass

Tall Fescue

PERENNIAL RYEGRASS

(Lolium perenne)





USES:

Mixed with Kentucky bluegrass

50:50

80:20

75:25



5 days after seeding







**20 days after
seeding**



Can compete with spring weeds (crabgrass)



Disadvantages



No. 1: Diseases



Brown Patch



Dollar Spot



Pythium



Rust




Red Thread

Avoid annual (Italian) ryegrass



Beware annual ryegrass!

CONTRACTORS MIXTURE			NET WT: 15 LBS.	
PURE SEED	VARIETY	KIND	GERMINATION	ORIGIN
49.00%	INTEGRA PERENNIAL RYEGRASS		90%	OR
24.00%	GULF ANNUAL RYEGRASS		90%	OR
14.50%	BOREAL RED FESCUE		80%	CANADA
9.50%	KENBLUE KENTUCKY BLUEGRASS		80%	WA
0.90%	OTHER CROP SEED			
1.70%	INERT MATTER			
0.40%	WEED SEED			
NOXIOUS WEED SEED:				
27	ANNUAL BLUEGRASS PER LB. (1.7 PER OZ.)			
27	HAIRY CHESS PER LB. (1.7 PER OZ.)			
18	CURLY DOCK PER LB. (1.1 PER OZ.)			

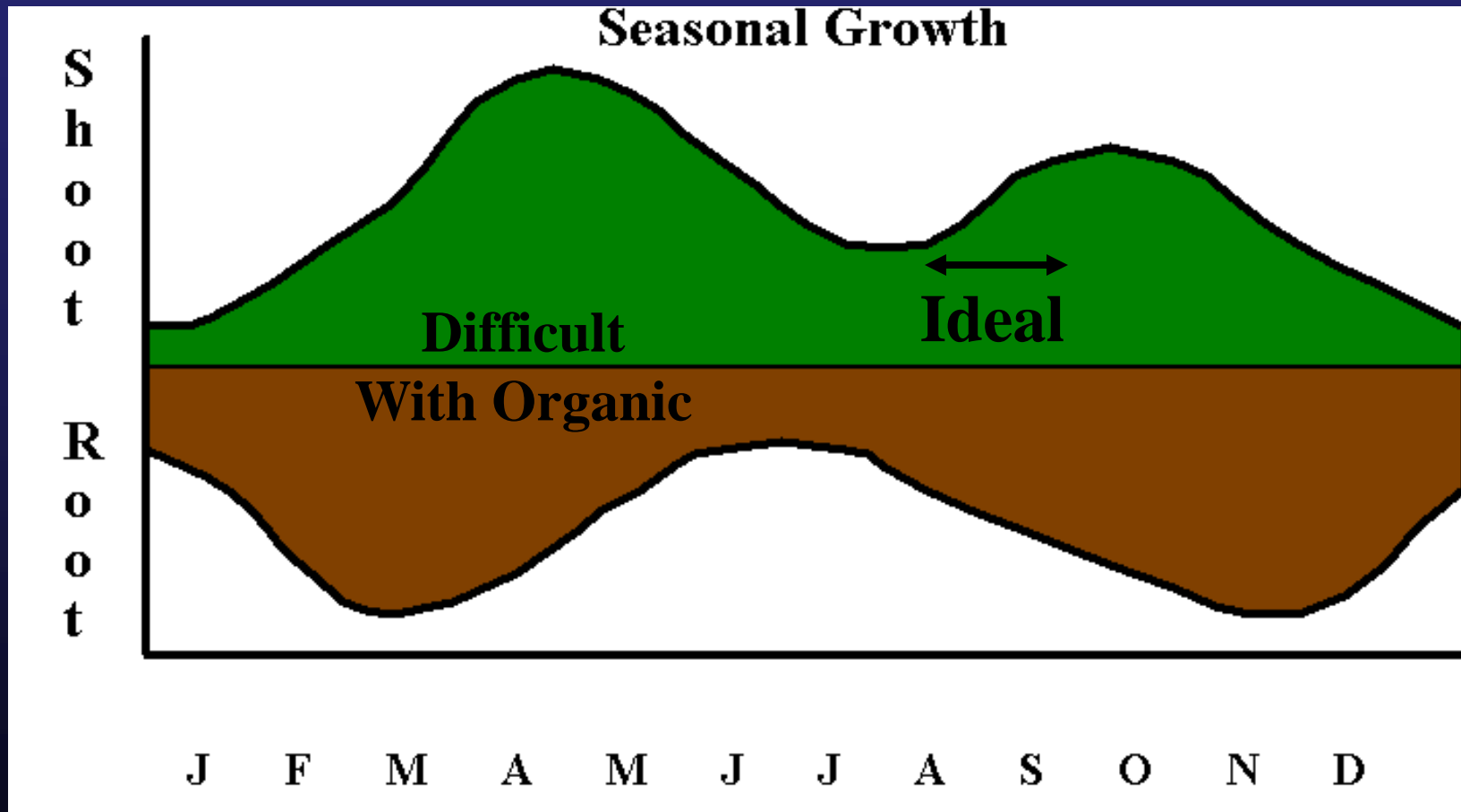


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Annual ryegrass in July



When to Seed Cool Season Turf





**Spring Seeding: No
Weed Control**

Fall Seeding of Cool Season Turf

- August 15 – September 15
 - Turfgrasses are more competitive
 - Warm season weeds (e.g. crabgrass) are at the end of their life cycle
 - Germinating grasses require warm soil temperatures, but are intolerant of summer heat

Seed Bed Preparation







Choosing the Right Seed

- Purchase high quality seed from reputable dealers only
- Read and understand the seed label



Desirable Grasses

Seed Label

Seed Mixture Analysis

Fine Textured Grasses

26.24% Glade Kentucky Bluegrass

24.00% Park Kentucky Bluegrass

18.45% Midnight Kentucky Bluegrass

Germ.

95%

90%

85%

Coarse Grasses

27.81% Pennfine Perennial Ryegrass

92%

Other Ingredients

0.45% Weed Seed

3.00% Inert Matter

0.05% Other Crop

Tested 4/95

50# Net wt.

Seed Company

Address

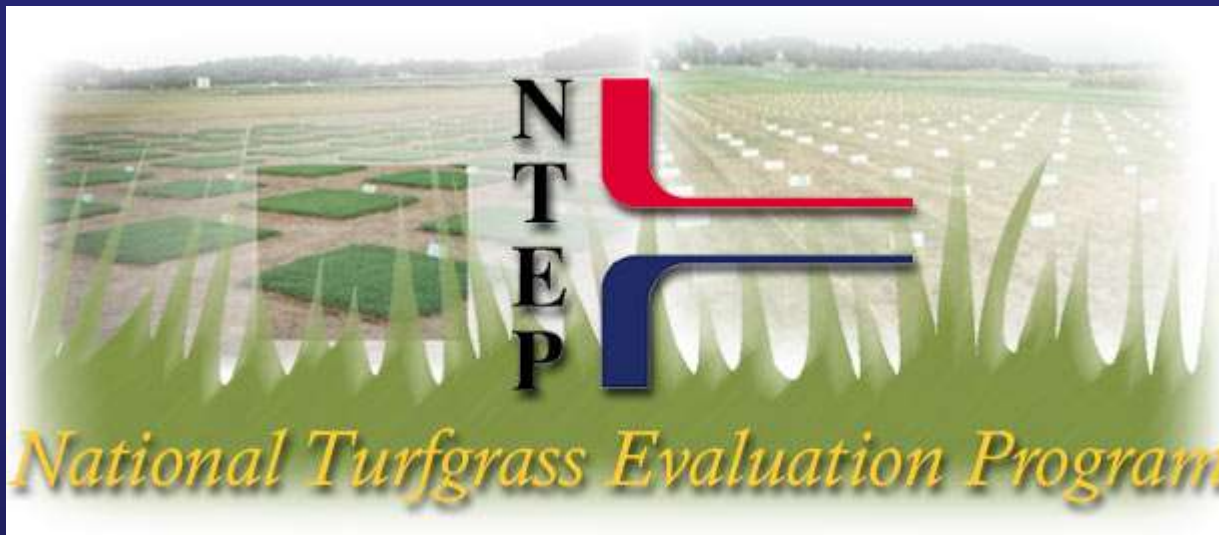
No Noxious Weeds

Undesirables

not grown as a farm crop
not seed (soil, stems, etc.)
plants normally grown for profit
the most difficult weeds to control

Anything not
seed (stems, soil,
etc.)

Other plants normally grown for
profit (often the worst weeds!)



Ntep.org

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Seeding Rate

- Temptation is to apply much more than necessary
 - Wastes money
 - Excess competition delays establishment
- Calibrate equipment and carefully apply correct amount of seed

Seeding Rate

Cool Season Species	Seeding Rate lbs / 1000 ft ²
Creeping Bentgrass <i>Agrostis palustris</i>	0.5 – 1.0
Tall Fescue <i>Festuca arundinacea</i>	7.0 – 9.0
Fine Fescue <i>Festuca rubra, F. longifolia</i>	3.5 – 4.5
Perennial Ryegrass <i>Lolium perenne</i>	7.0 – 9.0
Kentucky Bluegrass <i>Poa pratensis</i>	1.0 – 1.5

War

Buffa

Buchl

Bern

Cynoc

Zoys

Zoysia

Bahi

Paspal

St. A

Steno

Cent

Erem

Why the Difference?

- Different species have different size seeds
- Goal is to establish 1000 to 2000 seedlings ft^2



Seeding

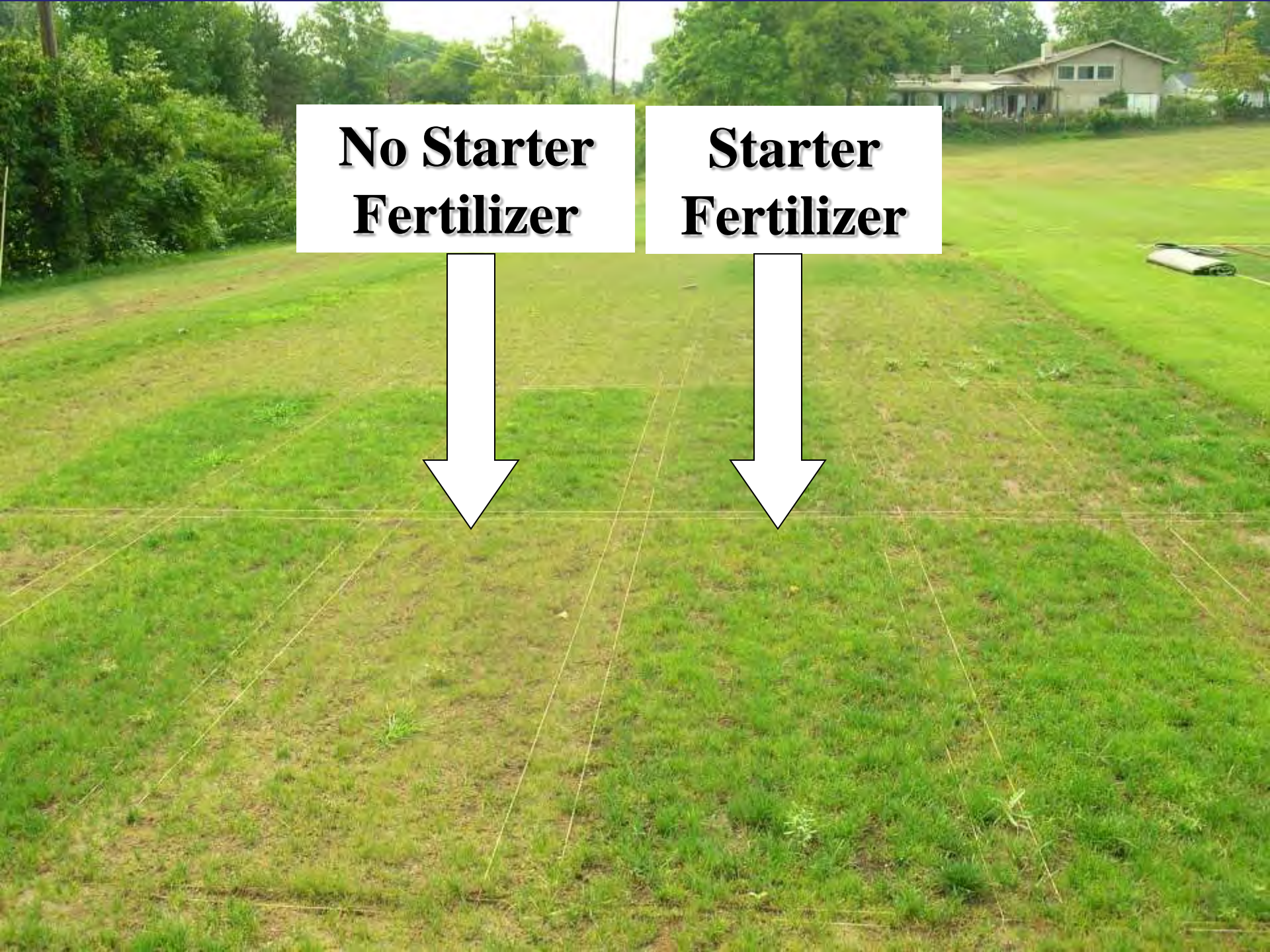
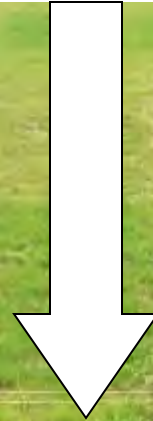
- Spread starter fertilizer
 - Such as 18-46-0
 - 1 to 1.5 lbs Nitrogen per 1000 ft²
- Apply lime as indicated by soil test
- Apply seed at $\frac{1}{2}$ recommended rate in 2 directions
- Rake in seed / cover to $\frac{1}{4}$ " depth





**No Starter
Fertilizer**

**Starter
Fertilizer**





Seed Germination Period

Cool Season Species	Germination Period (Days)
Creeping Bentgrass <i>Agrostis palustris</i>	7 - 14
Tall Fescue <i>Festuca arundinacea</i>	5 - 12
Fine Fescue <i>Festuca rubra, F. longifolia</i>	5 - 12
Perennial Ryegrass <i>Lolium perenne</i>	3 - 10
Kentucky Bluegrass <i>Poa pratensis</i>	6 - 28

Wa
Bu
Buc
Be
Cym
Zoy
Zoy
Ba
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Start Mowing



- When new grass is 3" tall cut with rotary.
- Cut often (2 x week)
- Return clippings

Management Practices



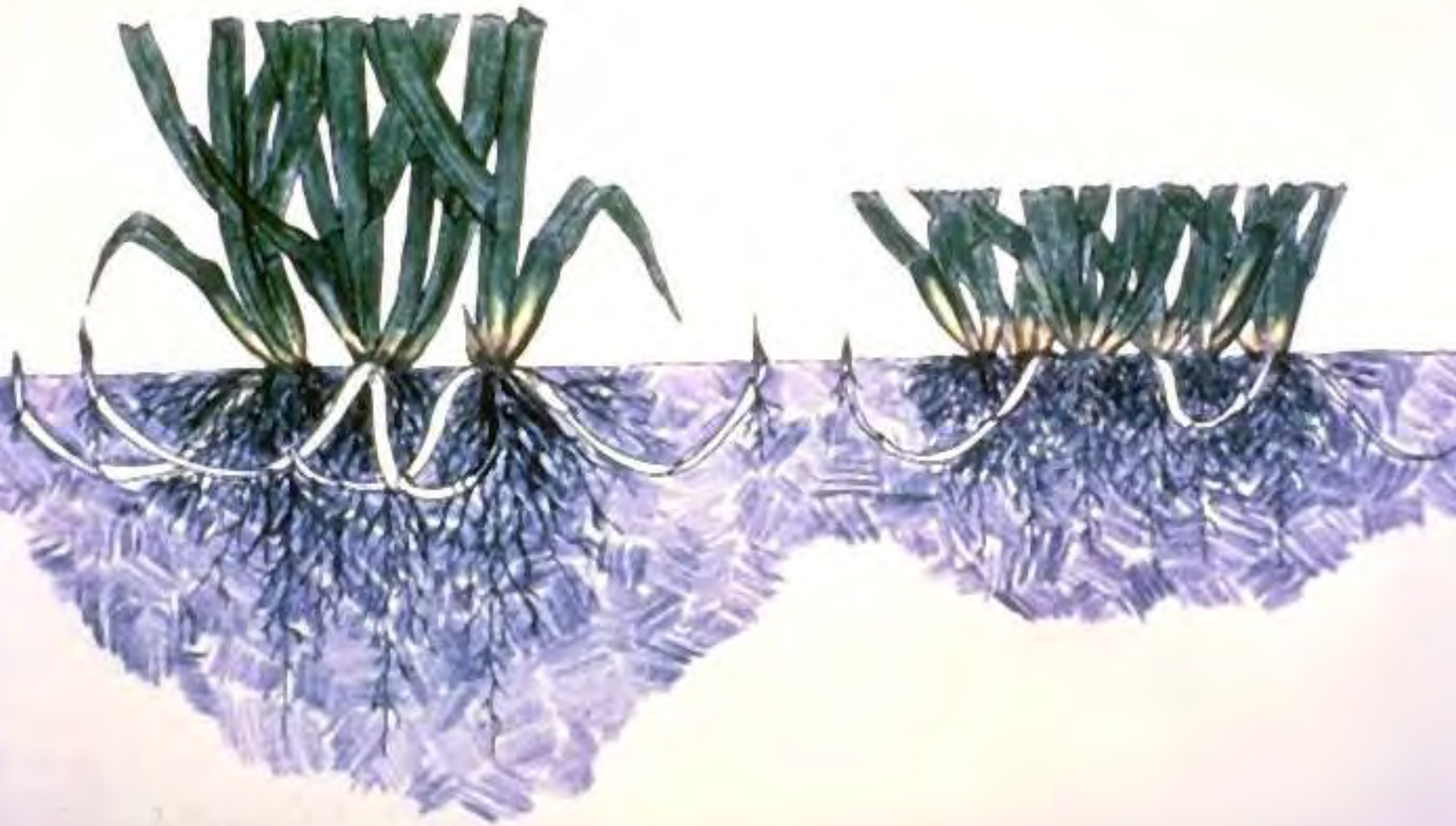
- Mowing
- Nutrition
- Irrigation
- Pest Control



MOWING

April to November

Lawn Height = 3 inches



1/3 RULE

***No more than 1/3 of the leaf
tissue to be removed at
any one time***

Grass Clipping = 1/3 Turf's Annual Nitrogen Needs



Mulching Mower



Compost

Lawn Nutrition

N fertilizer

N-P-K fertilizer
6-1-4 or 3-1-2



Natural Organic Fertilizers



- Nitrogen is derived from plant, animal or human bi-products
- Contains 2 to 10% nitrogen

Milorganite®

FERTILIZER

6-2-0

- 6% ORGANIC NITROGEN
- IRON FOR DEEP, EVEN GREENING
- NON-BURNING,
NO NEED TO WATER IN
- ALSO FOR USE ON
VEGETABLES



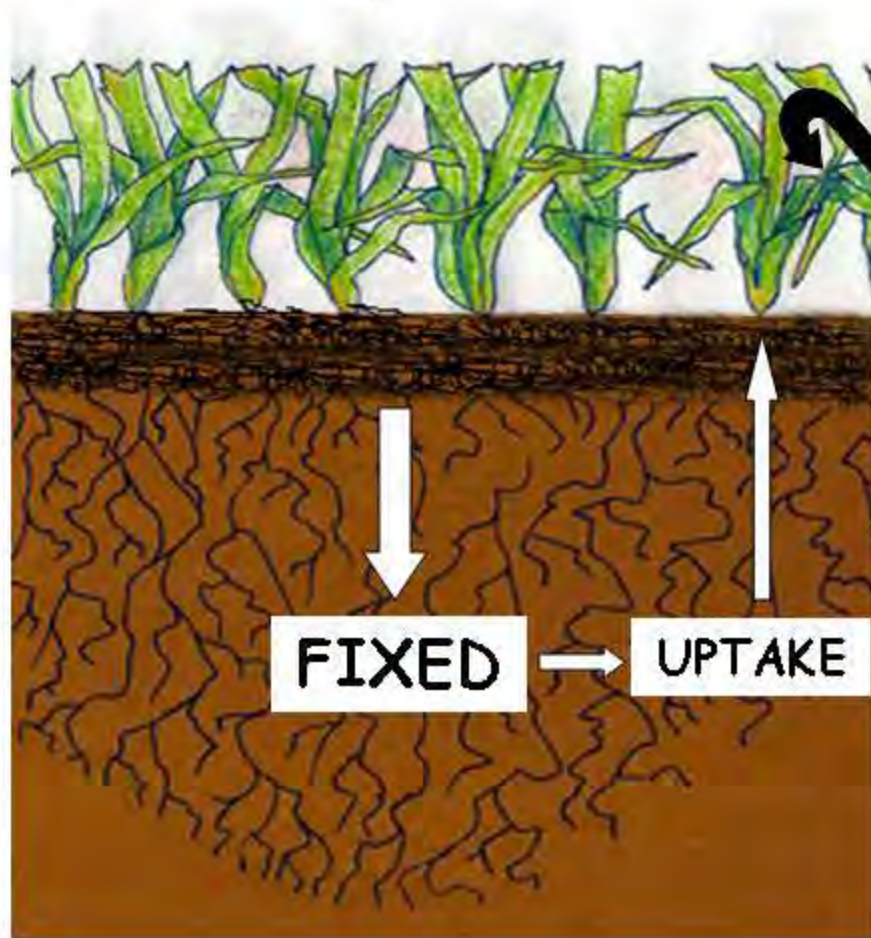
Timing of Natural Organic Fertilizer Applications on Ohio Lawns

Date	N Rate (lbs N/1,000 sq.ft.)	Notes
Early April	0 – 1.0	Apply corn gluten meal for crabgrass control (10% N)
September	1.0	At the same time as seeding operation. Granular product or compost topdressing.
October	0.5 – 1.0	If seeded areas need it
November	1.0	Late fall application
Total N	2.5 – 3.5*	* Heavier rates needed if lawn receives a lot of traffic & wear

Phosphorus in Water



PHOSPHORUS FERTILIZER P_2O_5



Clippings:
Removed →
Returned ↻

← NON TARGET
← RUN OFF &
EROSION

**Fate of
phosphorus
fertilizer applied
to turf areas**

P.J. Sherratt

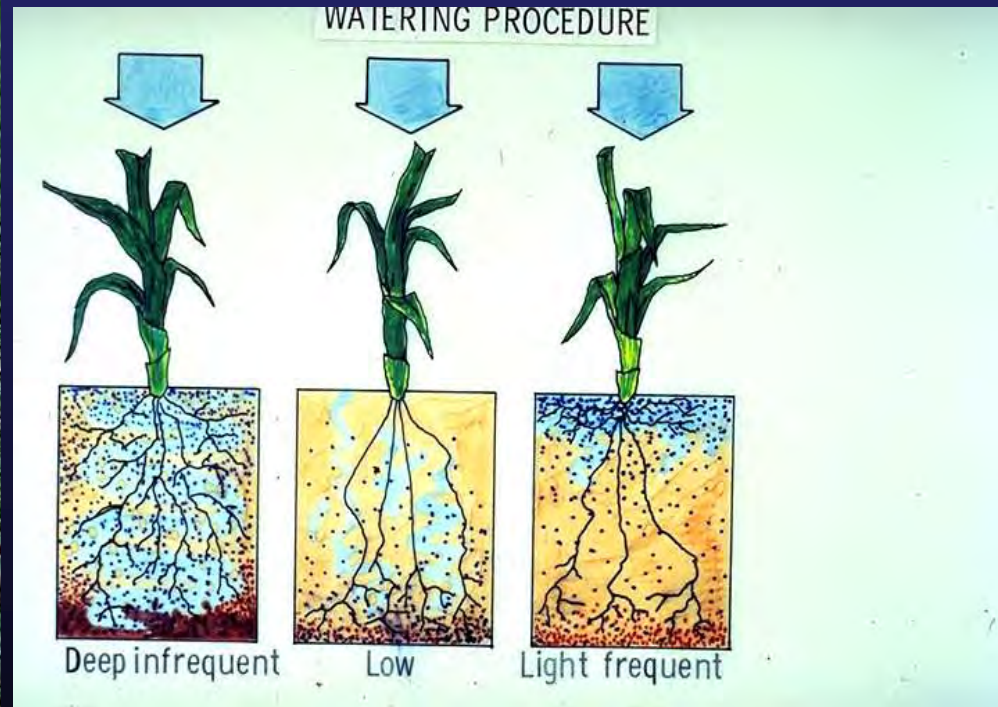
The Ohio State University



Irrigation

Irrigation Basics:

- Time of day
- Frequency
- Amount
- Application method



Lawn Problems

- Insects
- Diseases
- Weeds

A close-up photograph of a patch of daisies growing in a grassy area. The daisies have white petals and bright yellow centers. They are surrounded by green grass and other low-growing plants. The word "Weeds" is written in yellow text across the center of the image.

Weeds

**BEAUTY IS IN THE EYE OF THE
BEHOLDER? ...**



VOIDDOLOGY



As indicators



Weed Classes

- **Grassy Weeds**

- Annual (summer & winter)
- Perennial



- **Broadleaf Weeds**

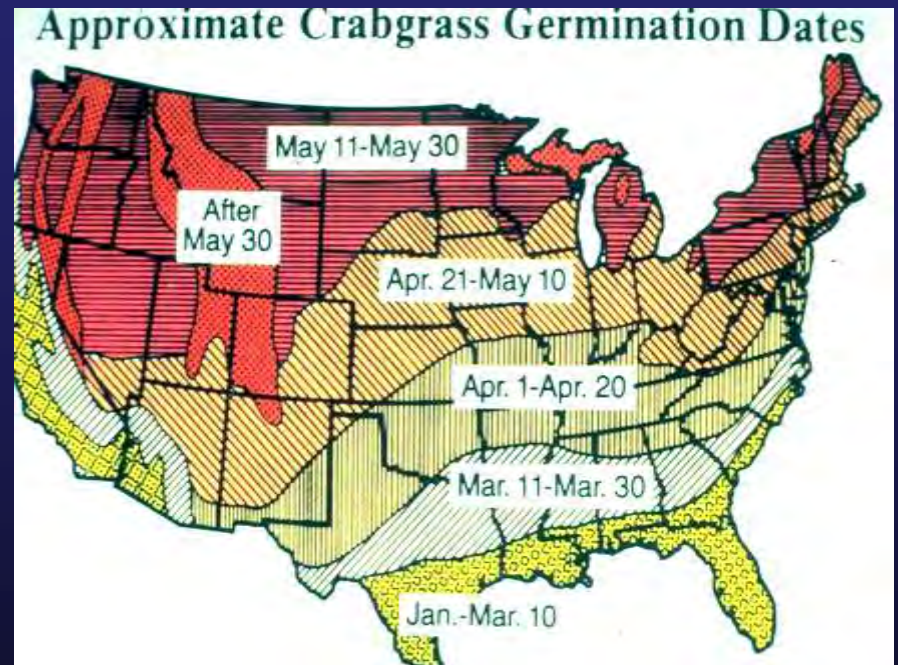
- Annual (summer & winter)
- Perennial







Crabgrass



Weed Control Options

- **Mechanical if possible**
- **Prevention if possible “voidology”**
- **Seed & fertilize often**
- **Corn Gluten Meal (not if seeding)**
- **Natural herbicides**
 - **Fiesta (Fe based)**
 - **Adios (Salt solution)**
 - **Herbicidal soaps, oils & vinegars – NON SELECTIVE**

Corn Gluten Meal

A close-up photograph showing a person's hand holding a large quantity of bright yellow, fine-grained powder. The powder is piled high on the hand and is also visible in a large white container in the background. The lighting is bright, highlighting the texture of the powder and the skin of the hand.

Tips to Optimize Corn Gluten Meal Efficacy (Christians, 2002)

- Apply in the spring 2-4 weeks before summer annuals (i.e. crabgrass) germinate. Crabgrass will germinate when the soil temperature reaches 55° F. Once soil temperatures consistently reach low to mid 50's, apply CGM at the recommended rate (20 lbs/1000ft²). This results in approximately 2 lbs N/1000 ft² per application
- If no precipitation occurs within 5 days of application, apply 0.25 in. water.
- Following weed seed germination, **do not irrigate** to encourage weed desiccation. Weeds will germinate, forming only a shoot, but not a root. If the soil is too wet, the weed can recover and form a root.
- CGM will **inhibit turfgrass germination** when applied at seeding. Inhibitory effects will last for approximately 5-6 weeks. Therefore, CGM should not be used 6 weeks before desirable grasses are seeded. If over-seeding is required in the spring, timing of CGM application is critical. CGM should not be applied until all turfgrasses germinate.
- The N will release slowly over a 3-4 month period following application. A follow-up application can be made in August to help control some perennial weeds germinating in late summer while providing an additional 2 lbs N/1000 ft².

Ref: Best Management Practices for Pesticide-Free Cool-Season Athletic Fields. (2014) Uconn Turfgrass

Active Ingredients Exempt Under 25(b) of the Federal Insecticide, Fungicide, & Rodenticide Act

* indicates exempt active ingredients that are also exempt from pesticide residue tolerance requirements

Castor oil (U.S.P. or equivalent)*	Linseed oil
Cedar oil	Malic acid
Cinnamon and cinnamon oil*	Mint and mint oil
Citric acid*	Peppermint and peppermint oil*
Citronella and Citronella oil	2-Phenethyl propionate (2-phenylethyl propionate)
Cloves and clove oil*	Potassium sorbate*
Corn gluten meal*	Putrescent whole egg solids
Corn oil*	Rosemary and rosemary oil*
Cottonseed oil*	Sesame (includes ground sesame plant) and sesame oil*
Dried Blood	Sodium chloride (common salt) *
Eugenol	Sodium lauryl sulfate
Garlic and garlic oil*	Soybean oil
Geraniol*	Thyme and thyme oil*
Geranium oil	White pepper
Lauryl sulfate	Zinc metal strips (consisting solely of zinc metal and impurities)
Lemongrass oil	

Ref: EPA

Insects: Namely White Grubs



- * Often misdiagnosed
- * need to know the life cycle
- * thatch inhabitants
- * selection of proper turfgrasses
 - ex. endophyte containing cultivars
- * thatch-inhabitators (surface feeders)
- * thinned turf susceptible to weed invasion

**Where do
grubs feed?**

Answer:


**Soil-Thatch
Interface**



Pesticide Toxicity

Substance	Acute Oral LD50 (rat) in mg/kg
Honey Bee Venom	2.8
Nicotine	10
Gasoline	50
Diazinon	100
Caffeine	200
2,4-D	666
Pendimethalin	1050
Aspirin	1200
Bleach	2000
Trimec Classic	2240
Table Salt	3320
Glyphosate	5180
Acelepryn	5,620

More Toxic



Less Toxic



Damage from
skunks & raccoons

Organic Options

- Beneficial nematodes
- Bt Grub Gone
- Pheromones
- Soaps
- Milky Spore X

Beneficial Nematodes

- Tiny, microscopic roundworms kill grubs and other insect pests
- Apply when pest is caterpillar or larvae
- Apply at soil temps $>60^{\circ}\text{F}$
- Irrigate after application
- Apply in evening
- Follow-up application generally needed



Ref: UC Davis IPM

DuPont™ Acelepryn™

INSECTICIDE

Alternative Option?

Professional Products

GROUP 28 INSECTICIDE

INTENDED FOR USE BY COMMERCIAL APPLICATORS ONLY

For foliar and systemic control of white grubs and other pests infesting landscape and recreational turfgrasses (including golf courses) as well as landscape ornamentals, interior plantscapes and sod farms.

Active Ingredient **By Weight**

Chlorantraniliprole*
3-Bromo-N-[4-chloro-2-methyl-5-[(methylamino)carbonyl]phenyl]-1-(3-chloro-2-pyridinyl)-1H-pyrazole-5-carboxamide 18.4%

Inert Ingredients 81.6%
TOTAL 100.0%

ACELEPRYN™ insecticide is a suspension concentrate. This product contains 1.67 pounds of active ingredient per gallon.

*Chlorantraniliprole belongs to the anthranilic diamide chemical class.

EPA Reg. No. 352-731 EPA Establishment No. _____

Nonrefillable Container

Net _____

E.I. du Pont de Nemours and Company
1007 Market Street
Wilmington, Delaware 19898

KEEP OUT OF REACH OF CHILDREN

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

FIRST AID

For questions regarding emergency medical treatment, you may contact 1-800-441-3637 for information.

PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS

When used as directed this product does not present a hazard to humans or domestic animals.

PERSONAL PROTECTIVE EQUIPMENT

Applicators and other handlers must wear:

Long-sleeved shirt and long pants.
Shoes plus socks.

After the product has been diluted in accordance with label directions for use, shirt, pants, socks, and shoes are sufficient Personal Protective Equipment (PPE). Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables are available, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

USERS SHOULD: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to aquatic invertebrates, oysters and shrimp. Do not apply directly to water. Drift and runoff may be hazardous to aquatic organisms in water adjacent to use sites.

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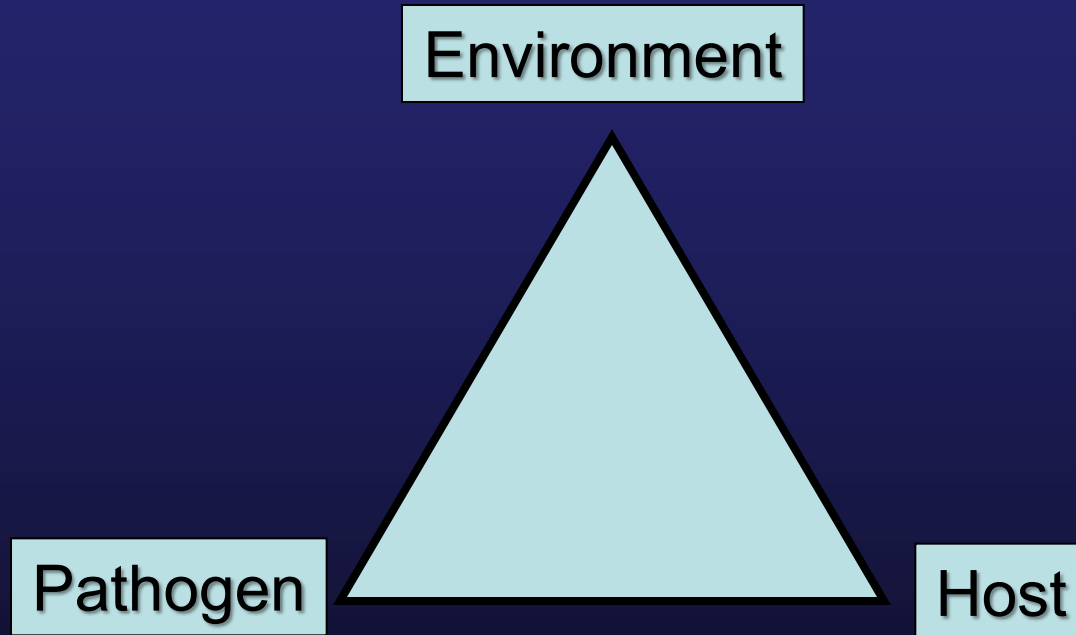
[NOTE: NO SIGNAL WORD is required for this product]



The miracles of science™

[NOTE: NO SIGNAL WORD is required for this product]

Lawn Diseases – The Disease Triangle Concept



New labels!

PROTECTION OF POLLINATORS



APPLICATION RESTRICTIONS EXIST FOR THIS PRODUCT BECAUSE OF RISK TO BEES AND OTHER INSECT POLLINATORS. FOLLOW APPLICATION RESTRICTIONS FOUND IN THE DIRECTIONS FOR USE TO PROTECT POLLINATORS.



Look for the bee hazard icon in the Directions for Use for each application site for specific use restrictions and instructions to protect bees and other insect pollinators.

This product can kill bees and other insect pollinators.
Bees and other insect pollinators will forage on plants when they flower, shed pollen, or

RED THREAD



RUST



Take Home Message:

- Maintain healthy soil & turf
- Don't disturb the soil in spring
- Use low risk products

References

- Natural Organic Lawn Care for Ohio, Ohio State University Extension Fact Sheet HYG-4031-04
- Best Management Practices for Pesticide Free, Cool Season Athletic Fields, University of Connecticut

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