Benefits of a quality Lawn

- Noise reduction
- Glare reduction
- Heat reduction
- Surface runoff reduction
- Injury from falls reduction
- Reduces “nuisance” pests and airborne allergens
Major Turfgrass Insect Pests

- White Grubs
- Mole Crickets (south mostly - CS)
- Caterpillars (CW, AW, & SWW)
- Billbugs
- Chinch Bugs
- Nuisance Pests

Thatch & Soil Pests

Chewing Pests
- White Grubs
- Mole Crickets

Sucking Pests
- Ground Pearls
- Root Aphids

*Indiana
Where do grubs feed?

Ans: Soil-Thatch Interface

What do grubs eat?

Ans: THATCH, soil (oh, and roots)
**Annual White Grub Species**

- **Masked Chafers** (North America - N, S, SW, W, SE)
- **Japanese Beetle** (eastern NA)
- **Oriental Beetle** (northeastern NA)
- **European Chafer** (northeastern NA)
- **Asiatic Garden Beetle** (northeastern NA)
- **Green June Beetle** (south-transition NA)
- **May/June Beetles** (southern only)

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**White Grub Adults**

- Annual Grubs: GJB, EC, SMC, NMC, JB, OB, AGB
- Multi-year Grubs: M/JB
- Multi-gen/yr Grub: BTA

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**White Grub Third Instars**

- Annual Grubs: GJB, EC, MC, JB, OB, AGB
- Multi-year Grubs: M/JB
- Multi-gen/yr Grub: BTA
Identifying Grub Species

- Identify grubs by raster pattern

- Adults are easy to ID but they don’t predict grub populations!

Japanese Beetle –

Japanese beetle adult skeletonizing leaf

Mating cluster of beetles in turf

Japanese Beetle Life Stages

Egg  Larva  Pupa  Adult
1st  2nd  3rd  Instar

Japanese Beetle Annual Cycle

Masked Chafers – (Unlike JB and June beetles, chafer adults do not cause much damage to leaves)
Identifying Grub Species

Masked chafers have no pattern!

Masked Chafer Distribution Maps

Northern Masked Chafer Southern Masked Chafer

Southwestern Masked Chafer Western Masked Chafer

Northern Masked Chafer Life Stages

<table>
<thead>
<tr>
<th>Stage</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>egg</td>
<td><img src="egg.png" alt="Image" /></td>
</tr>
<tr>
<td>1st</td>
<td><img src="1st.png" alt="Image" /></td>
</tr>
<tr>
<td>2nd</td>
<td><img src="2nd.png" alt="Image" /></td>
</tr>
<tr>
<td>3rd</td>
<td><img src="3rd.png" alt="Image" /></td>
</tr>
<tr>
<td>pupa</td>
<td><img src="pupa.png" alt="Image" /></td>
</tr>
<tr>
<td>adult</td>
<td><img src="adult.png" alt="Image" /></td>
</tr>
</tbody>
</table>
Masked Chafer Annual Cycle

Green June Beetle –

Identifying Grub Species

GJB crawls on back!
Green June Beetle Distribution

European Chafer –

Adult European chafer adults swarming to tree at dusk for mating

Identifying Grub Species

European chafer adults swarming to tree at dusk for mating

Identifying Grub Species

European chafers have Y-shaped anus & two rows of bristles that diverge at anus.

Y-shaped anus with two rows of bristles.
European Chafer Distribution (2000)

Oriental Beetle & Asiatic Garden Beetle –

Three common color forms of Oriental beetle

Asiatic garden beetles feeding & mating

Identifying Grub Species

Oriental beetle has two rows of small spines, 12-15 in number.

Asiatic garden beetle has vertical anus & broad U-shaped spine pattern.
Oriental Beetle & Asiatic Garden Beetle
Distribution Maps

Black Turfgrass *Ataenius* (& *Aphodius*)

Identifying Grub Species

*Ataenius* raster is random pattern of bristles and anal pads separate.

*Aphodius* raster has small V pattern and anal pad is only cleft, not divided.
Black Turfgrass Ataenius Distribution

Black Turfgrass Ataenius Life Cycle in Ohio

Life Cycles of Common White Grubs Found in Ohio
Japanese Beetle Annual Cycle

Traditional Control Timing

Preventive-Early Curative Timing

Turf Pests Life Cycle

Ranked Efficacy of White Grub Insecticides 1976 – 2001

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>rate (lb ai/a)</th>
<th>ave % control</th>
<th>range</th>
<th>% of tests below 70%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiamethoxam (=Meridian)</td>
<td>0.2</td>
<td>96.1</td>
<td>0-100</td>
<td>3</td>
</tr>
<tr>
<td>Halofenozide (=MACH2)</td>
<td>1.5</td>
<td>92.8</td>
<td>10-100</td>
<td>10</td>
</tr>
<tr>
<td>Imidacloprid (=Merit)</td>
<td>0.3</td>
<td>93.7</td>
<td>58-100</td>
<td>7</td>
</tr>
<tr>
<td>Trichlorfon (=Dylox, Proxol)</td>
<td>8.0</td>
<td>77.6</td>
<td>0-98</td>
<td>19</td>
</tr>
<tr>
<td>Carbaryl (=Sevin)</td>
<td>8.0</td>
<td>74.3</td>
<td>13-100</td>
<td>37</td>
</tr>
<tr>
<td>Diazinon</td>
<td>4.0</td>
<td>69.0</td>
<td>47-99</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>5.5</td>
<td>74.8</td>
<td>25-100</td>
<td>29</td>
</tr>
<tr>
<td>Chlorpyrifos (=Dursban)</td>
<td>4.0</td>
<td>54.6</td>
<td>0-96</td>
<td>59</td>
</tr>
</tbody>
</table>

* Data from ESA publications (1977-2001) using masked chafer and Japanese beetle data when label timing recommendations were used and label rate applied to square feet containing grubs.
Comparison of Grub Insecticide Efficacy by Time of Application

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>rate lb. ai./a.</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug 16 to Sept 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halofenozide (=MACH2)</td>
<td>1.5</td>
<td>92.8 (6)</td>
<td>96.8 (18)</td>
<td>92.2 (15)</td>
<td>92.0 (13)</td>
</tr>
<tr>
<td>Imidacloprid (=Merit)</td>
<td>0.3</td>
<td>90.2 (6)</td>
<td>91.8 (16)</td>
<td>94.9 (16)</td>
<td>95.6 (17)</td>
</tr>
<tr>
<td>Thiamethoxam (=Meridian)</td>
<td>0.2</td>
<td>80.0 (5)</td>
<td>98.6 (11)</td>
<td>98.3 (11)</td>
<td>93.7 (8)</td>
</tr>
<tr>
<td>Trichlorfon</td>
<td>8.0</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>91.0 (2)</td>
</tr>
</tbody>
</table>

Entomopathogenic Nematodes

Steinernema carpocapsae

S. riobravis

S. scapterisci

Heterorhabditis bacteriophora

Vector® TL, Exhibit®, Savior®

Vector® MC, Devour®

BioControl’s™ Nematode

Cruiser™, Scanmask®
Mole cricket damage to bermudagrass.

E. Buss, Univ. FL

Mole Cricket Tunneling

Mole Cricket Pests

Native (northern) mole cricket
Scapteriscus vicinus Scudder

Southern mole cricket
Gryllotalpa hexadactyla Perty
S. borellii Giglio-Tos (=S. acletus Rehn & Hebard)
S. abbreviatus Scudder

Tawny mole cricket
Shortwinged mole cricket

University of Florida Control Recommendations
Mole Cricket Damage

- Most destructive pests of Bermudagrass and Bahiagrass in Southeast US
- Do best on sandier soils
- Mole crickets are omnivores: feed on other insects or graze on plant material
- Damage occurs when larger nymphs and adults make tunnels that dislodge roots, or nick turf stems causing turf to dry.

Mole Cricket Distribution

- Native Mole Cricket
- Tawny Mole Cricket
- Southern Mole Cricket
- Shortwinged Mole Cricket

Mole Cricket Management Schedule

March - April

Visual rating
(based on experience)

Grid rating

Map Course for Adult Activity

(Eggs will be laid where adults tunnel and break surface is where eggs will be laid or PREVIOUS RECENT HISTORY OF DAMAGE MAY BE USED)
Mole Cricket Pesticides (preventive)

- imidacloprid (Merit)
- fipronil (Chipco Choice)

slit-placement only
(by contract applicator, golf only)

Merit is most effective when applied between start of egg laying and egg hatch. Adult female mole cricket eggs are yellow when ready to be laid. Sample adults in April and May to look for egg development. Immature eggs on left, mature eggs on left.

Timing Merit

Mole Cricket Management Schedule

May - June

Nymph Target Applications
(young nymphs most likely where spring adult activity was located)

Monitor - Soap Flush
Treatments
Sprays
Subsurface
Mole Cricket Management Schedule

July - September

Large Nymph Scouting
(may occur in places not treated earlier or where poor control)
Monitor - Soap Flush
Treatments
Sprays
Baits

October - December

Map Lawns for Activity
(large nymphs and adults tunnel and break surface)
Visual rating
Grid rating
Treatments
Sprays
Baits
Nematodes ??

Mole Cricket Pesticides (curative)

• acephate (Orthene)
• carbaryl (Sevin)
• trichlorfon (Dylox, Proxol)
• fipronil (Chipco Choice)

slit-placement only
(by contract applicator, not lawns)
Mole Cricket Pesticides (curative)

- bifenthrin (Talstar)
- cyfluthrin (Tempo)
- lambda-cyhalothrin (Scimitar)
- permethrin (Astro)