Invasive Insects
Create Opportunities

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Less than 1% of ALL insects are considered “pests”

• Yet, millions of $$$ are spent each year to control them
• Approximately 40% of all insect “pests” are exotic or introduced species
Introduced Pests
Understanding the **BIOLOGY** of an organism is the **KEY** to successful management!
Gypsy Moth History

- Native to Europe, Asia, and Africa
- Accidentally released in 1869 by L. Trouvelot near Medford, Massachusetts
Gypsy Moth History

- Since the early 1900’s, the gypsy moth has slowly moved westward across the U.S. causing measurable damage.
- As transportation and commerce has advanced, so has the speed of gypsy moth migration.
Gypsy Moth Biology

- Larvae (caterpillars) are the damaging life stage
- Younger larvae (1\textsuperscript{st} and 2\textsuperscript{nd} instars) are both diurnal and nocturnal
- Older larvae (3\textsuperscript{rd}-5\textsuperscript{th} instars) are nocturnal
- Larvae feed on over 300 species of plant material
Preferred Hosts in Wisconsin

- Oaks (most species)
- Aspens
- Willow
- Apple/ Crabapple
- Paper birch
- Mountain Ash
- Basswood and Linden
Gypsy Moth Biology

- Adult females can **NOT** fly
- Adult females lay egg masses that contain 600-1000 eggs
- All life stages can be transported via human activity
- Only **ONE** generation per year
Gypsy Moth Calendar of Events

- Count egg masses
- Egg masses
- Spray Programs
- Young Caterpillars
- Older Caterpillars
- Pupae
- Moths
- Egg masses
- Count egg masses

Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec
Gypsy Moth Control Options

- Biological (Pathogens, Parasites, Predators)
- Cultural (Mechanical/Physical)
- Chemical (Insecticides)
Chemical Control Options

- Carbaryl
- Acephate
- *Btk*
- Azadirachtin
- Cyfluthrin
- Golden Pest Spray Oil (GPSO)

- Diflubenzuron
- Phosmet
- Spinosad
- Malathion
- Lambda-cyhalothrin
Effectiveness of Chemical Controls

- Most control products provide excellent control (> 90%) when applied “correctly”
- Certain products must be applied to young caterpillars
- Certain products must be applied multiple times to ensure maximum control
- Certain products have quicker speed of kill
- Certain products are contacts while other must be ingested
- Certain products have longer residual activity than others
## Effectiveness of Chemical Controls

<table>
<thead>
<tr>
<th>Product</th>
<th>Residual Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acephate</td>
<td>10-21 days</td>
</tr>
<tr>
<td>Neem</td>
<td>14-21 days</td>
</tr>
<tr>
<td>Btk</td>
<td>7-10 days</td>
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<tr>
<td>Bifenthrin</td>
<td>7-10 days</td>
</tr>
<tr>
<td>Carbaryl</td>
<td>3-10 days</td>
</tr>
<tr>
<td>Cyfluthrin</td>
<td>7-10 days</td>
</tr>
<tr>
<td>Deltamethrin</td>
<td>7-14 days</td>
</tr>
<tr>
<td>Diflubenzuron</td>
<td>all season</td>
</tr>
<tr>
<td>Insecticidal Soap</td>
<td>&gt; 24 hours</td>
</tr>
<tr>
<td>Permethrin</td>
<td>7-10 days</td>
</tr>
<tr>
<td>Spinosad</td>
<td>7-14 days</td>
</tr>
<tr>
<td>Tebufenozide</td>
<td>all season</td>
</tr>
</tbody>
</table>
Golden Pest Spray Oil (GPSO)

- Soybean oil based product (93%) with a surfactant (7% secret recipe)
- Must be applied (oiled) to egg masses prior to egg hatch (Great winter project, especially since leaves are off tree)
- Provides >95% control when applied in Oct., Nov., Dec., Jan., Feb., 4, 3, 2, 1 week, and 3 days prior to egg hatch
- Available from Stoller Enterprises 713-461-1493
Japanese Beetle
Japanese Beetle History

• Introduced into the U.S. to New Jersey from Japan in 1916, “allegedly” in root-ball nursery material
• Since its introduction, the Japanese beetle has slowly migrated westward
• In the early 90’s is was first discovered in Wisconsin, the rest is history!
Japanese Beetle Adult

- Adults are an attractive broadly oval, 5/16-7/16” long, metallic green beetle with hard, coppery-brown wing covers
Japanese Beetle Grub

- Larvae are typical white grubs with three pairs of jointed legs and a yellowish-brown head capsule
- They usually assume the C-shape position
Japanese Beetle Biology

- Both the adults and larvae cause serious damage
- Adults feed on >300 species of plants
- Grubs feed on equally as many food sources
- Only ONE generation per year
Larval damage

Adult damage
Japanese Beetle Life Cycle (Annual White Grub)
Adult Behavior

- Adults prefer direct sunlight, they are most active between 10-4 on Southern and Western exposures
- Adults are gregarious (aggregate)
- Adults are not truly defoliators, they skeletonize within margins of leaf veins
JB uses a diversity of plant species and plant parts for hosts.
Preferred Hosts of Japanese Beetle

- Linden
- Maple (Japanese and Norway)
- White Birch
- Apple/ Crabapple
- Purple-leaf plant material
- *Prunus* spp. (Cherry, Plum, Peach, etc.)
- American and English Elm
- American Mountain Ash
- Roses
Adult Behavior

• Females mate multiple times, laying as many as 60 egg (1-4 eggs each time)
• Females live for about 30-45 days
• Eggs typically hatch in about 2 weeks once laid
Japanese Beetle Management Options

- Biological
- Cultural
- Chemical
Two Approaches to Chemical Control

• PREVENTATIVE and CURATIVE chemical control options are available for Japanese beetle adults and grubs
Chemical Control Options

• **PREVENTATIVE**
  - Proactive
  - Prior to infestation
  - “Insurance,” similar to snow mold treatments

• **CURATIVE**
  - Reactionary
  - Corrective
  - Response to pest infestation and damage
Adults: **Preventative**

Chemical Control Options

- Systemic insecticide treatments applied to the plant material
- Soil drench or injection at root flare or near drip-line
  - Merit (imidacloprid)
    - Preceding fall (late-Sept.-Oct.)
  - Meridian* and Flagship (thiamethoxam), *NOT currently registered!
    - Spring
Adults: Curative Chemical Control Options

- Contact insecticides directly applied active adults
- Trans-laminar (Merit) insecticides applied to foliage
Effective Control Products

- Orthene (acephate), contact
- Merit (imidacloprid), contact and trans-laminar
- Sevin (carbaryl), contact
- DeltaGard (deltamethrin), contact and deterrent
- Scimitar (lambda-cyhalothrin), contact
- Talstar (bifenthrin), contact
- Tempo (cyfluthrin), contact
- Astro (pyrethrum), contact
Grubs: Chemical Control Options

- Regardless of the control product and approach (preventative or curative), treatment **MUST** be watered-in with sufficient irrigation or rainfall!
Grubs: Preventative Chemical Control Options

- Must be applied before egg hatch (late-July)!
- Will **NOT** control larger grubs (2\textsuperscript{nd}/3\textsuperscript{rd})!
- May be applied in late-May, June, or July
- Long-residual activity (>120 days)
  - Merit (imidacloprid)
  - Mach 2 (halofenozide)
  - Meridian (thiamethoxam) **NOT** currently registered!
Grubs: Curative Chemical Control Options

- Applied once grubs or damage is evident
- Larger grubs, especially 3rd instars, are more difficult to control!
- Short-residual activity (<10 days)
- ONLY two registered products are suggested:
  - Dylox (trichlorfon)
  - Sevin (carbaryl)