Managing Common Pests in the Landscape: An Ecological Perspective

18th Annual IEPMA of Western Canada Conference
January 30, 2014

Dr. Ken Fry
Olds College
Overview

- Site Management
  - Spatial Diversity
  - Biodiversity
  - Temporal Diversity
- Pest Diagnostics
  - Diagnostic Process
  - Management Strategies
- Beneficial Insects in the Landscape
  - Necessary Resources
  - Predators
  - Parasitoids
- Identification Resources
  - Keys
  - Image Galleries
Habitat Diversity

- **Spatial Diversity**
  - Horizontal Diversity
    - Reduce monoculture
  - Vertical Diversity
    - Herbs, forbs, shrubs, trees
    - Inter-plantings with different heights

- **Biodiversity**
  - Alternate hosts/Refugia

- **Temporal Diversity**
  - Flowering plants all season long
Transition Zones

Pioneer Weeds  Grasses  Small Shrubs  Soft Hardwoods (Poplar, Willow)  Expanding Saplings  Mature Hardwoods

California Integrated Waste Management Board
### Bloom Timing of Native Plants Attractive to Beneficial Insects

<table>
<thead>
<tr>
<th>Native plant</th>
<th>Natural enemies</th>
<th>Bees</th>
<th>Bloom Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>wild strawberry</td>
<td>** **</td>
<td>*</td>
<td>May, June, July</td>
</tr>
<tr>
<td>golden Alexanders</td>
<td>** ** **</td>
<td>**</td>
<td>June, July, Aug</td>
</tr>
<tr>
<td>Canada anemone</td>
<td>** ** **</td>
<td>*</td>
<td>July, Aug, Sep</td>
</tr>
<tr>
<td>penstemon</td>
<td>** **</td>
<td>**</td>
<td>Aug, Sep, Oct</td>
</tr>
<tr>
<td>angelica</td>
<td>** ** **</td>
<td>*</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>cow parsnip</td>
<td>** ** **</td>
<td>*</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>sand coreopsis</td>
<td>** ** **</td>
<td>*</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>shrubby cinquefoil</td>
<td>** ** **</td>
<td>*</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>Indian hemp</td>
<td>** ** **</td>
<td>*</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>late figwort</td>
<td>** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>swamp milkweed</td>
<td>** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>Culver’s root</td>
<td>** ** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>yellow coneflower</td>
<td>** ** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>nodding wild onion</td>
<td>*</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>meadowsweet</td>
<td>** ** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>yellow giant hyssop</td>
<td>** ** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>horsemint</td>
<td>** ** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>Missouri ironweed</td>
<td>** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>cup plant</td>
<td>** ** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>pale Indian plantain</td>
<td>** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>boneset</td>
<td>** ** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>blue lobelia</td>
<td>** ** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>pale-leaved sunflower</td>
<td>** ** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>Riddell’s goldenrod</td>
<td>** ** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>New England aster</td>
<td>** ** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
<tr>
<td>smooth aster</td>
<td>** **</td>
<td>**</td>
<td>Sep, Oct</td>
</tr>
</tbody>
</table>

**KEY**

- * good
- ** better
- **** best
## Plants for our climate

<table>
<thead>
<tr>
<th>Plant</th>
<th>Bloom Colour</th>
<th>Time of Bloom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chokecherry</td>
<td>White</td>
<td>Spring</td>
</tr>
<tr>
<td>Pussy Willow</td>
<td>Yellow</td>
<td>Spring</td>
</tr>
<tr>
<td>Wild Rose</td>
<td>Pink</td>
<td>Early summer</td>
</tr>
<tr>
<td>Goldenrod</td>
<td>Yellow</td>
<td>Fall</td>
</tr>
<tr>
<td>Monarda</td>
<td>Light Blue</td>
<td>Summer</td>
</tr>
<tr>
<td>Penstemon</td>
<td>Pink</td>
<td>Early Summer</td>
</tr>
<tr>
<td>Echinacea</td>
<td>Purple</td>
<td>Summer</td>
</tr>
</tbody>
</table>
Large Scale Management Practices

- Drainage
  - Air
  - Water

- Hedgerows
  - Insect/Disease Refugia
  - Block Immigration
Miscellaneous Management Practices

- Biodiversity
  - Economic consideration
  - Beneficial insect community
- Understory
  - Different pest complex

- Neighbouring Plants
  - Chemical drift
  - Source of insects/disease

Effect of N fertilisation
- High nitrogen benefits aphids

Healthy Plants Have Fewer Pest Problems
Pine Needle Scale

*Chionaspis pinifoliiae*
Bronze Birch Borer

- 2-year Life Cycle
  - Adults lay eggs late June - early July
  - Under bark, old wounds

- Eggs laid in branches 25mm+ diameter
White Pine Weevil
*Pissodes strobi*
Conserving the Urban Ecosystem

- Soil Conservation
  - Reduced disturbance
  - Organic content
  - Preserve structure

- Water Conservation
  - Drought-tolerant plants
  - Rain capture

- Terraform
Conserving the Urban Ecosystem

- Plant Health
  - Hardy species
- Biodiversity
- Spatial diversity

- Insect Conservation
  - Flowering plants
- Refugia
- ↓ Pesticide Use
All Species

- Arthropods 75%
- Birds 20%
- Fish 50%
- Mammals 9%
- Herp’s 15%
- Amphib’s 6%
- Vertebrates 4%
- Other 18%

note: 9% of 4% = 0.36%
What Roles do Insects Play?

- Pollinators
- Decomposers/Recyclers
- Predators/Parasitoids
- Herbivores
Poplar Borer
Saperda calcarata
Web Resources

- Michigan State University – Dr. Doug Landis
  - http://www.nativeplants.msu.edu

- Plant Database
  - http://www.wildflower.org/plants/

- Plant Phenology
  - http://neoninc.org/budburst/
Web Resources, cont.

- Healthy Lawns Canada

- IPM Accreditation Ontario

- PMRA Reduced Risk Pesticides

- Canada Organic List
  - [http://www.tpsgc-pwgsc.gc.ca/cgscb/on_the_net/organic/index-e.html](http://www.tpsgc-pwgsc.gc.ca/cgscb/on_the_net/organic/index-e.html)

- OMRI List of Organic Products
  - [http://www.omri.org/OMRI_products_list.php](http://www.omri.org/OMRI_products_list.php)

- National Organic Program (U.S.) List of Organic Products
What questions to ask?

- Establish context
  - Host plant
  - Where on plant
  - How extensive on plant
  - When occurred
  - Health of plant
    - Watering practices
    - Soil condition
    - Fertility

- Specific signs (the pest)
  - Insect
  - Frass
    - Exuviae (cast skins)

- Symptoms (the plant)
  - Damage
  - Insect or disease?
  - Varmint?
Predators & Parasitoids
Ground Beetles – Carabidae
- In soil & ground surface
Lady Beetles
Coccinellidae
- Prey on soft-bodied insects
Podisus maculiventris
Pentatomidae
- Prey on caterpillars
Damsel Bug – Nabidae
- caterpillars, grubs
Ambush Bug – Phymatidae
- In flowers
Orius spp. – Minute Pirate Bug – Anthocoridae - thrips, caterpillars, grubs
Geocoris spp. – Big-eyed Bug – Lygaeidae
- Spider mites, caterpillars, grubs
Family Syrphidae: Flower Fly Larvae and Adult
Larvae feed on soft-bodied insects
Adults are pollinators
Family Cecidomyiidae: Midges
Larvae feed on soft-bodied insects
Adults feed on nectar
Feltiella acarisuga
Cecidomyiidae
- mites
Lacewings
*Chrysopidae, Hemerobiidae*
- aphids, soft-bodied insects
Phytoseiulus persimilis

Mite Predators

Neoseiulus fallacis
N. californicus
Yellow Jacket Wasps – Vespidae
Early-mid season predators
Araneidae
Orbweaver

Salticidae
Jumping Spider

Opiliones
Daddy Long-legs

Theridiidae
Tangled-Web Spiders
Thomisidae
Crab Spiders
Parasitoids lay eggs inside host
Ichneumonidae  *Banchus* spp.
Tachinidae
Pathogens

Viruses

Nematodes

Fungi
Beneficial Insect Requirements

- **Alternate hosts/prey**
  - Non-crop herbivores
  - Banker plants

- **Shelter**
  - Moderated microclimates
  - In-season refuges
  - Overwintering sites
  - Nesting sites

- **Food**
  - Nectar
  - Pollen
Access to Clean Water

- Wetlands
- Bird baths
- Ditches
Nesting Resources

- Nest entrance in soil
- Nest made in sloping soil
- Nest made in burrow
- Holes in a tree that could be used by bees
- Nesting box constructed for cavity nesting bees
Augmentation of Beneficial Insects

- Supplementing already present beneficial insects
- Inoculate
  - Introduce/reintroduce natural enemies
- Inundate
  - Repeated mass introductions
  - Commercially available beneficial insects
Web Resources for Biological Control

- **Applied Bionomics**
  - http://www.appliedbionomics.com/

- **Becker Underwood**

- **BioBest**

- **Biological Control Information Centre**
  - http://cipm.ncsu.edu/ent/biocontrol/

- **Guide to Biological Control**
  - http://cipm.ncsu.edu/ent/biocontrol/

- **Nematodes**
  - http://www.oardc.ohio-state.edu/nematodes/

- **Koppert**
  - http://www.koppert.nl/e005.shtml

- **List of Suppliers**
  - http://www.cdpr.ca.gov/docs/ipminov/bensuppl.htm
Insect Identification Sites

- Bee Genera of Canada
  - http://pick5.pick.uga.edu/mp/20q?guide=Bee_genera_United_States_and_Canada

- Bug Guide
  - http://bugguide.net/node/view/15740

- Discover Life
  - http://www.discoverlife.org/
Insect Identification Sites

- Butterflies & Moths
  - http://www.butterfliesandmoths.org/

- Earthworms

- Forest Pests
  - http://www.forestryimages.org/pests.cfm
Insect Identification Sites

- Yellow Jackets in Edmonton

- Royal Alberta Museum

- Key to common pests
Insect Identification Sites

- Bumblebees of North America
  - [http://www.nhm.ac.uk/research-curation/research/projects/bombus/wnearctic.html](http://www.nhm.ac.uk/research-curation/research/projects/bombus/wnearctic.html)

- Yellow Jackets of Western North America
Insect Identification Sites

- **Key to Butterflies and Moths of Canada**
  - [http://www.biology.ualberta.ca/bsc/ejournal/d_17/d_17_download.html](http://www.biology.ualberta.ca/bsc/ejournal/d_17/d_17_download.html)

- **Key to Aquatic Invertebrates of Alberta**
  - [http://sunsite.ualberta.ca/Projects/Aquatic_Invertebrates/index.php](http://sunsite.ualberta.ca/Projects/Aquatic_Invertebrates/index.php)

- **AAFC Monographs**
  - [http://esc-sec.ca/aafcmono.php](http://esc-sec.ca/aafcmono.php)
Point Pleasant Park, Halifax, NS