Exotic Pests of Concern for Ornamental Plants
Introduction

- Exotic Arthropod Pests
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  - Brown marmorated stink bug
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- Exotic Diseases
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  - Boxwood blight
  - Impatiens downy mildew
  - Chrysanthemum white rust
  - Texas Phoenix palm decline
  - Bleeding canker of horse chestnut
Exotic Arthropods
Red Palm Weevil

• *Rhynchophorus ferrugineus*
  
  – Distribution
    • Native to Asia, spread to Middle East, Portugal, Spain
    • First detected in US in California in 2010
  
  – Hosts
    • Palms, American Agave, sugarcane
    • Attracted to wounded plants

Image Credit:
John Kabashima, University of California
Bugwood.org, #5444382

Has been found and eradicated
Red Palm Weevil

Has been found and eradicated

Image Credit:
Top Left: Mike Lewis, Center for Invasive Species Research, Bugwood.org, # 5430201
Bottom Left: Amy Roda, USDA-APHIS
Right: Christina Hoddle, University of California,
Bugwood.org, # 5430200
Red Palm Weevil

Has been found and eradicated

Image Credit: Amy Roda, USDA-APHIS
Red Palm Weevil

Has been found and eradicated

Image Credit: Amy Roda, USDA-APHIS)
Red Palm Weevil

• Management
  – Monitoring
  – Cultural
    • Sanitation
    • Sealants
    • Groundcover
  – Chemical*
    • Carbaryl, chlorpyrifos, diazinon, endosulfan, fipronil, imidaclorpid, malathion, acephate, azinphos-methyl, methidathion, demethoate, trichlorfon

*Be sure to check with your local county agent to find out which chemicals are certified for use in your state, on what crop it is allowed to be used, if it is allowed to be used post-harvest or pre-harvest, and if it should be applied by a licensed applicator.

Has been found and eradicated

Monitoring bucket.
Image Credit: Amy Roda, USDA-APHIS)
Palm Weevil Similarities

Red palm weevil

Palmetto palm Weevil – red form

Palmetto palm Weevil – black form

South American palm Weevil

Image Credit: Charles Bronson, FDACS-DPI
Daylily Leaf Miner

- **Ophiomyia kwansonis**
  - Distribution
    - Native to Japan and Taiwan
    - First detected in US in Maine in 2006
    - Has been reported in NY, PA, MD, WV, VA, NC, SC, GA, AL, FL, LA, MS, and TX
  - Host
    - Daylilies

Has been found but is limited in its distribution

Daylily Leaf Miner

Has been found but is limited in its distribution

Image Credit:
Top Right: Gaye Williams, Maryland Dept. of Agriculture
Top Left, Bottom Left and Right: Gary Steck, FDACS-DPI
Daylily Leaf Miner

Has been found but is limited in its distribution

Image Credit:
Gary Steck, FDACS-DPI
Daylily Leaf Miner

Has been found but is limited in its distribution

Image Credit: Gary Steck, FDACS-DPI
Daylily Leaf Miner

• Management
  – Good sanitation practices are paramount
    • Removal and destruction of infested leaves
    • Must be sure to remove entire leaf; larvae could hide within low chlorophyll containing leaf tissue near leaf base.
  – Hard to manage fly population
    • Can overwinter on wild *Hemerocallis* spp.

Has been found but is limited in its distribution
Japanese Maple Scale

- *Lopholeucaspis japonica*
  - Distribution
    - Asia, South America, Australia, and North America
  - Hosts include:

Has been found but is limited in its distribution

Image Credit
Lorraine Graney, Bartlett Tree Experts, www.bugwood.org, #5472176
Japanese Maple Scale

Has been found but is limited in its distribution

Adults

Crawlers with adults

Image Credit
Lorraine Graney, Bartlett Tree Experts, www.bugwood.org, #5472174 and #5472182
Japanese Maple Scale

• Damage on tree and a heavy infestation

Has been found but is limited in its distribution

Image Credit
United States National Collection of Scale Insects Photographs Archive, USDA Agricultural Research Service, [www.bugwood.org](http://www.bugwood.org), #5123020, and Brian Kunkel, University of Delaware, [www.bugwood.org](http://www.bugwood.org), #5429866
Japanese Maple Scale

• Management
  – Mechanical
    • Sanitation, high pressure water sprayer, scrub brush
  – Chemical*
    • pyrethroids, buprofezin, pyriproxyfen, dinotefuran, clothianidin, and horticultural oils
  – Detection

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Passionvine Mealybug

- *Planococcus minor*
  - Distribution
    - Bermuda, Mexico, Central America, South America, Australia
  - Hosts
    - Polyphagous feeder, tremendous host range
      - such as banana, citrus, cocoa, coffee, corn, grape, mango, potato, and soybean

Has been found but is limited in its distribution.
Passionvine Mealybug

Has been found but is limited in its distribution

Image Credit:
Top left: Joel Miles, Office of Environmental Response and Coordination, www.bugwood.org, #2102097
Bottom left: Joel Miles, Office of Environmental Response and Coordination, www.bugwood.org, #2102096
Passionvine Mealybug

• Risk Assessment:
  – Climate
    • 52% of the Continental U.S. Has a suitable climate for this pest to become established
  – Host availability
    • 80 plant families including 250 different host plants
  – Time consuming and exhaustive survey methods
    • New pheromone bait traps have been successful in luring \textit{P. minor}

Image Credit:
Joel Miles, Office of Environmental Response and Coordination, Bugwood.org, #2102098

Has been found but is limited in its distribution
Passionvine Mealybug

Pictures of a closely related mealybug, *Planococcus citri*

Has been found but is limited in its distribution

Image Credit:
Left: Jeffrey Lotz, FDACS, Bugwood.org, #5195055
Right: USDA Agricultural Research Service, Bugwood.org, #5137040
Passionvine Mealybug

- **Management**
  - Biological Control

Example of a Syrphidae

Example of a Anthocoridae

Diomus sp.

Has been found but is limited in its distribution

Image Credit:
Sonya Broughton, Department of Agriculture & Food Western Australia, www.bugwood.org, #5186088;
Red Palm Mites

- *Raoiella indica*
  - Distribution
    - Asia, the Middle East, South America, and North America
  - Hosts
    - Primary Hosts: Palm family
    - Secondary Hosts: Banana family
    - Also reported on: *Pandanus* spp., Heliconia, and bird of paradise plants

Has been found but is limited in its distribution
Red Palm Mites

Has been found but is limited in its distribution

Red palm mite egg

Image credit:
Rita Duncan, University of Florida
Lyle Buss, Department of Entomology and Nematology, University of Florida
egg - Wikimedia commons
Red Palm Mites

Damage on palm fronds

Damage on banana leaves

Has been found but is limited in its distribution

Image credit: Wikimedia commons

First Detectors Protecting U.S. from Pests
Red Palm Mites

• **Management**
  – Biological Control
    • Mites, Beetles, Thrips, Lacewings, Parasitic Fungi
  – Cultural
    • Sanitation
  – Chemical*
    • Phosphamidon, monocrotophos, dimethoate, formothion and demeton methyl
    • petroleoum, neem, and horticultural oil
    • pyridaben, fenbutatin-oxide and dicofol; tank mix with sulfur.

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Tremex Wood Wasp

- *Tremex fuscicornis*
  - Distribution
    - Asia, Australia, Europe, and South America
  - Host
    - Beech, Poplar, Elm, Alder, Chinese wingnut, English walnut, birch, maple, black locust, willow, oak, Chinese hackberry, *Prunus* spp., European hornbeam
Tremex Wood Wasp

Image credit:
Tremex Wood Wasp

Image credit: Stanislav Krejcik [www.meloidae.com](http://www.meloidae.com)
Tremex Wood Wasp

- Management
  - Mechanical
    - Use of fumigants or heat
  - Cultural
    - Proper watering and pruning
    - Removal of cut wood and logs
    - Sanitation
  - Biological
    - Entomopathogenic Nematodes
    - Ichneumonid Wasps and other Predators
Sirex Wood Wasp

• *Sirex noctilio*

  – Distribution
    • Africa, Asia, Australia, Europe, South America, and North America

  – Hosts
    • Conifers, especially pine
    • Can also use fir, larch, spruce, and Douglas fir

Image credit: Vicky Klasmer, Instituto Nacional de Tecnologia Agropecuaria, [www.bugwood.org](http://www.bugwood.org), #5430567

Has been found but is limited in its distribution
Sirex Wood Wasp

Has been found but is limited in its distribution

male

female

larva

Image credit:
Steven Valley, Oregon Department of Agriculture, www.bugwood.org, #5455076 and #5455071; Dennis Haugen, www.bugwood.org, #1393017
Sirex Wood Wasp

• Damage

Has been found but is limited in its distribution

Image credit: Dennis Haugen, www.bugwood.org, #1393019 and #1393029; Stanislaw Kinelski, www.bugwood.org, #1258102
Sirex Wood Wasp

• Management
  – Mechanical
    • Use of fumigants or heat
  – Cultural
    • Proper watering and pruning
    • Removal of cut wood and logs
    • Sanitation
  – Biological
    • Entomopathogenic Nematodes
    • Ichneumonid Wasps and other Predators

Has been found but is limited in its distribution
Brown Marmorated Stink Bug

- *Halyomorpha halys*
  - Distribution
    - Asia (China, Japan, Korea Republic, Taiwan), Europe (Switzerland), North America (Canada and U.S.)
  - Host
    - Polyphagous, very wide host range. Agricultural, ornamental, vegetable and other crops.
Brown Marmorated Stink Bug

Eggs

Juvenile

Adult

Has been found but is limited in its distribution

Image credit:
Steven Valley, Oregon Department of Agriculture, www.bugwood.org, #5458959 and #5458958; Susan Ellis, www.bugwood.org, #5443482; Gary Bernon, USDA APHIS, www.bugwood.org, #1113011
Brown Marmorated Stink Bug

• Management
  – Biological
    • Birds, Parasitic Wasps
  – Chemical*
    • Bifenthrin, dinotefuran, and other pyrethroids
  – Physical (Homeowners)
    • Seal holes in house and windows
    • Weather Strip doors and entrances
    • Use of shopvac filled with soapy water
  – Monitoring
    • Black Pyramid Ground trap
    • Blue, black, white lights

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European Pepper Moth

- *Duponchelia fovealis*
  - Distribution
    - Africa, Asia, Europe, and North America
  - Hosts
    - Very wide host range including tomatoes, strawberries, peppers, English daisies, Lisianthus, poinsettia, begonia, and impatiens
    - Detritus

Image credit:
Carmelo Peter Bonsignore, Università degli Studi Mediterranei di Reggio Calabria

Has been found but is limited in its distribution.
European Pepper Moth

Has been found but is limited in its distribution

- **pupa**
- **caterpillar**
- **adult**

Image credit:
Henk Stigter, Plant Protection Service, National Reference Centre, The Netherlands; Carmelo Peter Bonsignore, Università degli Studi Mediterranei di Reggio Calabria; James Hayden, Florida Department of Agriculture and Consumer Services, Division of Plant Industry
European Pepper Moth

Has been found but is limited in its distribution

Image credits:
Carmelo Peter Bonsignore, Università degli Studi Mediterranei di Reggio Calabria; Marja van der Straten, Plant Protection Service, Wageningen, The Netherlands; Bryan Vander Mey, Department of Entomology, University of California, Riverside; Henk Stigter, Plant Protection Service, National Reference Centre, The Netherlands
European Pepper Moth

• Management
  – Monitoring and Inspection
  – Cultural
    • Removal of detritus and leaves in lower canopy
  – Chemical*
  – Biological
    • Mites, Beetles, Entomopathogenic Nematodes, Parasitic Wasps, Bt formulation

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Has been found but is limited in its distribution

Image credit:
Dr. Peter van Deventer, Plant Research International, Wageningen, The Netherlands
Exotic Diseases
Red Ring Disease of Palm

• Disease caused by a nematode
  – *Bursaphelenchus cocophilus*
    • Coconut Palm Nematode

• The nematodes are vectored by a beetle
  – *Rhynchophorus palmarum*
    • South American Palm Weevil

• Distribution
  – Caribbean and Central America, South America, and North America

• Hosts
  – Nematode is restricted to species found in the palm family
  – Vector can feed on species other than palms

Not found here yet
Vector of Red Ring Disease of Palm

Image Credit:
Left Images: Jennifer Duque, University of Puerto Rico, Bugwood.org,
# 5411179, 5411179
Right: Robin Giblin-Davis, University of Florida
Red Ring Disease of Palm

- Damage is similar to Red Palm Weevil.
- Wounds from laid eggs
- Palm toppling from reduced structural stability.

Image Credit: Robin Giblin-Davis, University of Florida
Red Ring Disease of Palm

Image Credit:
Robin Giblin-Davis, University of Florida
Red Ring Disease of Palm

- **Management**
  - Very difficult to manage
  - Sanitation is most effective
  - Chemical*
    - carbaryl, chlorpyrifos, diazinon, endosulfan, fipronil, imidaclorpid, malathion, acephate, azinphos-methyl, methidathion, demethoate, trichlorfon
    - Nematicides on leaf axils
  - The same traps used for the Red Palm Weevil will attract the South American Palm Weevil

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Boxwood Blight

- *Cylindrocladium pseudonaviculatum*
  - Distribution
    - Throughout Europe (i.e. U.K., Italy, Spain) and New Zealand.
    - In the U.S.
  - Hosts
    - Boxwood, sweet box or Christmas box, Japanese spurge

Image Credit:
A. Rawlins, University of Georgia, www.bugwood.org, #5458099

Has been found but is limited in its distribution.
Boxwood Blight

- Boxwood blight on leaves

Image Credit:
Sandra Jensen, Cornell University, www.bugwood.org, #5484089 and #5484088

Has been found but is limited in its distribution
Boxwood Blight

- Boxwood blight fungal fruiting bodies

Has been found but is limited in its distribution

Image Credit:
Sandra Jensen, Cornell University, www.bugwood.org, #5457981 and #5458095
Boxwood Blight

- Volutella blight

Has been found but is limited in its distribution

Image Credit:
Florida Division of Plant Industry Archive, Florida Department of Agriculture and Consumer Services, www.bugwood.org, #5260010 and #5260007
Boxwood Blight

• Management
  – Sanitation
    • destruction of leaves and removal of inoculated soil (if severe infection, remove whole plant)
  – Chemical*
    • fludioxonil, azoxystrobin, mancozeb, chlorothalonil, carbendazim, kresoxim-methyl, pyraclostrobin
  – Avoid overhead watering
  – Use of adequate spacing
  – Plant alternative plants

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Impatiens Downy Mildew

- *Plasmopara obductens*
  - Distribution
    - Throughout Europe, U.S., Canada, Guatemala, Costa Rica.
  - Hosts
    - Impatiens and wild balsam

Image Credit: Tom Creswell, Purdue University, www.bugwood.org, # 5494888

Has been found but is limited in its distribution
Impatiens Downy Mildew

Has been found but is limited in its distribution

Image Credit: Laura Sanagorski, University of Florida
Impatiens Downy Mildew

Has been found but is limited in its distribution

Image Credit: Mary Ann Hansen, Virginia Polytechnical Institute and State University, Bugwood.org, #5485738 and #5485739
Impatiens Downy Mildew

• Management
  – Sanitation
    • removal of infected leaves, do not compost infected material, use non-impatiens plant material (“crop rotation” in greenhouse/nursery)
  – Chemical*
    • fluopicolide, fenamidone, dimethomorph, mefenoxam, azoxystrobin.
  – Plant New Guinea Impatiens

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Chrysanthemum White Rust

- *Puccinia horiana*
  - Distribution
    - Asia, Africa, South and Central America, Australia, New Zealand, North America and Europe
  - Hosts
    - Chrysanthemums

Has been found and is under eradication
Chrysanthemum White Rust

Has been found and is under eradication

Image Credit:
Top Left: Central Science Laboratory, Harpenden Archive, Bugwood.org, #0454039
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Top Right: Florida Division of Plant Industry Archive, Bugwood.org, #5265030
Bottom Right: SRPV, Bourgogne Archive, Bugwood.org, #0725008
Chrysanthemum White Rust

• Management
  – Changing cultural practices to prevent conditions from becoming conducive for CWR
  – Use of effective fungicides, off-site shipping area (sanitary purposes), use fungicidal dip to prevent spread of fungus (cut flowers)
    • oxycarboxin, triforine, benodanil, triadimefon, diclobutrazol, dibitertanol and propiconazole, difenoconazole, myclobutanil, tebuconazole, and triticonazole
  – Monitoring host plants for the pathogen

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Chrysanthemum White Rust

• This pest is currently on the USDA Quarantine Pest List.
  – If host plants are found to be infected with this disease, commercial growers should consult this eradication plan regarding Chrysanthemum White Rust.

Texas Phoenix Palm Decline

- Caused by a Phytoplasma (a bacterium without a cell wall), like Lethal Yellows
  - Distribution
    - Texas and Florida
  - Hosts
    - Canary date palm, date palm, silver date palm, Queen palm, and Sabal palm
Texas Phoenix Palm Decline

• Initial symptoms

Fruit drop from a date palm

Death of the flowers

Has been found but is limited in its distribution
Texas Phoenix Palm Decline

- Initial symptoms

Discoloration of the leaves begins at the tip

Discoloration of the lowest (older) leaves comes next

Image Credit: University of Florida

Has been found but is limited in its distribution
Texas Phoenix Palm Decline

- Progression of symptoms
  - Death of the spear leaf
  - Broken roots
  - Ability to “rock” the palm

Has been found but is limited in its distribution
Texas Phoenix Palm Decline

• Management
  – No specific vector identified
  – Hard to control vectors
  – No cure at this time
  – Removal of infected plant material
  – Anti-biotic injections

Has been found but is limited in its distribution
Bleeding Canker of Horse Chestnut

• *Pseudomonas syringae* pv. *aesculi*
  – Distribution
    • United Kingdom, Ireland, the Netherlands, Belgium, France, Germany, India
  – Hosts
    • Horse chestnuts and buckeyes

Image credit: Wikimedia Commons
Bleeding Canker of Horsechestnut

• Symptoms

Image credit: Forestry Commission, United Kingdom
Bleeding Canker of Horsechestnut

• Management
  – No current chemical control
  – Disease progress monitoring
  – Good sanitation practices
  – Grow from seed/do not import plants
Questions?

• For more information, check out www.protectingusnow.org

• You can also contact:
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- Extension Disaster Education Network (EDEN)
- National Plant Board (NPB) and State Departments of Agriculture
- National Plant Diagnostic Network (NPDN)
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