
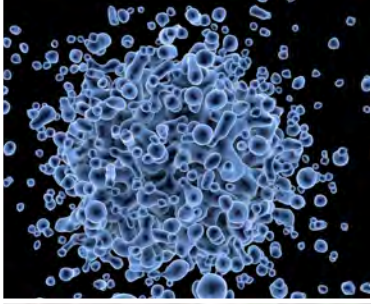
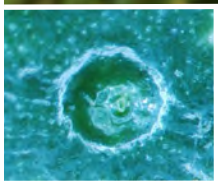


Master Gardener Specialist Training

Texas First Detectors
North Texas

May 8-9, 2017

Hosted by the Tarrant County Master Gardener Association




NPDN
National Plant Diagnostic Network

EDUCATE to DETECT

Texas A&M AgriLife Extension

TX Plant Clinic

Plant Pathology & Microbiology
PLPM
Texas A&M University

Photo Credits

Featured Photography:

Front Cover

Lewinski, Mike. *Cedar Apple Rust Gall, Sheffield, AL.* 2012 *Nature at Close Range.*

Follni, Franco. *Willow Gall Mite (Aculops tetanothrix) on Arroyo Willow (Salix lasiolepis) , Bear Valley, CA.* 2012

Nelson, Scott. *Long bean: Powdery Mildew.* 2015

Nelson, Scott. *Poss. Gymnosporangium clavipes (cedar-quince rust on hawthorn), Midwest, USA.* 2014

Pani, Tõnu. *European spruce bark beetles (Ips typographus) making their way in wood.* 2012

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Acknowledgments

Tarrant County Master Gardener Association for hosting.

This educational program is sponsored by the Southern Plant Diagnostic Network and the USDA-APHIS [USDA Farm Bill section 10007 funding "Texas Master Gardener Specialist - First Detector Education Program" (16-8448-1766-CA)].

Agenda

May 8, 2017 MONDAY

			Trainer
8:30 AM	9:00 AM	Registration & Welcome	
9:00 AM	9:15 AM	Logistics and overview of the MGS-FD program	Ong
9:15 AM	10:00 AM	Introduction to the NPDN and the National First Detector Program	Ong
10:00 AM	11:00 AM	Introduction to Plant Disease Diagnostics: Observations to Diagnosis (Diagnosing Plant Problems)	Ong/Little
11:00 AM	11:15 AM	BREAK	
11:15 AM	12:15 PM	Documenting observation workshop - exercise (Diagnosing Plant Problem review)	Ong/Little
12:15 PM	1:00 PM	LUNCH	
1:00 PM	2:00 PM	Insect: Introduction to Insect Identification	Merchant
2:00 PM	2:15 PM	BREAK	
2:15 PM	3:00 PM	Insect: Emerald Ash Borer/Brown Marmorated Stink Bug	Merchant
3:00 PM	3:15 PM	BREAK	
3:15 PM	4:00 PM	Insect: Crape Myrtle Bark Scale	Merchant
4:00 PM	4:45 PM	Insect: Field and Service Hour Activity Workshop	Merchant/Ong
4:45 PM	5:30 PM	Debriefing & Day recap	Ong

Dinner and Fellowship Reception

May 9, 2017 TUESDAY

8:30 AM	8:45 AM	Day 1 review and Day 2 overview	Ong
8:45 AM	9:45 AM	Pathogen: Rose Rosette Disease - part 1	Shires
9:45 AM	10:00 AM	BREAK	
10:00 AM	11:00 AM	Pathogen: Rose Rosette Disease - part 2	Shires/Ong
11:00 AM	12:00 PM	Pathogen: Field and Service Hour Activity Workshop	Shires/Ong
12:00 PM	1:00 PM	LUNCH	
1:00 PM	2:30 PM	Master Gardener Specialist FD Service Hours Requirements Overview	Shires/Ong/ Merchant
2:30 PM	3:00 PM	BREAK	
3:00 PM	3:15 PM	Group Photo: TXMGS-FD Cadre	Ong/Little
3:15 PM	4:15 PM	Exit Quiz and Survey	Ong/Little
4:15 PM	5:00 PM	Daily Recap: First Detector Educator Pin and Completion Certificate Presentation. Debriefing and Adjorn	Ong

Table of Contents

Frequently Asked Questions

The Master Gardener Specialist - First Detector training program

This year's Master Gardener Specialist – FIRST DETECTOR program is hosted by the Tarrant County Master Gardener Association. The following is a FAQ to some questions as well as some information that might help you understand the nature of this program.

What is the First Detector program?

The National Plant Diagnostic Network (NPDN) was established in 2002, to respond to the need for enhanced agricultural security through protecting the health and productivity of plants in agricultural and natural ecosystems in the U.S. The First Detector Training program is a national program established by the NPDN to promote the early detection of invasive and exotic pathogens and pests through education and enlisting the help of citizen "scientists".

Why the TX Master Gardener Specialist program?

The Master Gardener Specialist program is an established program in which interested Master Gardener volunteers can enhance their knowledge in specific areas and volunteer their time to gain that knowledge (20 volunteer hours are required for completion).

What is the Master Gardener Specialist - First Detector program?

For quite a few years, Master Gardeners and County Agents have requested that we develop a Master Gardener Specialist program in Plant Pathology. However, this was difficult as it would be time-consuming and tedious to prepare and conduct a practical class that would have several pathogens available at one time (culturing and maintaining bacterial, fungal and nematode cultures is tedious).

The First Detector program allows for training in some basic observation and surveying skills which are most helpful in the diagnostic process in the volunteer. Additionally, this program aims to train trainers. A Texas Master Gardener Specialist First Detector (TX MGS-FD) is expected to be able to know what to do when observing a suspected exotic pest or pathogen. The TX MGS-FD who qualified are encouraged to share the information learned in the training program to others and will have access to scripted Powerpoint to utilize in their presentations.

The Texas MG Specialist - First Detector program is a federally funded (Farm Bill) project, enabling us to develop and prepare materials for this program.

The 2017 program will encompass 4 primary emerging pests/pathogens. Focus will be on 3 exotic invasive insect pests: Emerald Ash Borer (EAB), which has been found once in North East Texas but has not been shown to be established in Texas; Brown Marmorated Stink Bug (BMSB), which has rarely been found in Texas but has not been shown to be established in Texas; Crape Myrtle Bark Scale (CMBS), which is blemishing many crape myrtles in the Dallas/Fort Worth area. Last but not least the pathogen of interest will be Rose Rosette Virus (RRV), causing Rose Rosette Disease which is devastating roses in the Dallas-Fort Worth (North Texas) region, but not found in other parts of Texas
(southern & central).

There is a 20-hour volunteer requirement to complete the program. How do we complete this requirement?

We are providing several service options. This may include plant survey exercises, EAB, BMSB trapping/ collection exercise, plant health support efforts, educational outreach efforts, and others.

RECOGNITION SYMBOLS

TEXAS FIRST DETECTOR PINS

The following lapel pin indicates that the individual has successfully survive and completed an organized Texas First Detector education event

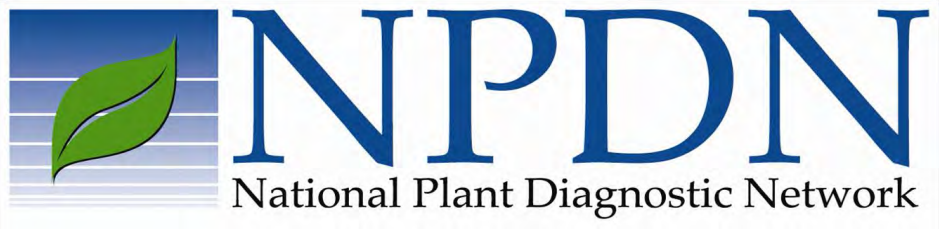
The circular pin is awarded to the individual that have successfully completed all the requirements and is recognized as a MASTER GARDENER SPECIALIST

– FIRST DETECTOR.

Currently, there are 22 such pins amongst Texas Master Gardeners.

The National Plant

Diagnostic Network



Trainer: Dr. Kevin Ong

Introduction to the National Plant Diagnostic Network

What is the National Plant Diagnostic Network?

- Created in 2002 by USDA-CSREES (and currently funded by USDA-NIFA) in response to the need to protect agricultural and natural plant systems from invasive pests and pathogens through early detection and diagnosis.
- The NPDN provides:
  - A presence in every state for the diagnosis of invasive pests and diseases
  - On-line training as well as workshops and webinars on invasive topics of concern

Regions of the NPDN

NPDN Responsibilities

- Outbreak detection and identification
- Secure communications system
- Information storage and management
- Data analysis
- Reporting and alerts
- Training

Plant Resource Security Concerns

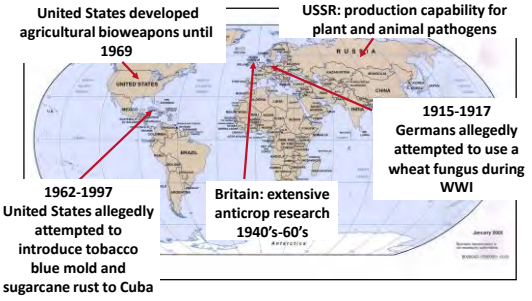
- Crop and rangeland vulnerability
- Natural areas and forested vulnerability
- Arthropod and nematode pests
- Virulent plant diseases

Agricultural Biosecurity

Agricultural Bioterrorism Act of 2002

- The Agricultural Bioterrorism Protection Act of 2002:
  - Regulates the possession, use and transfer of biological agents and toxins
  - Lists select agent pathogens for animals and plants
    - *7 CFR Part 331*
      - Agricultural research, laboratories, plant diseases and pests, reporting and record keeping requirements
    - *9 CFR Part 121*
      - Agricultural research, animal diseases, laboratories, medical research, reporting and record keeping requirements

A brief history of agroterrorism



Pest Introduction Avenues

Need for Plant Biosecurity

To maintain profitability of crop production

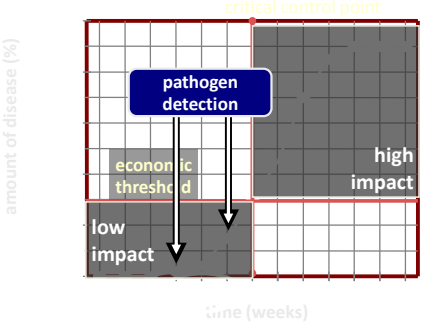
To maintain security of food production

To protect our crop supply and our natural ecosystems against invasive pests and diseases

NPDN Mission & The First Detectors

The NPDN mission is to enhance national agricultural security and to limit the impact of endemic, emerging, and exotic pathogens and pests on plants in the United States

- Early detection
- Accurate diagnosis
- Rapid communications

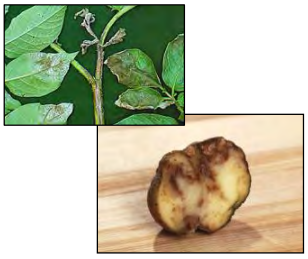


Who is a First Detector?

How to become a First Detector

- Go to www.firstdetector.org to find out about First Detector online training, workshops, seminars, etc.

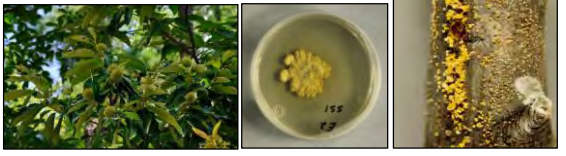
Historical examples of invasive species and their impacts



- Late Blight of Potato in Ireland - "The Irish Potato Famine"
  - *Phytophthora infestans*

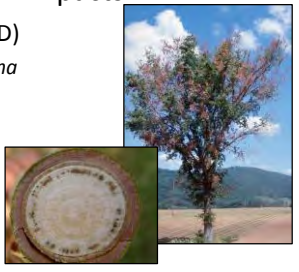
Historical examples of invasive species and their impacts

- Chestnut Blight
  - *Cryphonectria parasitica (Endothia parasitica)*



Historical examples of invasive species and their impacts

- Dutch elm disease (DED)
  - Pathogen = *Ophiostoma ulmi*
  - Vectors are elm bark beetles
    - *Scolytus multistriatus*
    - *Hylurgopinus rufipes*



Historical examples of invasive species and their impacts

- Boll weevil
  - *Anthonomous grandis*

Cotton bud: feeding damage

Current examples of invasive species and their impacts

- Asian longhorned beetle
  - *Anoplophora glabripennis*



Current examples of invasive species and their impacts

Emerald ash borer

Agrilus planipennis

Soybean aphid

Aphis glycines

Ralstonia solanacearum race 3, biovar 2

Your role as a First Detector

- Take NPDN training
  - Online or in person
- Be alert to the unusual or different
- Be placed on a national notification registry of First Detectors
- Receive pest alerts and other relevant updates through the First Detector newsletter and twitter

First Detector Training

- Sign up for workshops in your area through the First Detector website
  - Receive CEUs
- Or take the online training modules
  - Receive CEUs
- Both workshops and online training are free

Questions?

- Contact
  - Rachel McCarthy, Department of Plant Pathology and Plant Microbe Biology, Cornell University, rpl4@cornell.edu
- To find your local NPDN lab or for more information on the NPDN or your regional NPDN
  - www.npdn.org
- NPDN First Detector Training Website
  - www.firstdetector.org

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Publication Details

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- Publication Date: December 2006
- Updated January 2013

NPDN Partners

- United States Department of Agriculture Animal and Plant Health Inspection Service Plant Protection and Quarantine (USDA APHIS PPQ)
- Local and Regional Integrated Pest Management Programs
- Cooperative Agriculture Pest Survey Program (CAPS)
- National Plant board and State Departments of Agriculture
- Extension Disaster Education Network (EDEN)
- Center for Invasive Species and Ecosystem Health (Bugwood)

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Diagnosing Plant Problems: Plant Diseases and Disorders

Plant diseases and disorders

- Plant diseases
  - Biotic (living)
    - Result of plant disruptions caused by living organisms.
      - Fungi, bacteria, viruses, nematodes, phytoplasma, rickettsia, viroid, parasitic plants
- Plant Disorders
  - Abiotic (non-living)
    - Result of non-living disruptions.
      - Chemical damage, weather conditions, mechanical injury, genetic disorders, lighting, water, nutrient deficiencies, improper application of toxic agrichemicals

Plant diseases and disorders

Random pattern on leaf – plant disease

Uniform pattern on leaf –plant disorder

Photo credit: Left - Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org, #1436010; Right - Nancy Gregory, University of Delaware, Bugwood.org, #5427648

Plant diseases and disorders

Random pattern on entire plant – plant disease

Uniform pattern on plant –plant disorder

Photo credit: Left - John Hartman, University of Kentucky, Bugwood.org, #5424433; Right - Pennsylvania Department of Conservation and Natural Resources - Forestry Archive, Bugwood.org, #5010099

Plant diseases and disorders

Random pattern in field – plant disease

Uniform pattern in field –plant disorder

Photo credit: Left - Kevin Mathias, Bugwood.org, #1317032; Right - Lester E. Dickens, Bugwood.org, #5357028

Plant diseases

- Abnormal growth and development of a plant caused by pathogens
  - i.e. living organisms
- Three components:
  - Susceptible plant
  - Virulent pathogen
  - Conducive environment

Wheat stripe rust

Photo credit: Wiesenberg, Darrell, www.bugwood.org, #1319006

Causes of plant disease

Tomato Spotted Wilt Virus

Root knot nematode on pepper

Black spot on roses

Photo credits: Left – William M. Brown Jr., www.bugwood.org, # 5359077; Middle – Scott Bauer, USDA Agricultural Research Service, Bugwood.org , #1323037; Right – Bruce Watt, University of Maine, Bugwood.org, #5507644

Causes of plant disease: Endemic or Exotic Pathogens

Chestnut blight (exotic)

- Endemic pathogens are commonly found in a geographic area. They are also called "native."
- Exotic pathogens have been brought in from another place. Exotic pathogens can be very damaging when local crops are not resistant to them. They are also called "introduced."

Photo credit: Linda Haugen, USDA Forest Service, www.bugwood.org, #1400112

Plant disorders

- Caused by non-living factors
  - soil properties
  - fertility imbalances
  - moisture extremes
  - temperature extremes
  - chemical toxicity
  - physical injuries

Storm damage to a tree

Photo credit: wikimedia commons

Causes of plant disorders

Tree death due to calcium chloride dust abatement applied to road

Baldhead

Dry bean plants showing signs of moisture stress

Photo credit: Left – Susan K. Hagle, USDA Forest Service, www.bugwood.org, #1124168; Middle – Howard F. Schwartz, Colorado State University, www.bugwood.org, #5364033; Right – Howard F. Schwartz, Colorado State University, www.bugwood.org, #5364355

How plant disease and disorders are diagnosed

First steps of plant disease and disorder diagnosis

- Ask questions
  - What is healthy?
  - When was the problem noticed?
  - What percentage of plants are affected?
- Proper sample collection
  - Several different specimens at varying stages of disease
  - Provide adequate information

Questions to ask: What is normal?

Healthy boxwood plant

Boxwood with boxwood blight

Photo credit: Left – wikimedia commons; Right – Mary Ann Hansen, Virginia Polytechnic Institute and State University, Bugwood.org , #5507259

Questions to ask: How was the plant grown and harvested?

Ridge-Tillage in a soybean field to control weeds

Poinsettias grown in a greenhouse

Photo credit: Left – Keith Weller, USDA Agricultural Research Service, www.bugwood.org, #1321067; Right – wikimedia commons

Questions to ask: Were agrichemicals used?

- Any chemical used to improve crop production
- Questions to ask about agrochemicals:
  - What was applied?
  - Application rates?
  - Targeted pathogen(s)?

Fungicide application in a potato field

Photo credit: Howard F. Schwartz, Colorado State University, www.bugwood.org, #5362434

Symptoms of agrichemical use

Chemical injury to dogwood leaves

Winter wheat herbicide damage

Photo credit: Left – North Carolina Forest Service Archive, Bugwood.org, #1458059; Right – William M. Brown Jr., www.bugwood.org, # 5356815

Signs and symptoms of plant diseases

Potato scab

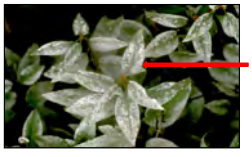
- Plant diseases can be recognized as growth irregularities in leaves, stalk and fruit, including:
  - Galls
  - Cankers
  - Rots
  - Scabs
  - Wilt
  - Necrosis (tissue death)

Photo credit: Clemson University, USDA Cooperative Extension Slide Series, www.bugwood.org, #1436170

Signs vs. Symptoms

- Sign: includes any part of the pathogen itself, or its products
- Symptom: visible effect of disease on a plant

SIGN



White powder is the pathogen itself (fungal colony)

SYMPTOM

Powdery mildew on lilac

Mosaic on common bean leaf

Photo credit: Left – Whitney Cranshaw, Colorado State University, Bugwood.org, #5366800; Right – Howard F. Schwartz, Colorado State University, www.bugwood.org, #5362090

Signs of plant disease

Chrysanthemum white rust pustules

Bacterial ooze in potato

Photo credit: Left – Karen Snover-Clift, Cornell University, www.bugwood.org, # 5458066; Right – Margery Daughtrey, Cornell University, Bugwood.org, #5511640

Symptoms of plant disease

Chlorotic or necrotic rings are a symptom of Tobacco ringspot virus

Tissue death is a symptom of bacterial leaf spot of begonia

Photo credit: Left – R.J. Reynolds Tobacco Company Slide Set, www.bugwood.org, #1440031; Right – Mike Munster, Bugwood.org, #5510701

Systemic plant diseases

Spinach leaves with chlorotic lesions caused by *Peronospora farinosa*

Sudden oak death, *Phytophthora ramorum*

Photo credit: Left – Gerald Holmes, Valent USA Corporation, www.bugwood.org, #1571109; Right – Department of Plant Pathology Archive, North Carolina State University, www.bugwood.org, # 1524156

Categories of Symptoms

Symptom

Underdevelopment (stunting) caused by Potato yellow dwarf virus

- Overdevelopment of tissue
  - Galls, profuse flowering
- Underdevelopment of tissue
  - Stunting, shortened internodes, failure of fruits and flowers to develop
- Death of tissue (necrosis)
  - Blights, leaf spots, fruit rots
- Alteration of normal appearance
  - Mosaic, altered coloration in leaves and flowers

Photo credit: American Phytopathological Society Archive, American Phytopathological Society, www.bugwood.org, #0162085

Categories of Symptoms

Overdevelopment

Caused by oak leaf blister. Note thickening and distortion.

Underdevelopment

Healthy plant in middle. Under-development in side plants caused by Chrysanthemum Stunt Viroid.

Death of tissue

Necrosis caused by early blight on potato

Altered appearance

Discoloration on tomato caused by herbicide injury

Photo credit: Top left – Joseph O'Brien, USDA Forest Service, www.bugwood.org, #5032018; Top right- J. Dunez, www.bugwood.org, # 0454059; Bottom left – Howard F. Schwartz, Colorado State University, www.bugwood.org, #5362498; Bottom right – Gerald Holmes, California Polytechnic State University at San Luis Obispo, www.bugwood.org, #1571188

Disease and disorder terms

GALLS

Galls on douglas fir caused by bacteria

SCAB

Pecan scab (fungus)

WILT

Southern bacterial wilt on flue-cured tobacco

Photo credits: Left – Steven Katovich, USDA Forest Service, www.bugwood.org, #1457017; Middle – R.J. Reynolds Tobacco Company, www.bugwood.org, #1402041; Right – University of Georgia Plant Pathology Archive, www.bugwood.org, #1494083

Disease and disorder terms

FLAGGING

Flagging on a leyland cypress tree

ROT

Black rot on sweet potatoes

CANKERS

Cankers caused by thousand cankers disease

Photo credits: Left - Jennifer Olson, Oklahoma State University, Bugwood.org, #5415275; middle - Charles Averre, North Carolina State University, www.bugwood.org, #1563470; Right - Whitney Cranshaw, Colorado State University, www.bugwood.org, #5406066

Disease and disorder terms

NECROSIS

Bacterial pith necrosis in center plant

Bleeding caused by a canker

BLEEDING

BLIGHT

Bean plants showing common bacterial blight symptoms (severe wilting)

Photo credits: Left – Gerald Holmes, California Polytechnic State University at San Luis Obispo, www.bugwood.org, #1573600; Middle – Joseph O'Brien, USDA Forest Service, Bugwood.org, #5254093; Right - Howard F. Schwartz, Colorado State University, www.bugwood.org, #5357506

Disease and disorder terms

LEAF SPOT

Leaf spot caused by *Cercospora arachidicola*

ROOT KNOT

Damage caused by a root-knot nematode on burley tobacco (*Nicotiana tabacum* (burley type) L.

Photo credit: Left – Virginia Tech Plant Pathology Archive, Virginia Polytechnic Institute and State University, www.bugwood.org, # 5332047; Right – R.J. Reynolds Tobacco Company Slide Set, www.bugwood.org, #1440048

Laboratory Examination and Testing

- May involve:
  - Dissecting microscope
  - Compound microscope
  - Electron microscope
  - Moist chamber incubation
  - Culturing
  - Tests for biotic agents
  - Tests for abiotic agents

Photo credits: Rachel McCarthy, Cornell University - NEPDN, www.bugwood.org, #5458065

Helpful Resources

- http://www.apsnet.org/edcenter/illglossary/Pages/default.aspx
  - Provides an on-line glossary of plant pathology
- http://msue.anr.msu.edu/
  - Offers publications and online information to assist with identification and control of serious plant diseases
- http://www.pestid.msu.edu/
  - Offers online factsheets covering various common plant diseases in Michigan and provides affordable diagnosis of diseased plant samples

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Publication Details

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- Publication Date: December 2006
- Edited September 2014

NPDN Partners

- United States Department of Agriculture Animal and Plant Health Inspection Service Plant Protection and Quarantine (USDA APHIS PPQ)
- Local and Regional Integrated Pest Management Programs
- Cooperative Agriculture Pest Survey Program (CAPS)
- National Plant board and State Departments of Agriculture
- Extension Disaster Education Network (EDEN)
- Center for Invasive Species and Ecosystem Health (Bugwood)

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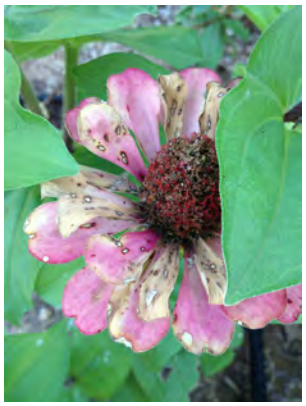
Plant Disease Diagnostics:

Observations to Diagnosis



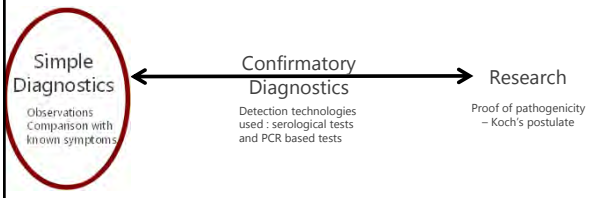
Trainer: Dr. Kevin Ong

What is DIAGNOSIS?

Merriam Webster definition:

1. **The art or act of identifying a disease from its signs and symptoms**
2. Investigation or analysis of the cause or nature of a condition, situation, or problem.

The Diagnostic Continuum



Steps in Field Diagnostics

1. Identifying the plant

WHEN?

- As soon as possible OR as early as possible

WHY?

- Knowing the identity of the plant allow for basic understanding/knowledge of the plant.

HOW?

- Ask the plant owner
- Consult the county agent or fellow Master Gardener
- Consult reputable reference sources

2. Assess the nature of the problem

WHEN?

- After knowing (if possible) what the plant is.

WHY?

- Need some background information to find clues that would lead to a possible answer.

HOW?

- Utilize bodily senses:
  - **Hearing** (Ears) – be prepared to listen to "complaints" and the answers to your questions.
  - **Sight** (Eyes) and **Smell** (Nose) – Look, see and smell any signs or symptoms that are visible.

Is there a problem?

3. Develop a suspect list

WHEN?
- As you gather information, clues and evidences.

WHY?
- The more information you piece together, the better idea as to what could cause the damage. (* experience is valuable)

HOW?
- Evaluate the symptoms. Symptoms are most often generic.
- The patterns of symptom development and spread can point to causal agent
- Look for signs.

3. Developing a suspect list (cont'd)

Ex 1. Coming up with suspects

BIOTIC	ABIOTIC
▪ Symptoms is usually scattered ▪ Symptoms develops gradually over time (on individual and whole plantings) ▪ Sign of pathogen is observable	▪ Symptoms are uniformed ▪ Generally appear all at one time ▪ Does not appear to spread ▪ Affects more than 1 type of plant in immediate area

4. Narrow list of suspects (Refining diagnosis)

WHEN?
- After you have a list of suspect. Begin to narrow it down.

WHY?
- To get to the best possible guess of the "culprit" so that you can elect to use correct treatment methods/approaches

HOW?
- Gather information (research) on the suspects on your list. Compare key elements to current situation.

5. Optional: Get HELP!

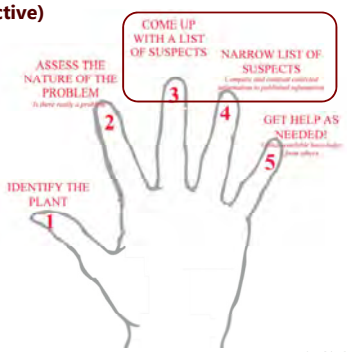
WHEN a simple observational diagnosis is NOT enough.

WHY?
- Person/plant owner want a more definitive identification of the problem

HOW?
- Seek out local experts for their opinions
- Utilize Plant Diagnostic Clinic that practice confirmatory diagnosis

Steps in Field Diagnostics

(in FD perspective)



First Detector Skill Mantra

A First Detector should be:
- Observant
- Knowledgeable
- Calm
- Decisive

Collecting & Documenting Evidence

Trainers: Dr. Kevin Ong/
Mandy Little

DOCUMENTING OBSERVATIONS WORKSHOP

Instructions:

TEAM ASSIGNMENT: Use a camera of your choice to take photos of a plant or plants exhibiting abnormal phenotype OR insect.

Image can be emailed to txfirstdetector@sickplants.org or image can be downloaded from memory card onsite.

Things to consider:

- How would this photo convey what I am seeing to the viewer?
- Does it show the symptom(s) that are important?
- Does the image provide sufficient details for a diagnosis?
- Is the image sufficient for identification of the problem?
- Is the image in focus?
- Does the image give a broad view of the problem?

Communication is an integral part in informing and reporting potential pest/pathogen of concern. The goal of this exercise is to evaluate important factors in an image to the public and to a scientist/identifier.

Discussion:

- What are the limitations of using an image or images (photographs) in the diagnostic process?
- What are the pros for utilizing image(s) in the diagnostic process?
- What is the perception of diagnosis based on images?
- How can one improve on current communication methods for better diagnostics?

Submitting Samples for Diagnosis

Trainer: Dr. Kevin Ong

Submitting Samples for Diagnosis

Sample Security

- Communication: Early contact with diagnostic labs and regulatory officials
- Delivery details: Where, How, When
- Confidentiality
- Accuracy of source data
- Chain of custody

Sample Quality

- Diagnosis or identification is only as good as the sample provided.
  - Appropriate samples need to be submitted
  - Digital images
  - Fresh and in good condition
  - Rapid delivery may be critical
- Diagnosis or identification is only as good as the information provided.
  - Fill out the clinic form fully

Samples Should Contain ALL Plant Parts

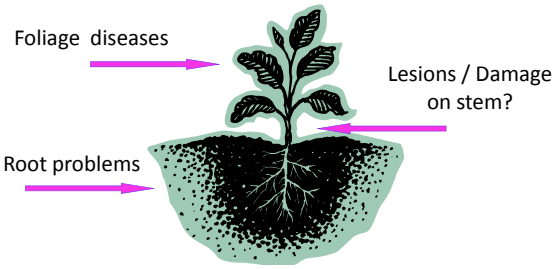


Photo credit: PowerPoint clipart

Submitting Plant Samples

- Field patterns may provide clues to things like:
  - Root disease, nematodes, chemical injury, etc.

Fraser Fir: Phytophthora root rot

Corn: Herbicide Injury

Photo credit: Left - Linda Haugen, USDA Forest Service, www.forestryimages.org, #1400148; right - Tom Jordan, Purdue University

Submitting Plant Samples

- Incidence vs. Severity

Incidence: Percent of the crop affected

Severity: a measure of impact on a plant or the crop

Photo credit: Left - Andrej Kunca, National Forest Centre - Slovakia, www.forestryimages.org, #1415142; right - Clemson University - USDA Cooperative Extension Slide Series, www.bugwood.org, #1234116

Submitting Plant Samples

- Avoid dead plants
- Choose plants which show a range of symptoms: moderate to severe

Photo credit: Left - Oliver T. Neher, University of Idaho, www.bugwood.org, #5449440; Right - Ron Jones, North Carolina State University, www.forestryimages.org, #5078059

Submitting Plant Samples

- When collecting plant samples:
  - Keep samples fresh in a cooler with ice packs
  - Have plastic bags, dry paper towels or newspaper, and ties available
  - Bring labels and permanent markers

Submitting Plant Samples

- When the plant sample is too big to submit:
  - Include *digital images* of the site and symptoms observed
  - Include affected branches with healthy and diseased tissue
  - Include feeder roots and soil

Photo credit: Karen Rane, University of Maryland

Submitting Plant Samples

- Digital image submission of suspect select agents or exotics
  - Can assist with secure identification
  - May allow for rapid detection of possible suspect exotic agents

Photo credit: R.Zachmann, APS digital CD, Fundamental Fungi 2002.

Submitting Plant Samples

- Packaging and shipping
  - Keep soil on roots
  - Do not add water

Photo credit: Left - Gail Ruhl, Purdue University; right - Tom Creswell, Purdue University, www.bugwood.org, #5078061

Submitting Plant Samples

- Packaging and shipping
  - Place the entire plant in a zippered plastic bag
  - Add a dry paper towel or newspaper to protect leaves from contact with plastic bag/moisture

Photo credit: Tom Creswell, Purdue University, www.bugwood.org, #5078062

Submitting Plant Samples

Photo credit: Eric LeVeen, Department of Entomology and Nematology, University of Florida

Submitting Plant Samples

- Packaging and shipping
  - Suspect select agents, invasives and exotics should be double bagged
  - Exterior of the bag should be disinfected
  - Paperwork gets its own plastic bag

Photo credit: Stephanie Stocks, Department of Entomology and Nematology, University of Florida

Submitting Plant Samples

- Paperwork information should include:
  - Who?
  - What?
  - When?
  - Where?
  - How?

Submitting Plant Samples

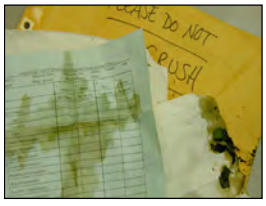
- Packaging and shipping

Photo credit: Gail Ruhl, Purdue University

Submitting Plant Samples

- Packaging and shipping

Good Intentions



Actual Results

Photo credits: Tom Creswell, North Carolina State University

Packaging and Shipping Blunders

Photo credit: Tom Creswell, North Carolina State University

Submitting Insect Samples

- Digital photos of damage and insect assist with identification
- Describe the level of infestation on the plant


Photo credit: left: Tom Creswell, North Carolina State University, www.bugwood.org, #5078064; right - William M. Ciesla, Forest Health Management International, www.bugwood.org, #0017018

Submitting Insect Samples

- Killing and preserving insects
  - Include multiple representatives and as many life stages as possible

Photo credit: Beetle - Scott Bauer, USDA Agricultural Research Service , www.bugwood.org, #1321016; grasshopper - Russ Ottens, University of Georgia, www.bugwood.org, #1242046; wasp - Russ Ottens, University of Georgia, www.bugwood.org, #1242095; stink bug nymph - Herb Pilcher, USDA Agricultural Research Service, www.bugwood.org, #2134081; planthopper - Kevin D. Arvin, www.bugwood.org, #5175051; containers - Tom Creswell, North Carolina State University

Submitting Insect Samples

- Soft bodies larvae should be placed in boiling water for one minute prior to preservation
- ***Do not microwave the specimens!***
- Include example of host plant foliage

Photo credit: Fly larva - Sturgis McKeever, Georgia Southern University, www.bugwood.org, #1471023; Caterpillar - Herbert A. "Joe" Pase III, Texas Forest Service, www.bugwood.org, #0007043; Beetle larva - Stephanie Soppoe, Natural Resources Canada, www.bugwood.org, #5331011

Submitting Insect Samples

- Scales, mealybugs and immature whiteflies may be submitted on the host
- Wrap plant material in dry paper towel before placing in bag
- Double bag the live sample

Photo credits: Whiteflies - Clemson University - USDA Cooperative Extension Slide Series, www.bugwood.org, #1236060; Mealybugs - Whitney Cranshaw, Colorado State University, www.bugwood.org, #1326196; Scales - United States National Collection of Scale Insects Photographs Archive, USDA Agricultural Research Service, www.bugwood.org, #5112093; Mites - Frank Peairs, Colorado State University, www.bugwood.org, #5364108

Submitting Insect Samples

- Packaging and shipping
  - Suspect select agents, invasives and exotics should be double bagged
  - Exterior of the bag should be disinfected
  - Paperwork gets its own plastic bag

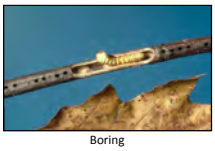
Photo credit: Eric LeVeen, Department of Entomology and Nematology, University of Florida

Submitting Insect Samples

- Paperwork information should include:
  - Who?
  - What?
  - When?
  - Where?
  - How?

Submitting Insect Samples


Piercing/Sucking


Boring


Leaf mining


Skeletonizing

Photo credits: Piercing/sucking - Clemson University - USDA Cooperative Extension Slide Series, www.bugwood.org, #1435129; Leaf mining - William M. Ciesla, Forest Health Management International, www.bugwood.org, #1254082; Boring - James Solomon, USDA Forest Service, www.bugwood.org, #3050029; Skeletonizing - Bradford Walker, Vermont Department of Forests, Parks and Recreation, www.bugwood.org, #0907049

Submitting Insect Samples

- Packaging and shipping

Photo credit:Top and bottom left - Lyle Buss, Department of Entomology and Nematology, University of Florida; Right - : Tom Creswell, North Carolina State University, www.bugwood.org, #5078058

Submitting Weed Samples

- Submit fresh samples
- Collect whole, intact specimens
- Preserve and package sample properly
- Exotics? Seal box inside and out, double bag

Photo credit: Jeffrey Mullahey, University of Florida, www.forestryimages.org, #5524017

Submitting Weed Samples

- Include: flowers, fruits, stems, leaves, roots
- May preserve samples by pressing and drying in newspaper

Photo credit: Florida Department of Agriculture, Division of Plant Industry

Submitting Weed Samples

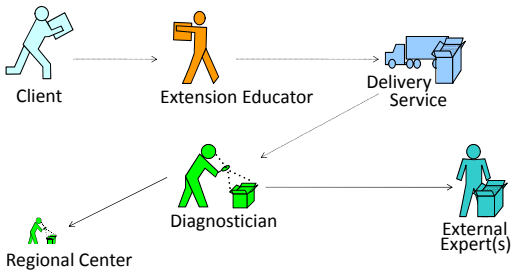
- Stems
- Root structures
- Whole leaves attached to the stem
- Flowers, fruits, or seeds

Photo credit: John D. Byrd, Mississippi State University, www.forestryimages.org, #1391354, #13911347, and #1391353

Submitting Weed Samples

- Paperwork information should include:
  - Who?
  - What?
  - When?
  - Where?
  - How?

Summary of Sample Delivery



Useful Sample Submission Videos

- Submitting a plant sample
- Submitting an insect sample in preservative
- Submitting a soft bodied insect sample
- Submitting a sample of an insect attached to a plant

Questions?

- Contact
  - Gail Ruhl, Plant & Pest Diagnostic Lab, Purdue University, ruhlg@purdue.edu
    - http://www.ppdl.purdue.edu/PPDL/physical.html#plant_disease
- To find your local NPDN lab or for more information on the NPDN
  - www.npdn.org
- NPDN First Detector Training Website
  - www.firstdetector.org

Author

- Authors:
  - T. Creswell, C. Thomas, R. Cullen, L. Buss, A. C. Hodges, C. L. Harmon, K. Wright, and T. Ailshie. December 2006.
- Updated by :
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  - Eric LeVeen, B.S., Department of Entomology and Nematology, University of Florida
  - Stephanie Stocks, M.S., Department of Entomology and Nematology, University of Florida

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Publication Details

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- Publication Date: December 2006
- Updated January 2013

NPDN Partners

- United States Department of Agriculture Animal and Plant Health Inspection Service Plant Protection and Quarantine (USDA APHIS PPQ)
- Local and Regional Integrated Pest Management Programs
- Cooperative Agriculture Pest Survey Program (CAPS)
- National Plant board and State Departments of Agriculture
- Extension Disaster Education Network (EDEN)
- Center for Invasive Species and Ecosystem Health (Bugwood)

References

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  - http://www.clemson.edu/cafls/departments/esps/factsheets/household_structural/submitting_insect_samples_for_identification_hs22.html
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  - http://ohioline.osu.edu/hyg-fact/2000/pdf/2121.pdf

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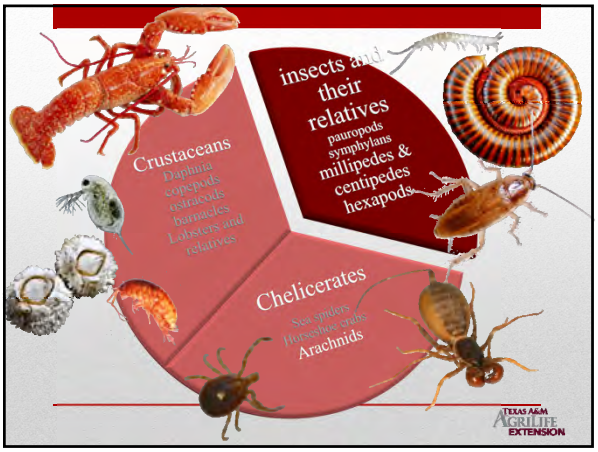
  - http://edis.ifas.ufl.edu/sr007
- Plant Sample Submissions. Accessed 6 January, 2013.
  - http://edis.ifas.ufl.edu/sr007
- Purdue University Plant and Pest Diagnostic Laboratory. 2012. Submitting physical specimens for diagnosis. Accessed 6 January, 2013.
  - http://www.ppdl.purdue.edu/PPDL/physical.html#plant_ID
- Ruppert, P.F. and L.J. Buss. 2006. Insect identification form. Accessed 5 January, 2013.
  - http://edis.ifas.ufl.edu/pdffiles/SR/SR02200.PDF

Entomology

Trainer: Dr. Mike Merchant

What are insects and mites?

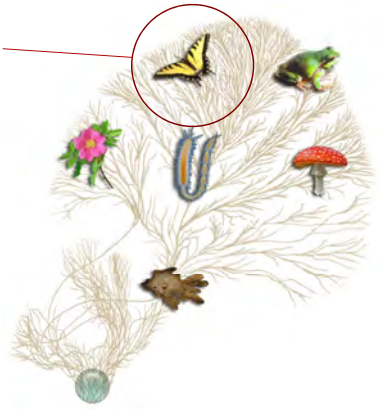
- Phylum Arthropoda
  - bilaterally symmetrical
  - hard outer exoskeleton
  - segmented bodies
  - jointed legs



- We live in a world of insects
- Over 1.2 million described species
- 2/3 of all living species (plant and animal) are arthropods
- 59% of all living species are insects
- 60% of insect species are beetles

Insects: the most diverse form of life on the planet

Insects: 90% of all animal species



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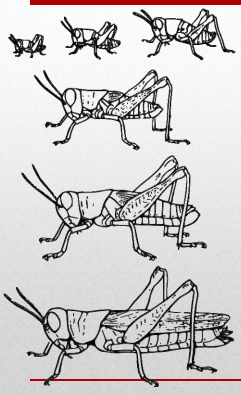
Class Insecta Characteristics

- Three main body regions
- Six legged
- Antennae
- Metamorphosis



Metamorphosis:
(<Greek)
a change in form

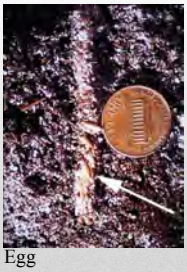
No metamorphosis (some Hexapoda)

- Diplurans
- Proturans
- Silverfish and firebrats
- Collembola

Metamorphosis: (<Greek) a change in form

- *Gradual * metamorphosis*: grasshoppers, termites, thrips, dragonflies
- *Complete metamorphosis*: beetles, butterflies and moths, flies, bees and wasps, ants, fleas

Gradual metamorphosis



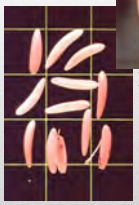
Egg

Nymph

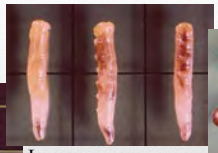
Adult

Photos ® Van Waters & Rogers / Univar

Complete metamorphosis

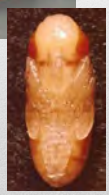


Eggs



Larvae

Pupa



Adult

Photos courtesy of Univar

Linnaean taxonomy

(> Greek: taxon=a group; taxa=to arrange, classify or place)

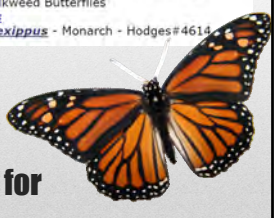
- Kingdom
- Phylum
- Class
- Order
- Family
- *Genus*
- *Species*

Memory tool: King Philip Came Over from Gloria Spain

Species *Danaus plexippus* - Monarch - Hodges#4614

Phylum Arthropoda - Arthropods
Subphylum Hexapoda - Hexapods
Class Insecta - Insects
Order Lepidoptera - Butterflies and Moths
Superfamily Papilionoidea - Butterflies and Skippers
Family Nymphalidae - Brush-footed Butterflies
Subfamily Danainae - Milkweed Butterflies & Glasswings
Tribe Danaini - Milkweed Butterflies
Genus *Danaus*
Species *plexippus* - Monarch - Hodges#4614

Scientific name:
Danaus plexippus



Linnaean taxonomy for Monarch butterfly

Insect classification based on wings (per Linnaeus)

- Four wings
  - Crustaceous
    - Completely crustaceous (Coleoptera: beetles)
    - semi-crustaceous (Hemiptera: e.g., true bugs)
  - Membranous
    - Covered with scales (Lepidoptera: e.g., butterflies)
    - Not covered with scales
      - Tail unarmed (Neuroptera: e.g., lacewings)
      - Tail armed (Hymenoptera: e.g.,wasps)
- Two wings (Diptera: flies)
- No wings (Aptera-everything else)

30 Insect Orders

- Archaeognatha (bristletails)
- Thysanura (silverfish)
- Ephemeroptera (mayflies)
- Odonata (dragonflies)
- Plecoptera (stoneflies)
- Isoptera (termites)
- Blattodea (cockroaches)
- Mantodea (mantids)
- Grylloblattodea (ice crawlers)
- Mantophasmatodea
- Orthoptera (grasshoppers)
- Phasmatodea (walking sticks)
- Embiidina (webspinners)
- Dermaptera (earwigs)
- Zoraptera

5 "Big Orders"

- Psocoptera (booklice)
- Phthiraptera (lice)
- Thysanoptera (thrips)
- Hemiptera (bugs, aphids, etc)

Holometabolous orders

- Megaloptera, Raphidioptera, Neuroptera
- Coleoptera (beetles)
- Strepsiptera
- Mecoptera (scorpionflies)
- Siphonaptera (fleas)
- Diptera (true flies)
- Hymenoptera (bees, wasps, ants)
- Tricoptera (caddisflies)
- Lepidoptera (moths, butterflies)

Ptera = Latin for wings

Wild and crazy names

- Tarantula named by Chris Hamilton in 2016
- *Aphonopelma johnnycashi* (named after country music legend Johnny Cash)
  - This species can be found near the area of Folsom Prison in California
  - Mature males of the species are clothed in a distinctive coat just like the "Man in Black"

Wild and crazy names

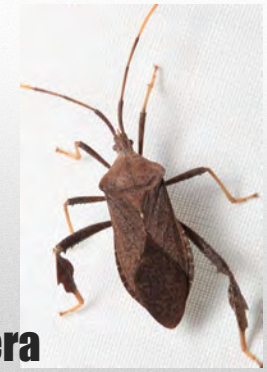
- Tropical canopy-inhabiting beetles by Terry Irwin
  - *Agra vation*
  - *Agra cadabra*
  - *Agra katewinslettae* (ESA Newsl. 9/2005)
- Golden "bootied" fly by Bryan Lessard (CSIRO)
  - *Scaptia beyonceae* is "Bootylicious"

Wild and crazy names

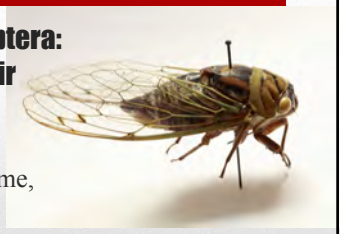
- Small moth with yellowish coif of scales on the head, named by Vazrick Nazari in 2017
- *Neopalpa donaldtrumpi* was named after the hairstyle that showed that nature always invents (even the weirdest things) first

Order Hemiptera

- Name: Hemi- half, ptera=wing
- Metamorphosis: gradual
- Mouthparts: piercing/sucking
- Two large suborders



Suborder Homoptera: Cicadas and their relatives



- Name: *homo* = same, *ptera* = winged
- Food: plant feeders
- Notes: Wings uniformly membranous, held roof-like over the body. Aphids, whiteflies, leafhoppers, scales

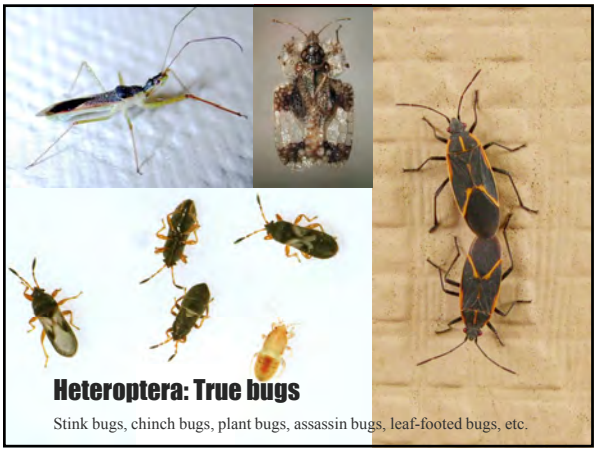
Suborder Homoptera: mealybugs,aphids, leafhoppers, scales, others

Treehoppers
Membracidae

Calico scale

Suborder Heteroptera: true bugs

- Name: *heteros Gr.*= different, *ptera* = winged
- Wings held flat over the body, often X shaped pattern
- Food: plant feeders, predators
- The "true bugs"



Heteroptera: True bugs

Stink bugs, chinch bugs, plant bugs, assassin bugs, leaf-footed bugs, etc.

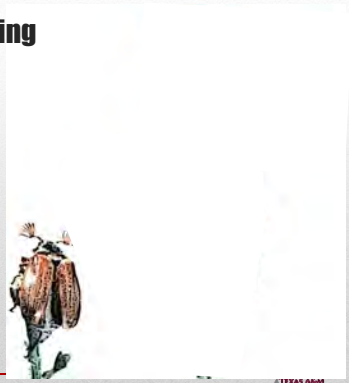
Bed bug

Coleoptera: Beetles

- Name: *Coleo* = sheath, *ptera* = winged
- Metamorphosis: complete
- Mouthparts: chewing
- Notes: Only second pair of wings used in flight. Most diverse insect order.

June beetle taking flight

- First pair of wings is the elytra

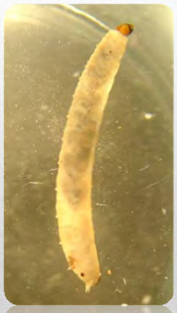


Diptera: Flies

- Name: *di* = two, *ptera* = winged
- Metamorphosis: complete
- Mouthparts: sponging, piercing/sucking
- Notes: Excellent fliers. Larvae are legless and generally found in water or around wet environments.

Diptera: Flies

Diptera larvae



- Legless and generally found in water or around wet environments.

Lepidoptera: moths and butterflies

- Name: *lepido* = scale, *ptera* = winged
- Metamorphosis: complete
- Mouthparts: siphoning
- Notes: Scaly wings, often colorful.

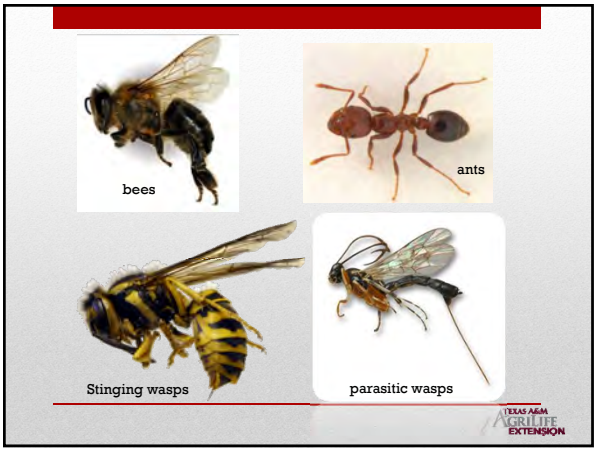
- Some Lepidoptera families considered "moth" and others "butterfly" families
- Butterflies diurnal, moths nocturnal
- Butterflies rest with vertical wings, moth with flat wings
- Butterfly antennae knobbed, moth antennae feathery or filamentous

Moths v butterflies?

Luna moth freshly emerged

Hymenoptera: Bees, wasps and ants

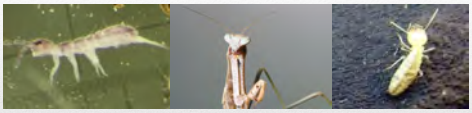
- Name: *humen* = membrane, *pteron* = wing
- Metamorphosis: complete
- Mouthparts: usually chewing
- Notes: Abdomen and thorax joined by narrow waist. Many social.



12,000 species of ants currently known (1,000 in N.A.)

Other notable Orders...

Mantodea: mantids



Collembola: springtails

Isoptera: termites

Orthoptera: Grasshoppers

Odonata: dragonflies

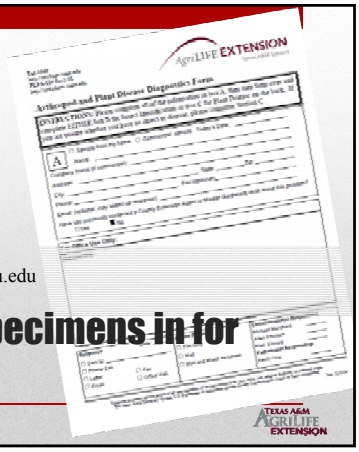
Siphonaptera: fleas

Texas Cooperative Extension

- Hard bodied insects
  - Alcohol
  - Dried in container
    - Cushion with Kleenex, not cotton
- Soft bodied insects
  - Alcohol
- Fill out form in pencil, drain most of alcohol before shipping

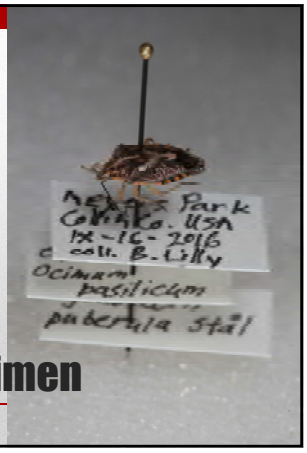
Preparing insects for ID

- Department of Entomology
- Local entomology specialist
- http://citybugs.tamu.edu



Sending specimens in for ID

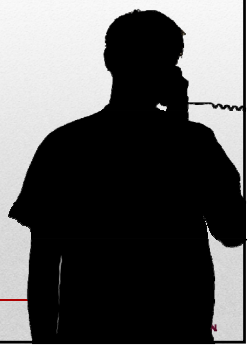
- When submitting specimens include
  - City, county
  - Date collected
  - *Plant species* or other information about where collected
- Specimens will be labeled with scientific name and placed in collection



Pinned specimen

African cluster bug

- Pick up with tape, Kleenex dipped in alcohol, brush dipped in alcohol
- No skin or body specimens
- No vacuum cleaner bags or large containers of wash water
- Limit to five specimens or less



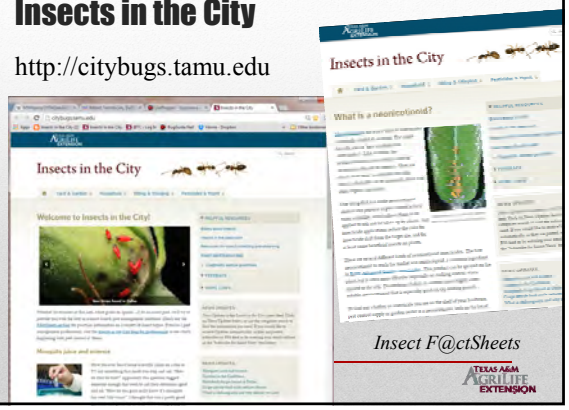
Human parasites and tiny insects

- Use good lighting
- Fill up frame with insect
- Closeup lens, hand lens, microscope helps with small specimens
- Need same info as for mailed in specimens (plus estimate of size)

Photographing insects for ID

Insects in the City

http://citybugs.tamu.edu



http://bugguide.net

Creation of Bugguide

- An online insect image collection
- Similar to a bugs and labels collection
  - Organized taxonomically
  - Includes collection data
  - Welcomes all contributors
- Started in 2003 by Troy Bartlett
- Maintained today by John Vandyke, Iowa State

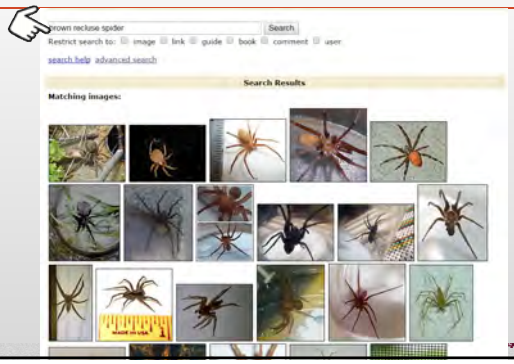
BugGuide Brain Trust: Bartlett, Boone, Jordan, VanDyk

What can you do on Bugguide?

- Compare an insect in hand or in photo with an identified insect in Bugguide
- Search on a name to see what a particular kind of insect looks like
- Look for insects on a particular host plant
- Submit insect images for identification by an expert
- Search for when an insect might occur
- Search for what similar insects are found in your area
- Download pictures for PowerPoint presentations

Search for pictures of an insect or spider

Search for pictures of an insect or spider



http://citybugs.tamu.edu
http://bugguide.net

Emerald Ash Borer and Brown marmorated stink bug:
Newest invasive insects for Texas?

First Responder Training - 2017

Michael Merchant, PhD, BCE
Extension Urban Entomologist
Texas A&M AgriLife Research and Extension Center at Dallas
M-merchant@tamu.edu

Ash in the United States

- *Fraxinus*: genus of flowering trees in family, Oleaceae
- 21 species of trees in North America north of Mexico
- Opposite leaves, usually pinnately compound

Ash in the United States

- Seeds borne in samaras
- Dioecious in most species (male and female trees)
- Popular shade tree with dense hardwood

Uses of ash (white ash)

- Baseball bats
- Tool handles
- Oars
- Pallets
- RR ties
- Bows
- Electric guitars
- Firewood
- Furniture
- Seeds used by birds

Emerald ash borer

- *Agrilus planipennis* (Coleoptera: Buprestidae)
- Native of Asia, first detected in Detroit MI in 2002 (prob. had been in MI since early 1990s)
- By 2003 5-7 million dead or dying ash trees in 6 county area of SE Michigan

History of EAB in U.S.

- Initially very little known about this insect
- Range from China, Korea, E. Russia
- Two pages in a Chinese textbook and a few taxonomic descriptions in journals

History of ash borer in U.S.

- Attacks all species of ash
- In U.S. attacks not only weakened trees, but heathy trees
- Attacks trees in forests and urban sites
- In MI, more than 99% of forest ash with stems >2.5 cm killed

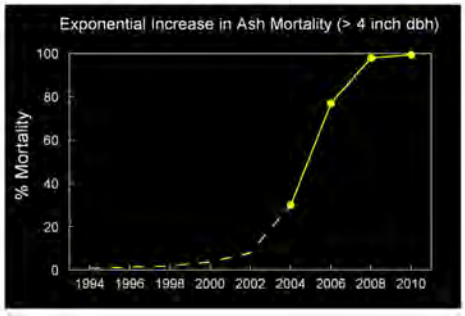
Texas A&M AgriLife Extension

Impact

- Larvae feed under bark, disrupt transport of water, nutrients
- Healthy trees killed within 1-3 years of first symptoms
- All sized trees attacked

Courtesy Dan Hermes, Ohio State University
Efficacy of insecticide treatments for EAB: they do work! July 2012

EAB-Induced Ash Mortality in the Upper Huron River Watershed, SE Michigan



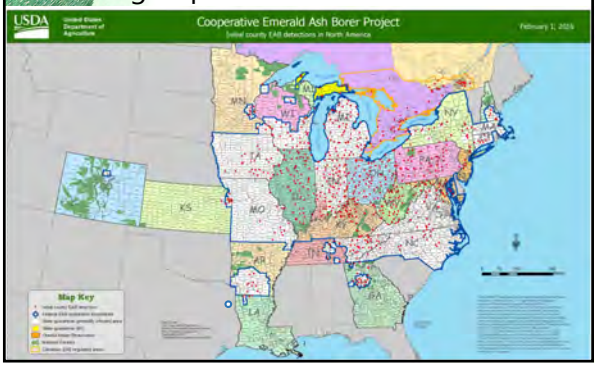
New EAB Host: White Fringetree

ref: Cipollini, D. 2015. J Econ Entomol. 106(1): 370 ff

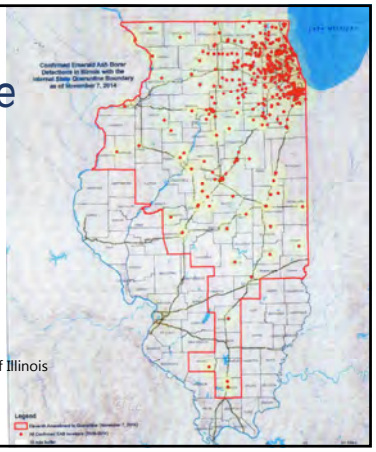
- Live larvae and dead adult found in white fringetree, *Chionanthus virginicus,* in SE Ohio
- Completed development
- Attacked trees in presence of available ash trees
- Close relatives include *Forestiera, Osmanthus, Olea*.

Texas A&M AgriLife Extension

EAB range April 2016



EAB range in Illinois



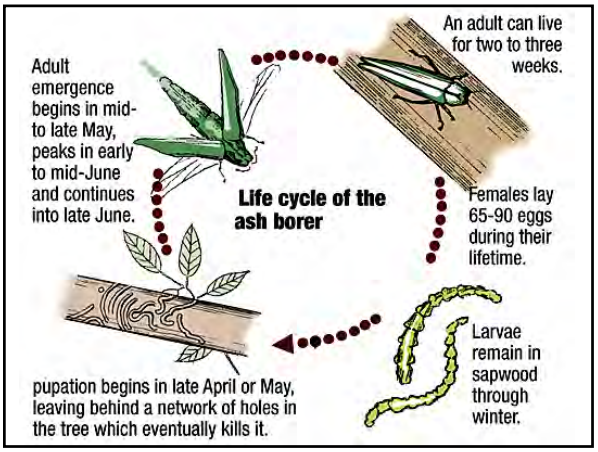
Courtesy Phil Nixon, University of Illinois

Ash Species Mortality from EAB

- Faster growing ash species die quicker
- Black ash, a fast-growing swamp ash dies quickest
- Green ash die several years quicker than white ash

Black Ash Photo: USDA

TEXAS A&M AGRILIFE EXTENSION



Recognizing damage

TEXAS A&M AGRILIFE EXTENSION

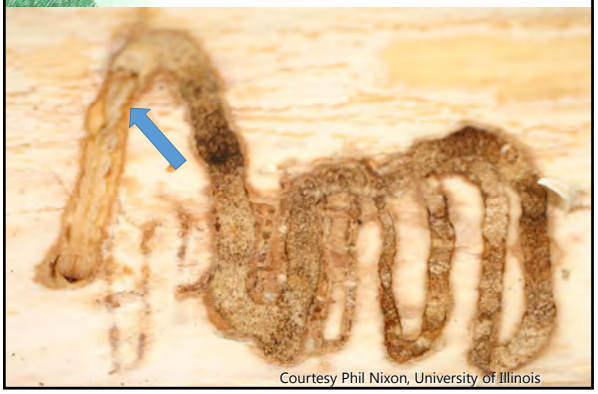
EAB Seeking Egg-laying Site

Courtesy Phil Nixon, University of Illinois

Emerald Ash Borer Egg

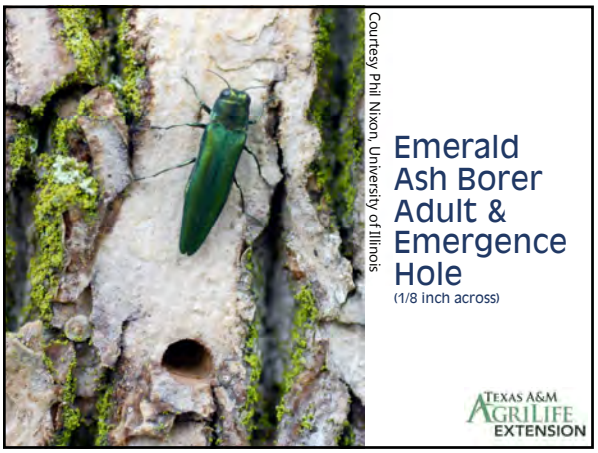
Courtesy Phil Nixon, University of Illinois

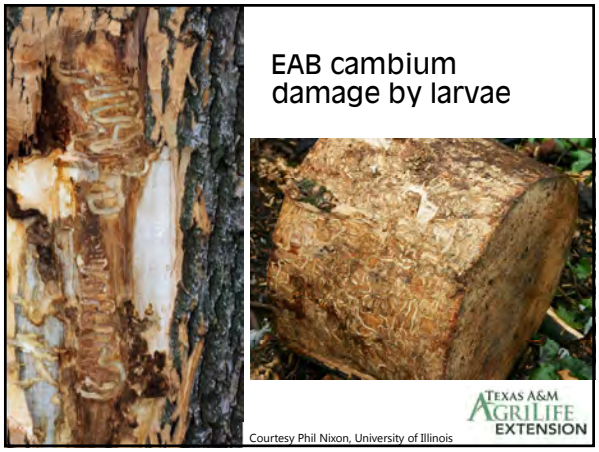
Emerald Ash Borer Larva



Courtesy Phil Nixon, University of Illinois


EAB larvae
UGA5016056


Courtesy Phil Nixon, University of Illinois
Emerald Ash Borer Adult & Emergence Hole
(1/8 inch across)
Texas A&M AgriLife Extension


EAB cambium damage by larvae
Courtesy Phil Nixon, University of Illinois
Texas A&M AgriLife Extension


Serpentine tunnels
Cornelia Schaible E+ Getty Images


EAB-encouraged Woodpecker Damage "flecking"


UGA1249006

EAB thinning canopy & epicormic branching

Photos courtesy Phil Nixon, University of Illinois

Insects Confused with EAB

Ash and Privet Borer

Ash and Privet Borer Tunnels

Redheaded Ash Borer Adult

Redheaded Ash Borer Larva

Courtesy Phil Nixon, University of Illinois

Distinguishing exit holes of ash borers:

Emerald ash borer
Shape: D-shaped
Width: 3 mm (1/8")

Clearwing borers
Shape: Round
Width: 6 mm (1/4")

Roundheaded borers
Shape: oval - round
Width: 6 mm (1/4")

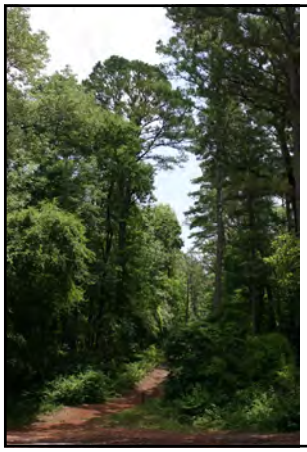
TEXAS A&M AGRILIFE EXTENSION

The future?

TEXAS A&M AGRILIFE EXTENSION

EAB Monitoring in Texas

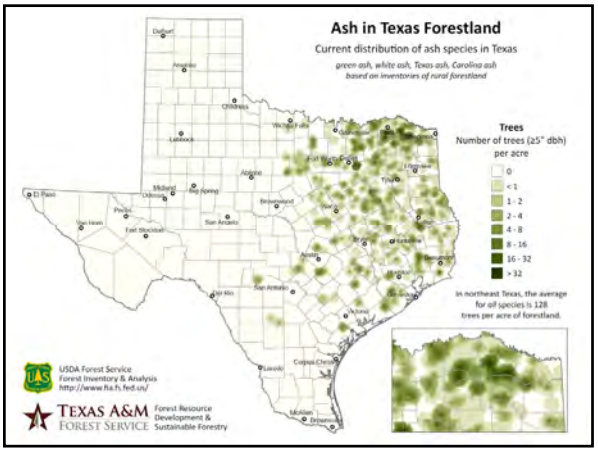
TEXAS A&M AGRILIFE EXTENSION



Hopeful signs:
Fewer ash trees in TX

- Ash density lower in Texas compared to other Midwestern states
  - <2% forest canopy in TX
  - Chicago 12% urban trees
  - Minneapolis 15% urban trees
  - Iowa 16% urban trees
  - Pennsylvania 14% trees
  - Missouri 14% urban trees
  - Colorado 15-25% urban trees

TEXAS A&M AGRILIFE EXTENSION



Hopeful signs:
Parasitic Wasps

- 3 species imported from China
- At least 2 U.S. species have adapted to EAB
- Some areas EAB densities decreasing 5-fold after establishment
- Too soon to determine whether control will be achieved from releases

Imported parasite *Tetrastichus planipennisi* adult (top) and pupae in borer tunnel

Hopeful signs:
host plant resistance

- Asian ashes resistant
- Research to determine source of resistance
- Future resistance
  - Conventional crosses
  - Gene implantation

Manchurian Ash
Photo: D. Herman

Hopeful signs:
> 10 years of research

- Multiple effective treatment methods
  - Including at least one "organic" option
- Biological controls may be increasing in effectiveness

University of Kentucky

Management

EAB Management

- Preventatively treat ash trees no more than 15 miles from known infestations
- Infestation likely to be present for 4-6 years before noticed

EAB Insecticide Treatments

- Treated trees may survive and be attractive for many years
- Annual or biennial treatment needed for foreseeable future
- Tree short-term survival
  - Allows time to generate funds for removal costs

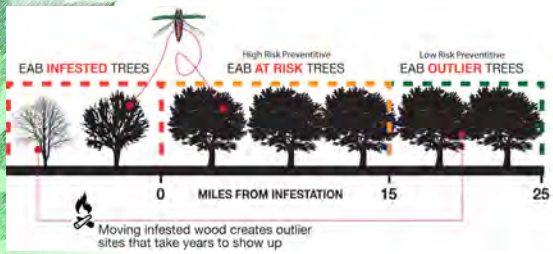
Research Overview

Research Partner

Columbian Park, Lafayette, IN

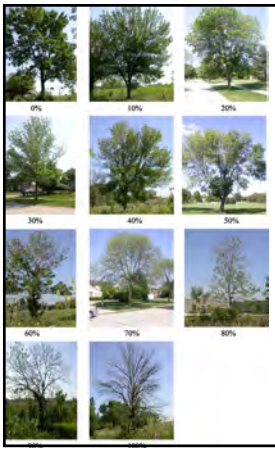
Photo courtesy of Dr. Cliff Sadof

When should treatments start?



Stage for Removal

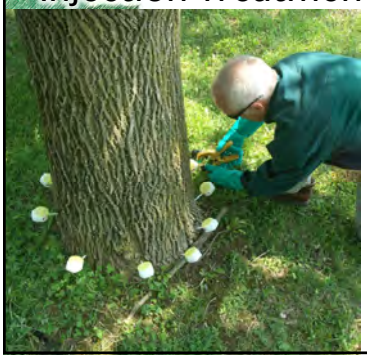
Legacy Trees



When is tree removal the best option?

- Defoliation >30-40% may not be salvageable
- Smitley scale (Michigan State University)
- Tree removal does not slow spread of borer into new areas

EAB Professional Trunk Injection Treatment Options



- Emamectin benzoate as Arborjet Tree-Age every 2-3 years
- Imidacloprid (Merit, Xytect, Imicide, IMI-jet) every 1-2 years
- Azadirachtin (Azasol, TreeAzin) annually

Professional Soil and Bark Treatment Options

- Imidacloprid (Merit, others) at high rate as soil injection or soil drench annually
- Dinotefuran (Safari, Transact, Xylam) as soil injection, soil drench, or bark spray annually
- Apply soil injection or soil drench within 2 feet of trunk

Emamectin Benzoate

- 98-99% control for two years
- Kills adults feeding on leaves
- Kills larvae in cambium area
- Restricted use pesticide
- Sold as Tree-Age by Arborjet

Imidacloprid

- 2X rate most effective on large trees (ca. 96% control)
  - Xytect
  - Optrol
- Injectable form as Merit, Xytect, Imicide, IMA-Jet, Pointer, others
- Kills adults feeding on leaves
- Spring applications more effective than fall

Dinotefuran trunk spray

- Moves through bark or roots into cambium area
- Most effective with smaller trees that have thinner bark – about 96% control
- Kills adults feeding on leaves

Azadirachtin

- Organic insecticide, derived from Neem tree
- Young larvae die in treated trees
  - 75-80% control in trees treated every two years
- Apply annually in high infestations

Homeowner Treatment Option

- High labeled rate of imidacloprid
- Remove mulch, sod, or other organic matter before application
- Apply as a soil drench within 2 ft of trunk
- Repeat annually

Homeowner imidacloprid

- Bayer Advanced 12 Month Tree & Shrub Insect Control
- Bonide Annual Tree & Shrub Insect Control
- Bonide Borer-Miner Killer with Systemaxx
- Ferti-lome Tree & Shrub Systemic
- Hi Yield Systemic Insect Granules
- Optrol
- Ortho Max Tree & Shrub Insect Control

Homeowner Treatment Option

- Dinotefuran sold as Green Light Emerald Ash Borer Killer, others
- Granules applied evenly to soil surface within 1 ½ feet of trunk
- Apply annually

Brown marmorated stink bug

Halyomorpha halys

TEXAS A&M AGRILIFE EXTENSION

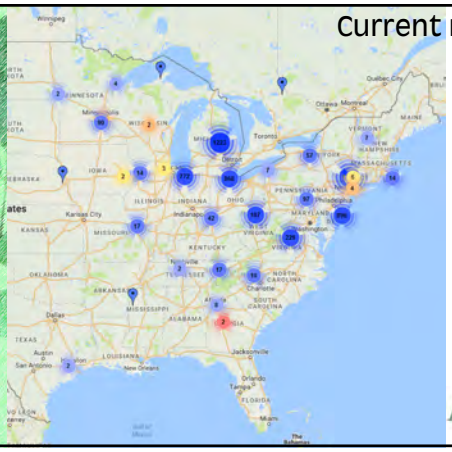
History

- True bug from Asia
  - Native home in China feeds on *Eucommia* and a variety of fruit and ornamental trees, including pear, peach, apple, plum, and mulberry
  - Japan a significant new pest
  - Korea, major pest on soybean, sweet persimmon, yuzu, and citrus
- Accidentally imported to U.S. in late 1990s (Allentown, PA)

Damage to apple. By Tracy Leskey and Torri Hancock.

TEXAS A&M AGRILIFE EXTENSION

Current range



TEXAS A&M AGRILIFE EXTENSION

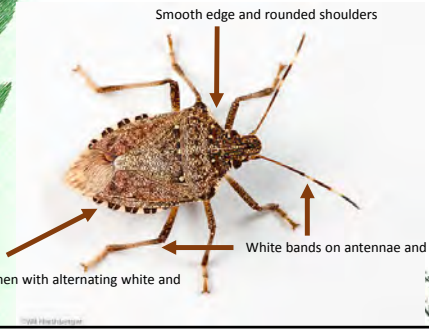
Pest problem

- Tree-loving bug with wide host range
- Severe agricultural problems in 9 states, (especially sweet corn, peppers, tomatoes, apples, and peaches)
- Nuisance pest, overwintering in homes, office buildings, and warehouses.

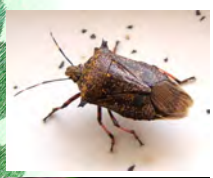
BMSB damage to snap pea. Photo by Tom Kuhar

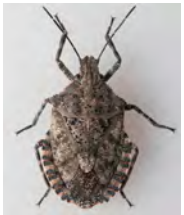
TEXAS A&M AGRILIFE EXTENSION

Identification



Not BMSB





TEXAS A&M AGRILIFE EXTENSION

If you think you see BMSB

- Report to AgriLife Extension
- Report sightings on http://www.eddmaps.org/bmsb/

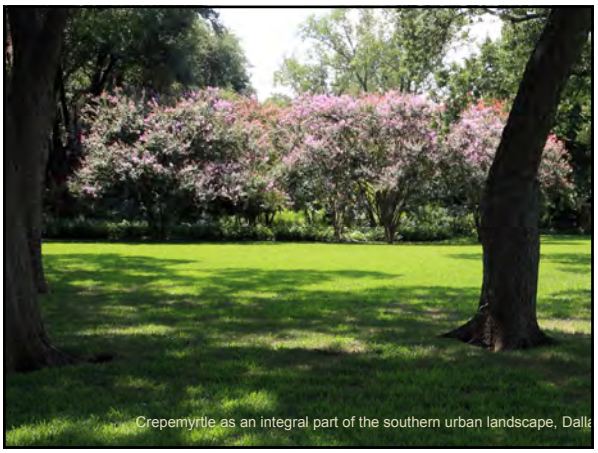
Texas A&M AgriLife Extension

Acknowledgements

- Dr. Phil Nixon
  University of Illinois Cooperative Extension
- Patrick Anderson
  Rainbow Treecare
- Dr. Joe LaForest
  University of Georgia, Bugwood Network
- Dr. Dan Herms
  Ohio State University
- Stop BMSB website: http://www.stopbmsb.org/

Texas A&M AgriLife Extension


Lagerstroemia indica 'Petite'
Harlow Gardens, Tuscon AZ


Crepemyrtle as an integral part of the southern urban landscape, Dall

Systematic entomology laboratory, USDA/APHIS, Beltsville, MD

TEXAS A&M AGRILIFE EXTENSION

Initial identification:
Eriococcus azaleae

- Azalea bark scale a pest of azalea, rhododendron, Andromeda, hawthorne, poplar and willow.
- Never recorded on Lagerstroemia

Azalea Bark Scale (Plate 166)

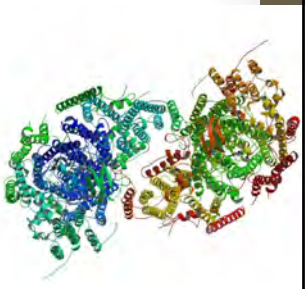
Text and pictures from Johnson and Lyon, Insects that Feed on Trees and Shrubs

TEXAS A&M AGRILIFE EXTENSION

An exotic pest?

What is the identity of this scale on crapemyrtle?

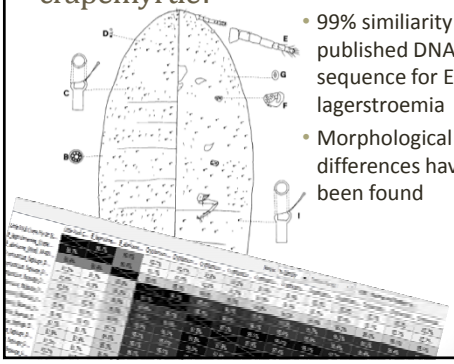
- Mystery for ten years
- Morphologically nearly identical to azalea bark scale
- Genetic analysis now supports an Asian origin
- Genetically distinguishable from azalea bark scale



Protein produced by the Cytochrome oxidase subunit 1 gene
Source: Wikipedia

TEXAS A&M AGRILIFE EXTENSION

What is the identity of this scale on crapemyrtle?



- 99% similiarity to published DNA sequence for E. lagerstroemia
- Morphological differences have now been found

Comparable latitudes in U.S.

How did E. lagerstroemia get to the U.S.?

TEXAS A&M AGRILIFE EXTENSION

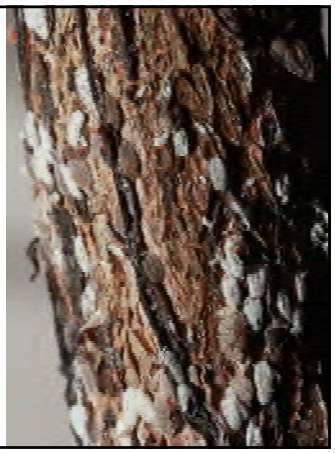
Scale insects

- Plant feeders in suborder Homoptera
- Important families
  - Mealybugs (Pseudococcidae)
  - Cochineal scales (Dactylopiidae)
  - Margarodid scales (Margarodidae)
  - Kermes scales (Kermesidae)
  - Pit scales (Asterolecanidae)
  - Armored scales (Diaspididae)
  - Soft scales (Coccidae)
  - Bark or felt scales (Eriococcidae)

TEXAS A&M AGRILIFE EXTENSION

Life stages

- Males
  - Egg
  - Crawler
  - Nymph
  - Prepupa (sac)
  - Pupa (sac)
  - Adult
- Females
  - Egg
  - Crawler
  - 2 nymph instars
  - Adult female (ovisac)



TEXAS A&M AGRILIFE EXTENSION

Eggs in female ovisac

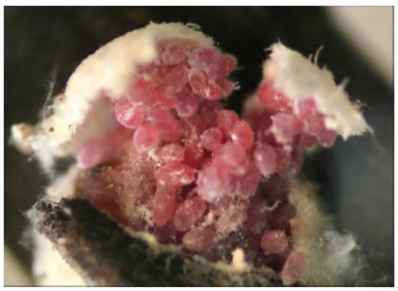


Photo courtesy Zinan Wang et al, LSU

TEXAS A&M AGRILIFE EXTENSION

Nymph (second instar)

Photo courtesy Zinan Wang et al, LSU

TEXAS A&M AGRILIFE EXTENSION

Adult male

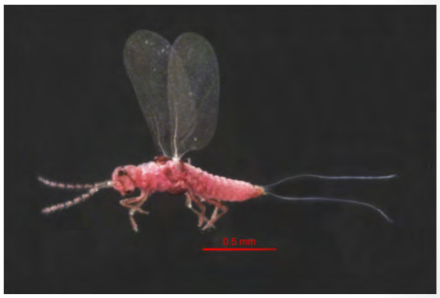


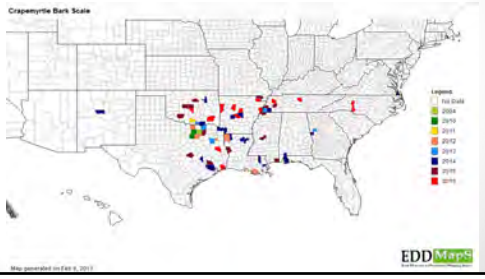
Photo courtesy Zinan Wang et al, LSU

TEXAS A&M AGRILIFE EXTENSION


How does a wingless insect spread?

Spread of bark scale on crapemyrtle

- Discovered in Richardson, TX in 2004
- Slow spread initially through DFW metroplex
- Fast (man assisted?) spread in last five years



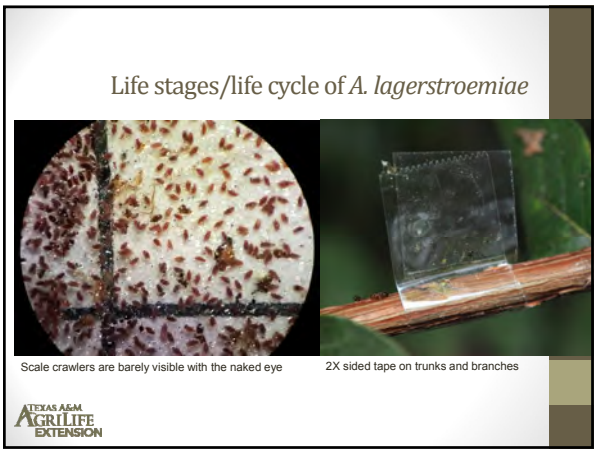
Recorded hosts of *Acanthococcus lagerstroemia*

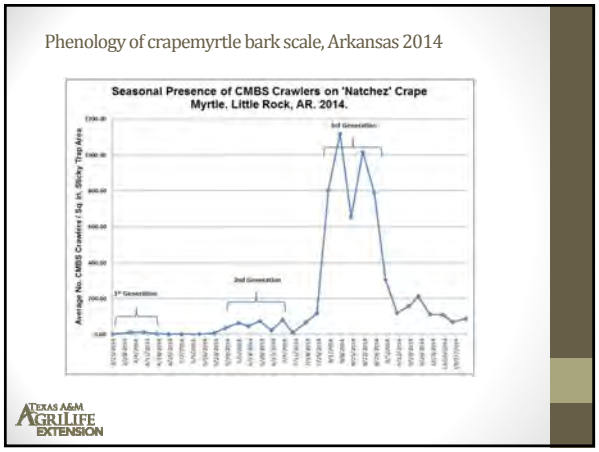
- *Lagerstroemia indica and L. japonica, L. flosreginae* (Lythraceae)*
- *Mallotus japonicus, Glochidion puberum* (Euphorbiaceae)
- *Ligustrum obtusifolium* (Oleaceae)
- *Punica granatum* (Punicaceae)
- *Celtis sinensis* (Ulmaceae)
- *Buxus microphylla* var. koreana (Buxaceae)
- *Malus domestica, Rubus sp.* (Rosaceae)
- *Anogeiussus latifolia* (Combretaceae)
- *Diospyros kaki* (Ebenaceae)
- *Dalbergia* sp., *Glycine max* (Fabaceae)
- *Ficus carica* (Moraceae)
- *Myrtus* sp. (Myrtaceae)

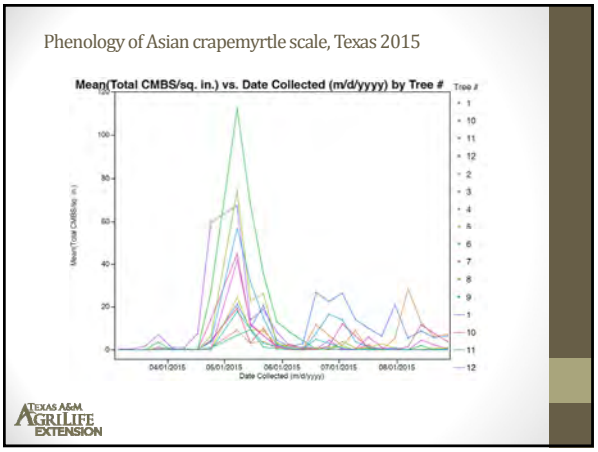
*native or important cultivated taxa in U.S.
Source: Kwon and Han. 2003. J. Asia-Pacific Entomol. 6(2):151-157. The Genus *Eriococcus* from Korea

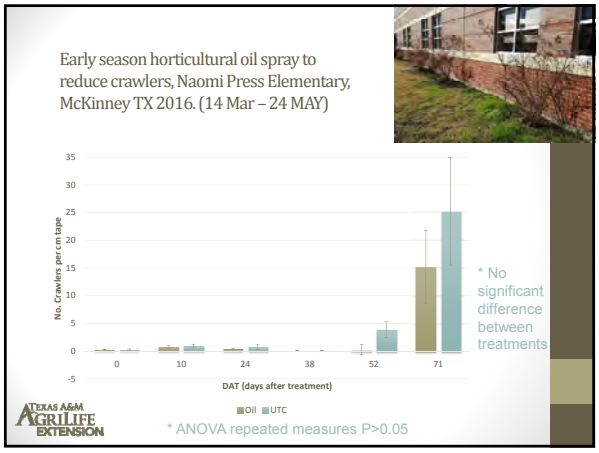
American beautyberry
Callicarpa americana

Insecticide trials since 2008

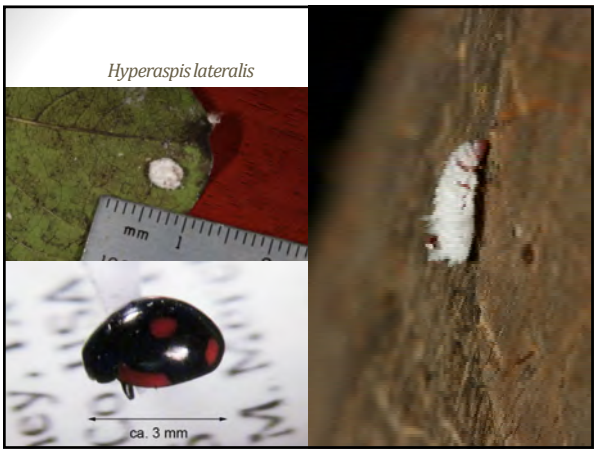

Life stages/life cycle of *A. lagerstroemiae*
Scale crawlers are barely visible with the naked eye
2X sided tape on trunks and branches
TEXAS A&M AGRILIFE EXTENSION


Phenology of crapemyrtle bark scale, Arkansas 2014
Seasonal Presence of CMBS Crawlers on 'Natchez' Crape Myrtle, Little Rock, AR. 2014.
TEXAS A&M AGRILIFE EXTENSION

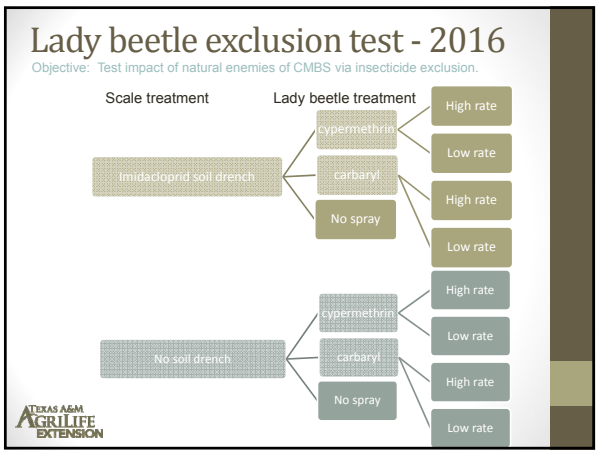

Phenology of Asian crapemyrtle scale, Texas 2015
Mean(Total CMBS/sq. in.) vs. Date Collected (m/d/yyyy) by Tree #
TEXAS A&M AGRILIFE EXTENSION

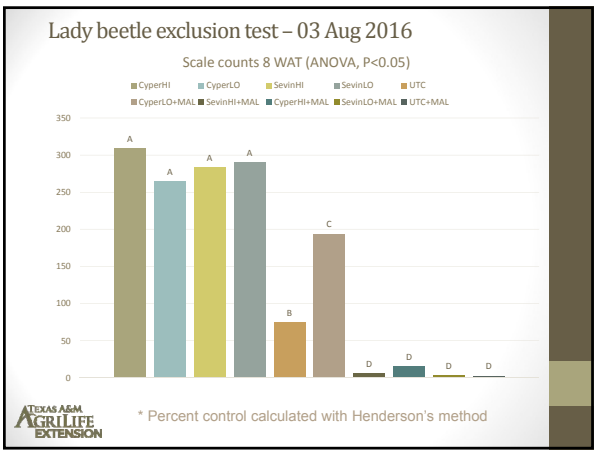

Early season horticultural oil spray to reduce crawlers, Naomi Press Elementary, McKinney TX 2016. (14 Mar – 24 MAY)
No. Crawlers per cm tape
DAT (days after treatment)
Oil UTC
* No significant difference between treatments
* ANOVA repeated measures P>0.05
TEXAS A&M AGRILIFE EXTENSION


Predators of CMBS
Twice-stabbed lady beetle, *Chilocorus cacti*


Hyperaspis lateralis
mm
ca. 3 mm

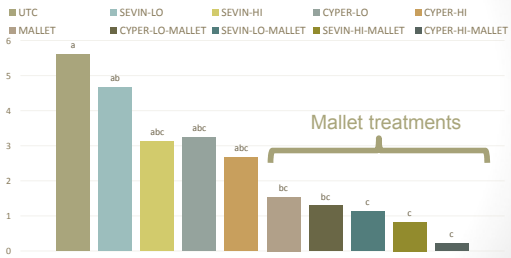

Red imported fire ants raiding ovisacs?


Lady beetle exclusion test - 2016
Objective: Test impact of natural enemies of CMBS via insecticide exclusion.
Scale treatment
Lady beetle treatment
Imidacloprid soil drench
No soil drench
cypermethrin
carbaryl
No spray
High rate
Low rate
High rate
Low rate
High rate
Low rate
High rate
Low rate
Texas A&M AgriLife Extension


Lady beetle exclusion test – 03 Aug 2016
Scale counts 8 WAT (ANOVA, P<0.05)
CyperHI
CyperLO
SevinHI
SevinLO
UTC
CyperLO+MAL
SevinHI+MAL
CyperHI+MAL
SevinLO+MAL
UTC+MAL
350
300
250
200
150
100
50
0
A
A
A
A
B
C
D
D
D
D
Texas A&M AgriLife Extension
* Percent control calculated with Henderson's method

Impact of insecticide treatments on lady beetles - 2016

Average 2 minute timed lady beetle count/tree (larvae+pupae+adults)



TEXAS A&M AGRILIFE EXTENSION

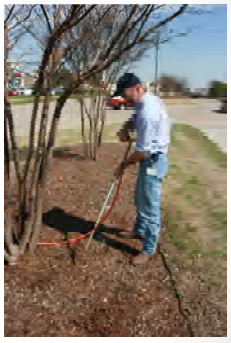
Conclusions to date

- What works
  - Soil applied neonicotinoids
  - Talstar, Pyriproxyfen may provide some control
  - Oil may help in combination with other treatments
- What doesn't work
  - Horticultural oil alone
  - Trunk sprayed or foliar sprayed neonicotinoids
  - Malathion alone
  - Sevin and cypermethrin make scale worse--likely by eliminating predators

TEXAS A&M AGRILIFE EXTENSION

Current IPM recommendations

- Applying dormant oil sprays to trees in Jan/Feb to control crawlers may be helpful
- When practical, scrub bark and main branches with brush dipped in soapy water (removes sooty mold and egg masses)
- Apply neonicotinoid insecticide to soil after leaves emerge
  - Imidacloprid
  - Thiamethoxam
  - Clothinidin
  - Dinotefuran



TEXAS A&M AGRILIFE EXTENSION

- Bayer Advanced Garden Tree and Shrub Insect Control
- Cost:
  - 12 Month Tree & Shrub Insect Control II (1 gal) $130, or $22.85/15 ft tree
  - Protect and Feed (qt) $26.99 treats a 10-11 ft tree

DIY control with imidacloprid

TEXAS A&M AGRILIFE EXTENSION

New Extension publication

http://www.agrilifebookstore.org/product-p/eht-049.htm

TEXAS A&M AGRILIFE EXTENSION

You are asked to report new CMBS sightings here

www.eddmaps.org/cmbs

Rose Rosette Disease

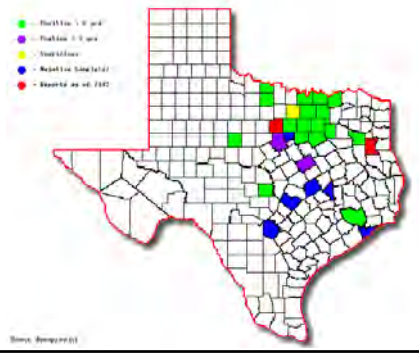
Trainer: Maddi Shires

Where did it come from?

History

- Late 1800's R. multiflora brought to United States for better rootstock
- 1930s multiflora planted heavily to reduce soil erosion
- First identified in 1940 on multiflora in northern US and Canada
  - Wyoming
  - California
  - Nebraska
- Discovered in Texas in 1990's
- Was first suspected to be a phytoplasma
- In 2011 was discovered to be a virus

Distribution of RRV in Texas

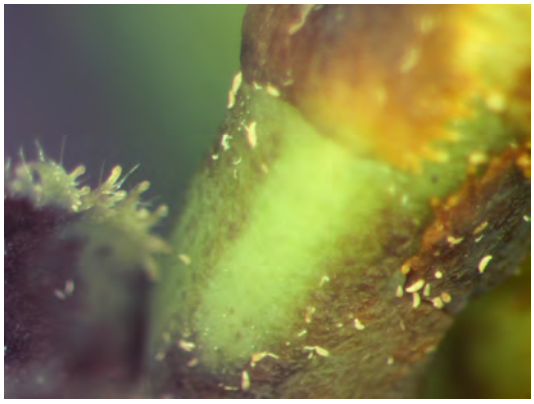


Counties:

- ❑ Archer
- ❑ Collin
- ❑ Cooke
- ❑ Dallas
- ❑ Denton
- ❑ Ellis
- ❑ Fannin
- ❑ Grayson
- ❑ Harris
- ❑ Kaufman
- ❑ Llano
- ❑ Parker
- ❑ Rockwall
- ❑ Smith
- ❑ Tarrant
- ❑ Taylor
- ❑ Wichita
- ❑ Wood

Vector

- Eriophyid mite- *Phyllocoptes fructiphilus*
- 140-170 microns in length and 50 microns wide
- Light yellow/green color with 4 legs
- Live on new growth between leaf sepals and flower buds.
- Disbursed by wind to neighboring plants



Symptoms of Rose Rosette

- Excessive thorniness
- Distorted and malformed leaves
- Distorted canes
- Red leaf pigmentation
- Excessive lateral shoot growth
- Witches' brooms
- Thickened stems and canes

- **Excessive Thorniness**
- Distorted Canes
- Small crinkled leaves
- Red/Pink pigmentation

- **Distorted Canes- epinasty**

- **Red pigmentation**
- Excessive thorns
- Tall lateral shoots
- Witches Broom

- **Elongated shoots**
- Deformed leaves
- Overgrown Calyx

- **Witches Broom**

What you will see

- Symptoms not as extreme
- Differential expression of symptoms

Lady Banks Rose

- No thorns
- Skinny stems and canes
- Little red pigmentation
- Small distorted leaves and stems

Julia Child Rose

- Healthy flowers
- Average sized stems
- No red pigments
- Small distorted leaves
- Some thorny clusters

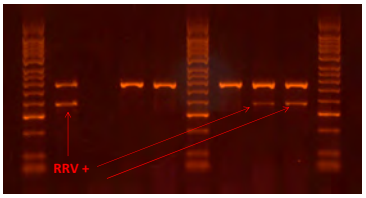
Pink Home Run Rose

- Normal Stems
- No red pigmentation
- Witches Broom
- Small deformed/ cupped leaves
- Thorns

New Growth V.S. RRV

Testing for RRV

- Observation of symptoms
- Presence or absence of eriophyid mites
- Molecular PCR testing for RRV



What is NOT RRV

- Chemical
- Nutritional
- Other rose disease symptoms
  - Rose Mosaic Virus
  - Black Spot
  - Powdery Mildew
  - Botrytis Blight

Herbicide damage differentiation

- Small distorted leaves

Rose Mosaic Virus

Black Spot

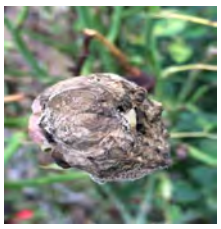
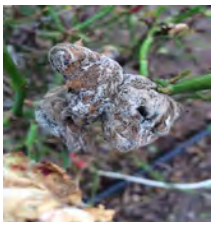
- Caused by Diplocarpon rosae
- Dark brown- reddish necrotic spots

Powdery Mildew

- Usually caused by *Sphaerotheca pannosa var. rosae*
- White moldy growth on upper leaf surfaces


Botrytis

- Caused by *Botrytis cinerea*
- Water-soaked brown spots that develop into gray, fuzzy mold

Management of RRV

Current recommendations for managing this disease:

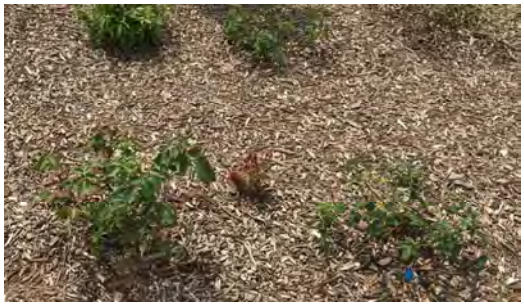
1. Remove confirmed and/or symptomatic plants early after observation including roots (bag and discard; do not compost).

2. Treat adjacent plants with miticide to reduce probability of transmission by eriophyid mites (use abamectin or horticultural oil). Please note: this will not stop the virus, if it is already in the plant.

3. Remove any wild roses in the vicinity of cultivated roses.

4. Monitor (weekly) for symptoms and act quickly when and if symptoms are observed.

Why is it important to dig up roots?



How to send a sample

- Collect samples with STERILIZED utensils
- Place in plastic bag
  - Label with variety, age, and supply photo
- Send **without** ice or moist paper towel
- Send in a box
  - 435 Nagle St.
    TAMU 2132
    College Station, TX 77845

Questions?

Texas Plant Disease Diagnostic Lab contact information:

1500 Research Pkwy. Suite A130

College Station, TX 77845

(979)-845-8032

http://plantclinic.tamu.edu/

Email: plantclinic.tamu.edu

Completing Your

Service Requirements

SERVICE ACTIVITY GUIDELINES

Service requirements: In order to become a certified Master Gardener Specialist, participant will be required to complete 20 hours of service. The following listed are options to satisfy this requirement:

AREA SERVICE PROJECT *

The purpose of this project is to survey a determined location (presumably in immediate neighborhood of domicile) to record plantings of potential hosts and observations of possible disease or insect of concern issues.

FIRST DETECTOR EDUCATOR OUTREACH *

There will be several prepared presentations (speaker bureau) that can be used in an educational program such as NPDN mission, Recognizing Signs & Symptoms, Emerald Ash Borer, Boxwood Blight, Rose Rosette Disease, Brown Marmorated Stink Bug, and others. In addition, outreach education programs involving how-to recognize symptoms and/or reporting symptoms can be claimed as service hours.

CALL CENTER SUPPORT

Trainees that provide plant management, plant health or horticultural support can claim service hours for volunteered time per approval of Extension county agent and/or Master Gardener coordinator.

CONSULTATIONS

In situations where trainees have the opportunity to visit site and provide expertise using knowledge gained from the Master Gardener Specialist First Detector program can be claimed as service hours (per approval of Extension county agent and/or Master Gardener coordinator).

SPECIAL CIRCUMSTANCES/ACTIVITES

If trainee volunteers and/or provide support to any activity utilizing knowledge obtained or discussed at the Master Gardener Specialist First Detector program can be claimed as service hours- provided it is approved by Extension county agent and/or Master Gardener coordinator AND the Texas NPDN First Detector coordinator (currently, Dr. Kevin Ong).

* At least one of these activities is required to complete service hours.

SURVEY LOG GUIDANCE

Completed log form should be scanned and emailed to **TXFirstDetector@sickplants.org** or uploaded to the TXFirstDetector webpage (http://plantclinic.tamu.edu/mgspecialistfd/)

Please complete **ONE** form per location

1. Enter date of survey.
2. Enter name of First Detector conducting survey.
3. Service hours: Please note the service hours being claimed to conduct this survey.
4. Check appropriate box to define type of survey target: **Rose Rosette** OR Insect.
5. Survey description: It is sometimes easier to breakdown the survey location into subsections for ease of description. (see example survey log)
    a. Location: Identify location of the survey area. Provide an address, or list adjacent major streets and/or intersections. This information should allow for one to be able to identify the location on a map.
    b. Location description: General comments by the First Detector to provide an overview observation. Eg. *Residential area, plant located in area park roughly containing in ½ city block. General landscaping with 80% turfgrass coverage. Plants (subjects) located in northeast corner of park.*
    c. GPS coordinate: If available, provide general GPS coordinates so that location can be revisited.
    d. Number of plants: Identify the number (estimated is OK) of plants in the surveyed area. This information provides data whether this is a concentrated planting or an isolated planting.*
    e. Comments: Additional observation notes which could include other information that First Detector assumes might be important to note.*
    f. Target detected (Y/N): Did you observe disease symptoms or target insect?

    * Identify plant variety is possible. Also note if disease is present. See example for guidance

6. Map Sketch: Provide a general sketch of surveyed area to show location of plants. This does not need to be to scale. It is meant to provide a general visual guide for future visits to locate plants.

EXAMPLE

MASTER GARDENER SPECIALIST FIRST DETECTOR
SURVEY LOG

1. Date of survey: 7/19/13
2. First Detector ID: Ong
3. Service Hours: 1 hr.

4. Survey type:

☐ BOXWOOD SURVEY ☒ ROSE SURVEY

5. SURVEY				
Location	Location description	GPS coordinates	# of plants	Comments
G.Bush pkwy & Texas Ave. -Northeast corner	Beautification area. Public. multiple types of plants. Formal raised beds. Bed A (see map)	30.618 -96.929	12 5-KO 7-BD	KO - Knockouts, appear healthy. BD - Belinda's Dream. minor yellowing on lower leaves.
"	Bed B (see map)	"	10 5- KO 2- BD 2-seaf 1 -unk	KO = okay BD = okay, some yellow lower leaves Seafoam=recently pruned. Unknown looks like mutabilis. Not sure!

6. Use back of page for Map Sketch

EXAMPLE

AREA SURVEY LOG - 2017

1. Date of survey: _____
2. First Detector ID: _____
3. Service Hours: _____

4. Survey type:

☐ ROSE ROSETTE ☐ INSECT

5. SURVEY					
Location	Location description	GPS coordinates	# of plants	Comments	Target detected (Y/N)

6. Use back of page for Map Sketch.

CERTIFICATION & REIMBURSEMENT INFORMATION

Now that you have completed your training and are on your way to becoming a Master Gardener First Detector Specialist, there are a couple of matters you will need to attend to:

If you want to receive your certificate at the next conference, you will need to fill out the **Master Gardener Specialist Project Approval Form**. You can either use the link provided, or the form is in this handout for your reference.

http://txmg.wpengine.netdna-cdn.com/wp-content/blogs.dir/1/files/Specialist-Project-Approval-Form.pdf

If you want to be reimbursed $50 following your volunteer service component, you will need to fill out the **Specialist Reimbursement Request Form**. Please note: If you fill out the reimbursement form, you will not need to fill out the Master Gardener Specialist Project Approval Form. This form is provided in this handout for your reference.

Either/or will need to be mailed, faxed, or emailed to the Texas Master Gardener Coordinator – Jayla Fry

Texas Master Gardener
Office Attn: Jayla Fry
225 HFSB
College Station, TX
77843-2134

Fax: 979-845-8906
Email: jbfry@tamu.edu

Once you complete your educational service, you may call yourself a Master Gardener First Detector Specialist even though you will not receive your certificate until the following conference.

CONGRATULATIONS!!!

You have made the first step in becoming a TEXAS FIRST DETECTOR!

Master Gardener Specialist Project Approval Form

Name of Master Gardener:

_____

County:

_____

Specialist Class:

_____

Date	Description of Service	Total Hours	Number of People Served

*additional information may be added to the back or a separate sheet of paper

Approved by:

County Agent _____

Signature

Forms may be mailed, faxed or emailed to the Texas Master Gardener Office, 225 HFSB, College Station, TX 77843-2134; fax: 979-845-8906; email: jbfry@tamu.edu.

TEXAS A&M AGRILIFE EXTENSION

Texas Master Gardener Association

Specialist Reimbursement Request Form

$50.00 Reimbursement per Specialist

(Please Type or Print Legibly)

Name of Specialist Class		Class Location		Class Date	
Name:			County:		
Address:			City/State/Zip:		
E-mail:			Phone:		

The Master Gardener is required to provide a minimum of 20 hours service. Please List
(Note: service hours must be completed within 12 months from class date.)

Date	Service Description	#People Educated	# Hours

Your Signature: Date:

Your CEA Signature: Date:

For Reimbursement

Mail to: Jayla Fry
225 HFSB Mail Stop 2134
College Station, TX 77843-2134

cc: County Extension Office of Specialist class location

Eligibility for Reimbursement

- Complete Specialist Class.
- Complete 20 hour service commitment within 12 month of class start date.
- Apply for reimbursement within 12 month of class start date.
- Request signed by you and your County Master Gardener Coordinator.

Texas Master Gardener Association, Inc.
225 HFSB Mail Stop 2134, Texas A & M University, College Station, TX 77843-2134
Phone: 979-845-3308 Fax: 979-845-890

Rev 5/28/13 dwr

References & Resources

Helpful Resources and Links

Plant Pathology & Diagnostics	Texas A&M Department of Plant Pathology	http://plantpathology.tamu.edu
	National First Detector official website	http://firstdetector.org
Horticulture	Texas A&M Department of Horticulture	http://hortsciences.tamu.edu
USDA Animal and Plant Health Inspection Service		https://www.aphis.usda.gov/wps/portal/aphis/home/
AgriLife Bookstore	For useful Factsheets on a range of topics	www.agrilifebookstore.org
Pesticides	Product research for commercial pesticide Labels	www.cdms.net
	Pesticide information at Insecticide Resistance Action Committee (IRAC)	http://www.irac-online.org/
Entomology (insects)	Texas A&M Department of Entomology	http://entomology.tamu.edu/

TX PLANT CLINIC

Contact the Texas Plant Disease Diagnostic Lab

1500 Research Parkway, Suite A130
College Station, TX 77845
(979) 845-8032

Or visit http://plantclinic.tamu.edu/ for more information about TPDDL, sample submission forms, plant disease factsheets and more.
Also be sure to check us out on the social media outlets!

Want to access a digital copy of this booklet? Scan this QR code or follow the link below to access resources for Texas First Detectors online.

http://plantclinic.tamu.edu/mgspecialistfd

About the Trainers

Dr. Kevin Ong is the director of the Texas Plant Disease Diagnostic Laboratory (TPPDL) which provides plant disease diagnostic service to AgriLife Extension personnel, homeowners, farmers, greenhouse and nursery producers, landscape contractors, interiorscapers, arborists, consultants, and any other group or individual needing accurate identification of plant disease problems. The Plant Clinic collaborates efforts with state and federal agencies through the National Plant Diagnostic Network – Southern Region. He also serves as an Associate Professor in the Department of Plant Pathology and Microbiology at Texas A&M University.
Contact: email: kevo@tamu.edu; phone: 979-845-8000

Dr. Mike Merchant is an Extension Urban Entomologist out of the Dallas Research and Extension office and serves as a Professor in the Department of Entomology at Texas A&M University. He is a Board Certified Entomologist and was involved in the early development of the ACE certification program. He designs informational materials and training programs to help reduce pesticide use and promote use of low impact pesticides for schools and other institutional facilities. He develops training materials and continuing education programs on pests and integrated pest management for the public. His research interests include control of fire ants in electrical equipment and in urban landscapes; low impact pesticides; spider management; documentation of Formosan Termite range expansion in Texas; and improvement of existing termite control technologies.
Contact: email: m-merchant@tamu.edu; phone: 972-952-9204

Madalyn 'Maddi' Shires graduated from Oklahoma State University with a Bachelors in Plant and Soil Sciences, and is now a PhD student and Graduate Research Assistant in the Department of Plant Pathology and Microbiology at Texas A&M Unversity with an emphasis in Rose Rosette. Her project includes field trials, extension education and the virus movement in infected plants. In addition, she helps test for RRV on samples that are sent in to the Texas Plant Disease Diagnostic Laboratory (TPDDL).
Contact: email: m-shires@tamu.edu; phone: 979-845-2802

Mandy Little is an Extension Assistant at Texas Plant Disease Diagnostic Laboratory (TPDDL). She graduated from Texas A&M in 2015 with a Masters of Agriculture, where she focused on international agricultural development. She assists in the development of educational, promotional, and program materials for the Master Gardener Specialist-First Detector and the Texas Plant Disease Diagnostic Laboratory.
Contact: email: mlittle0710@tamu.edu; phone: 979-845-8032