

Ambrosia Beetle Control and Understanding How and Why they Attack Certain Plants

Putting the pressure on
trees



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lecture after Oct 1 2017

(1) What species of ambrosia beetles are problematic in nurseries and landscape?

landscape?



(2) Symptoms of an infestation?

(3) What is their biology and life history?

(4) What trees do they attack?

(5) How do I monitor for them?

(6) What management tactics are effective?



Black Stem Borer

Xylosandrus germanus

- Native to South east Asia
- First reported from NY in 1932
- Found in 32 of 50 states
- Males are flightless



Lindgren trap
Baited with
ethyl alcohol



1 mm

female

male

Adult Female



♀

2.0 mm

Damage to Hybrid chestnut – 13th
back cross being wiped out by
Xylosandrus germanus



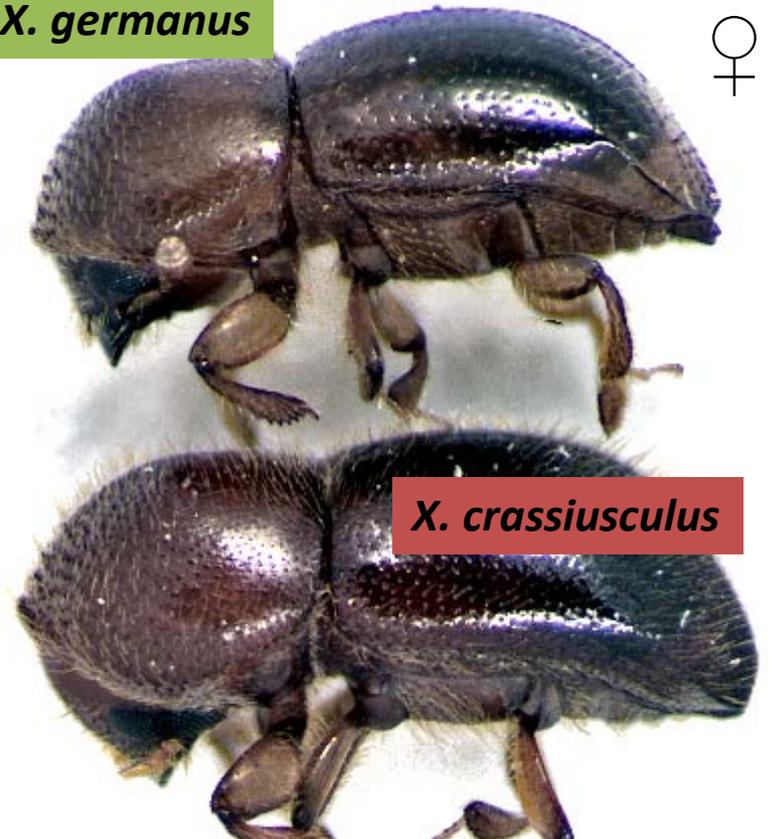
Granulate Ambrosia Beetle

Xylosandrus crassiusculus

- Native to Southeast Asia
- First reported from South Carolina in 1974
- Found in 29 of 50 United States



X. germanus



X. crassiusculus



Black Twig Borer

Xylosandrus compactus

- First reported from FL in 1941
- Texas to North Carolina
- Attacks twigs less than 2 cm diameter
- Damage to Avacado and orchids in Florida. Hits Coffee Plants
ornamental trees



1.0 mm

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Jiri Hulcr, U. Florida

Symptoms of an infestation? First warm period
in spring – 60- 70 F for 3 – 5 days

Tunneling Behavior- wet spot first sign





Weeping on trunk – first signs to look for on infested trees

Yellowwood – April 2017



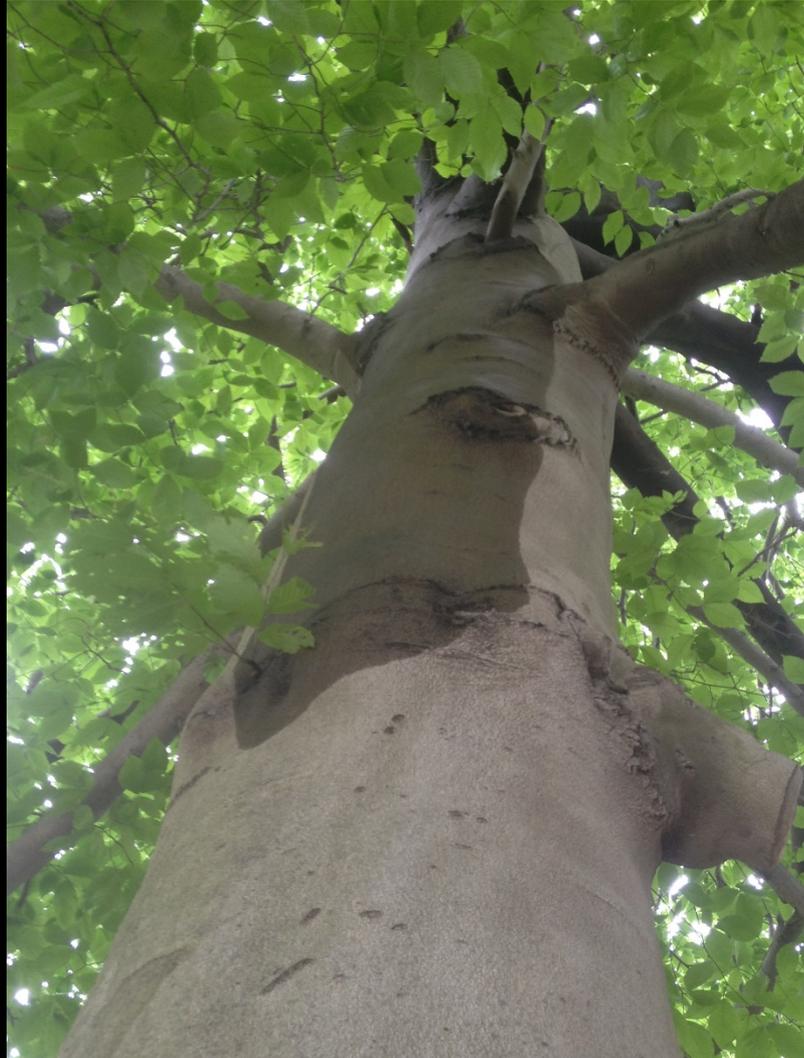
Symptom: Defensive S



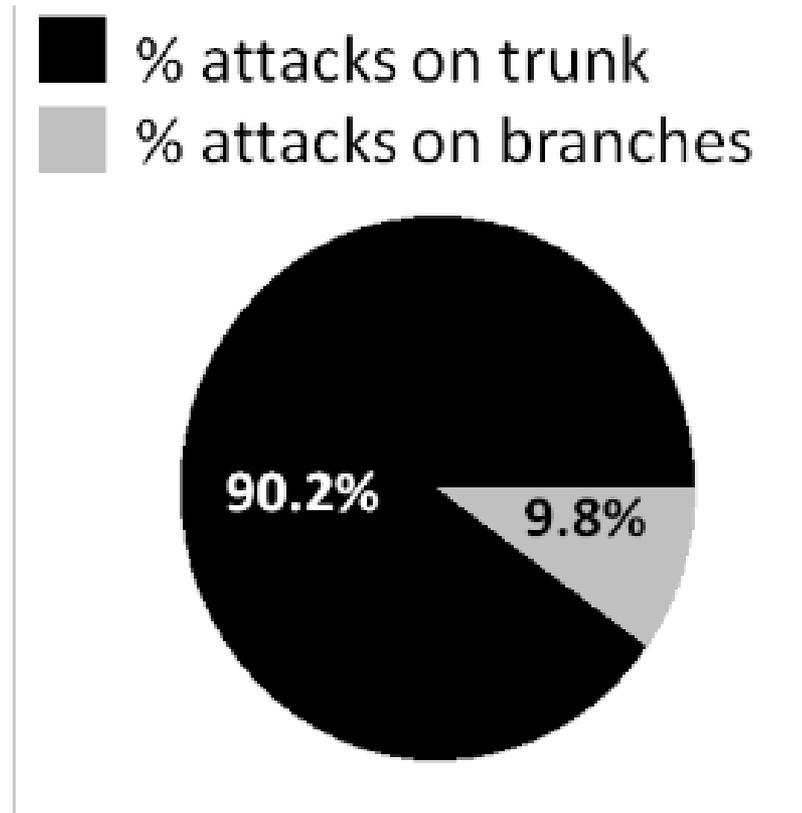
Rose of Sharon – late March 2015



European beech – April 2016



Stems/Trunks preferred over Branches



Chris Ranger work in Ohio (USDA) - neither black stem borer or granulate ambrosia beetle are strongly size selective



1 mm diameter

Female beetle
chew through
bark into
heartwood

Symptom: Sawdust “Toothpicks”



Cornus florida



Magnolia virginiana

Xylosandrus beetle feeding on deciduous azalea (March 2011)



Symptom: Defensive Sap Production



Styrax japonicus



Gleditsia triacanthos



Cornus florida

Symptom: Wilting and Branch Die-Back



- Symbiotic fungus?
- Secondary pathogens?
- Hypersensitive host response?

Galleries Created in Trees



Fungus Carriers



Fungal symbionts

Ambrosiella grosmanniae (Xg)

Ambrosiella roeperi (Xc)

Secondary microorganisms

Fungi and bacteria

Variety of *Fusarium* species

Sustainable Fungus Farmers

Applying for a Mathias Grant for sustainability



Xylosandrus germanus Phenology



Adults
overwintering
in galleries

Eggs → Adults

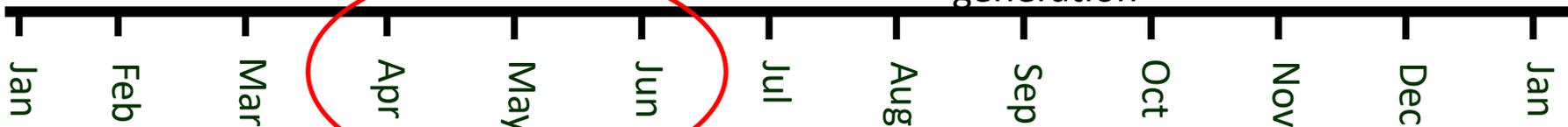
Eggs → Adults

Adults
overwintering
in galleries

~35-40 days egg to adult

2nd
generation

3rd
generation



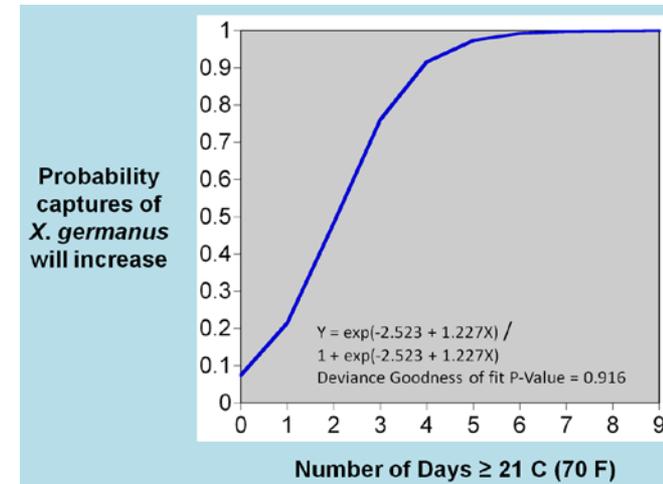
Majority of attacks (typically)



Influence of Temperature on Flight Activity



Flight activity dramatically increases with 2-3 consecutive days above 70 °F



FIRST FLIGHT

February to March

Florida

Mississippi

South Carolina

March to April

Illinois

Maryland

Missouri

North Carolina

Ohio

Tennessee

Virginia

Preferred Hosts

- Black Stem Borer, *Xylosandrus germanus*
 - >200 tree species
- Granulate Ambrosia Beetle, *Xylosandrus crassiusculus*
 - >120 tree species
- Dogwood, Dogwood hybrids – Stellar series, honeylocust, magnolia, maple, redbud, *yellow wood, birch, European beech, London Plane trees* and styrax
- Traditionally viewed as secondary pests of stressed trees
- But, reports of attacks on “apparently healthy” trees too

Crepe myrtle infested



Ambrosia Beetle Host Location Behavior

- Visual Cues

????

- Olfactory Cues

- Host-derived volatiles, particularly ethanol

)



Why Ethanol?

- Ethanol emitted due to physiological stressors:
 - Flooding
 - Drought
 - Frost injury
 - Excessive heat
 - Girdling
 - Pollutants
 - Pathogens
 - Impaired root function

- Induced within 1-2 days following stress

- Asymptomatic, but still emit ethanol



Water Logging/Flood-Stress



- Extreme weather events, poor drainage, over-watering, etc.



Field Observations of Flood-Stress



- Symptoms and attacks on dogwoods detected on 7-June-2011
- Neighboring species not attacked
- 166 trees examined
- 99% exhibited dieback
- 70% of the symptomatic trees were attacked



Field Observations of Flood-Stress

- Dieback, but no attacks



Field Observations of Flood-Stress

- Planting depth?
- Poor drainage?





Field Observations of Winter Injury in 2014 and 2015



- Acer sacchaarum*
- Cercis canadensis*
- Celtis occidentalis*
- Crataegus punctata*
- Eucommia ulmoides*
- Liquidambar styraciflua*
- Quercus* species
- Tilia* species
- Ulmus parvifolia*



Extensive reports of attacks on fruit trees throughout eastern US in 2014

Field Observations of Winter Injury in 2014 and 2015



Sawdust
from
ambrosia
beetles

Monitoring Flight Activity

Ethanol lures can be purchased or made using a small container with a wick



Better to purchase lures though

Use ethyl alcohol
NOT isopropyl alcohol (rubbing alcohol)



Monitoring Flight Activity



Traps can be purchased or homemade

Place low to the ground near a woodlot!

Monitoring Flight Activity



Soak bolt in ethanol for 24 hours
Or core, fill with ethanol, and cap

Flood-stress
using plastic bag
in a pot



Management Tactics

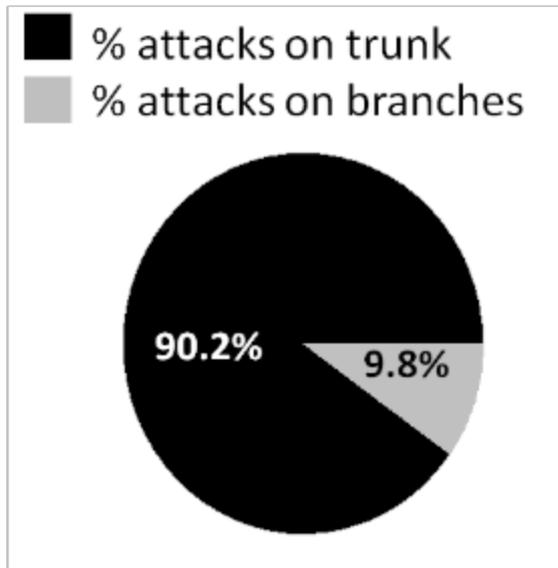


Maintaining tree health is the primary foundation

Recognize abiotic stressors (flooding, frost, and winter injury)

Insecticide Efficacy

- Permethrin-based insecticides are most effective
 - Tengard SFR
 - Perm-UP 3.2EC
 - Onyx - bifenthrin
- Systemics are not effective!



Preventative Chemical Controls

Insecticides reduce, but do not prevent attacks on stressed trees

Insecticides disrupt colonization

No oviposition if no fungal establishment



Fungicides do not inhibit fungal establishment or colonization



There are currently no rescue treatments



Ambrosia Beetle Management Plan



- (1) Maintain host vigor; address physiological stressors
- (2) Monitor spring flight activity with ethanol-baited traps or ethanol-soaked bolts
Prior to 2-3 days of 70 °F
- (3) Thorough coverage of trunk with permethrin-based insecticides
- (4) Use heavily infested trees as trap trees (2 weeks), then discard

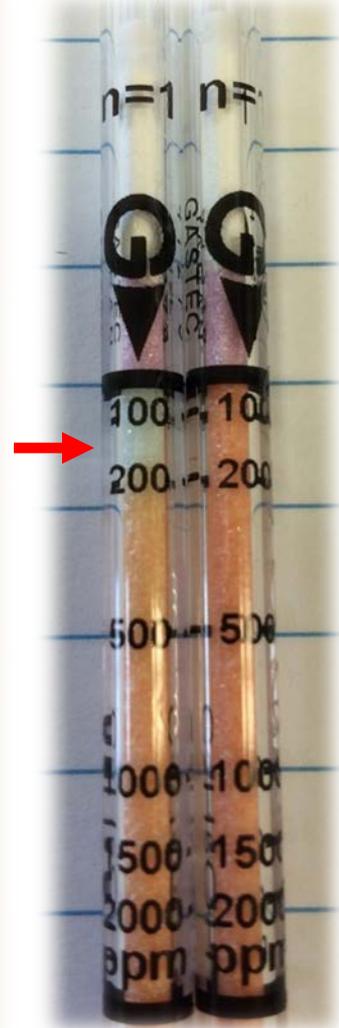


Intercepting Beetles





Evaluating Portable Devices for Rapidly Detecting Ethanol



Hope we did not get into this too deep

