



Rose Rosette Disease
A Research Update
Mark Windham



>2000 rose producers grow 40 million roses each year which contributes more than \$1 billion to the U.S. economy



Rose Rosette Disease is a *significant* threat to the entire industry and has the potential to cause an *industry collapse*

RRD and a Wholesale Nursery in Georgia

Information from Dr. Jean Williams-Woodard – Univ. of Georgia:



- Wholesale nursery grows 500,000 + container roses
- 2018: block of 40,000 3 gal coral drift roses destroyed
- Roses valued at \$10 each, so nursery counted \$400,000 lost.



RRD is not just a production problem



50+ RRD symptomatic shrub roses <100 yards away from garden center with Knock Out, Drift and hybrid teas roses in plain view

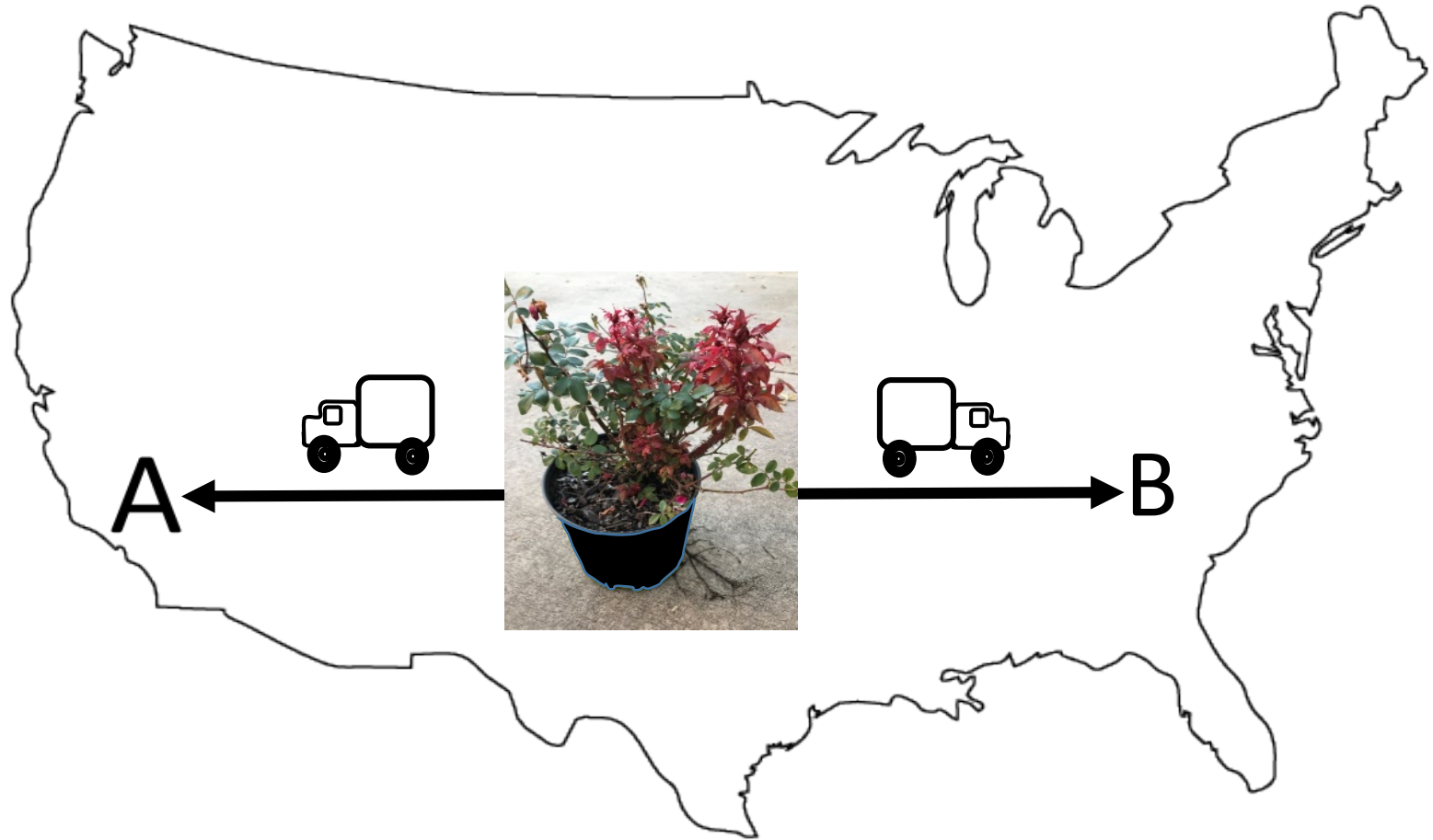
June 21, 2018

Where does fault lie if customers are taking



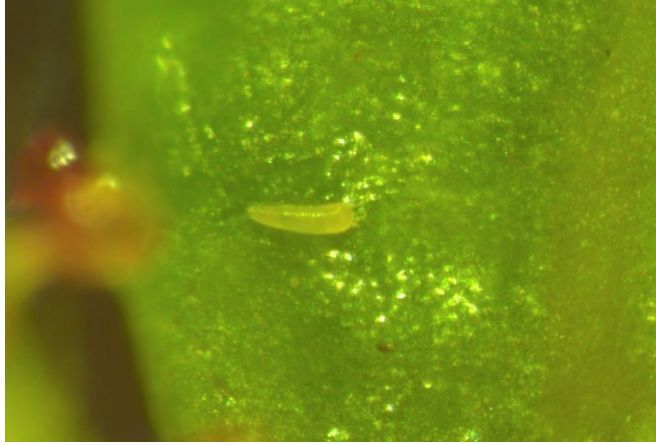
home plants infected with RRD?

Movement of Rose Rosette Virus



To new locations: interstate shipment of infected plants that are infested with eriophyid mites

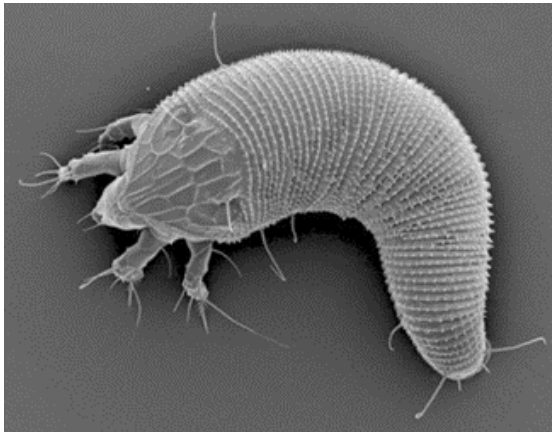
Phyllocoptes fructiphilus (eriophyid mite)



Transmits Rose Rosette Virus.
The mite hides under sepals and leaf scars and can be hard to find. Magnification is 60 X (60 times)



Male at 100X. Mite populations build throughout the summer and peak in fall.



Scanning electron microscope.
Note conical shape and 4 legs. No eyes, no wings.

Local movement of Rose Rosette Virus



Localized spread: ballooning mites

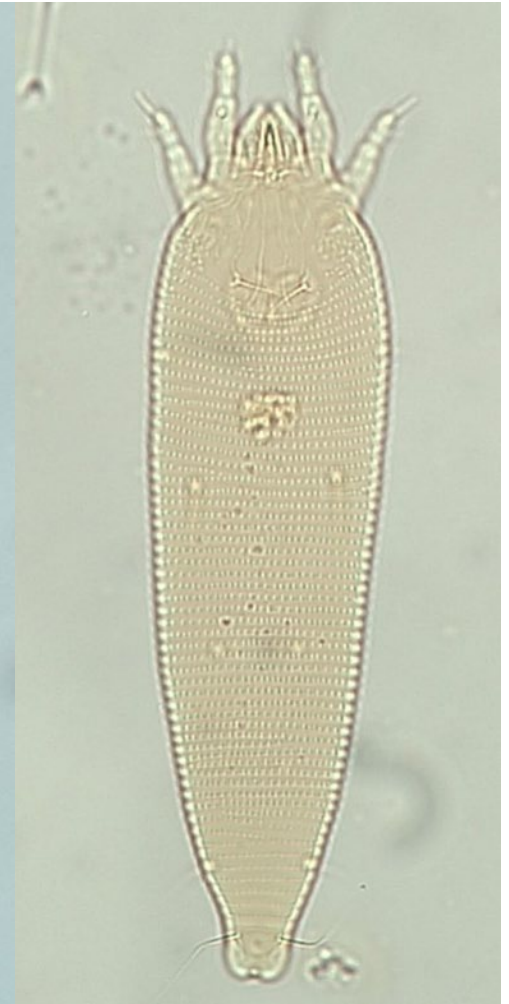
It's a jungle out there!



*Phyllocoptes
fructiphilus*

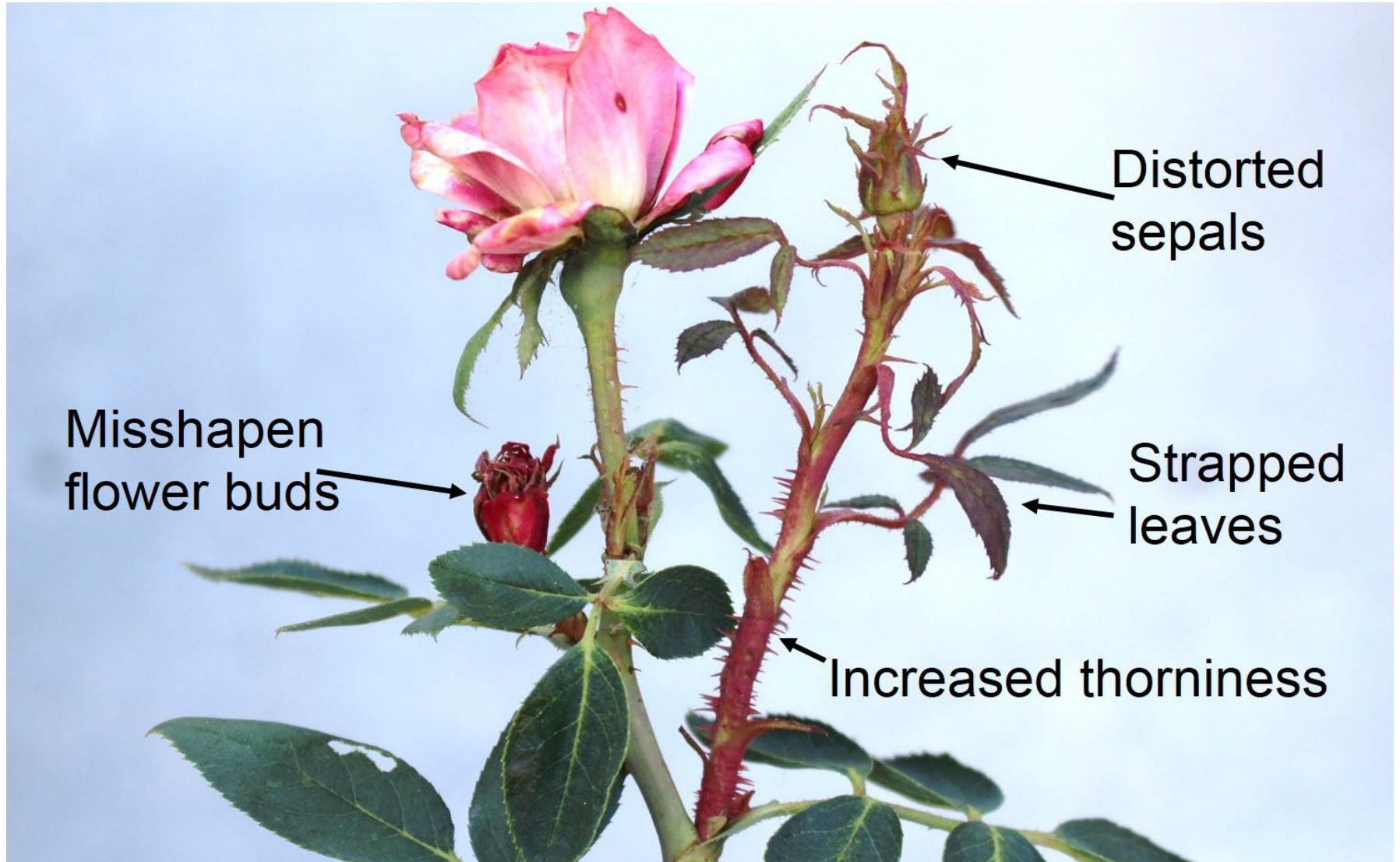


*Callyntrotus
schlechtendali*



*Eriophyes
eremus*

Knowing if you have RRD is the first step in management



Populations of *P. fructiphilus* are >40X higher on rosettes than on asymptomatic foliage



Pruning off rosettes until the plant can be removed makes sound epidemiological sense

Until new techniques are released to sample symptomless plants, scouting involves looking for symptoms



Action stage!



To late
for action!!

Eradication of symptomatic plants



Bagging plant was thought to be needed, but, based on new data, this step may not be needed.

Symptomatic plants should be rouged immediately

Dig up root ball, can go into hole with another rose within 1 week

Send sample to state diagnostic lab

Inspect remaining asymptomatic plants often

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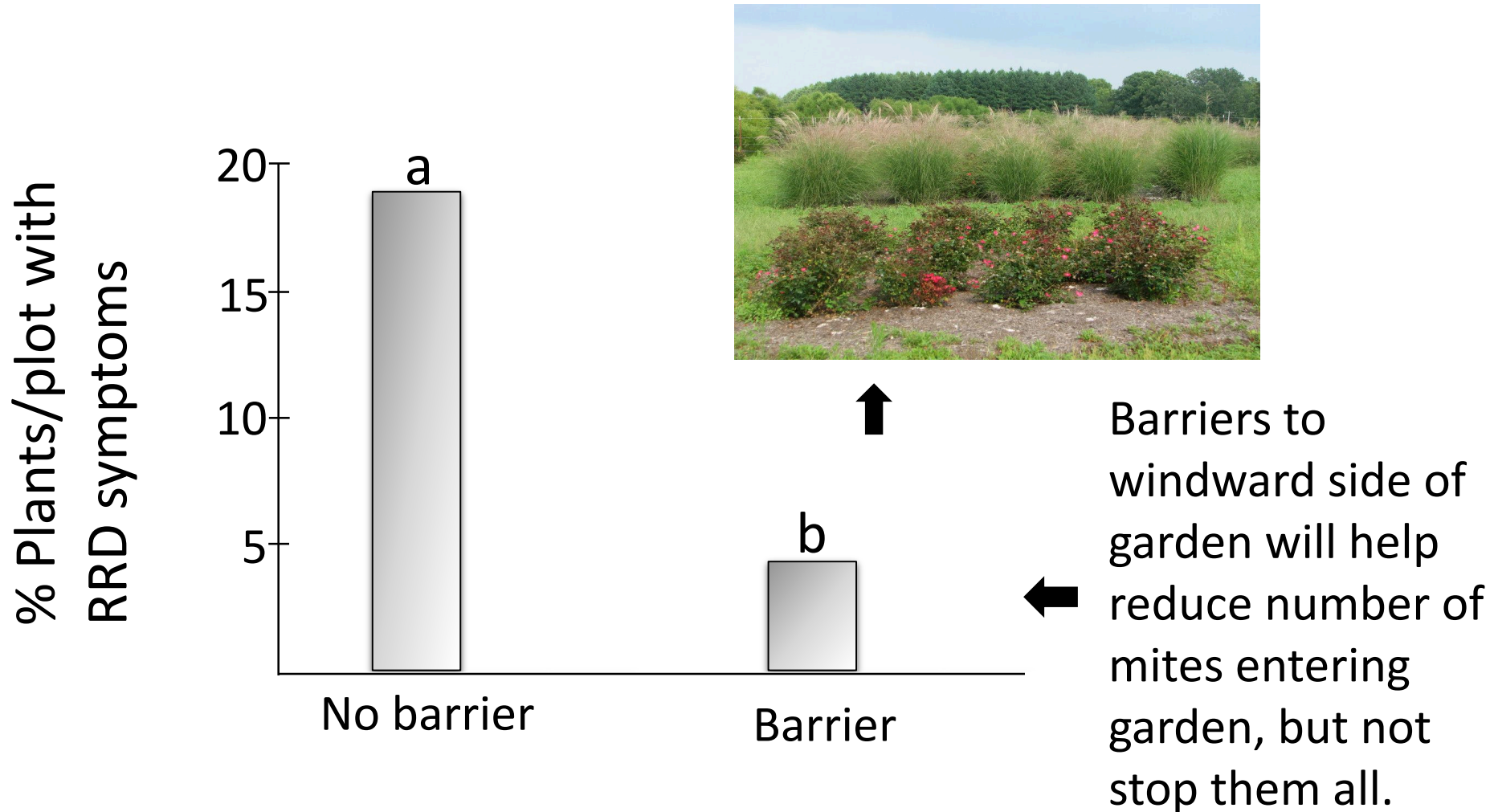
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Barrier effects on Rose Rosette Disease incidence



Miticides used to successfully stopped RRV in the field studies

Commercial



Akari, Forbid, Kontos and Talstar have prevented RRV in research plots for 5 years (control plants fail in 2 yrs or less) – check label before use

Work is underway to determine proper spray intervals, when to start and stop spraying and if spray intervals are the same for the all miticides

Home use



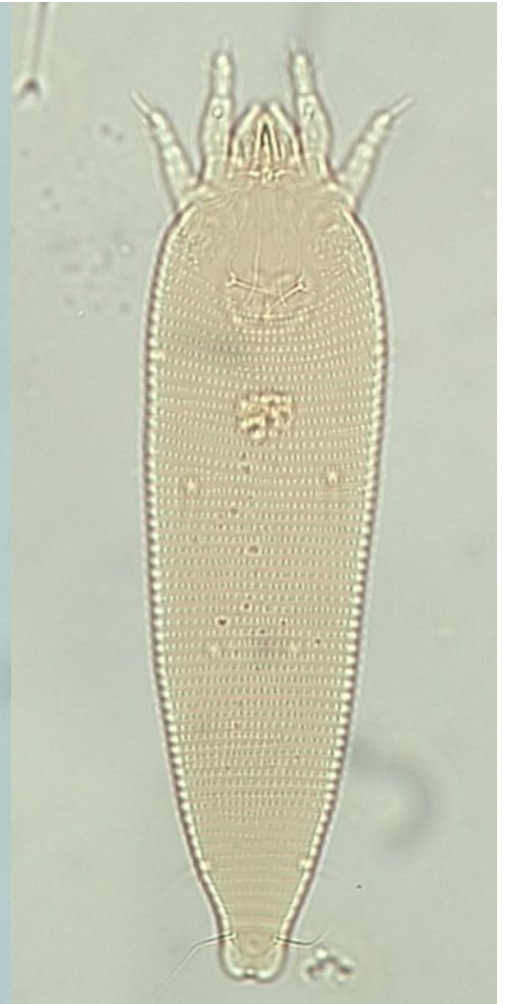
They don't seem to like each other



*Phyllocoptes
fructiphilus*



*Callyntrotus
schlechtendali*

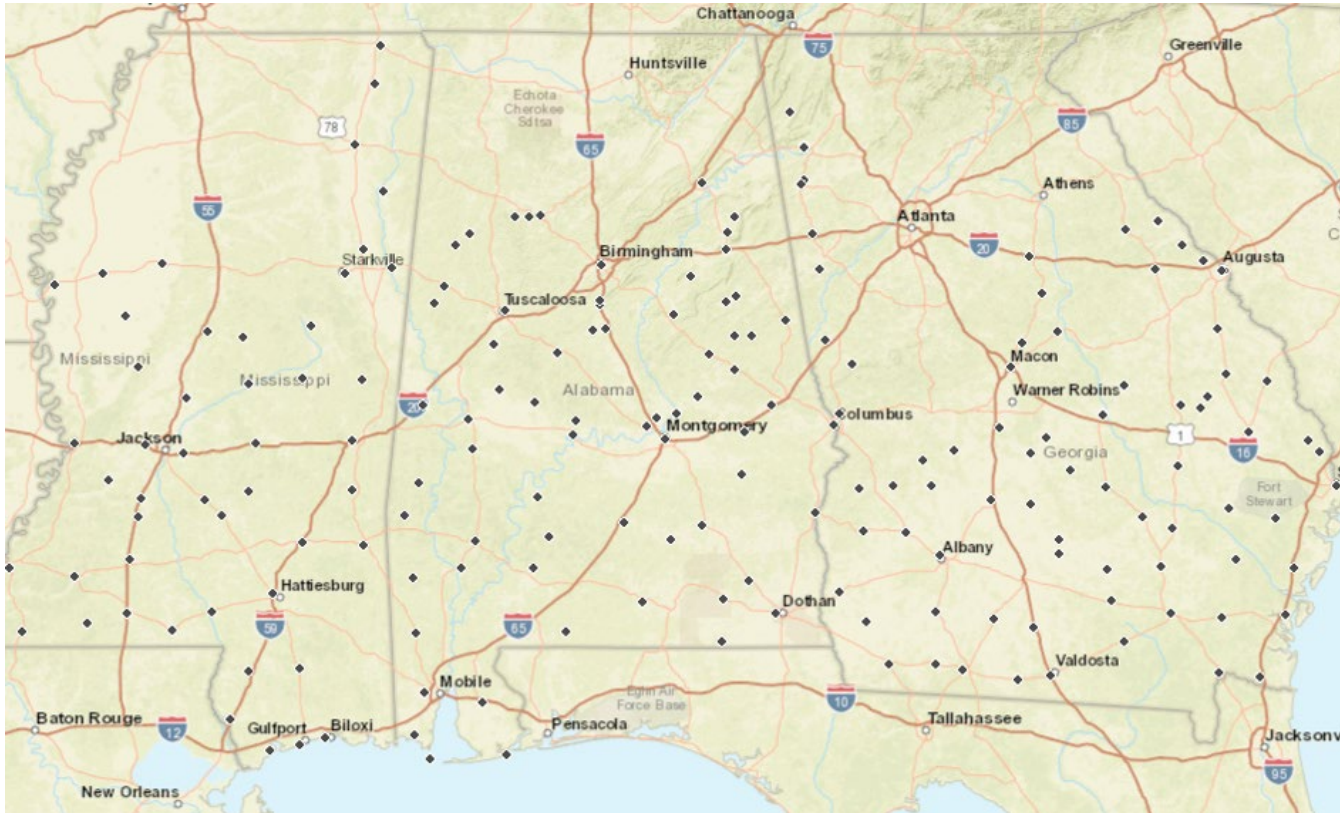


*Eriophyes
eremus*



Katherine Solo

What does *Rose Rosette Virus* and *P. fructiphilus* distribution in the Deep South have to do with other areas of the country?

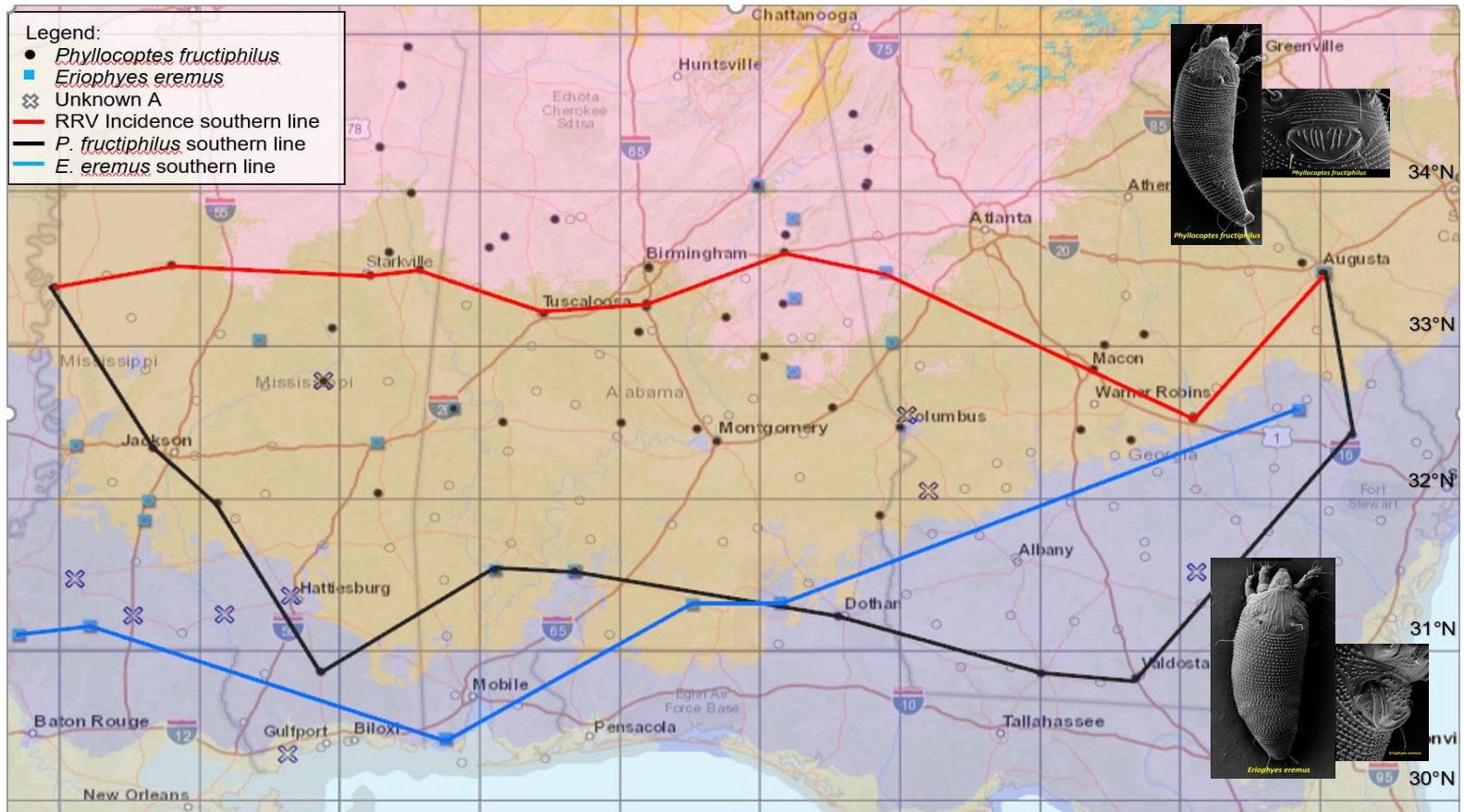


Number of plots = 204



RRV and Mite Distribution

Katherine Solo

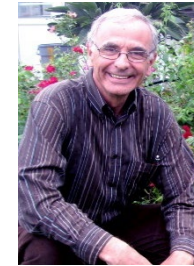


Screening for resistance to RRD

Plateau Res. and Ed. Ctr. – Crossville, TN

M. Windham, S. Collins, B. England,
A. Windham, F. Hale and W. Hitch

Out of State Partners



Dave Byrne* Brent Pemberton
Texas A&M University



Tom Evans Jennifer Olson
University of Oklahoma State
Delaware University

* Project Leader





2018 TN test site



Infesting roses with
viruliferous mites

- 1,252 roses tested for 2-3 years in replicated trials in Tennessee (RRD), either Delaware or Oklahoma (RRD) and Texas (Black spot and Cercospora leaf spot)
- To date, 3.8% of accessions are scored as immune (free of symptoms and virus)
- 2% of accessions RRD resistant (symptom free or minimal symptoms, virus positive)

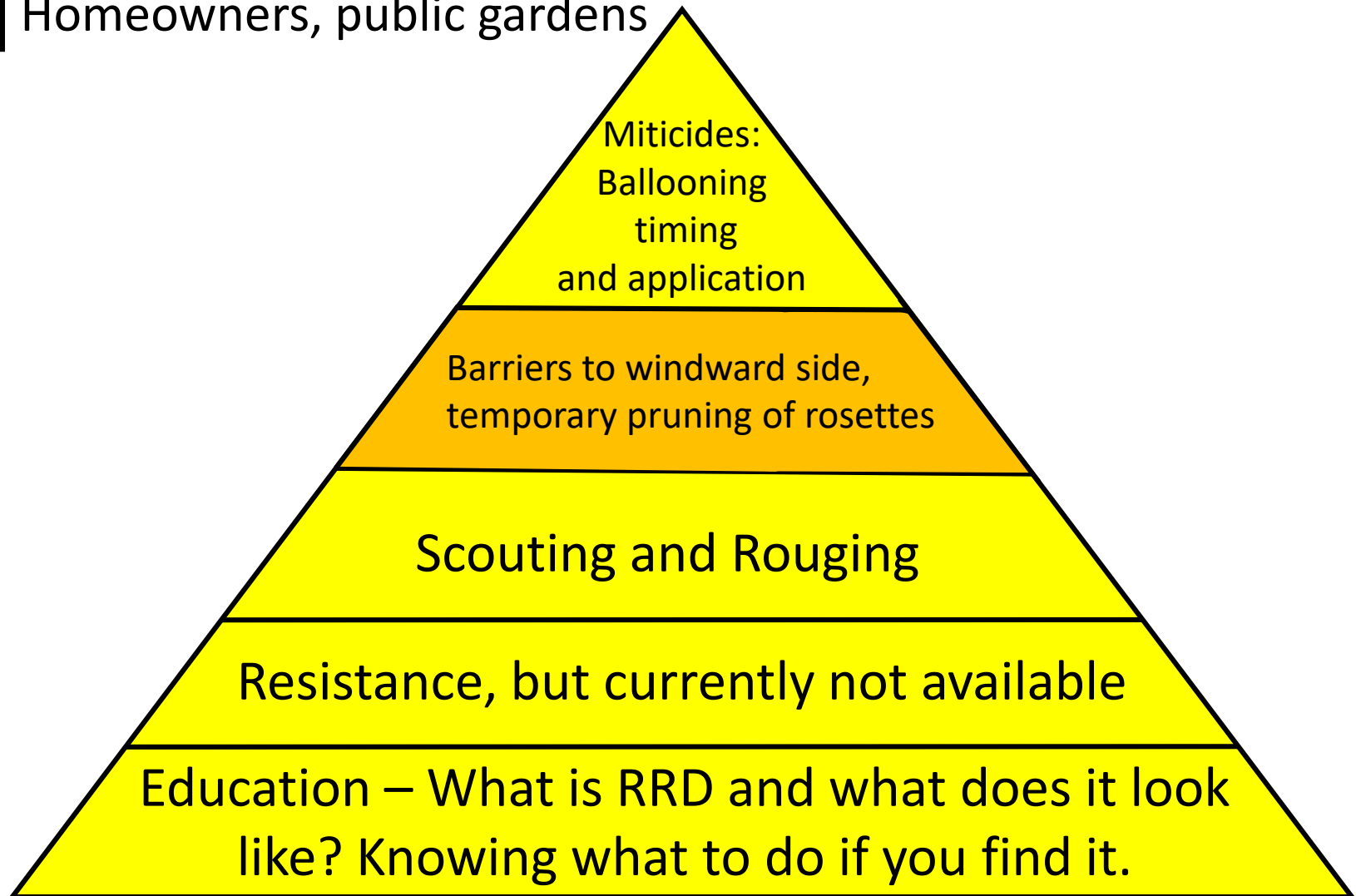
2018 – 1,600 seedlings with at least one parent
on the immune or resistant list



Integrated Management of RRD

 Commercial landscapes, propagators, nurseries, public gardens, homeowners

 Homeowners, public gardens



New in 2019

<https://extension.tennessee.edu/publications/Documents/SP806.pdf>

SP 806

EARLY DETECTION OF ROSE ROSETTE DISEASE

Alan Windham, Professor and UT Extension Specialist
Mark Windham, Distinguished Professor
Frank Hale, Professor and UT Extension Specialist
Department of Entomology and Plant Pathology

Rose rosette is a serious virus disease of roses. It is spread primarily by a microscopic mite. Successful management of rose rosette disease (RRD) involves early detection of symptoms.

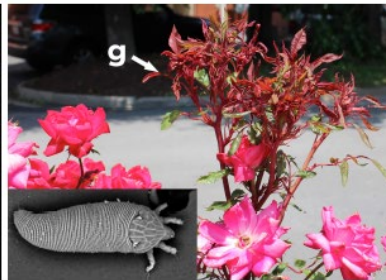
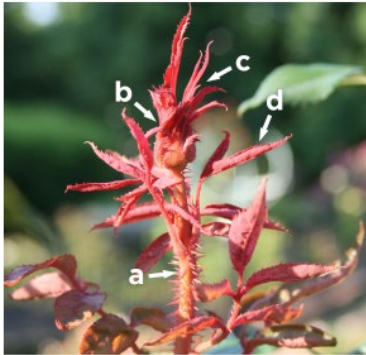
EARLY SYMPTOMS OF RRD INCLUDE:

- Hyper (excessive) thorniness.
- Distorted flower buds.
- Affected tissues may be red, but they are sometimes green.
- Strapped (thin) leaves.
- Thickened stems.

YOU MUST ACT QUICKLY TO MINIMIZE IMPACT OF RRD:

- Plants should be inspected at one- to two-week intervals for symptoms during the growing season.
- Do not wait until the plant has multiple symptomatic shoots or a rosette before digging, removing and bagging the plant. Delayed action could jeopardize other roses in your garden as the microscopic mites* that vector RRD are more numerous on symptomatic tissue.

*Eriophyid mite courtesy: Gary Bauchan, USDA-ARS



WHAT CAN BE CONFUSED WITH RRD SYMPTOMS?

- Herbicide damage may appear as strapped, bunched or dwarfed leaves but not as swollen canes or hyper-thorniness.
- Shoots damaged by chill thrips may have dwarfed, distorted leaves. Leaves may become blackened as they mature.
- Fasciation of stems has not been associated with RRD. Fasciation may be found in many herbaceous and woody plant species. It is the result of several flattened stems growing together. The cause of fasciation is unknown.

ACTIONS IF RRD IS SUSPECTED:

- If multiple symptoms are present, even one shoot, remove the plant; losing one plant is preferable to losing the rose garden.
- Send a sample of live, symptomatic foliage to your Extension office for positive confirmation. This will aid you with future diagnoses.
- For more information on rose diseases, see *A Guide to Rose Diseases and their Management* at rose.org.



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New Publications

July 2019

August 2019

W 833

Rose Diseases: Identification and Management

Alan Windham, Professor and Extension Specialist
Mark Windham, Distinguished Professor
Department of Entomology and Plant Pathology

Roses are the most popular ornamental plant grown in gardens throughout Tennessee. No other ornamental plant will reward you with numerous blooms, often for long periods of time. A variety of flower shapes, sizes and fragrances are added bonuses. Plant diseases can detract from a rose's beauty and sometimes cause extensive damage, even death. Identifying rose diseases and choosing best management strategies will help minimize the impact of plant diseases.

Diseases of roses are primarily caused by fungi, bacteria and plant viruses. Fungal pathogens are responsible for diseases such as powdery mildew, downy mildew, anthracnose, canker diseases, rust, root rots, gray mold, ghost spot and leaf spot diseases such as black spot and cercospora leaf spot. Plant viruses cause diseases such as rose mosaic and rose rosette disease. Crown gall is caused by a bacterium. Fungi are responsible for most common rose diseases, but the rose rosette virus is the most economically important rose pathogen at this time.

Powdery Mildew

Powdery mildew is caused by the fungal pathogen *Podosphaera pannosa* (syn *Sphaerotheca pannosa*). Signs of the pathogen include white, powdery fungal growth on leaves, petioles and flower buds (Figure 1). Symptoms of powdery mildew include blistering and twisting of leaves and red-to-burgundy foliage.

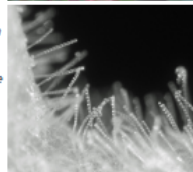
Powdery mildew may be severe in periods of warm, humid weather when rainfall is limited. Although high humidity

is needed for spore germination, free moisture on leaves is not needed as it inhibits germination of spores. Spores are disseminated in air currents. The fungus overwinters in infected rose canes and leaf litter underneath plants.

Management of powdery mildew includes cultural strategies such as removal of diseased foliage and canes, dormant oil sprays in the winter, resistant cultivars and fungicides. Fungicides are more effective if applied before disease development as a preventative measure rather than as a control measure after it becomes severe in the garden.



Figure 1. Powdery mildew on leaves (top left) and flower buds (top right); powdery mildew sporulation on a rose cane (bottom).



W 834

Diagnosis of Ornamental Plant Diseases

August 2019

Alan Windham, Professor and Extension Specialist
Mark Windham, Distinguished Professor
Department of Entomology and Plant Pathology

The diagnosis of diseases of ornamental plants can seem overwhelming if you focus on the number of plant species grown in greenhouses, nurseries and landscape plantings. If you know when, where and what to observe, you can identify the cause of many plant problems. Nothing aids in diagnosis like experience. Over time you learn that certain plants have signature or key diseases. You also learn that certain environmental conditions favor development of certain diseases. Plant diseases occur when three critical elements come together to make a disease triangle. They are a pathogen, susceptible host plant and a favorable environment. Plant pathogens may be present year-round, but only cause disease when environmental conditions favor infection and development of disease in a susceptible host. Plant disease diagnosis follows a progression of steps observing the host, pathogen and environmental conditions.

• **Identify the host** – Each plant species has a distinct group of diseases/plant pathogens. It's important to correctly identify the plant or you will be derailed from the start. Also, most references on plant diseases list them by host. This sounds like a simple concept, but flower, shrub and tree species are sometimes misidentified, making disease diagnosis more difficult.

• **Imagine a healthy plant (what is normal)** – Normal is conforming to a standard, such as usual, typical or expected shape, color, size, etc. It helps to know what a healthy plant species or particular cultivar should look like. Is it normal for this plant to have nodules on roots? Variegated foliage? Flattened stems? Knowledge of plant structure and characteristics is helpful when considering plant problems.

• **It pays to compare plants.** Is there a healthy species or cultivar to compare with one that is less desirable due to size, shape, color, conformation? Comparing symptoms of a diseased plant with the morphology of a healthy plant can yield clues that are helpful.

• **What plant parts are affected?** Leaf spots, mildews and blights are limited to leaves. Canker diseases are limited to stems and branches. Root rot is limited to roots, of course. Vascular wilt diseases damage xylem tissue conducting water to leaves.

• **Look for signs and symptoms of disease.** A sign of disease is the visible portion of a plant pathogen, such as white mycelium of fungi that causes powdery mildew, or the orange spores associated with rusts. Symptoms refer to damage caused by the pathogen, including wilted leaves, yellow leaves, leaf spots, discolored vascular stem tissue (xylem), stunted plants, ring spots, mosaic, witch's broom (rosette), etc.

• **Living (biotic) or non-living (abiotic) causes of disease/plant problems.** Biotic pathogens that cause plant disease include fungi (the most prevalent pathogen group), bacteria, viruses, nematodes and phytoplasmas. Abiotic causes of plant problems include moisture (excess or deficient), temperature extremes, pesticide injury, soil pH extremes, and nutrient deficiencies or excess (high-soluble salts).

• **Document signs and/or symptoms of disease.** Use a digital camera to capture the signs or symptoms of disease. Take four to five images that "tell the story" of the problem. Suitable images include a comparison of a healthy and unhealthy plant side by side; an image of a whole plant; an image of the root system with the substrate or soil washed away; or an image of leaf spots, mildew or rust. These images can be very helpful to an Extension agent or diagnostician arriving at a diagnosis. Make sure the image is in focus and clearly shows the problem you are observing.

• **Collect a specimen.** If you decide you need an expert opinion to aid in plant problem diagnosis, collect a specimen. For most herbaceous plants, such as bedding plants or perennials, the specimen should include the whole plant; for woody plants, collect the portion of the plant with signs or symptoms of disease. Dead plants yield fewer clues than a live plant, as they may be colonized by fungi and bacteria after death, which makes diagnosis more difficult.

• **A diagnostic kit with a few items is helpful for examining and collecting specimens.** Carry a small magnifying glass (3-4X). You'll use the magnifying glass to triage specimens and to examine leaves and twigs for signs of disease. Carry a trowel to remove small plants or to collect roots or a soil sample. Hand pruners are useful for removing twigs or branches for further examination, and alcohol wipes for cleaning tools. Always carry plastic bags for collecting

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4.8 4.8 out of 5 · Based on the opinion of 57 people

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Soil, Plant Pest Center
May 29 · 🌐

Rose rosette on Drift rose was submitted to the lab today. The rosette is typical of those we see on Drift, a robust witch's broom full of flower buds. The close up image shows an abnormal number of thorns, which is typical of rose rosette virus infection. Drift rose is a very nice rose, but like so many roses, it is susceptible to rose rosette disease.

Soil, Plant Pest Center
April 25, 2016 · 🌐

Water management can be critical if you're trying to minimize black spot on rose. Drip irrigation is preferred to overhead irrigation. A regimented spray programs certainly helps too. Black spot resistant roses are available too. See below. AW

Photos See All

A Big Thank You!!!



Without you, the resistance work would
have been plowed under!

As we learn more, RRD will become less scary;
while some things will always be scary!



New Iberia, LA 2016



Eastern diamond back
rattlesnake discovered
while weeding rose beds.
St. Augustine, FL 2019.



Thank you!

If you don't believe God made
Tennessee **Big Orange Country**, just
look to the mountains at sunrise!!!