

THE 2014 FIRE BLIGHT EPIDEMIC: MAYHEM, MYSTERY, MYTHS, AND MANAGEMENT



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College of Agricultural Sciences

~May 19, 2014
The Mayhem...



May 27 , 2014



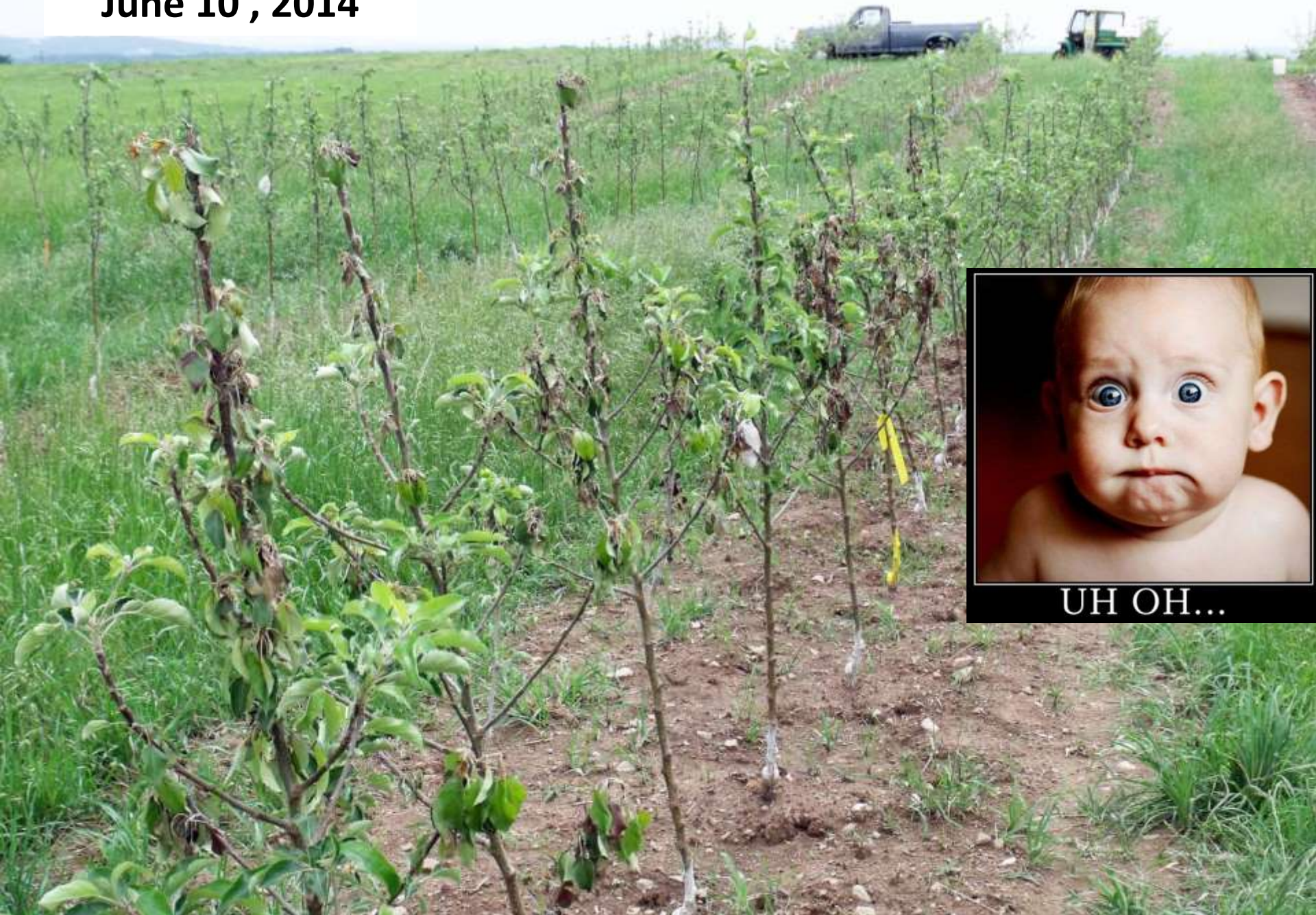
May 27 , 2014



May 27 , 2014



June 10 , 2014



UH OH...

Early July 2014



What happened? Fact or Fiction?

Spraying streptomycin doesn't work!

I haven't had fire blight in 25 years, I don't need to spray strep!

I haven't had fire blight in 25 years -- where did it come from???

We have streptomycin resistance!

My neighbor gave me fire blight!

Since fire blight was so bad this year, fire blight isn't going to be a problem next year!

Fire blight is just a cosmetic disease.



For effective management: Understanding how disease occurs

MANAGEMENT STRATEGIES



- Obvious hosts
- Less obvious

Disease Cycle

- Overwintering Sources of Bacteria
- Bacteria Dispersal and Colonization
- Five phases of infection
 - Blossom blight
 - Canker blight
 - Shoot blight
 - Trauma blight
 - Rootstock blight

Crabapple



Hosts

Hawthorn



Bradford Pear



<http://www.festibrate.com/season/bradford-pear-tree/>



Pear

Quince



European Mountain Ash



<http://beechwoodlandscape.blogspot.com>

Fire thorn



Asian pear



Cotoneaster

Hosts - Apple



➤ Rootstock susceptibility

Mark

Interstems

M.9

M.26

➤ Cultivar susceptibility

Crispin (Mutsu)

Jonathan

Nittany

Fuji

Pink Lady

Rome Beauty

Gala

Paulared

Ginger Gold

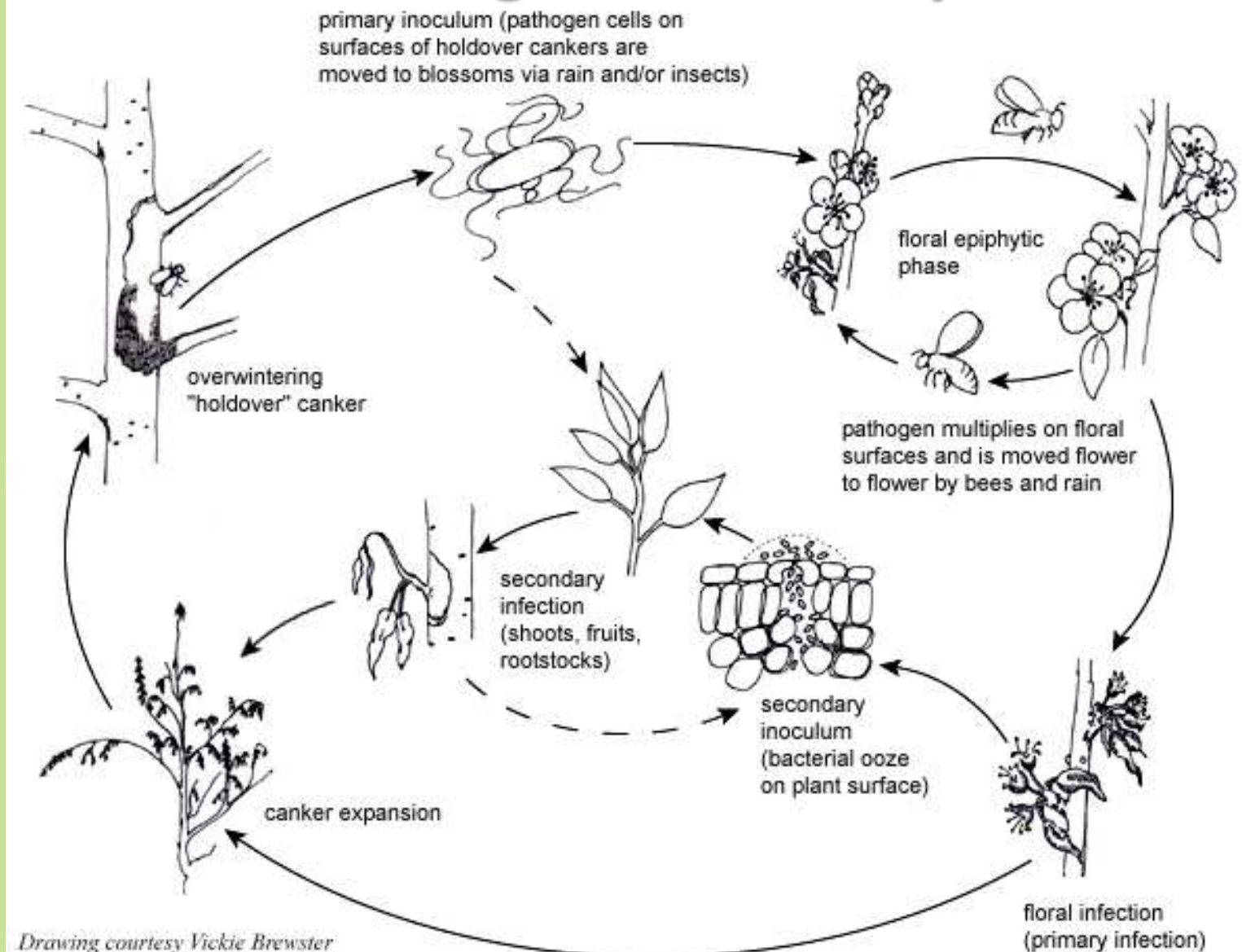
Idared

Jonagold

York

“Resistant” cultivars can still get fire blight

Pathogen + Environment: Fire Blight Disease Cycle



Drawing courtesy Vickie Brewster

Overwintering sources of bacteria

Bacteria overwinters in the living tissue surrounding cankers

Bacterial populations multiply at canker margins

- ~ Tight cluster to early pink
- **Pathogen first available

Optimum temperatures: ave. 65 °F
Moisture

****High bacterial populations influenced by temperature**



Bacteria Dispersal and Colonization

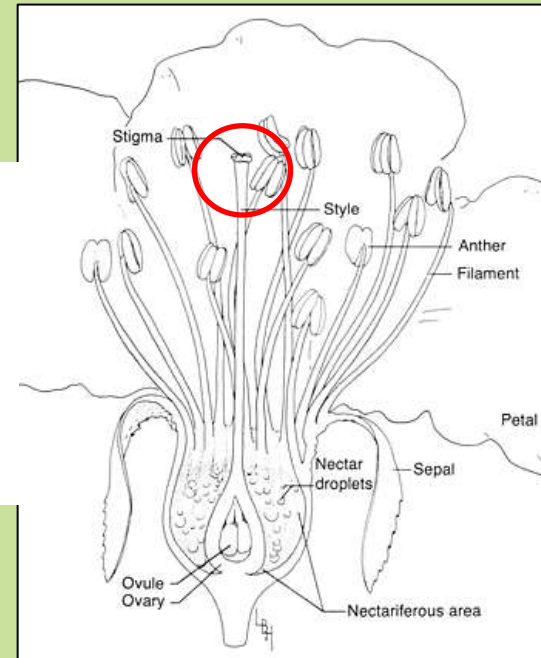
**Oozing bacteria:
Attracts insects –
insects disperse bacteria**



**Insects move
the bacteria to
flowers**



**Stigmas:
Bacteria grows
epiphytically – does
not cause disease
(yet)**



**Other modes of
dispersal:
Rain (splashing or
aerosols)
Wind**



Blossom blight

Rain
Heavy dew

5 – 30 days postinfection

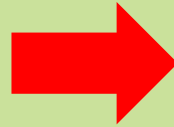
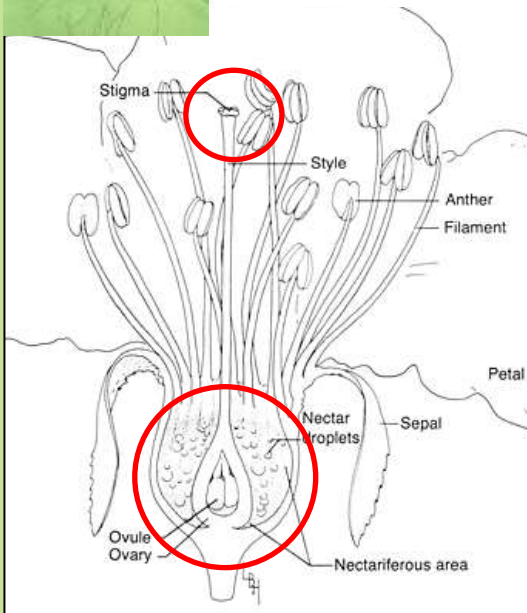


photo 2-20 - K. D. Hickey

Nectaries: Bacteria enters the plant

EIP: Epiphytic Infection Potential

< 100%: few infections

100 – 150%: sufficient to support an epidemic

200 – 250%: infection will occur if a wetting event

Blossom blight

How blossom blight can explode:

- 1) Initial bacteria dispersed from cankers to flowers: several weeks before bloom
- 2) Once flowers open and stigmas colonized, insects spread bacteria quickly
- 3) Bacteria populations can double within 20 – 30 minutes...
 - 1 bacterium → a trillion bacteria
 - Each capable of initiating infection
- 4) When all conditions for blossom blight exist, infections probably occur within minutes.



**When an infection event occurs →
several hundred thousand more →
control difficult**

Canker blight**

Symptoms occur after bloom

Develops because of...

Renewed activity by the pathogen at the margins of overwintering cankers from previous season

Occurs regularly every year where the disease is established

*****Bacteria invades systemically from canker:**

Alternative bacteria source for initiating summer shoot blight epidemics in years when blossom blight is scarce (think back to the summer of 2013...)

Can serve as primary source of bacteria for a continuing epidemic of secondary shoot infections → major losses



Shoot blight

Appears 1 wk to several weeks post petal fall

On the youngest 2-3 tender, un-expanded leaves at the tips of vegetative shoots

Infections tend to progress downward rapidly → invading and destroying larger supporting limbs

Potato leafhoppers feed on shoot tips → injury, opening for bacteria to invade

Wind → damage to leaf hairs

Greatest number of shoot tip infections: days with gusty winds



Trauma blight



Hail, strong storms, late season frost

Not limited to susceptible cultivars only

Leaf surfaces colonized by bacteria → Injury → Entry point for bacteria

Rootstock blight

Girdled tree = red leaves



**Rootstock
susceptibility**

Mark

M.9

M.26

Interstems

**Rootstock infection may develop when
bacteria move systemically from scion
infections down into the rootstock**

Young trees very susceptible: actively growing

























Losses can occur in resistant apple varieties (Red Delicious)



How Did the 2014 Epidemic Occur?

Green tip: ~ Mid-April

May 2014

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Decent conditions for cankers to be active				1 	2 	3 
4 	5 	6 	7 	8 	9 	10 
					INFECTION	
11 	12 	13 	14 	15 	16 	17 
INF.	HIGH	INFECTION			HIGH	
18 	19 	20 	21 	22 	23 	24 
			HIGH	INF.	HIGH	INF.
25	26	27	28	29	30	31
INF.	HIGH	INFECTION		HIGH		

JUNE

INFECTION

Managing Fire Blight

- Dormant
- Green Tip
- Pre-Bloom
- Bloom
- Petal Fall
- After Bloom – Summer
- Additional tips

Management - Dormant

Prune blighted limbs, shoots, cankers to reduce bacteria sources

→ May have to push trees

Remove wild or neglected fruit trees, susceptible host plants from fencerows and areas nearby



Management – Green Tip/Pre-Bloom

Fertility

- Excessive amounts of nitrogen: more susceptible
 - Legume cover crops should be avoided

Tree Stress

- Stressors: Nutrition, drainage, nematodes
- Less capable of resisting the progress of infection

Early Copper Sprays

- Reduces bacteria colonizing bark and bud surfaces
- 2 lbs/A of metallic copper at green tip



Management – Bloom – Petal Fall

Blossom sprays protect only flowers that are open

Monitor weather conditions: Resources available

- Average temp >60°F
- Wetting event (rain, heavy dew)

***Be mindful of
rattail bloom**

Antibiotics – complete, + adjuvant or surfactant

***Most effective when they are applied the day before or the day after an infection event (within 24 hrs!)**

- Streptomycin – Still the best option
 - Partial systemic activity
- Kasugamycin – Suppresses bacteria
- Oxytetracycline – Suppresses bacteria
- **4 spray maximum (resistance management)**

Alternatives

- Blossom Protect – Yeast antagonist
 - High pressure conditions: ~40% control
- Serenade Optimum – possibly rotating with strep (20 oz/A at 20% bloom)



<http://www.omafra.gov.on.ca>

Management – Post Bloom to terminal bud set

DO NOT spray antibiotics post petal fall

- Hail event – the exception
 - Cultivar susceptibility, fire blight history, PHI, spray within 24 hrs, crop value justifies cost

Plant growth regulator: Apogee, 6 -12 oz/100 gal dilute + adjuv.

- Late bloom, active shoot growth 1 – 3 inches
- Hardens off shoots = not susceptible to shoot blight
 - Occurs 10 - 14 days after application
- Can be tank mixed with strep (NOT a strep replacement)



Monitor regularly for infections if there were blossom blight conditions – prune as necessary

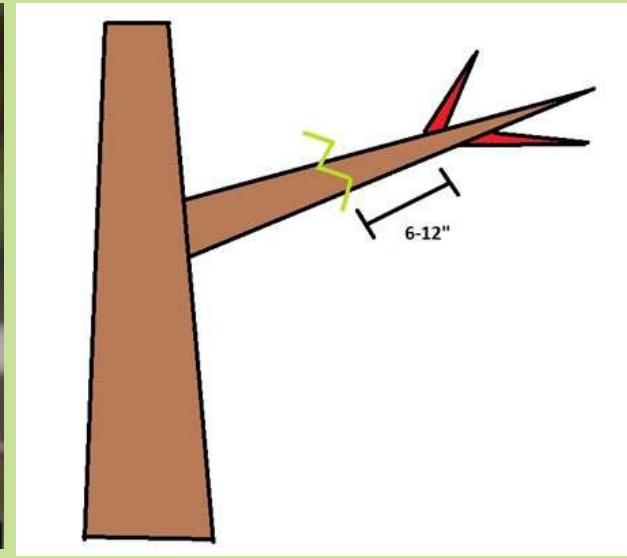
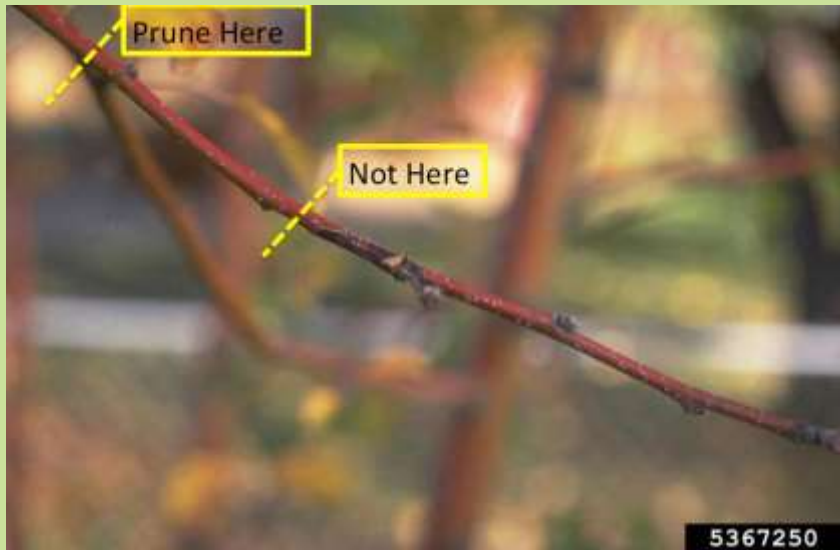
- Symptoms manifest 5 – 30 days post infection
- Shoot blight infection: risk continues until shoot growth ceases

Control piercing-sucking insects

- Aphids, leafhoppers, pear psylla

Starting at Petal Fall -
Cueva 2 qts/100 gal dilute +
Double Nickel 8 oz/100 gal dilute
Serenade Optimum 1 lb/A

Management – Cutting out infections



- Do not cut out infections during wet weather
- Cut out active infections early – before necrosis develops (limits spread of bacteria)
- ***Incidence is low***: pruning most effective
- ***Incidence is high***: Focus on salvaging tree structure; young high density plantings
- ***Avoid excessive cutting***: stimulates secondary shoot growth
- Bacteria can invade healthy tissue up to ~3 feet in advance of visible symptoms
 - Tool sterilization not effective
- Ugly stub: 6 -12 inches below margin of visible infection (remove later – winter)
- **Remove/burn infected tissue**

Additional items to keep in mind

Confusing with Nectria twig blight

- In late May – June
- May have a shepherd's crook like fire blight
 - NTB: Necrosis begins and the base of the shoot
 - FB: Necrosis begins at the shoot tip
 - NTB will have orange colored spores present at the base of the shoot



Additional items to keep in mind

Bacteria can live outside of the host and still be viable



Bacterial ooze on a Tyvek tree guard

Take home messages:

Good fire blight management program

- Limits the amount of damage occurring during the current season
- Reduces the risks for the following seasons



- Dormant pruning to remove blighted limbs and cankers (and removal of entire trees)
- Spring: Copper spray at green tip
- Monitor orchard conditions during bloom: Strep spray
- Consider Apogee to minimize shoot blight
- After petal fall: prompt removal of any blossom, canker or shoot blight symptoms
- Control piercing sucking insects

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QUESTIONS?



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