

Continental Dialogue 2019



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES

Beech Leaf Disease Update

Pierluigi (Enrico) Bonello

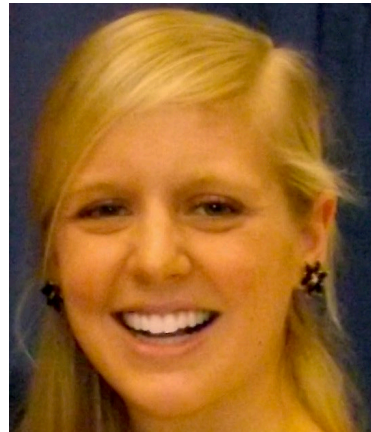
Department of Plant Pathology
The Ohio State University



Acknowledgements

- Funding provided to my program by the USDA NIFA AFRI's Exploratory Grant program (ending Nov. 31, 2019)
- Co-PIs:
 - Lucy Stewart (USDA ARS, Wooster, OH)
 - Jason Slot (OSU Dept. of Plant Pathology)
- An active collaboration with:
 - Cleveland Metro Parks (Connie Hausman)
- Other collaborators:
 - Soledad Benitez (OSU Dept. of Plant Pathology)
 - Cristina Rosa (Penn State Dept. of Plant Pathology)
 - Lynn Carta (USDA ARS, Beltsville, MD)
 - David Burke (The Holden Arboretum, Kirtland, OH)





Carrie Ewing, PhD Candidate
The Ohio State University
Environmental Science Graduate Program



Phenological studies of symptom progression



Ongoing Work





Ongoing Work





Ongoing Work



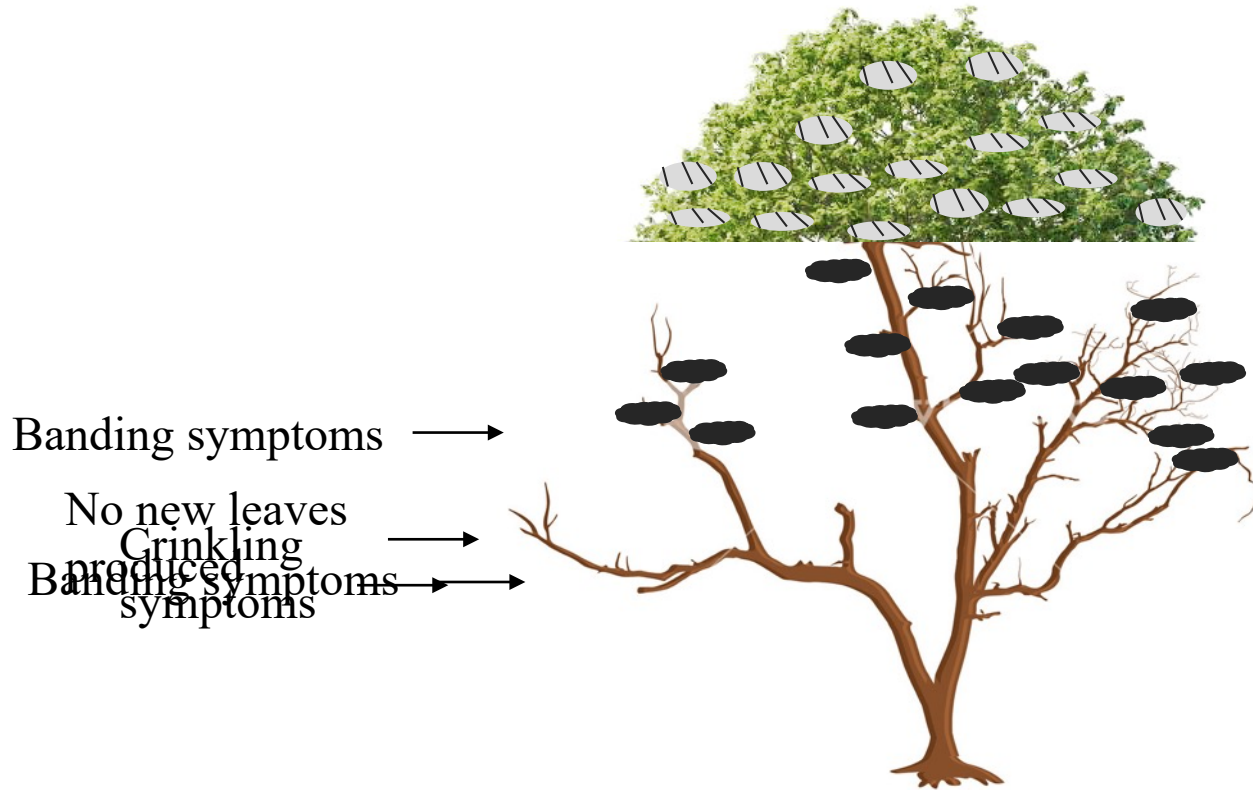




Photo from Dr. Rebecca
Lidster, Forest Health
Technical Specialist in
Ontario



BLD in Ohio nurseries



American beech (*Fagus grandifolia*)

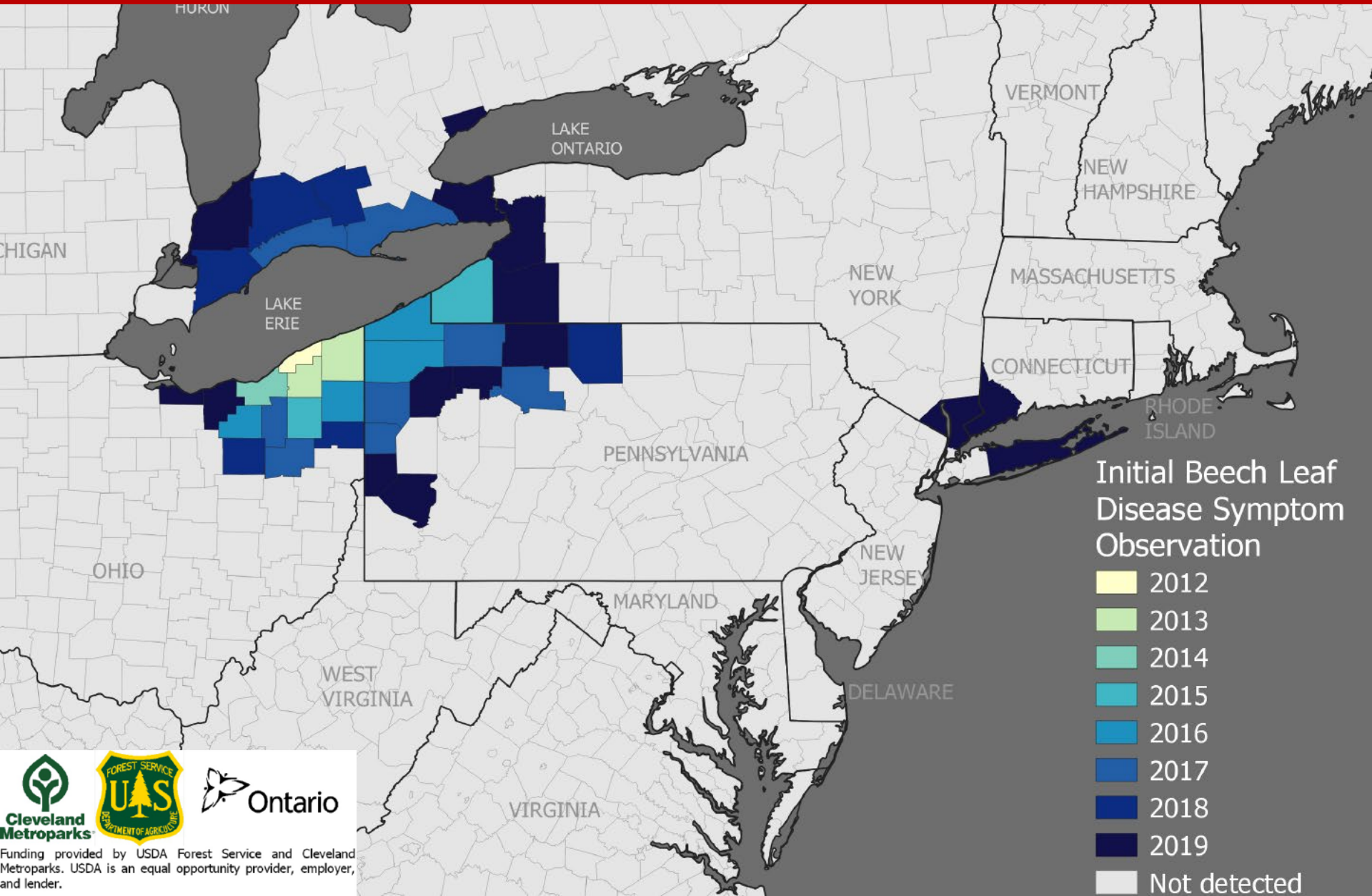


European beech (*Fagus sylvatica*)



European beech (*Fagus sylvatica*)

Photos from Dr. David McCann, Ohio Department of
Agriculture Division of Plant Health



Funding provided by USDA Forest Service and Cleveland Metroparks. USDA is an equal opportunity provider, employer, and lender.

NEWS

Science & Environment

Mystery disease killing beech trees

By Mark Kinver
Environment reporter, BBC News

19 February 2019

f WhatsApp Twitter Email Share



C.MATHIAS

Once a tree displays the symptoms of Beech Leaf Disease, it will die in the coming years

A mysterious disease that is killing beech trees is spreading across parts of the United States.

Top Stories

US attorney general faces House contempt vote

President Donald Trump hits back by moving to shield the full Mueller report from public view.

7 hours ago

Denver decriminalises magic mushrooms

3 hours ago

Guaidó deputy detained in Venezuela

2 hours ago

ADVERTISEMENT

Features



The meaning behind Archie and



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES

What's causing it?





HOME

ABOUT EPPO ▾

MEETINGS ▾

ACTIVITIES ▾

RESOURCES ▾

MEMBERS ONLY ▾



EPPO Alert List – Beech leaf disease and its potential causal agent (*Litylenchus crenatae*)

Why

A new disease of beech trees (*Fagus* spp.) called 'Beech leaf disease' (BLD) has increasingly been observed in forest areas in Eastern USA and Canada (EPPO RS 2018/178) and is raising serious concerns among foresters and local communities in affected areas. The disease was first reported on *Fagus grandifolia* in Ohio (Lake county) in 2012, and it rapidly spread to other counties in Ohio, as well as to Pennsylvania, New York, and Ontario (Canada). The disease has mainly been observed in forests but also in landscaped areas. The cause of this emerging disease remains to be elucidated, but a nematode species, *Litylenchus crenatae* n. sp., newly described from Japan on *Fagus crenata*, is now suspected to be at least one of the causal agents of BLD. Considering the threat that this new disease of uncertain etiology represents to beech trees, the NPPO of the United Kingdom has added it to the UK Plant Health Risk Register and also suggested to add it to the EPPO Alert List. This proposal was supported by the Panel on Phytosanitary Measures.

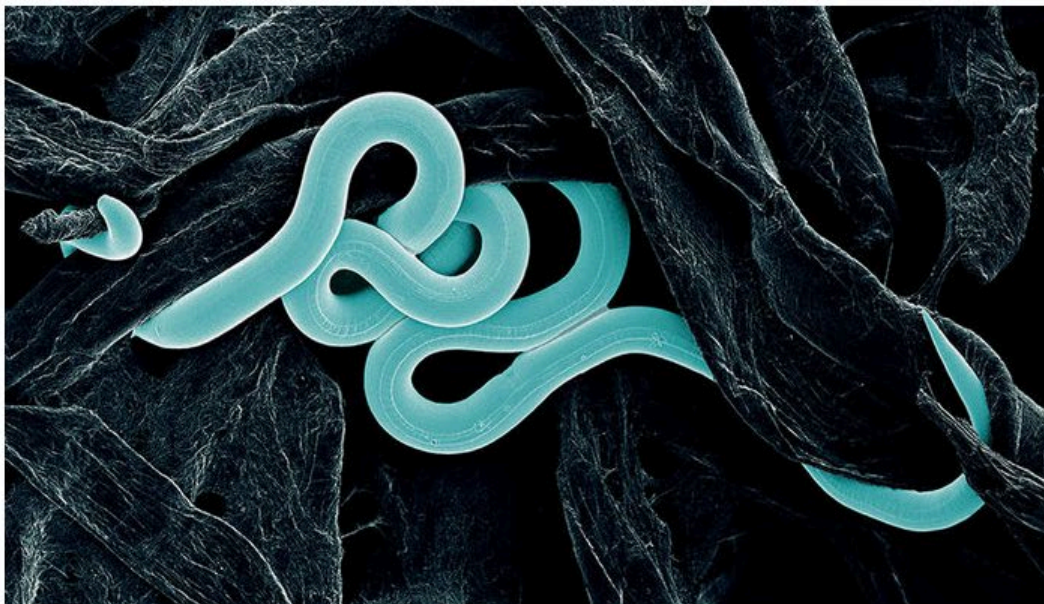
SHARE



3K



7



Some researchers believe a nematode native to Asia is causing a deadly disease in American beech trees. USDA/ARS/ELECTRON & CONFOCAL MICROSCOPY UNIT/LYNN CARTA/GARY BAUCHAN/CHRIS POOLEY/MYCOLOGY AND NEMATOLOGY GENETIC DIVERSITY AND BIOLOGY LABORATORY; COLORIZATION BY IT SPECIALIST/SOYBEAN GENOMICS AND IMPROVEMENT LABORATORY

A mysterious disease is striking American beech trees

By [Gabriel Popkin](#) | Nov. 14, 2019, 3:00 PM

A mysterious disease is starting to kill American beeches, one of eastern North America's most important trees, and has spread rapidly from the Great Lakes to New England. But scientists disagree about what is causing the ailment, dubbed beech leaf disease. Some have recently blamed a tiny leaf-eating worm introduced from Asia, but others are skeptical that's the whole story.

Enjoy reading News from *Science*?
Subscribe today. If you have already subscribed, log into your **News account.**

Got a tip?

How to contact
the news team

ScienceInsider

Ballot initiative takes shape to give California stem cell agency a second life



BY KELLY SERVICK | NOV. 15, 2019

Move by journals to 'seamless' off-campus access raises privacy concerns



BY JEFFREY
BRAINARD | NOV. 15, 2019

EPA's 'secret science' plan is back, and critics say it's worse



BY DAVID MALAKOFF | NOV. 12, 2019

Why NIH is beefing up its data sharing rules after 16 years



BY JOCELYN KAISER | NOV. 11, 2019

United States should make a massive investment in AI, top



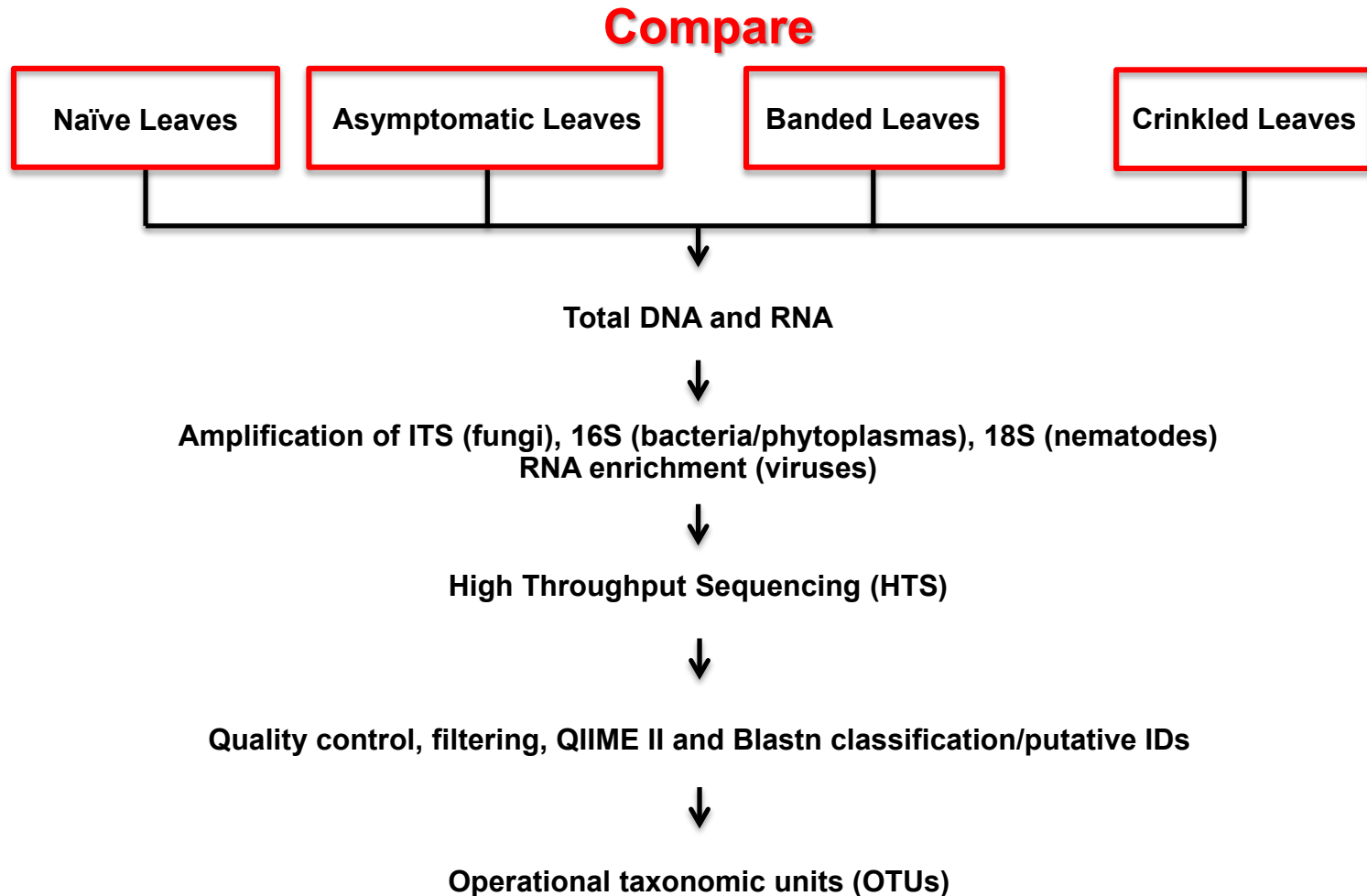


Ongoing Work

Microbial profiling to discover the causal agent of BLD



Molecular Leaf Microbial Community Profiling

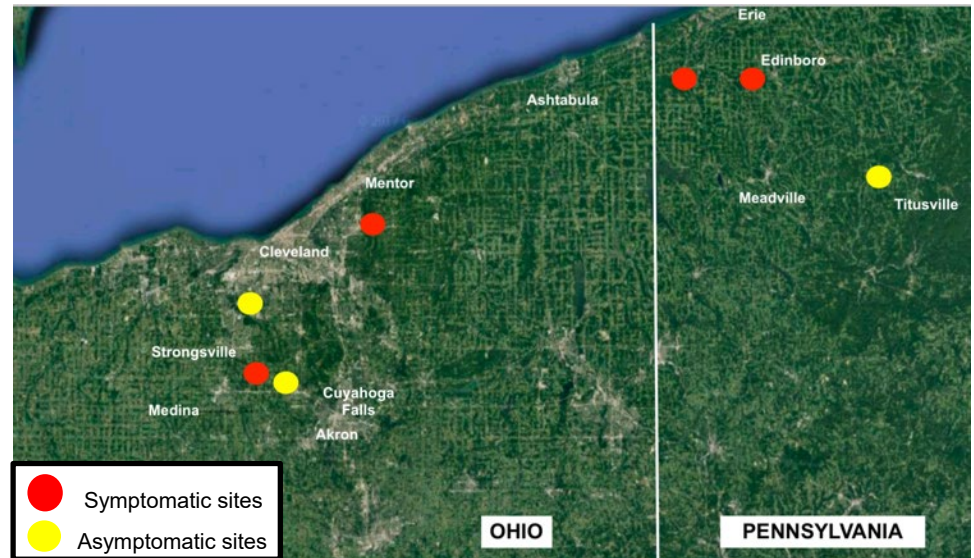




Foliage Sampling

Sampled May & August
of 2017, 2018 & 2019

- 8 permanent plots
 - 4 in northeast Ohio
 - 3 in northwest Pennsylvania
 - 1 in Pataskala, OH (control site)
- 100 trees tagged
 - 4-6 leaves/tree (based on sample type)





Key question: Are there correlations between virus-like RNA sequences, and other pathogen group-specific DNA sequences & symptom/exposure status?

N.B.: Phytoplasmas have already been excluded



So, what about the nematode?

- Whole tree disease expression patterns are consistent with nematodes: Starting in lower canopy where moisture is higher (favors foliar nematodes).
- The crinkling symptom is consistent with what is known about foliar nematodes: They destroy the mesophyll leading to tissue collapse, among other effects.



So, what about the microbes we found associated with symptoms?

- *Wolbachia* sp. – endosymbiont of the nematode? May not be responsible for BLD but could help the nematode survive.
- *Pseudomonas chlororaphis* – Has known anti-fungal properties and can cause necrosis in plants when inoculated at high levels. Could be an opportunist.
- Perhaps most interesting is *Erwinia persicina* – Could cause vascular wilt which slowly kills the trees, similarly to what *Erwinia amylovora* does in fire blight of apple/pear trees.

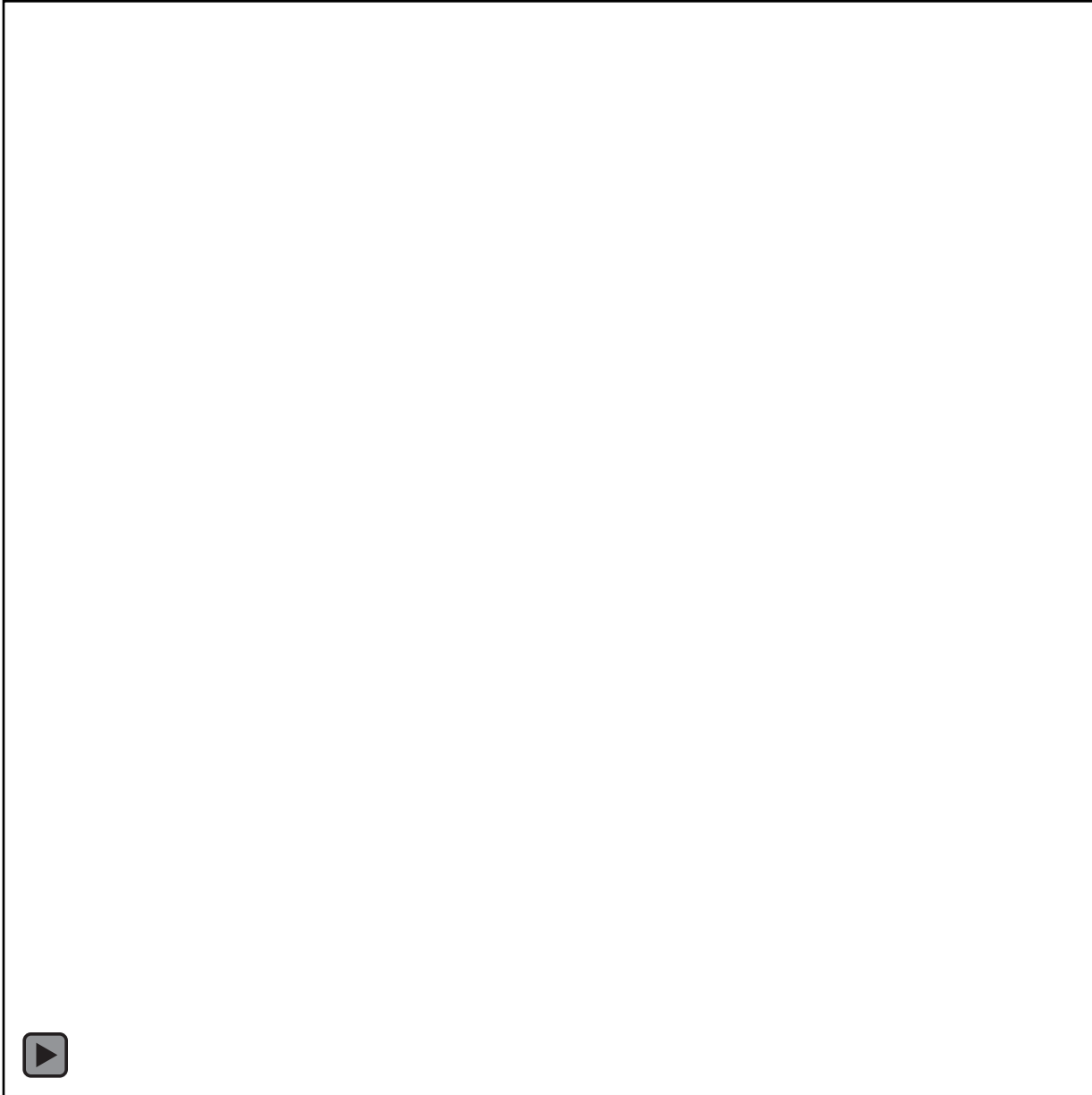


Could be a case of a microbial disease vectored by a nematode (vectored by?)

- Current consensus between us, Lynn Carta and David Burke is that the nematode is a necessary but non-sufficient condition for disease development
- Perhaps the nematode is itself vectored by mites



Nematodes and Mites





Could be a case of a microbial disease vectored by a nematode (vectored by?)

- Next step: metabarcode nematodes themselves. If association between *Pseudomonas chlororaphis*/*Erwinia persicina* and the nematode is confirmed, then:
- Need to conduct Koch's postulates with nematode alone, microbe(s) alone, nematode + microbe(s)



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES



THANK YOU!