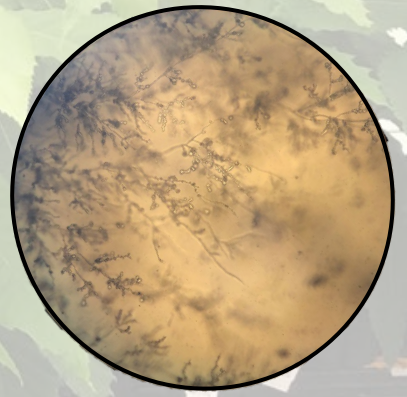
Screening hybrid seedlings for resistance to *Phytophthora cinnamomi* at the USDA Forest Service Resistance Screening Center



Dr. Katie McKeever
USDA Forest Service, Forest Health Protection
Resistance Screening Center
Asheville, NC

USDA Forest Service Resistance Screening Center (RSC)

Screening facility to identify seedlots resistant to disease

fusiform rust (***Cronartium quercuum* v. *fusiforme***)

pitch canker (***Fusarium circinatum***)

Phytophthora root rot (***P. cinnamomi***)

dogwood anthracnose (***Discula destructiva***)

brown spot needle blight (***Mycosphaerella dearnessii***)

chestnut blight (***Cryphonectria parasitica***)

Evolution of *Phytophthora cinnamomi* Resistance Screening @ RSC

2016: Pilot Study


2017: Tub Construction, Screening Year 1


2018: Tub Expansion, Screening Year 2


2019 - 2021: Full Capacity, Screening Years 3 - 5


Experiment #1: Operational Screening

Collection of TACF blight-resistant backcross families

Collection of generations F_1 – F_3

OP American & Chinese chestnuts included as +/- controls

Standard isolate applied to all blocks; approx. 120-200 trees per block

Mortality recorded weekly

Final assessment ~18-20 w.p.i.

Survivors outplanted to assess longevity under field conditions

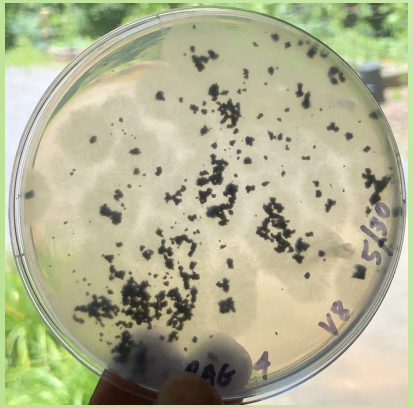
Experiment #2: Virulence Assessment

Treatment	No. Isolates in treatment	Source of isolates	
		State	County
Clemson Standard	2	SC	Oconee
NC Root	3	NC	Graham
TN Root	3	TN	Carter, Cocke
VA Root	3	VA	Wise, Giles
Soil	3	TN, VA, NC	Cocke, Giles, Clay
Azalea & Rhododendron	3	SC	Lexington, Greenville, Anderson
<u>Misc. Ornamentals</u>: Distylium 'Cinnamon Girl' Oconee Bells Heuchera 'Coral Bells'	3	SC	Newberry, Pickens, Greenville
Non-inoculated Control	none	…	…

planting

Photos: Jules Smith, TACF & Bill Evans, WLOS

develop inoculum



Seed spawn bags of V8-enriched vermiculite with *cinnamomi* cultures 14 d.

Purity confirmed prior to inoculation

inoculation

subirrigation

symptoms

assessments

Disease Incidence & Progress = weekly mortality

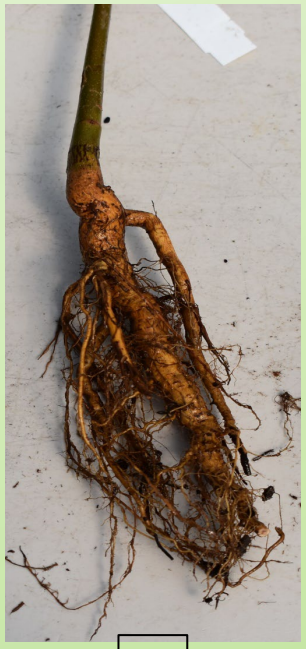
- Cull out dead seedlings, collect tags for data entry

assessments

Survivor Disease Severity = visual root rot rating

- Visual assessments on a 0 – 3 scale

0	Healthy, no lesions
1	Lesions limited to feeder roots
2	Lesions on feeder roots and tap root
3	Root system fully decayed



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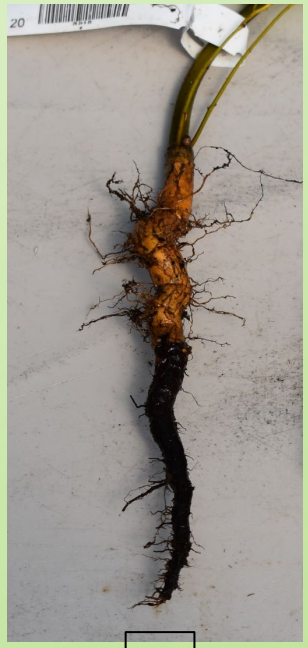

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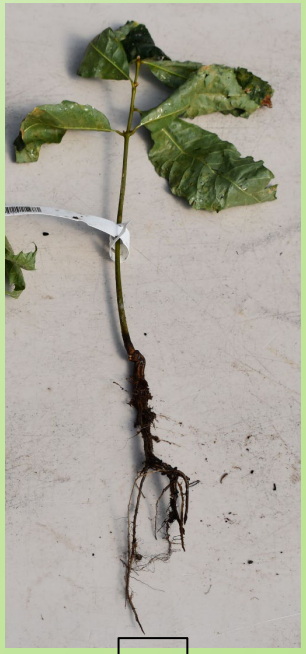
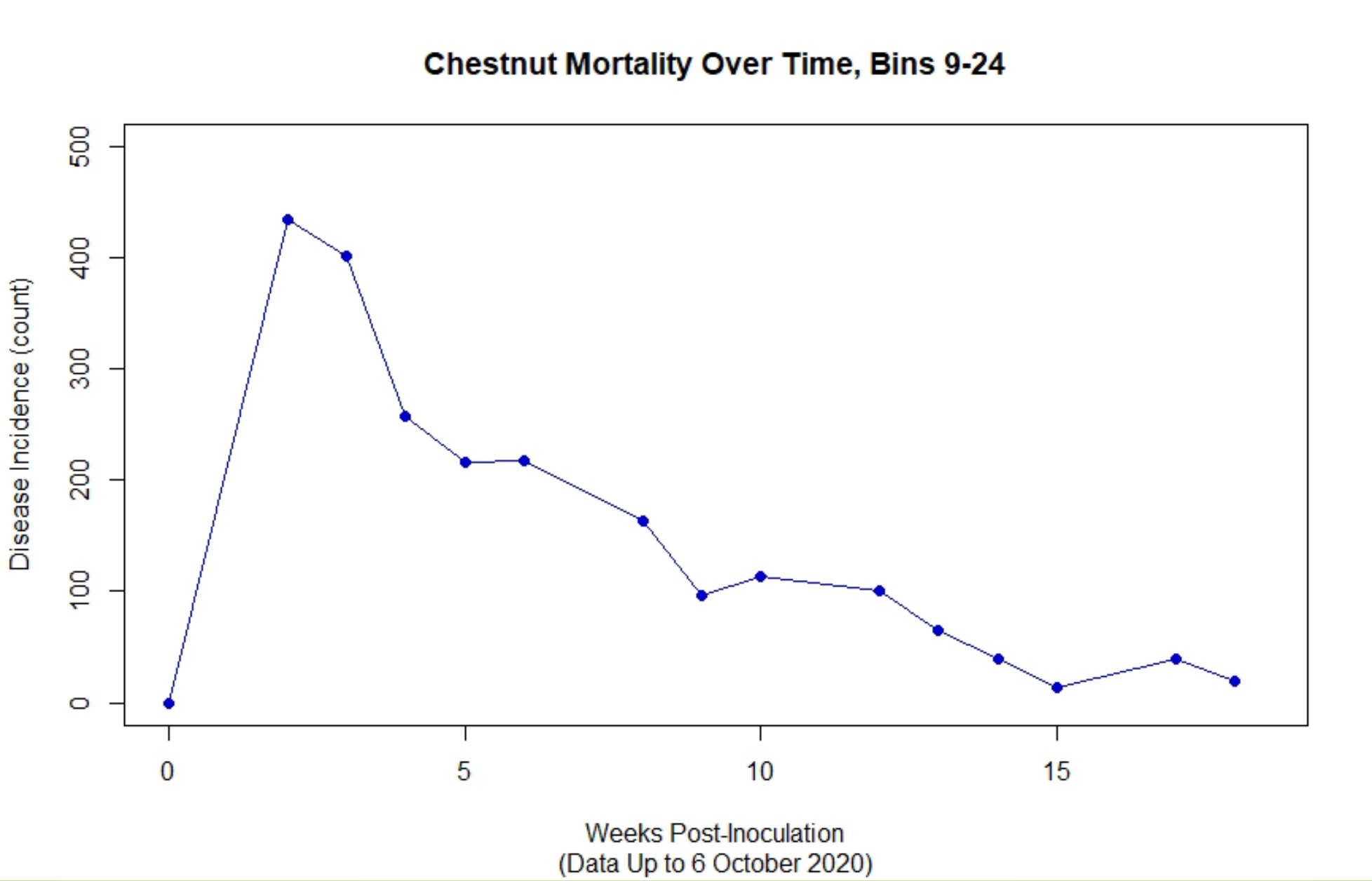
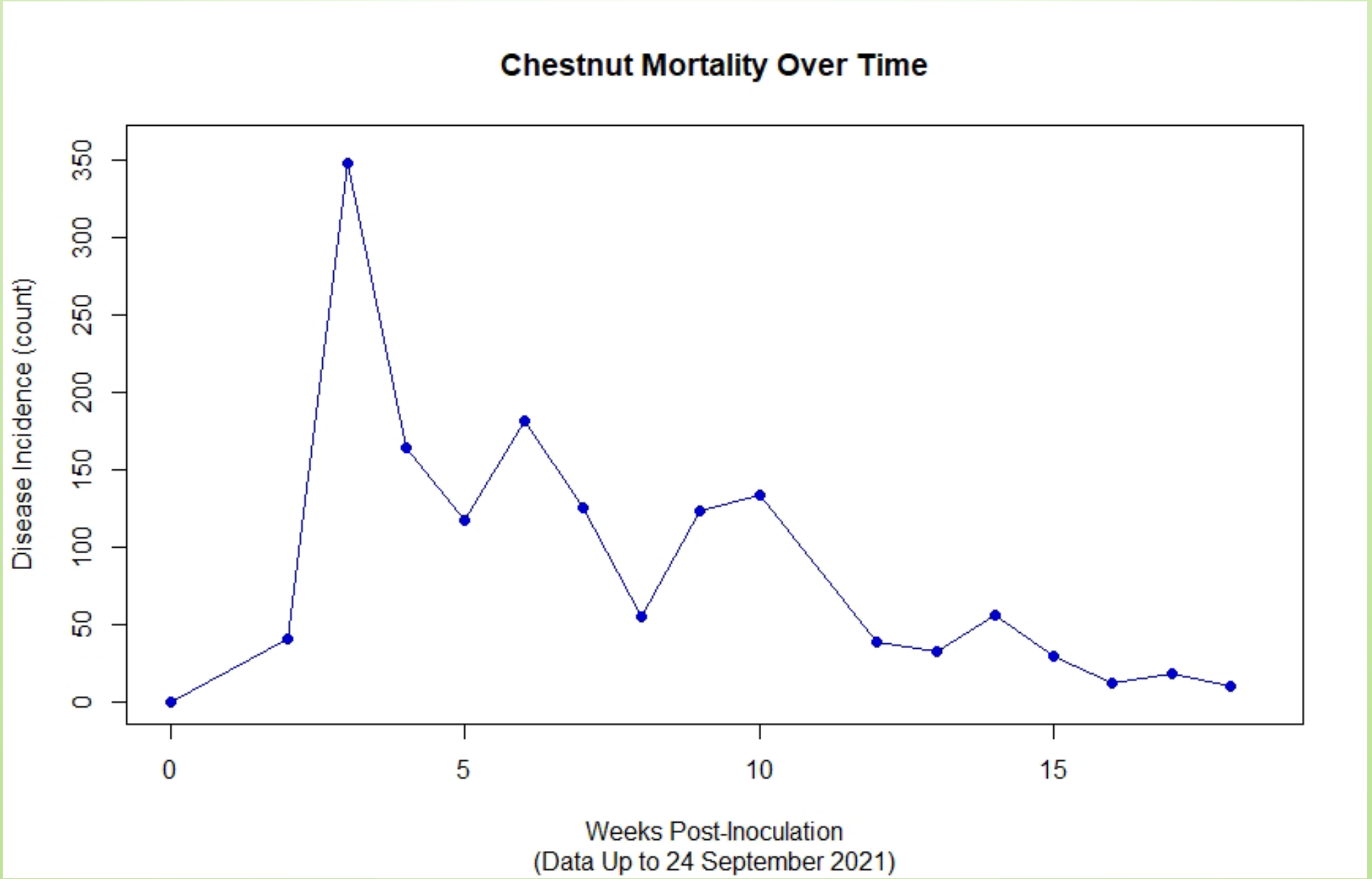


3

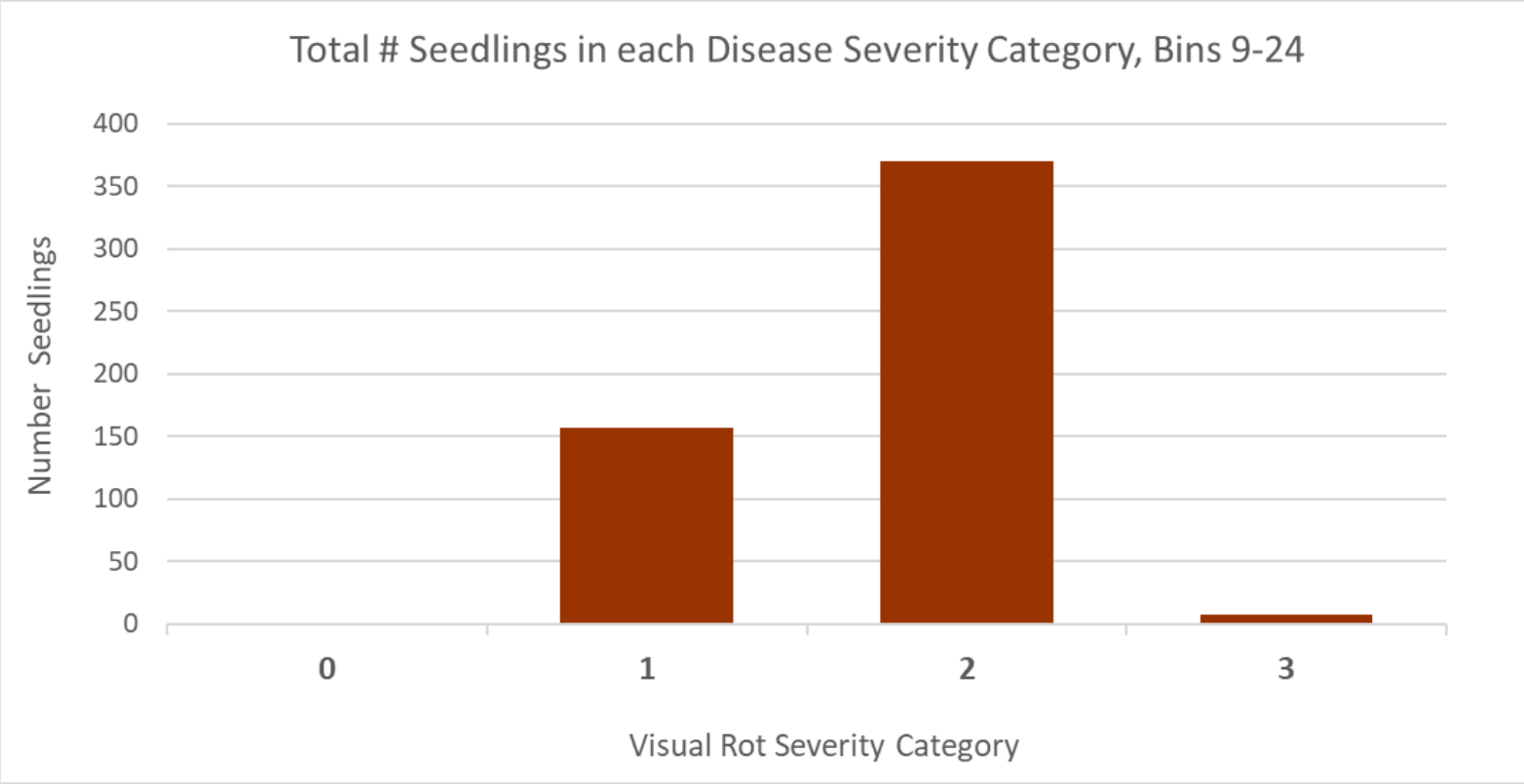
disease incidence 2020 – isolate sourced from GA



disease incidence 2021 - isolate sourced from MD



frequency of seedlings per rot severity rating 2020



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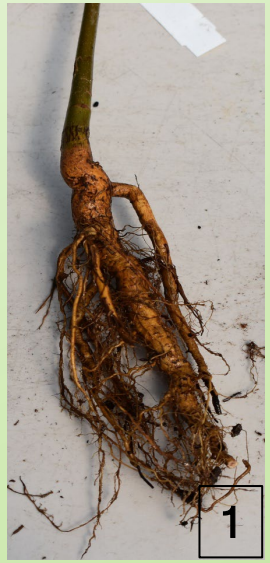
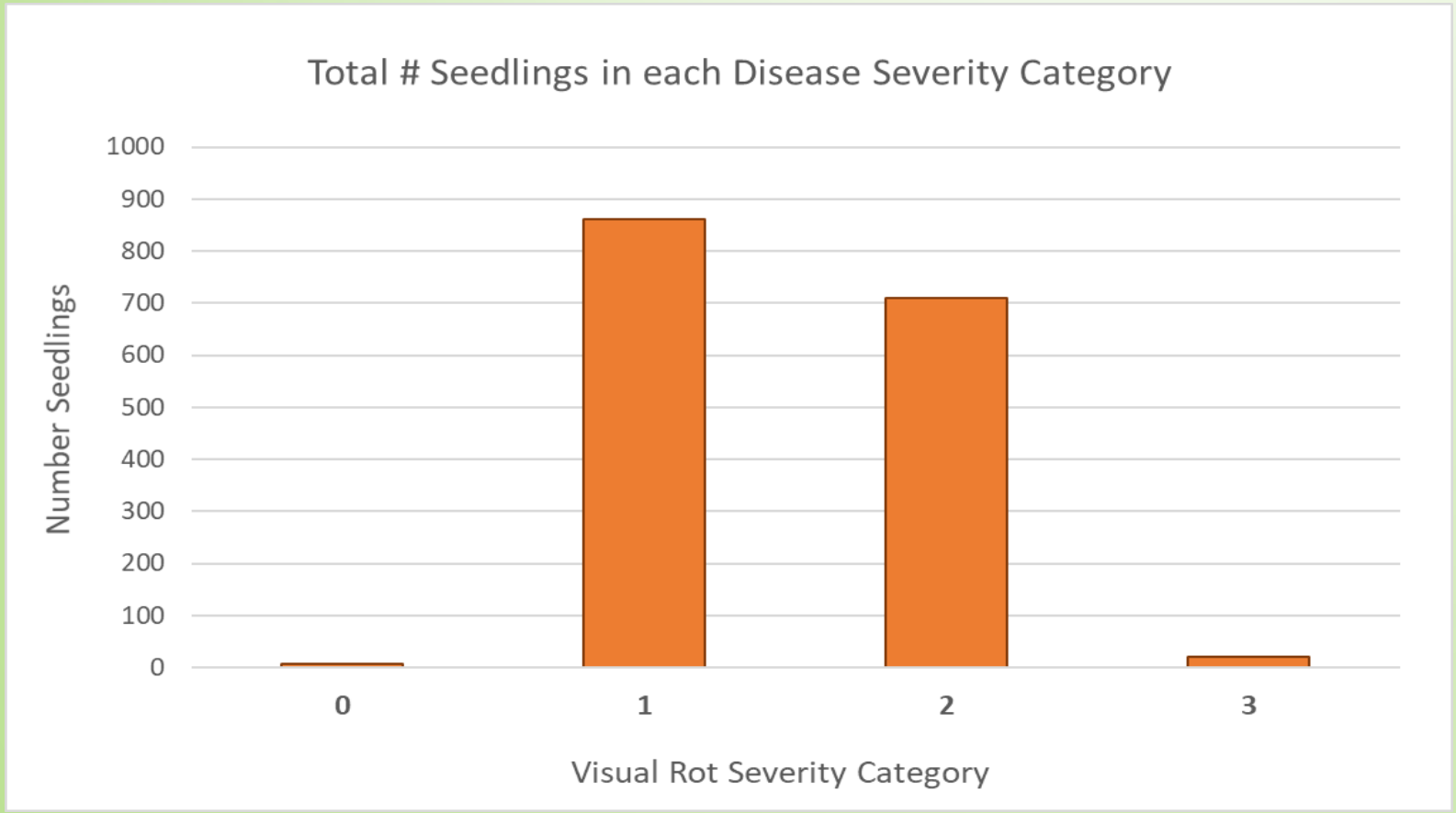


frequency of seedlings per rot severity rating 2021



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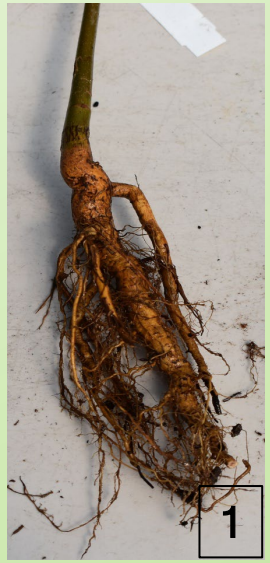

observations - virulence experiment

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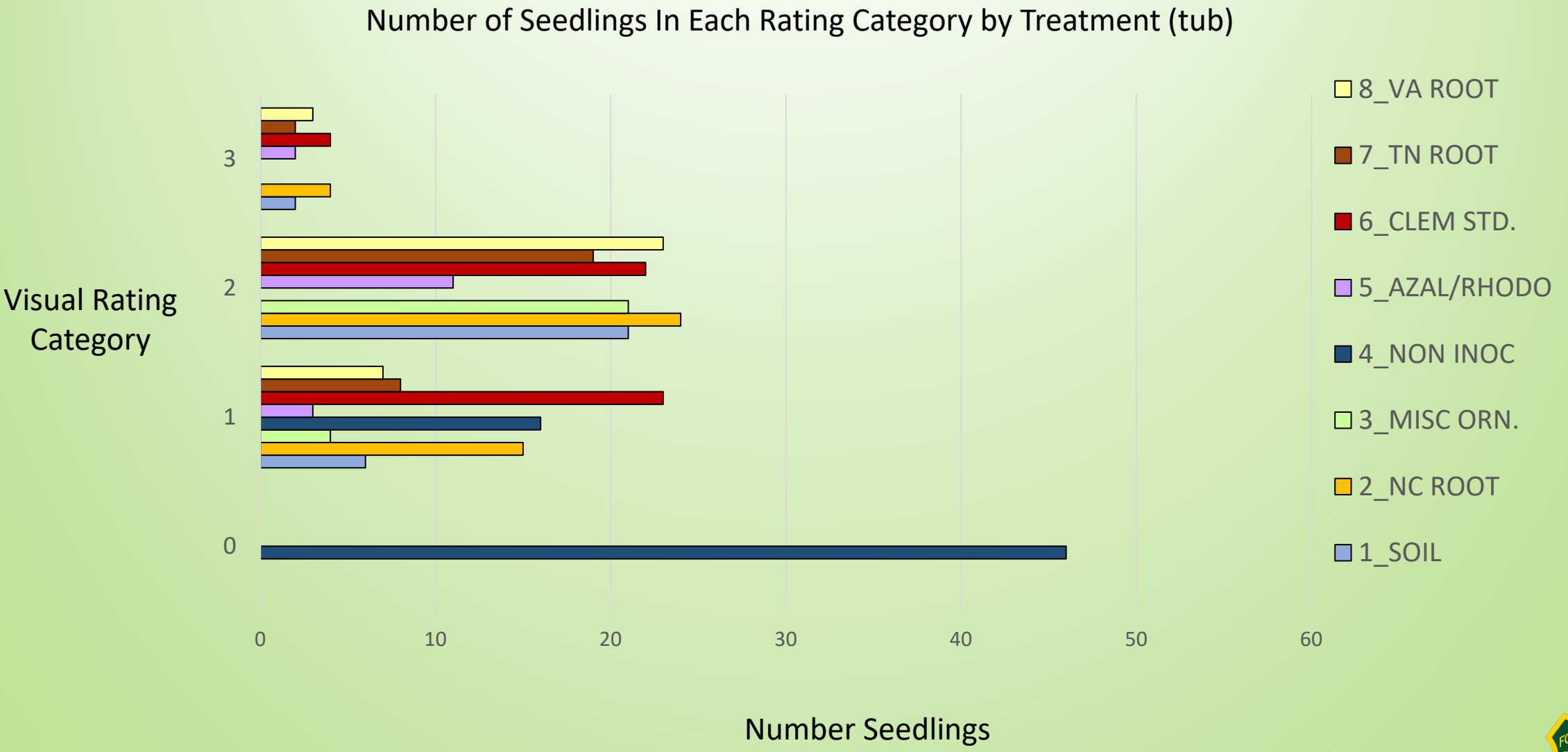
Number of Seedlings In Each Rating Category by Treatment (tub)
Visual Rating Category
3
2
1
0
0
10
20
30
40
50
60
Number Seedlings
8_VA ROOT
7_TN ROOT
6_CLEM STD.
5_AZAL/RHODO
4_NON INOC
3_MISC ORN.
2_NC ROOT
1_SOIL


Photo: Dr. John French


Photo: Dr. Paul Sisco


Photo: Dr. John French


Photo: Dr. John French


Two of the presumed Pseudo F1's
in the Warren Wilson
PRR Resistance Orchard
9/22/2020
WWPRR-17
WWPRR-70
Photo: Dr. Paul Sisco


Photo: Dr. Paul Sisco

Photo: Dr. John French

Thanks to All Who Make This Happen!

ESF

THE AMERICAN CHESTNUT FOUNDATION

FOREST SERVICE U S DEPARTMENT OF AGRICULTURE

https://wlos.com/news/local/local-scientists-volunteers-work-to-restore-the-american-chestnut