

Grapevine Red Blotch and Leafroll Viruses: Virus-Host Interactions, and Vector Biology and Management

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Topics/questions to be addressed:

- ❖ Provide an update on your research aimed at understanding and controlling vector-borne viruses impacting wine grapes
- ❖ Identify key areas where additional study is needed to understand the basic biology of virus-host interactions and vector biology
- ❖ Identify areas where significant progress could be made towards developing effective control strategies. What knowledge gaps and barriers need to be overcome?
- ❖ Discuss any other aspects of red blotch and leafroll that you feel are important for the committee to take into consideration

Grapevine leafroll-associated viruses

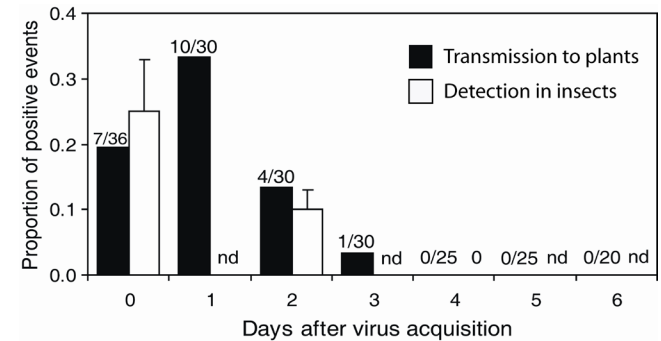
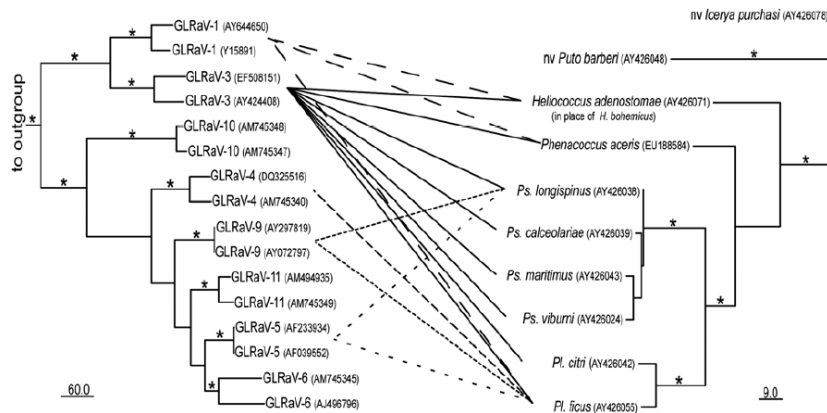
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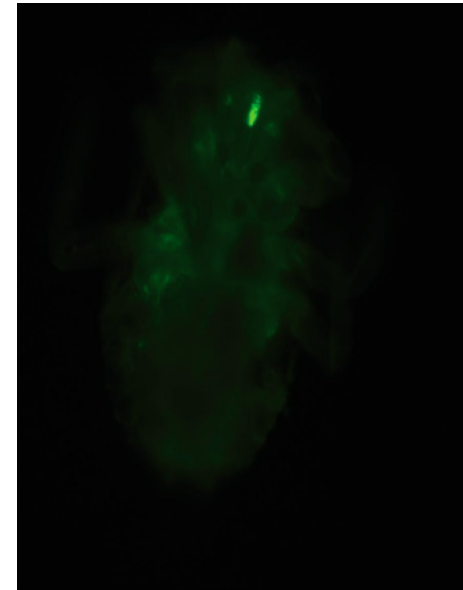
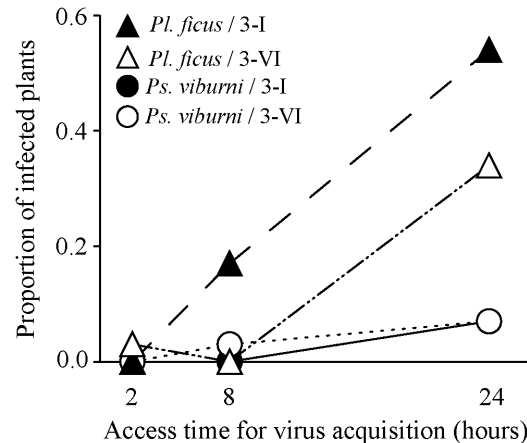
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transmission biology

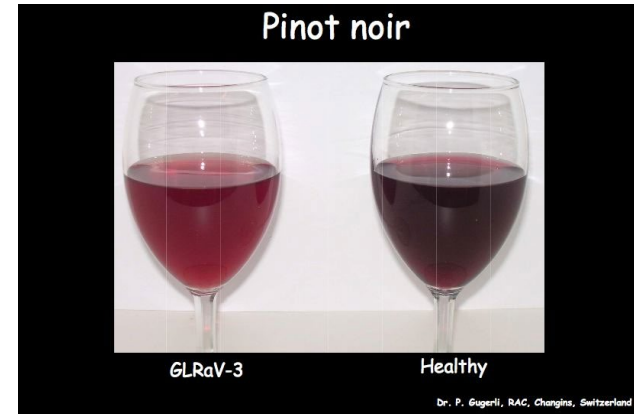
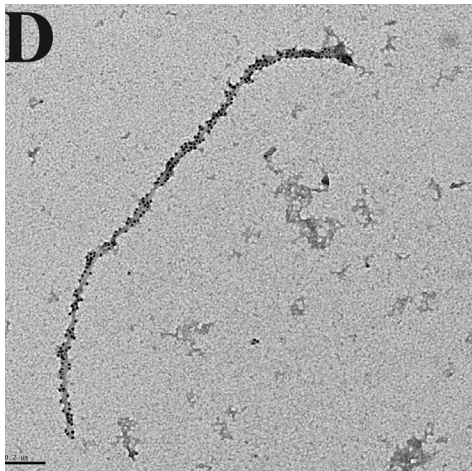


I am of the opinion that vector biology is sufficiently understood

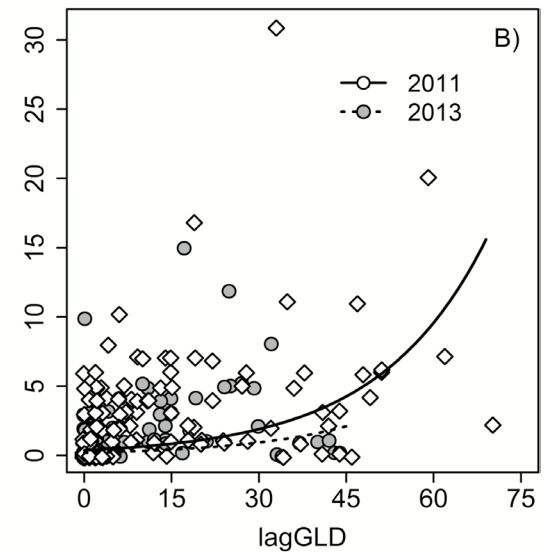
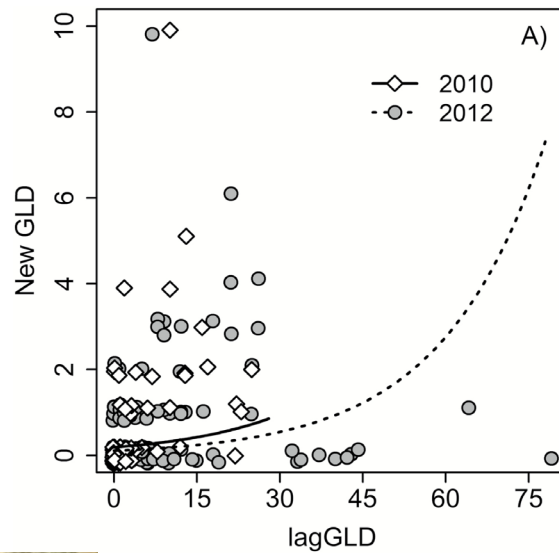


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virus-host interactions

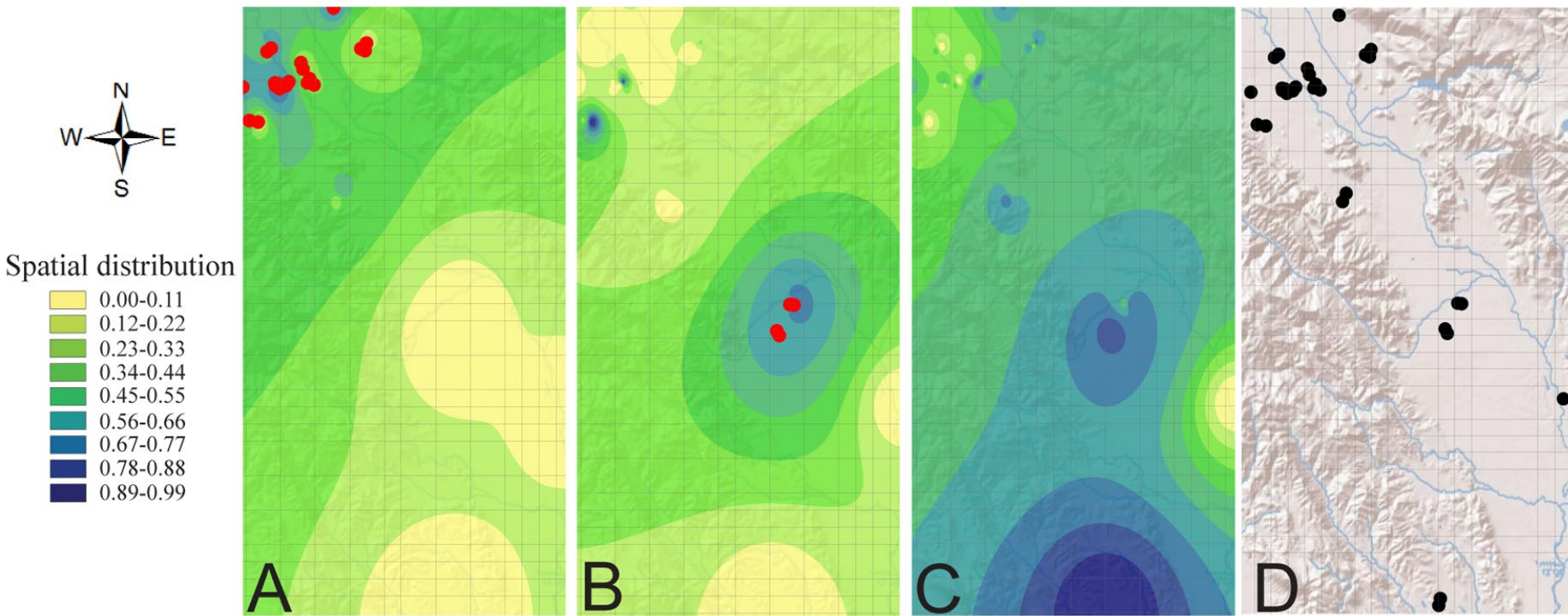


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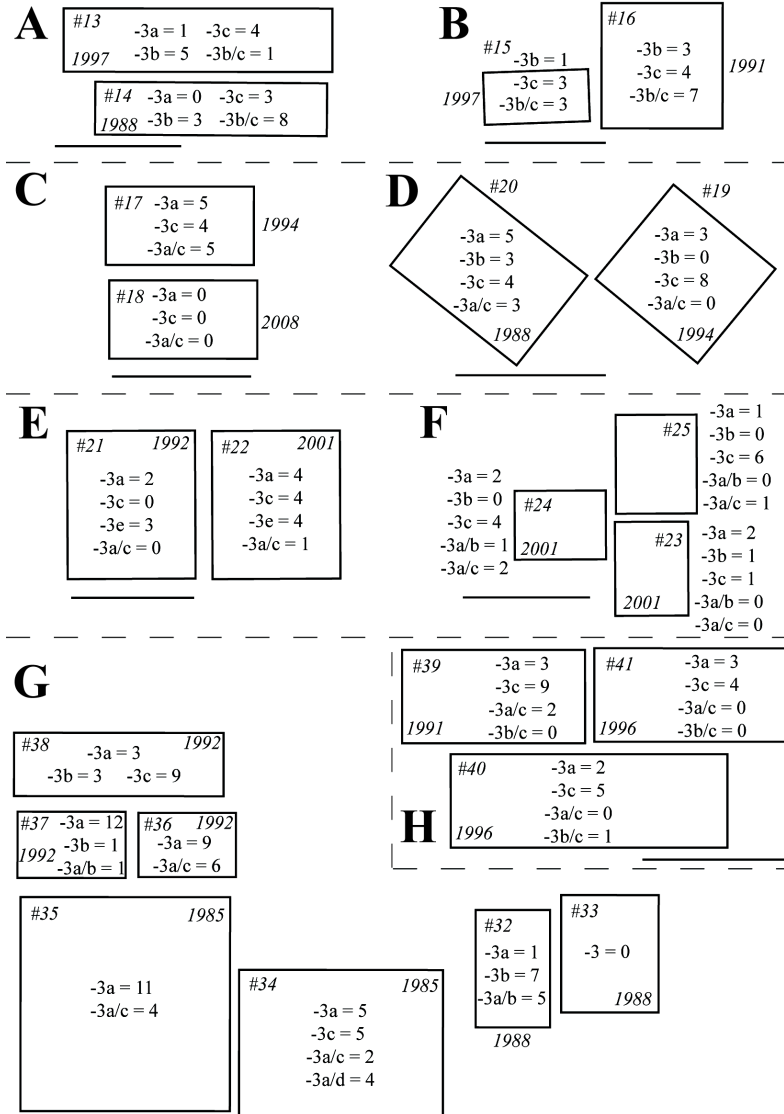


Continuous baseline work on pathogen and vector applied biology and ecology, and pathogen and disease spread, should continue.

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- ❖ Discuss any other aspects of GLD/GLRaVs that you feel are important for the committee to take into consideration

One can always improve on everything. BUT, as far as effective control strategies are concerned, I believe that we are in good shape. We already have effective control strategies available and, in the case of the Napa Valley, implemented. Although leafroll was a nightmare in the Napa Valley in the 2000's, I probably have not heard a single complaint about leafroll for one decade, I have probably not had one request to talk about leafroll for the same amount of time. If anything, our funding was cut because leafroll was no longer considered an issue. As an example, about ten years ago I sat by a manager who told me that leafroll was no longer an issue and that everybody knew how to handle it.

The current issue is one of grower/manager education, and willingness to implement strategies already proven to effectively control leafroll.

Grapevine red blotch virus

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Everything, other than GRBV causes GRBD. Vector biology and ecology have been studied somewhat, but mostly disconnected from pathogen and disease ecology.

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One example:

Are the limited number of studies on temporal and spatial disease patterns representative of most vineyards?

Differential Spread of Grapevine Red Blotch Virus in California and New York Vineyards

Elizabeth Cieniewicz,^{1,†} Madison Flasco,¹ Melina Brunelli,^{1,2} Anuli Onwumelu,^{1,3} Alice Wise,⁴ and Marc F. Fuchs¹

Spatial Associations of Vines Infected With Grapevine Red Blotch Virus in Oregon Vineyards

Daniel T. Dalton,^{1,†} Richard J. Hilton,² Clive Kaiser,³ Kent M. Daane,⁴ Mysore R. Sudarshana,⁵ Julia Vo,⁵ Frank G. Zalom,⁶ Jessica Z. Buser,¹ and Vaughn M. Walton¹

Two examples of very different rates of disease spread, as well as the lack of *S. festinus* from 2/3 of the sites included in the Oregon study.

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Nothing at all until six months ago.

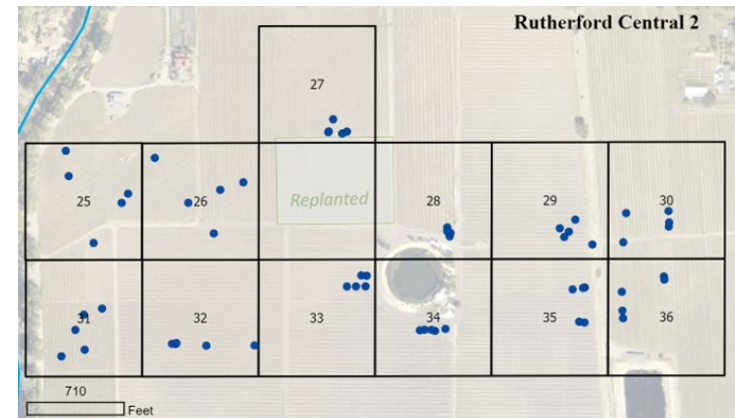
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 - Understand the ecological drivers behind spatial and temporal spread
 - Begin addressing questions about roguing (considered as priority by M. Cooper)

Data: disease mapping data from M. Cooper's group (12 sites; ArcGIS into R)

genetic data from samples collected in late 2023 (~850 samples sequenced)

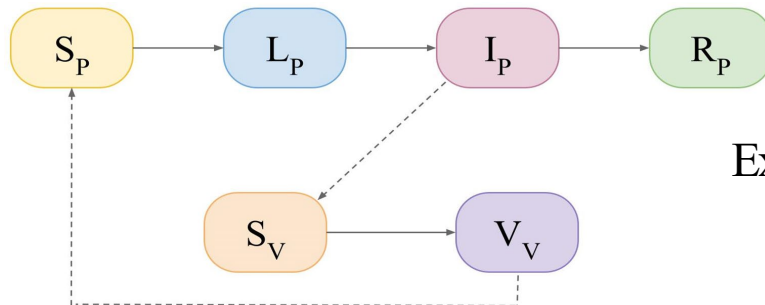
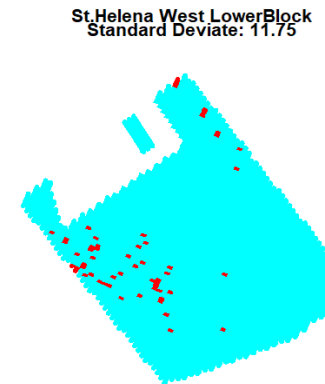
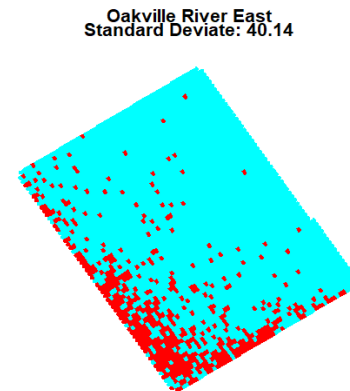
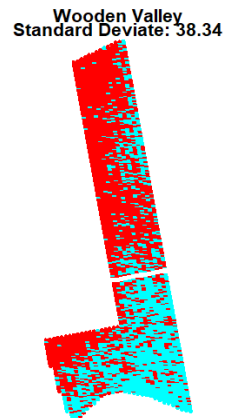
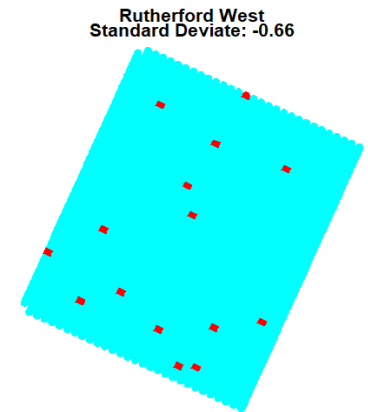
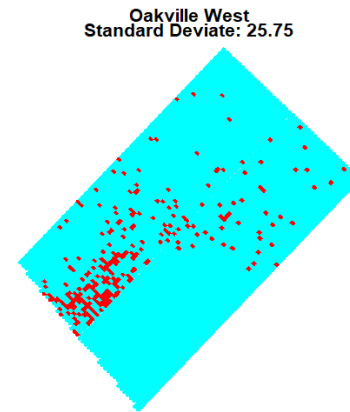
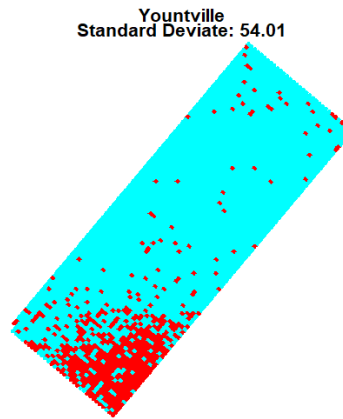
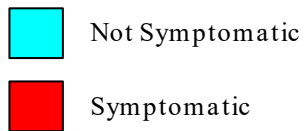
Field Work (two types of sites):

- Non-Neighbor Sites
 - Study sites for the UCCE in Napa, not looking at surrounding areas
 - 20 symptomatic samples per site, spaced out
 - 24 sites
- Neighbor Sites
 - Large study area broken up into a 12-cell grid (5 acre cells)
 - 5 asymptomatic samples from each grid
 - 6 sites



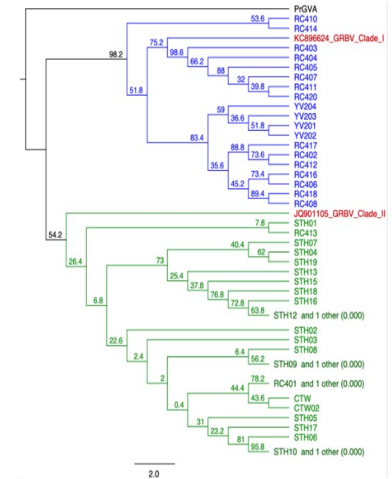
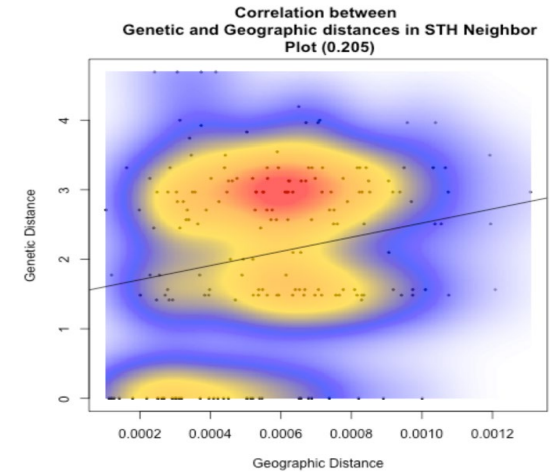
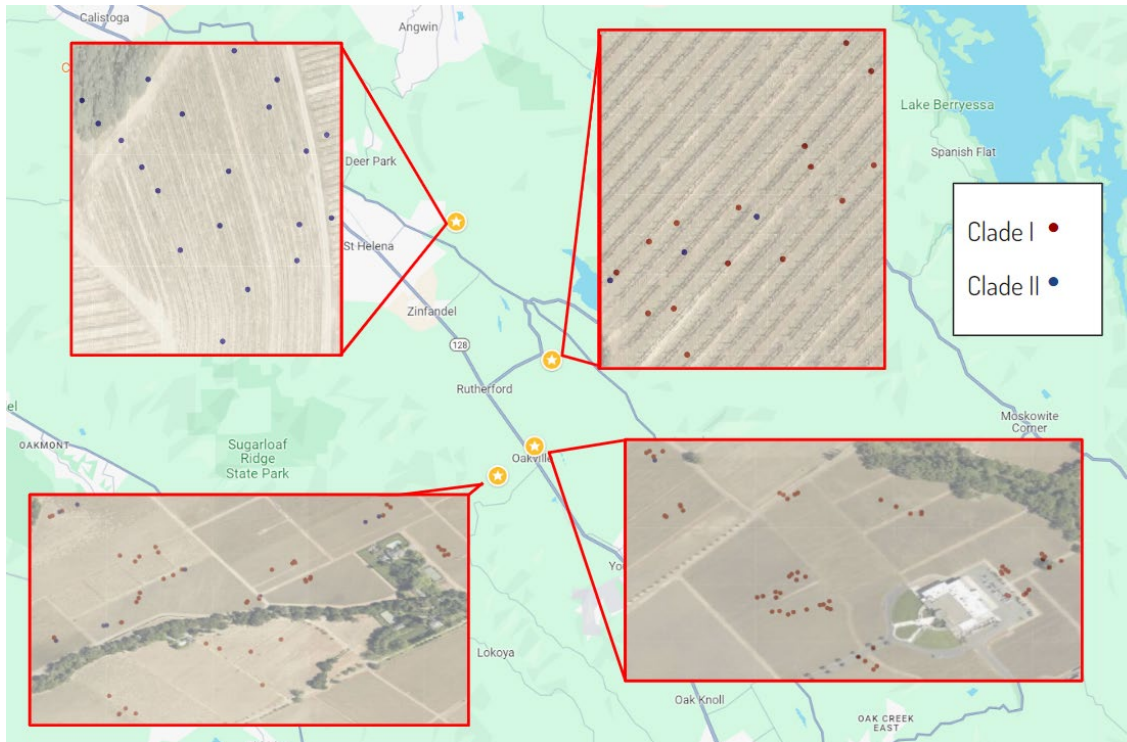
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Spatial autocorrelation



Exploring SIR models?

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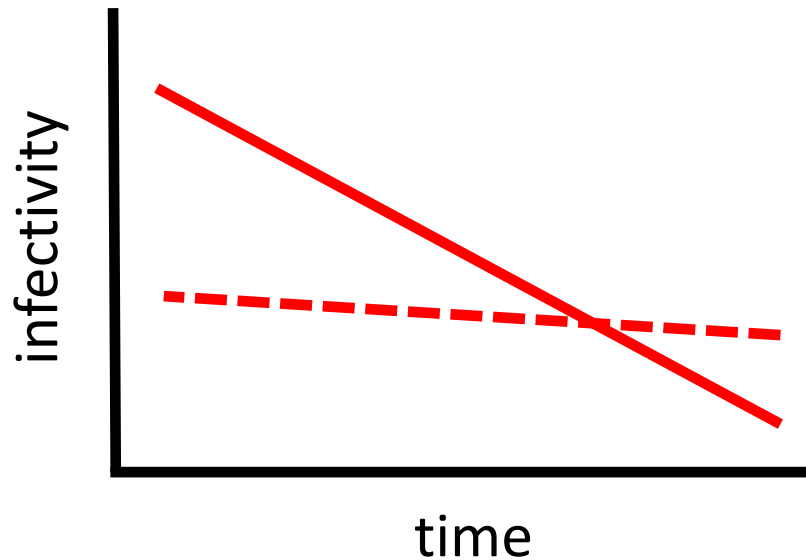
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Pretty much everything is needed at this point. There is substantial lack of knowledge about the disease system. There is doubt, among scientists and practitioners, about fundamental aspects of the disease system. How can effective control strategies be developed, and deployed, if even scientists disagree on how vector transmission of the etiological agent occurs (as one example)?

- . Host-pathogen, host-vector, vector-pathogen relations
- . Transmission biology
- . Disease ecology
- . Pathogen ecology
- . Vector ecology in relation to pathogen transmission and disease spread
 - the corners of the 'disease triangle' are being studied independently-

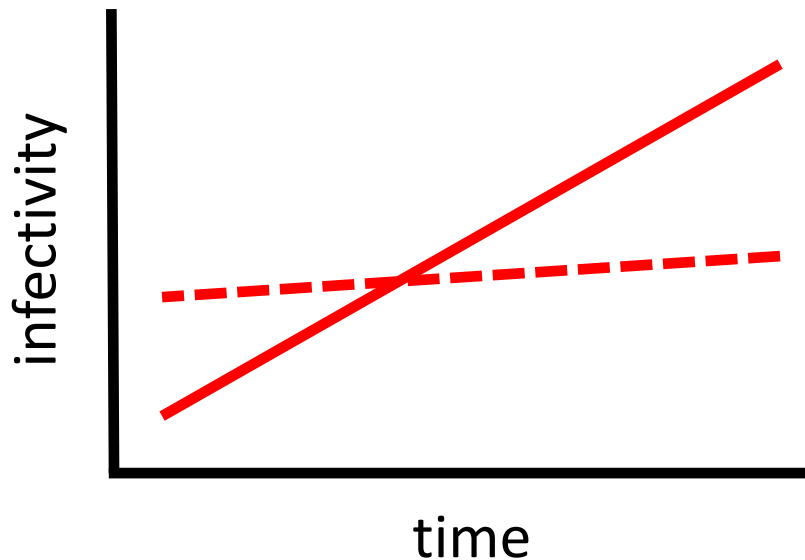


- collected nearly 2500 BGSS from traps
- cleaned, extracted, tested for *X. fastidiosa* via qPCR
- what fraction of vectors are infective?



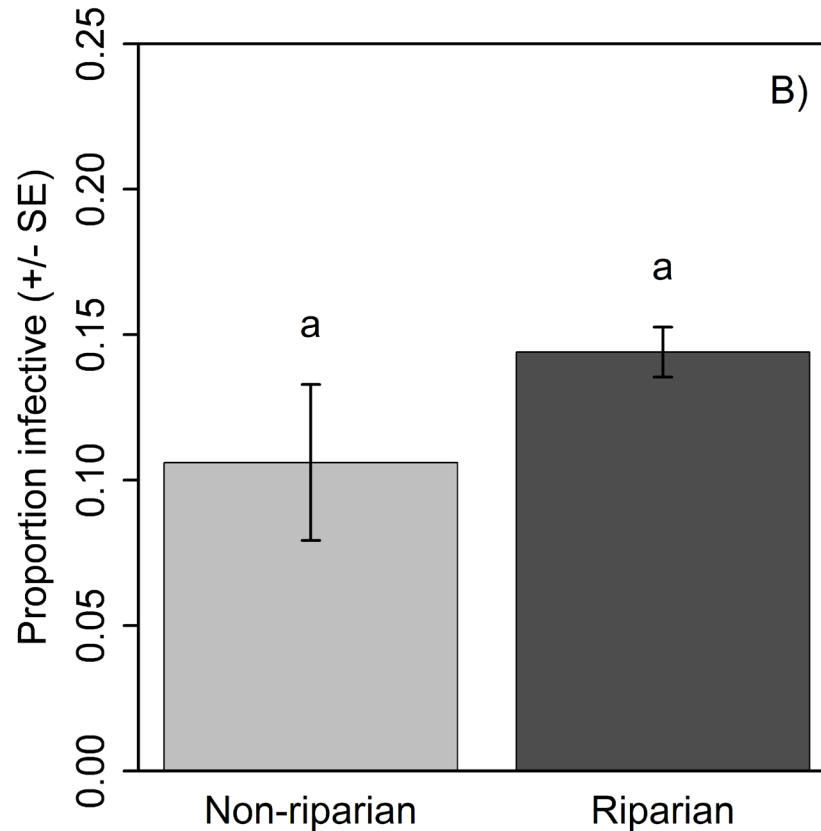
- if acquisition occurs outside vineyards, infectivity may decline or stay flat over the season?

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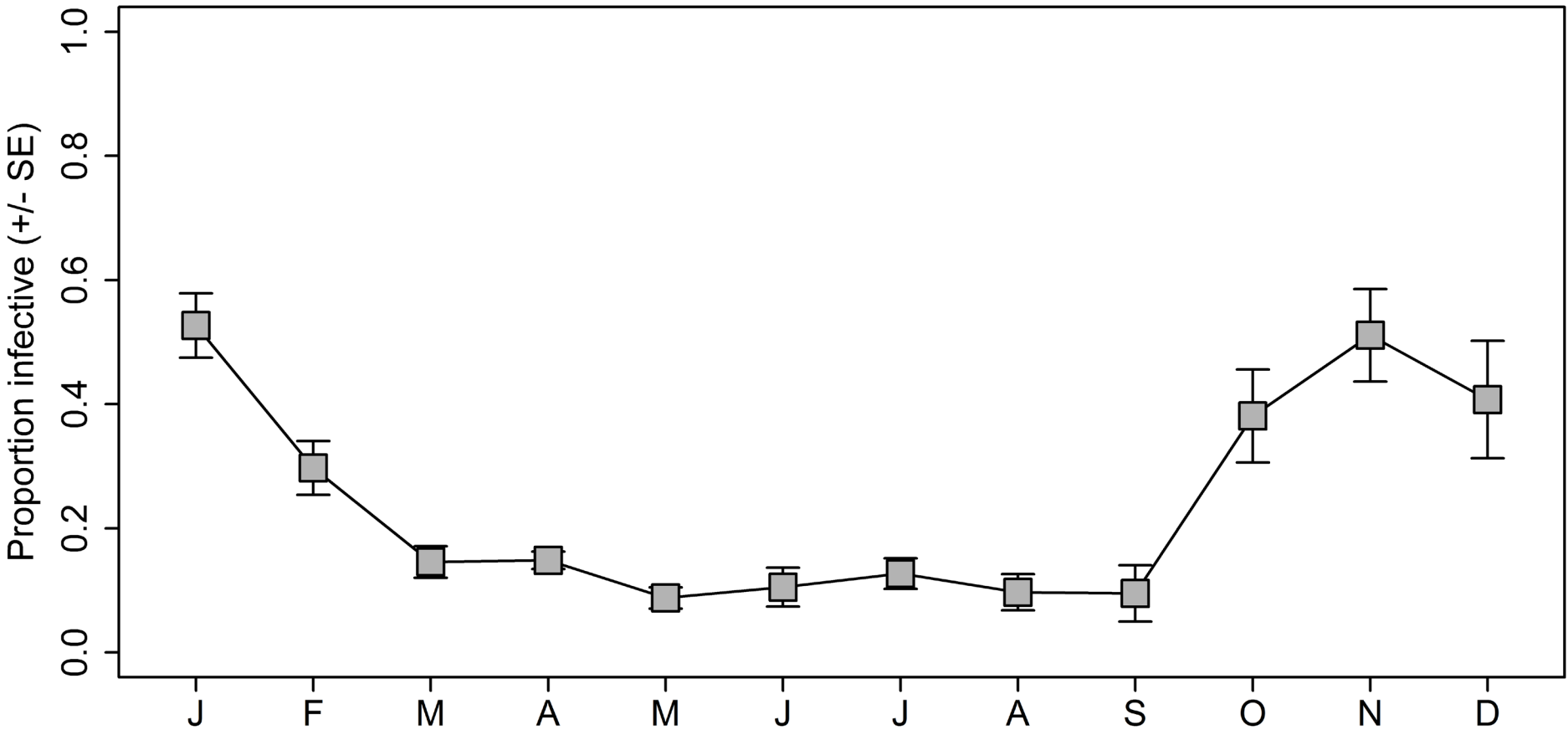
- if acquisition occurs in vineyards, infectivity may increase over the season?

Overall, ~15% of BGSS were infective



-similar for BGSS from edge vs. within vineyard, and for riparian and non-riparian sites

Natural infectivity of BGSS over the season?



-declines Winter through Spring, increases late-Summer through Fall