



# Is there a link between water deficits and European vineyard decline?

*-Gregory Gambetta*



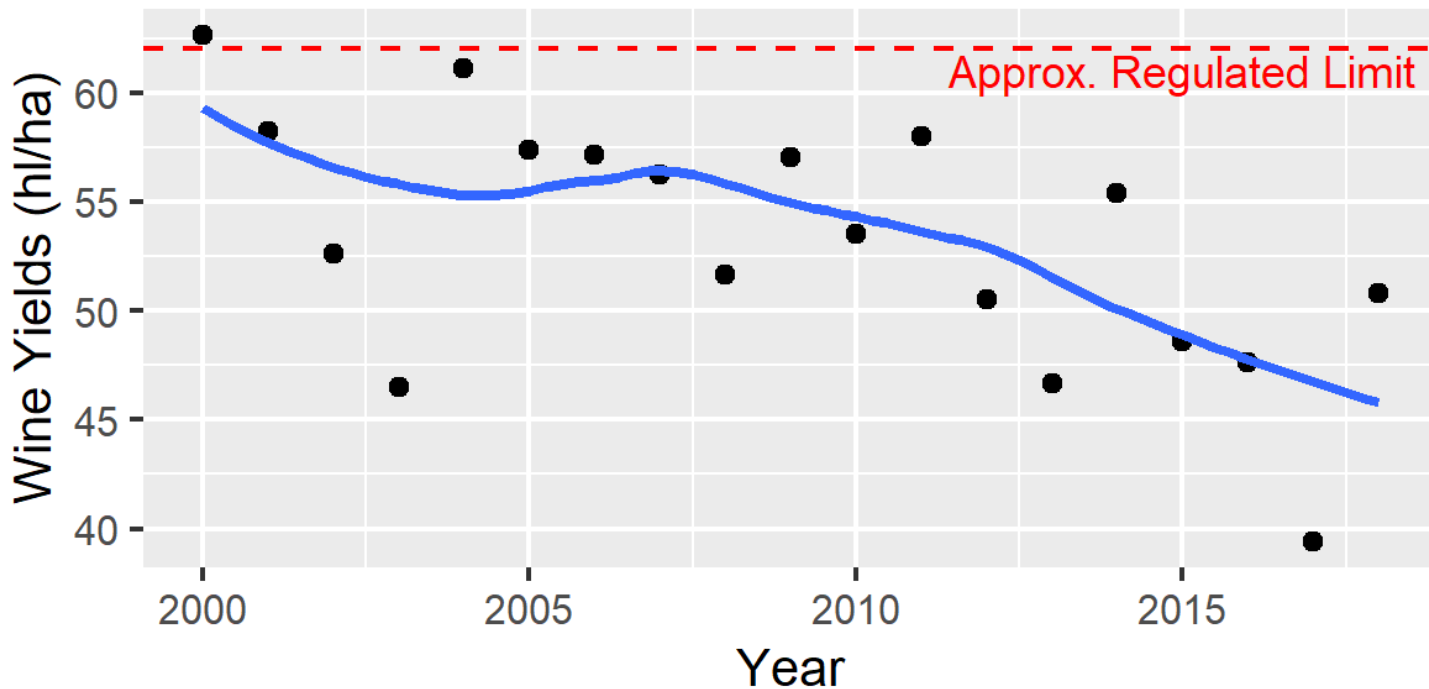


# Presentation Outline

1. European vineyard decline and the French PNDV.
2. Framework for water deficit responses and productivity impacts.
3. Water status trends in Napa & Bordeaux (irrigation vs. dry-farming).

# Recent yield declines have growers worried

## France AOC/AOP Wine Yields 2000-2018



# This reality launched a huge investment



Launched in 2016 with an annual budget of over 2.5 million euros aimed at addressing the underlying causes of this decline.

*What are the factors contributing to these declines?*

**Disease was the real focus  
at the start**



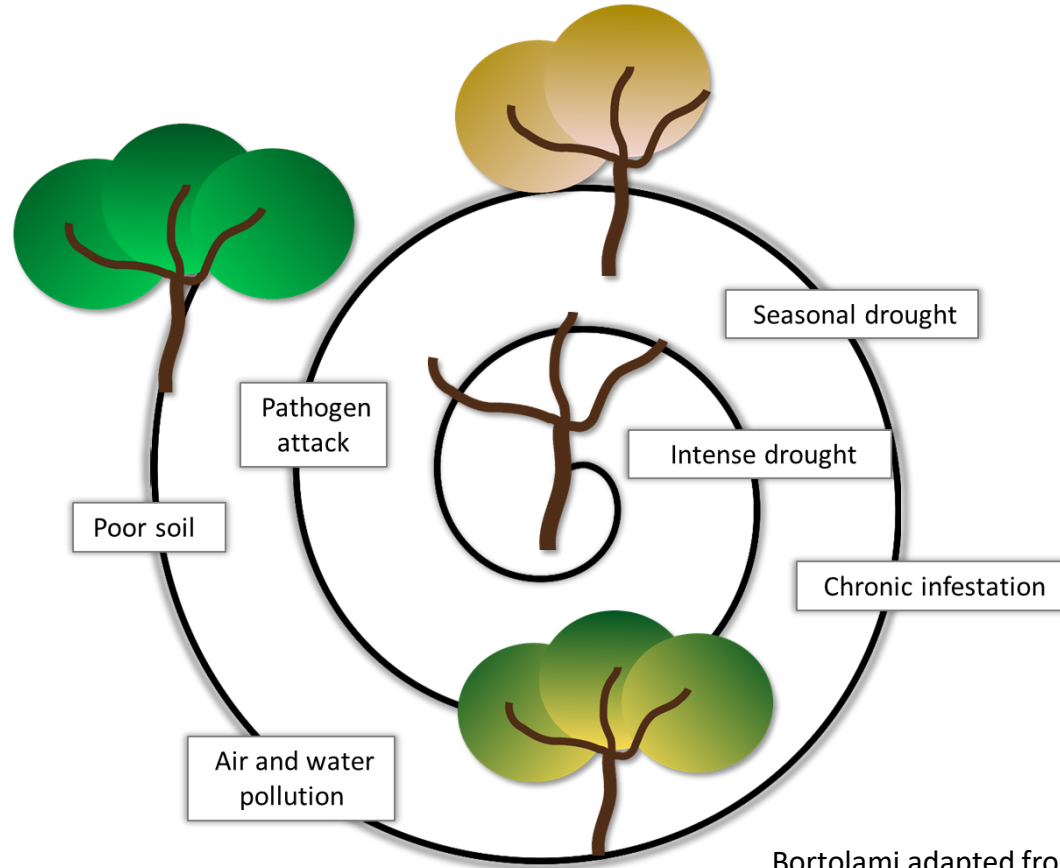
**Esca Disease**

Photos courtesy of  
Giovanni Bortolami

*But disease is only part of the story*



# The multifactorial death spiral



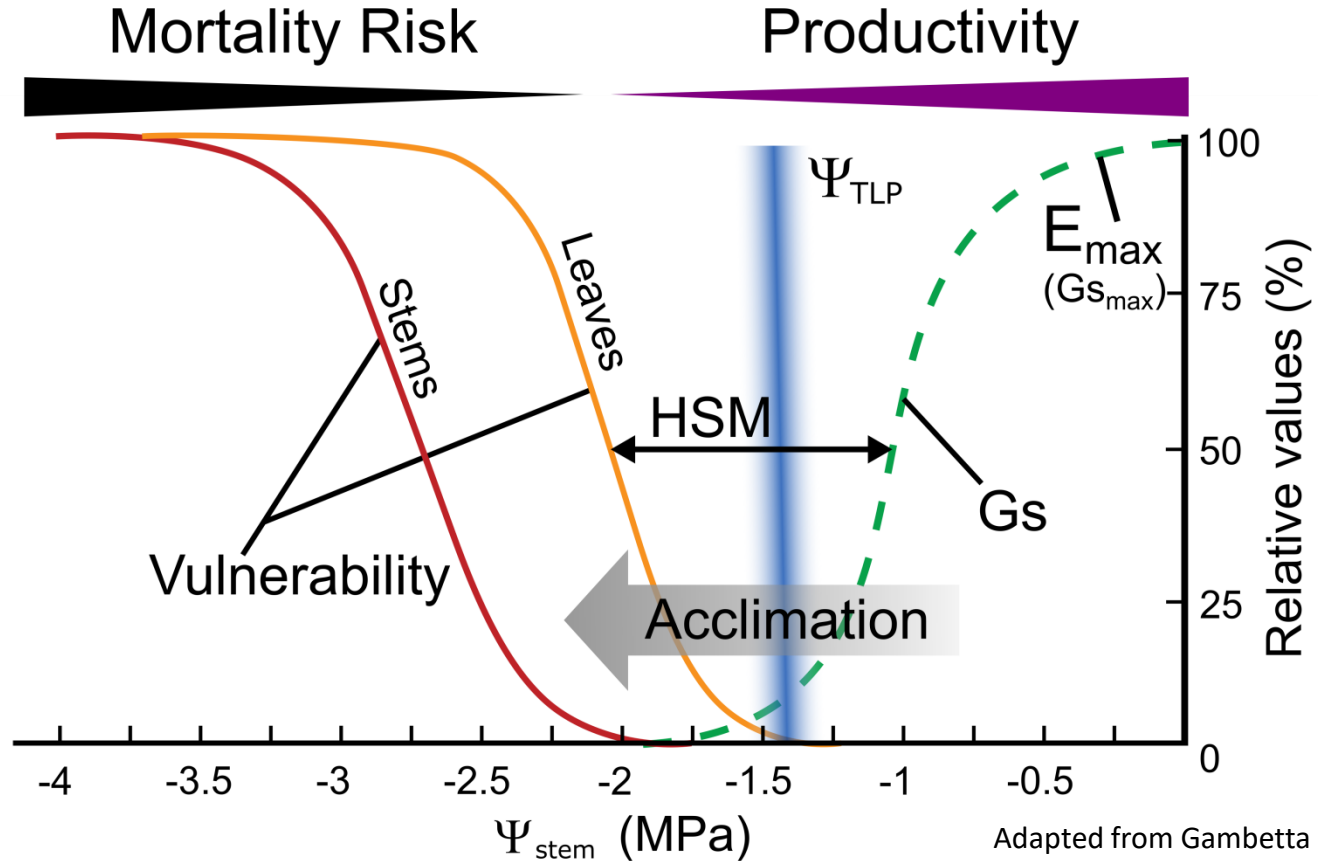
Bortolami adapted from Manion, 1991



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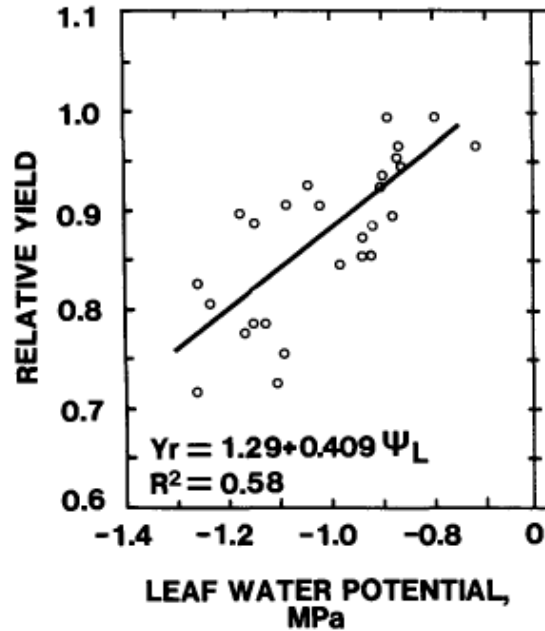
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# Hydraulic integration as traits...

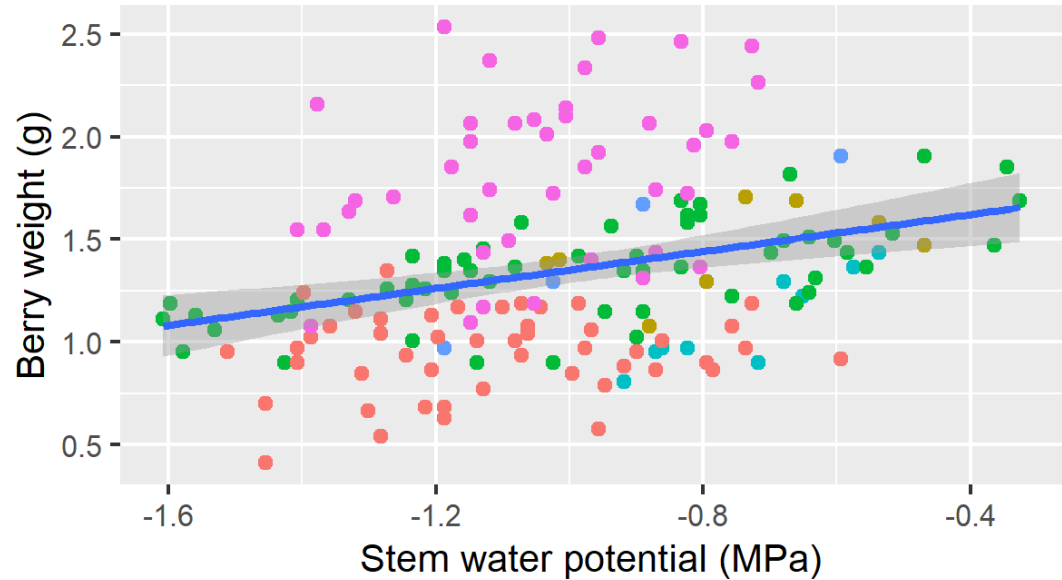




# Water deficit yield declines are nearly linear



Grimes and Williams, 1990



Adapted by Gambetta,  
Mirás-Avalos and Intrigliolo, 2017

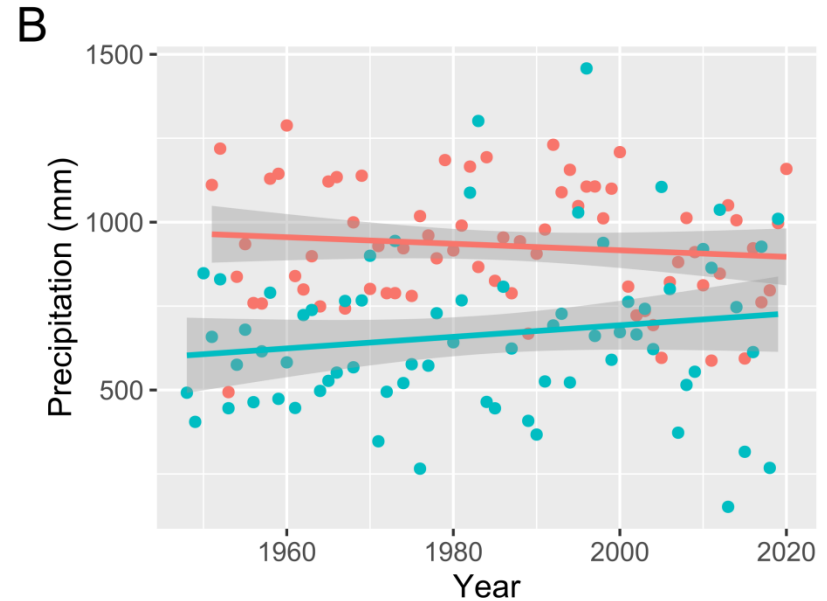
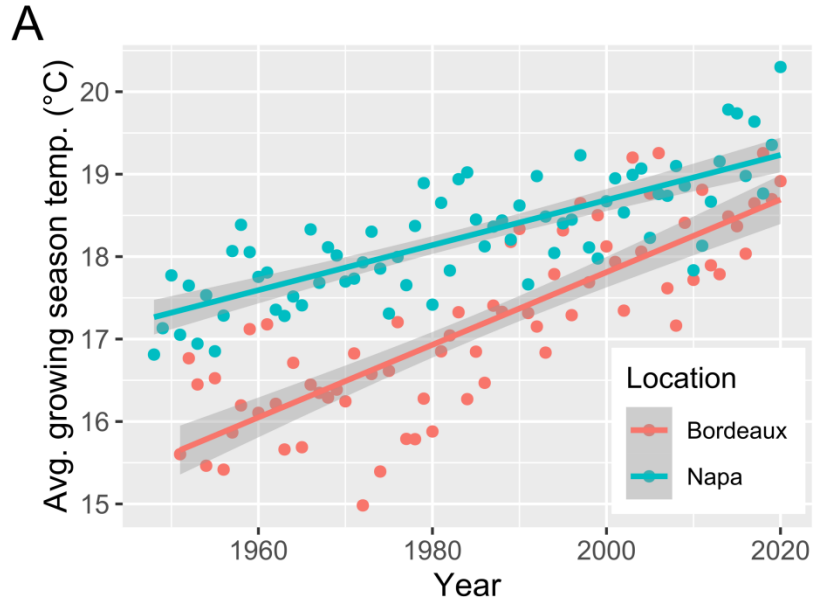
*On average yields decrease about 40% per MPa...*



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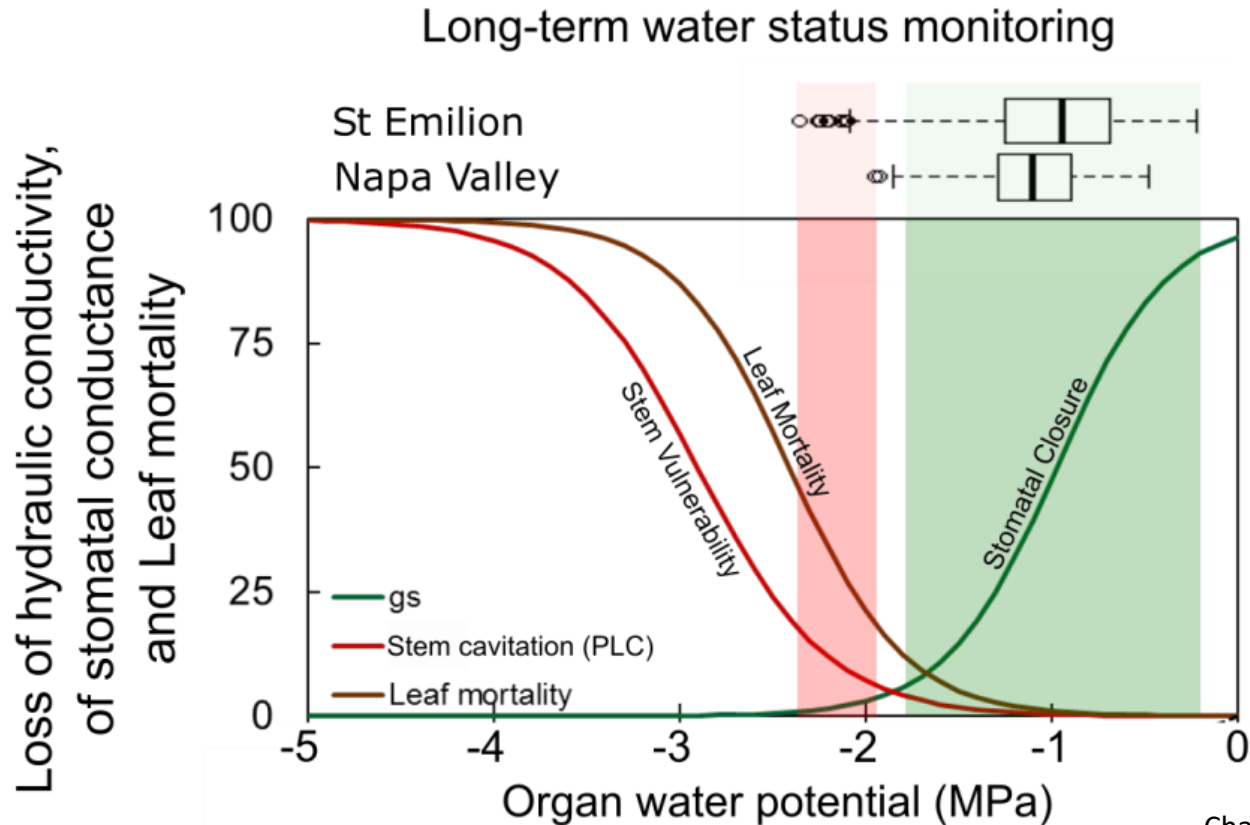
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# Regional differences in water status

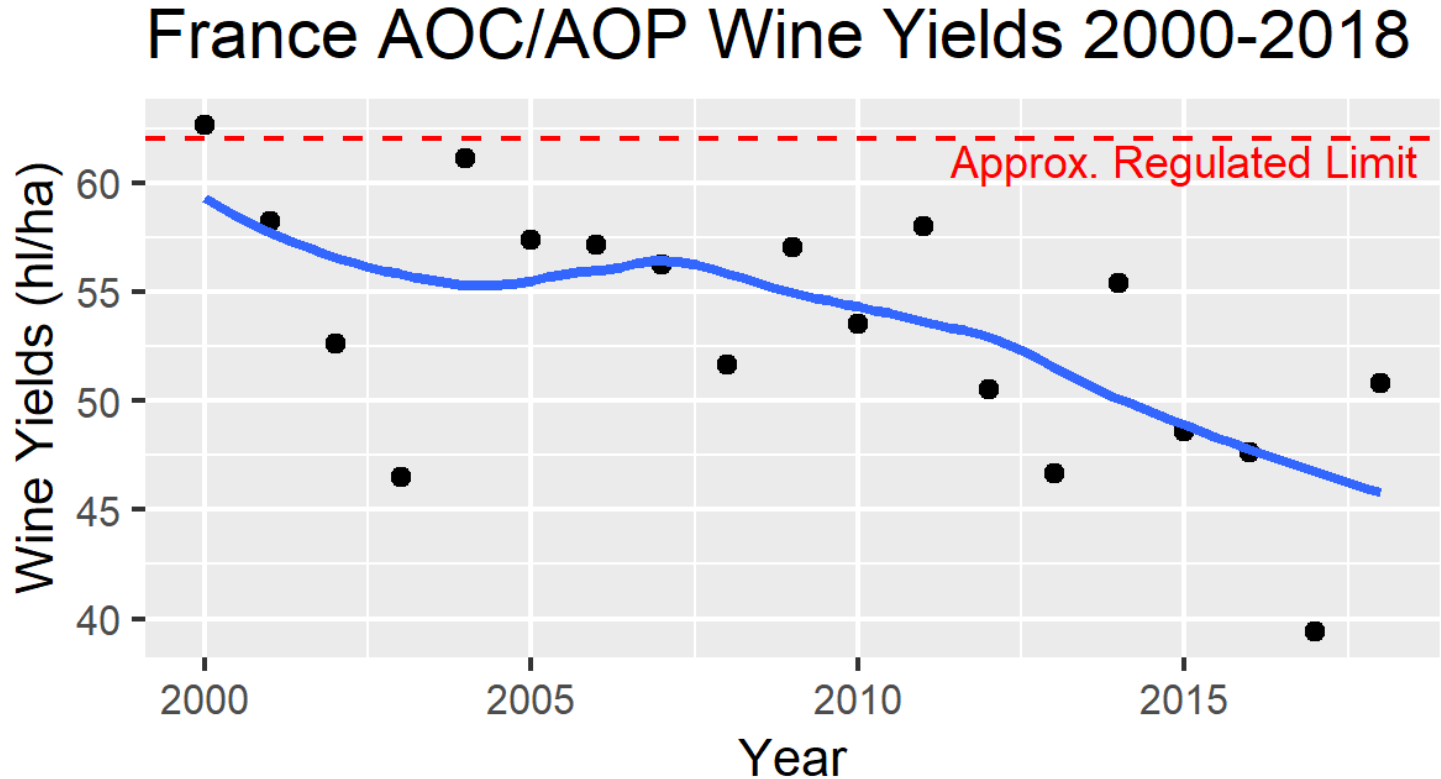


Kurtural & Gambetta, 2021

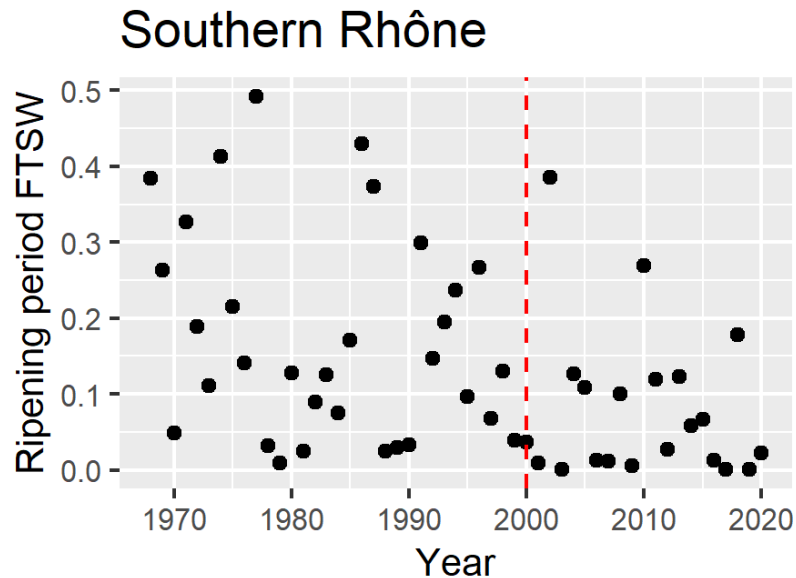
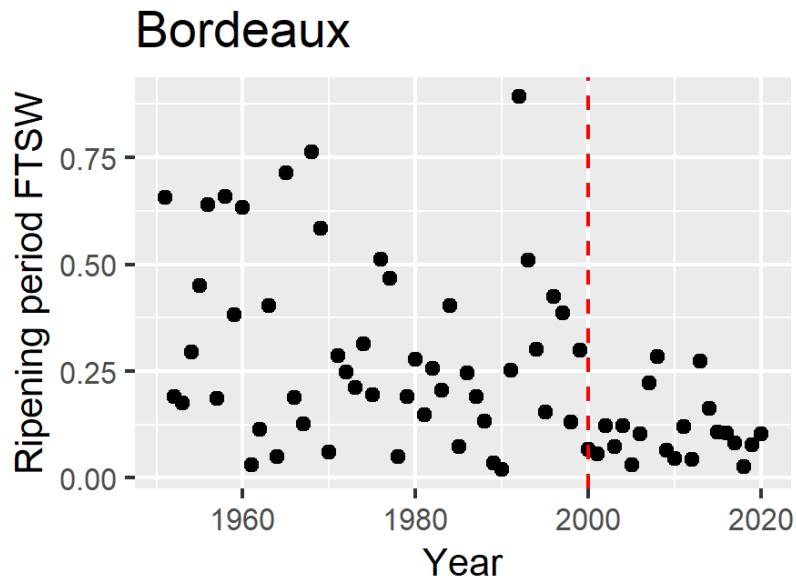
# Regional differences in water status



# Are the frequency of water deficits increasing?



# Are the frequency of water deficits increasing?



Gambetta et al unpublished data





# Conclusions

- Yield declines are insidious because there are multiple causes that interact.
- In dry farmed regions water status can be largely unknown.
- Since yield declines are incremental in response to water stress impacts on yield could be largely unquantified.



# Thank you and questions

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