Landscape scale risk assessment of cyanobacteria blooms in California lakes

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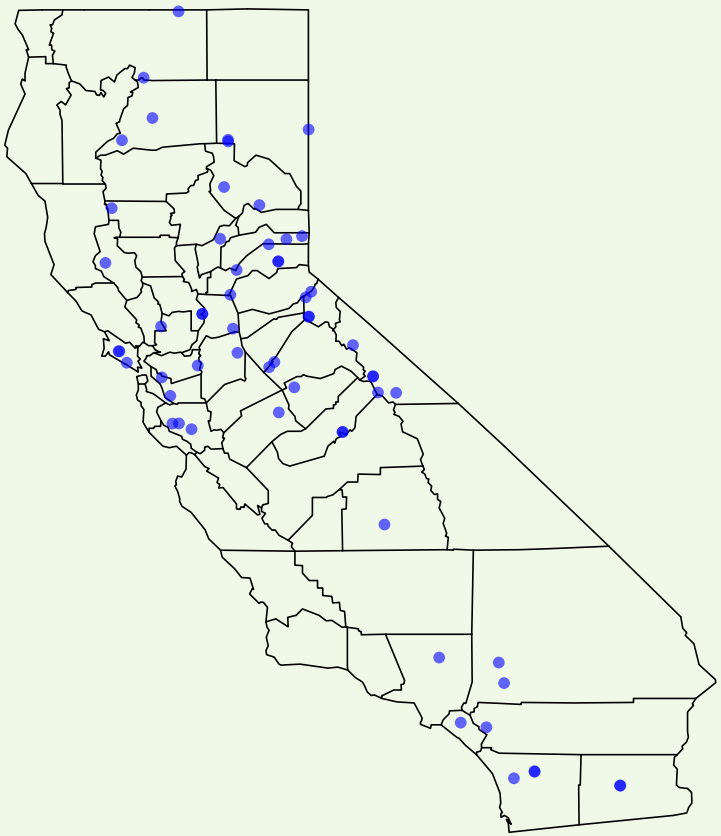
- New situations and HAB organisms
  - Golden algae, *Pyrmnesium parvum*
  - Ubiquitous and year round toxins
  - Cyanotoxins detected in marine shellfish and marine outflows

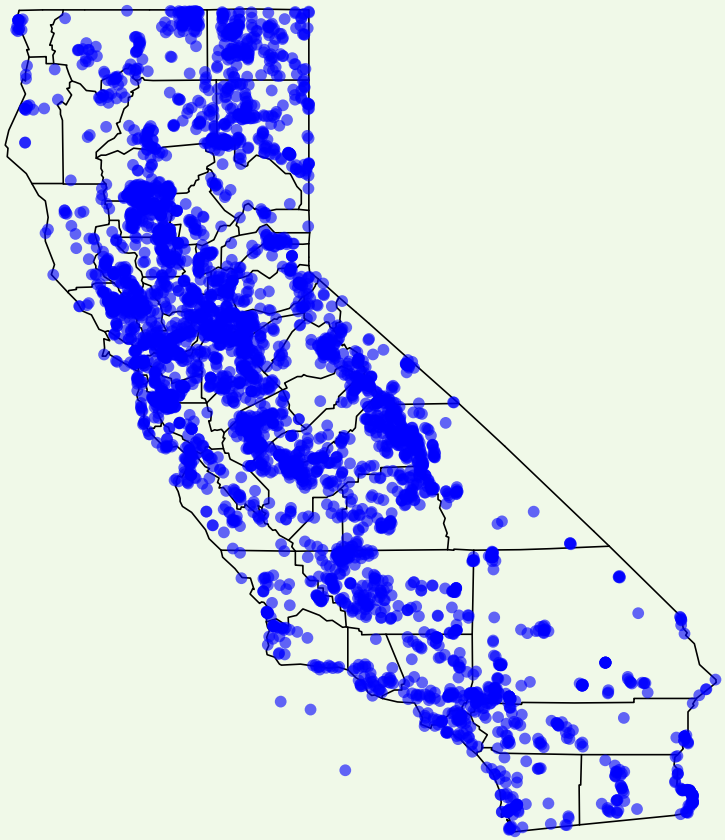
California lakes have a data problem

Limited *in situ* data for California, tons of watershed data

NLA07, NLA12: 59 lakes



LakeCat: 4924 lakes



[USEPA, 2009, USEPA, 2017, Hill et al., 2018]

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Goal: develop screening tool to evaluate the relative risk of HABs in order to prioritize lakes assessment

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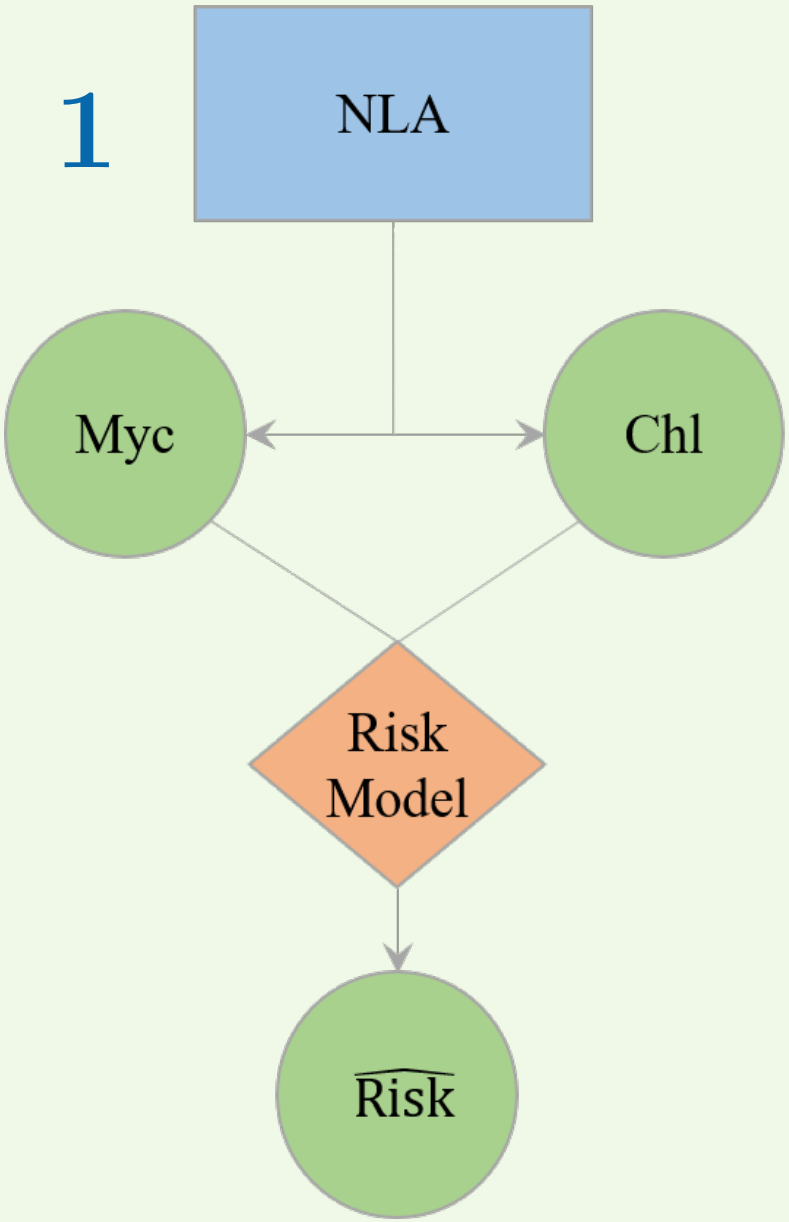
An exercise in diminishing returns...

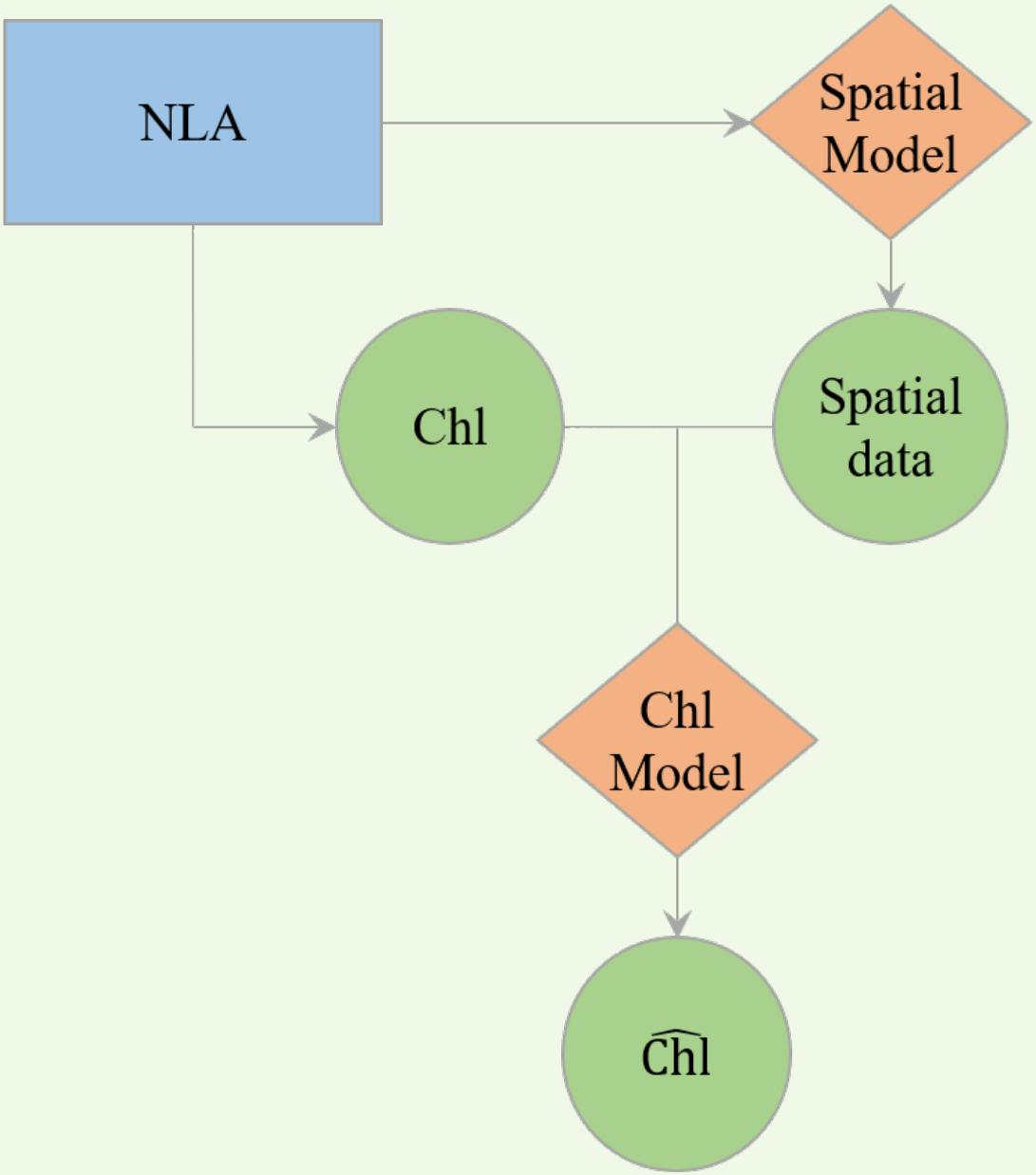
Modelling approach



Link between chlorophyll and microcystin

Modelling approach

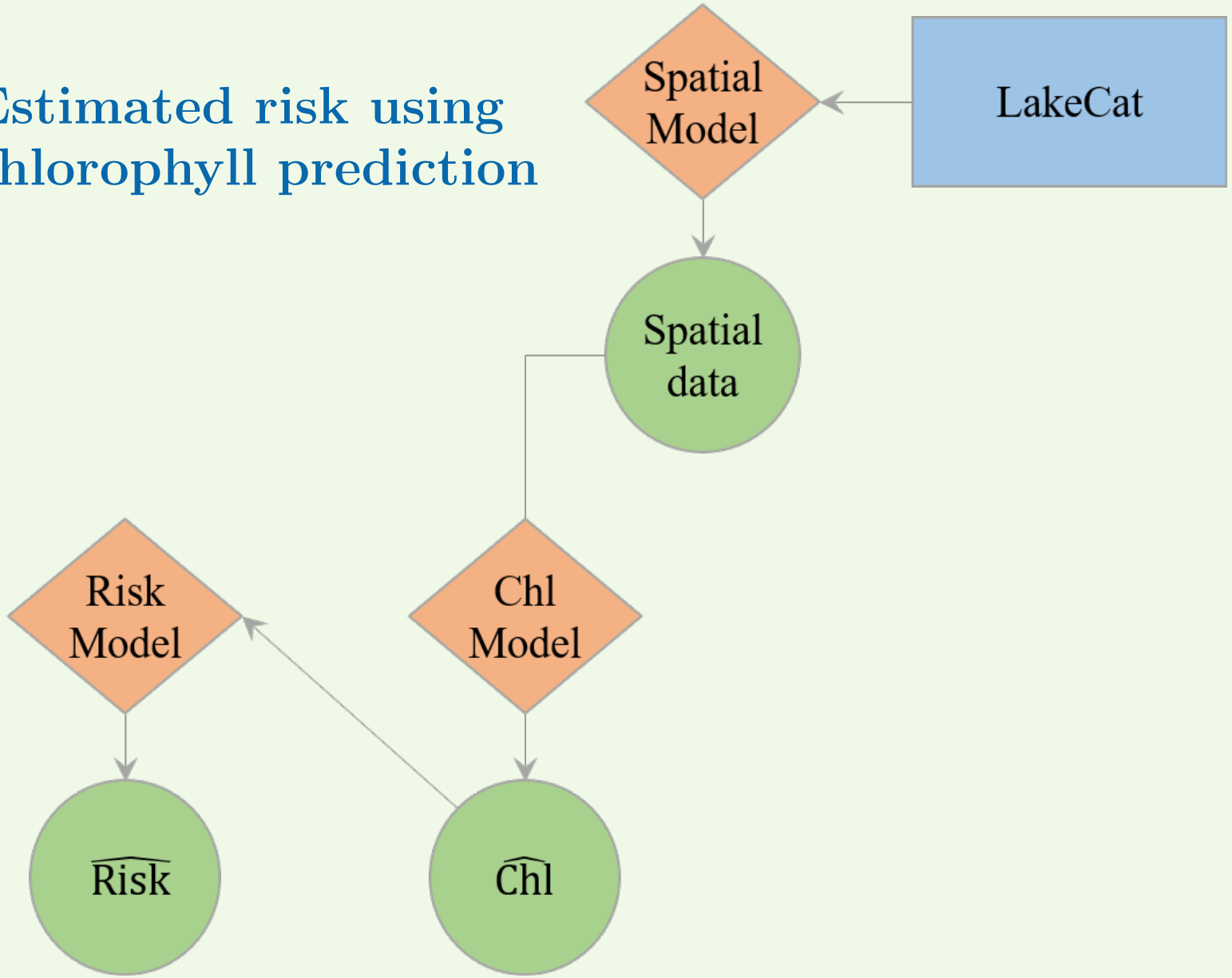
2



Link between chlorophyll and location

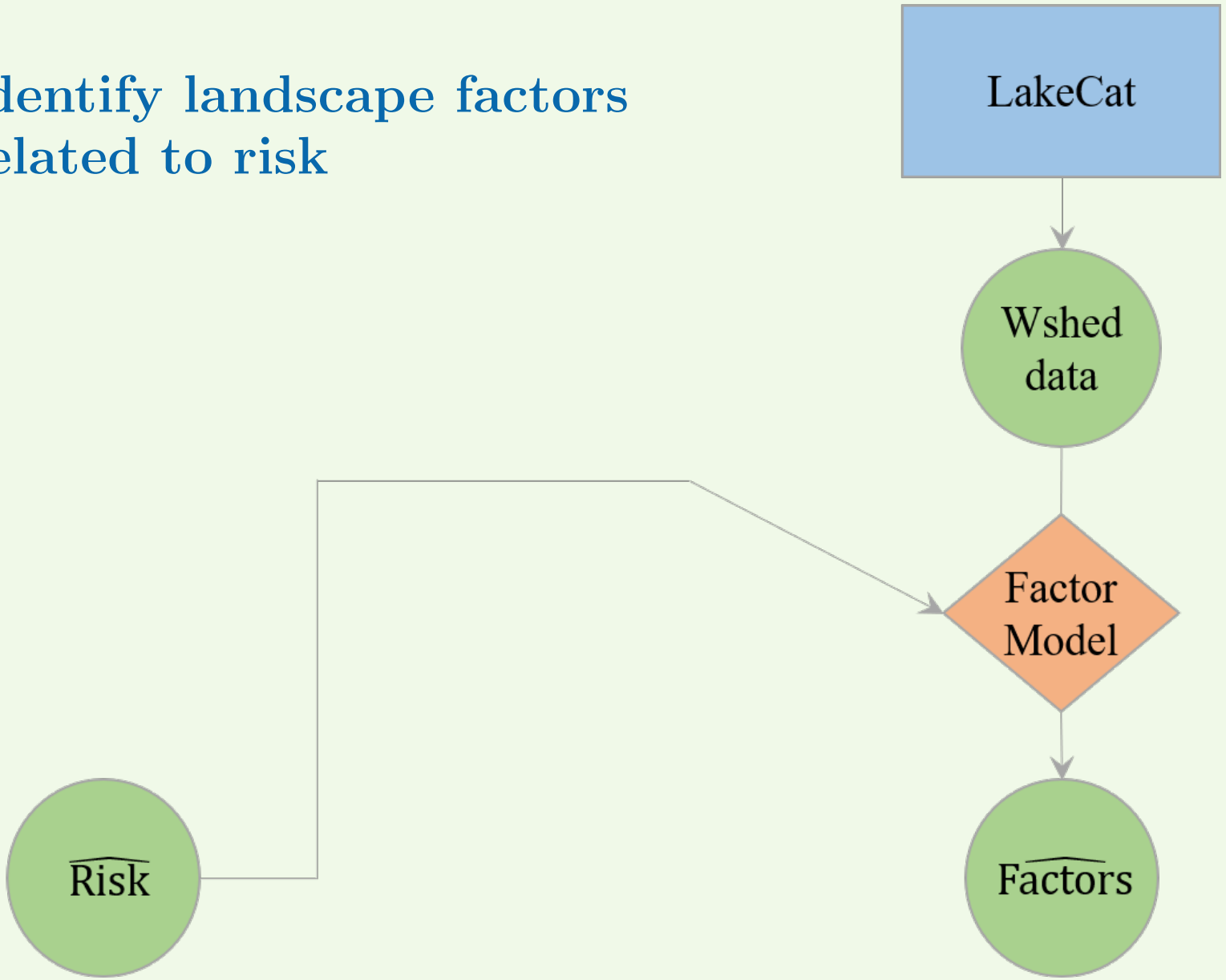
Modelling approach

3 Estimated risk using chlorophyll prediction



Modelling approach

4 Identify landscape factors related to risk



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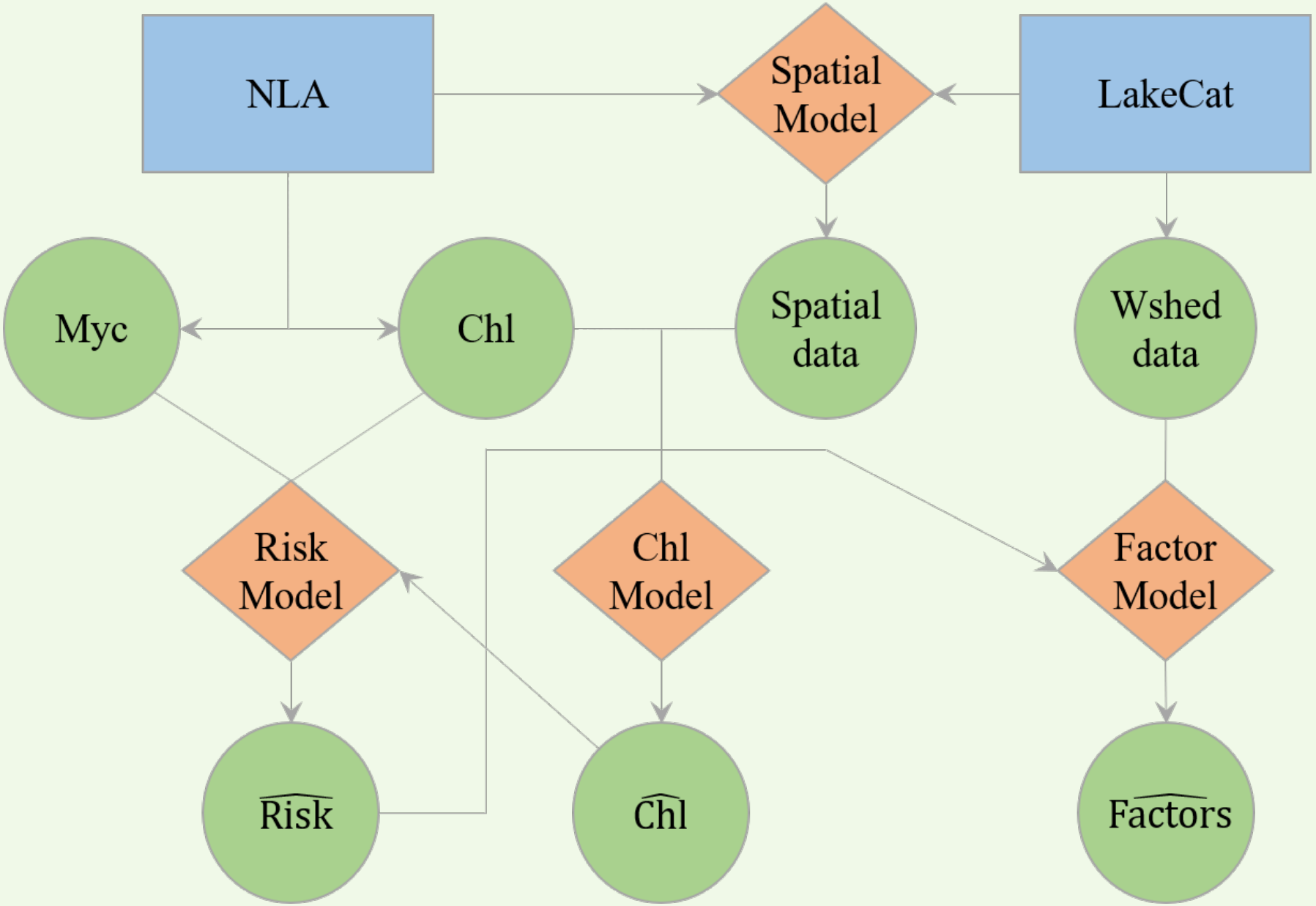
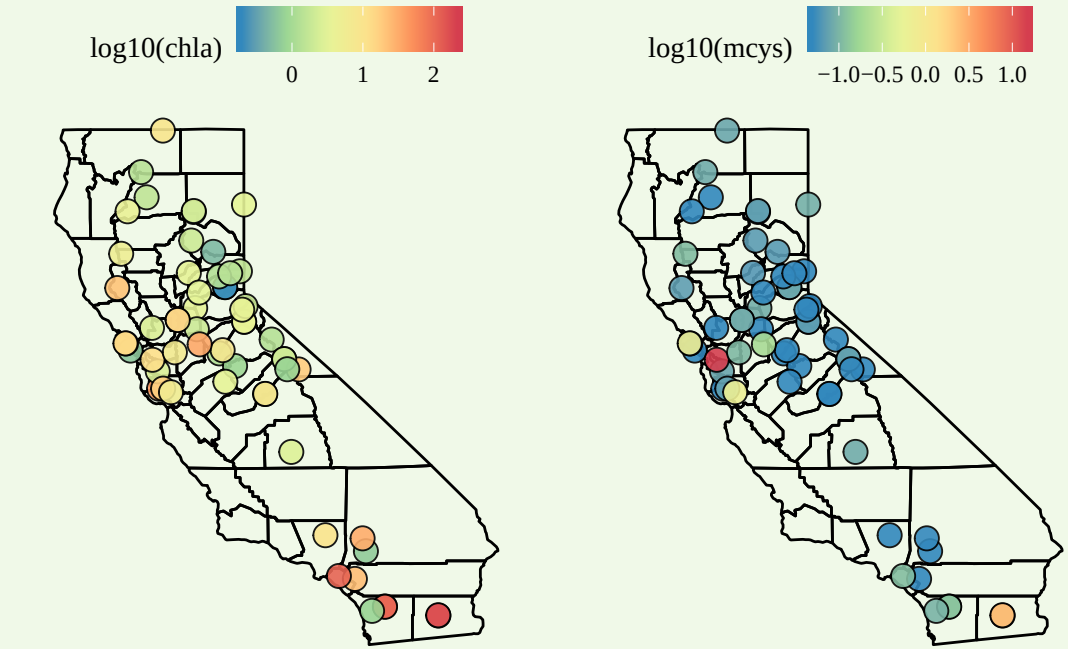
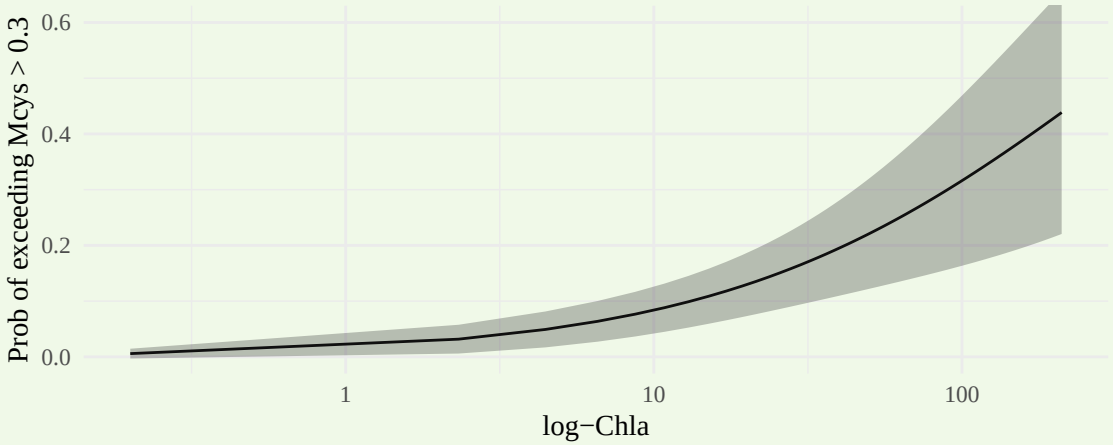


1) Link between chlorophyll and microcystin

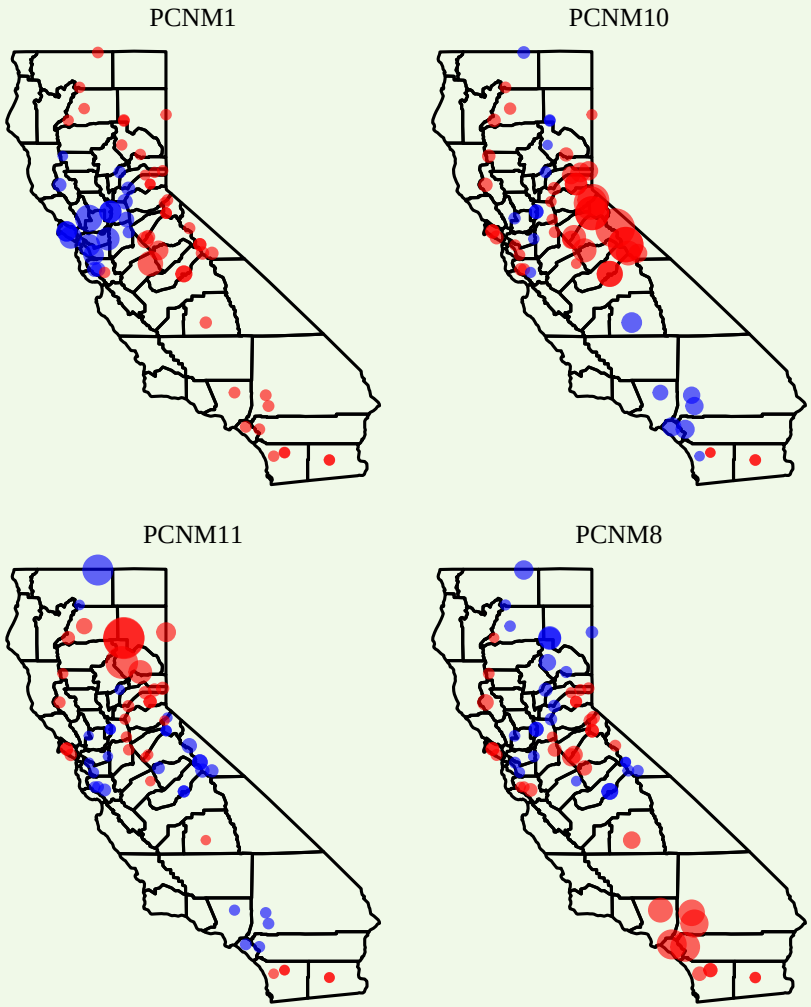


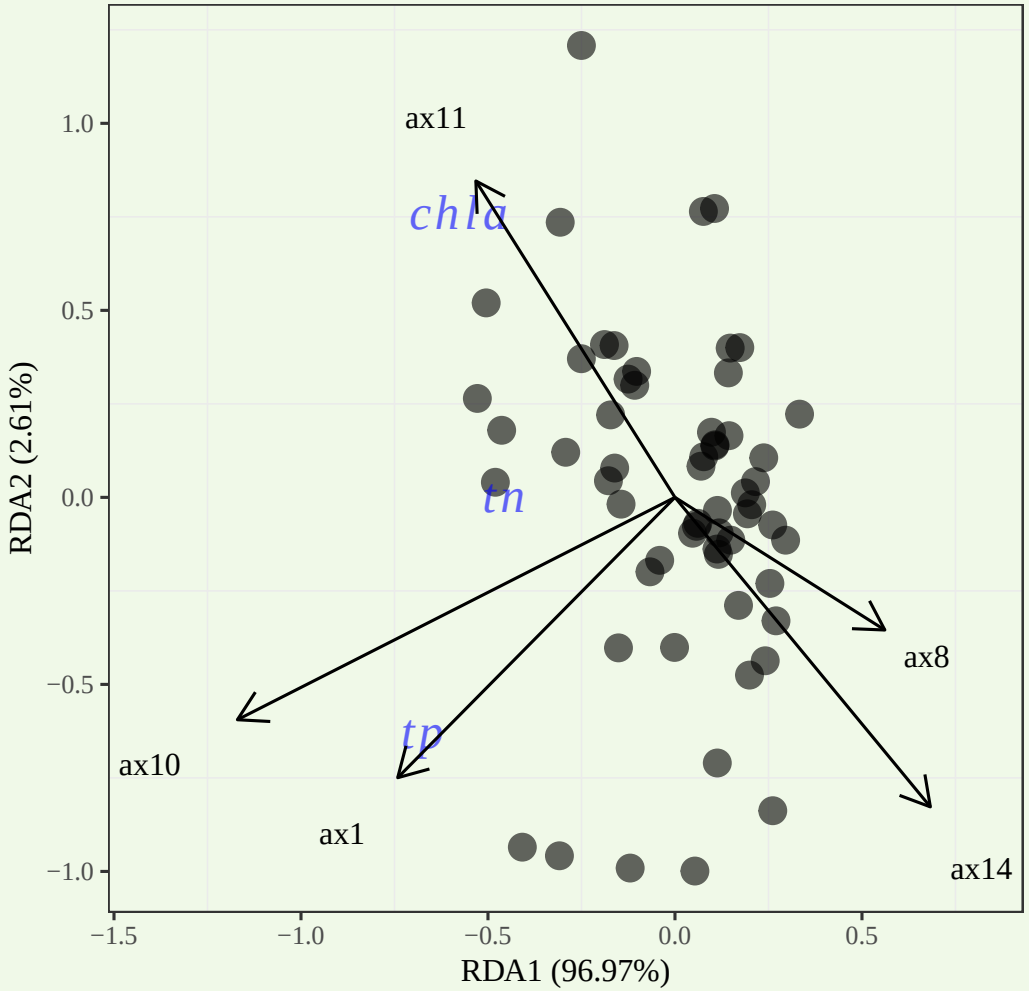


- *In situ* NLA data as probabilistic survey
- Build a simple model of the likelihood of exceeding some threshold
- Define a criteria threshold, arbitrary at this point

2) Link between chlorophyll and location

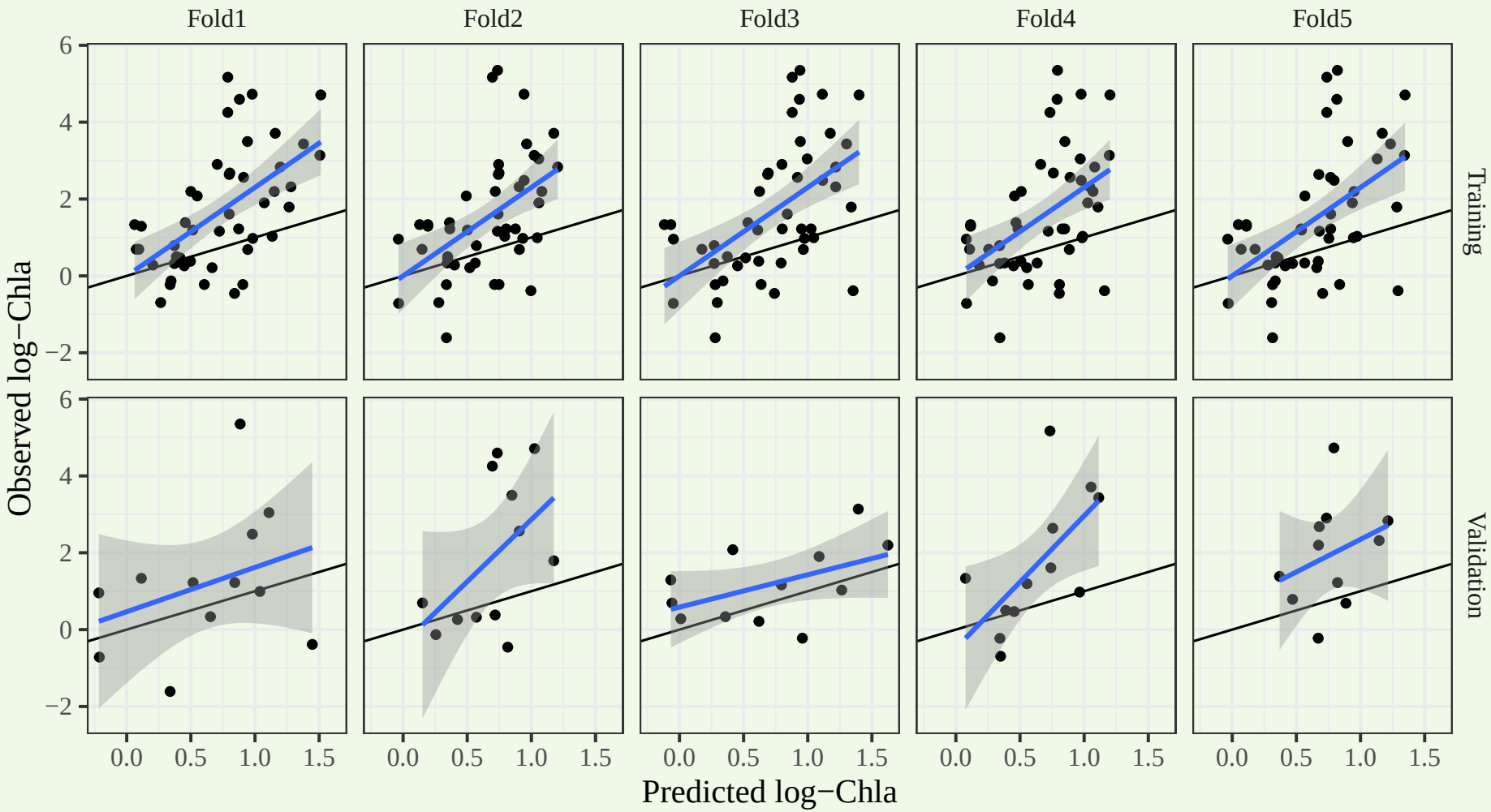
Using a spatial model to predict chlorophyll from lat/lon





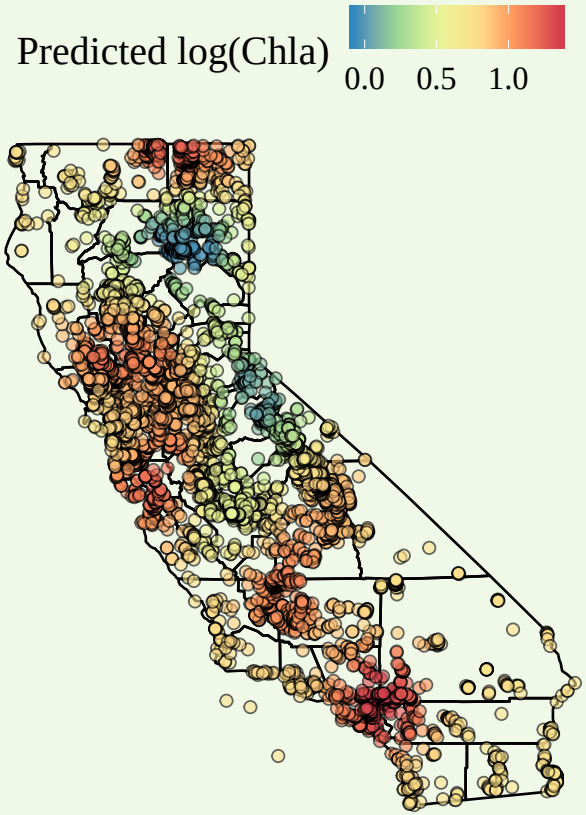
2) Link between chlorophyll and location

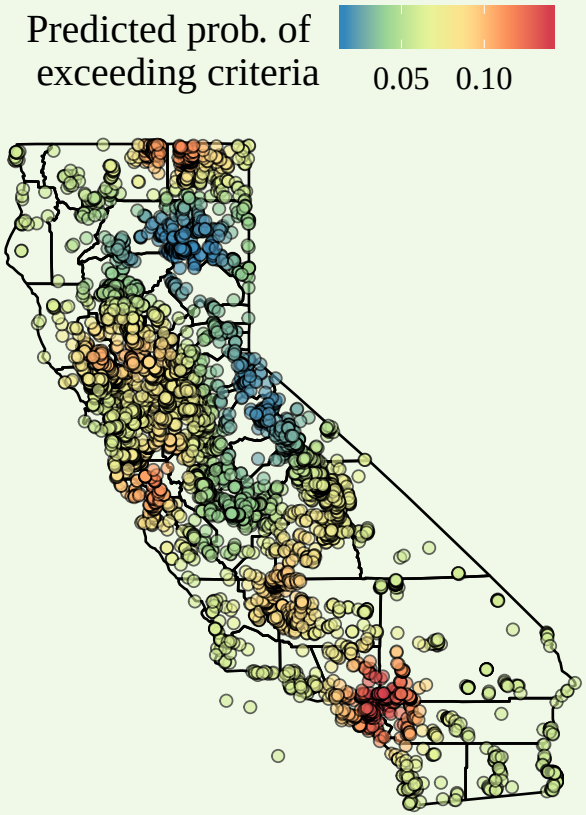
Predicted chlorophyll from location seems okay

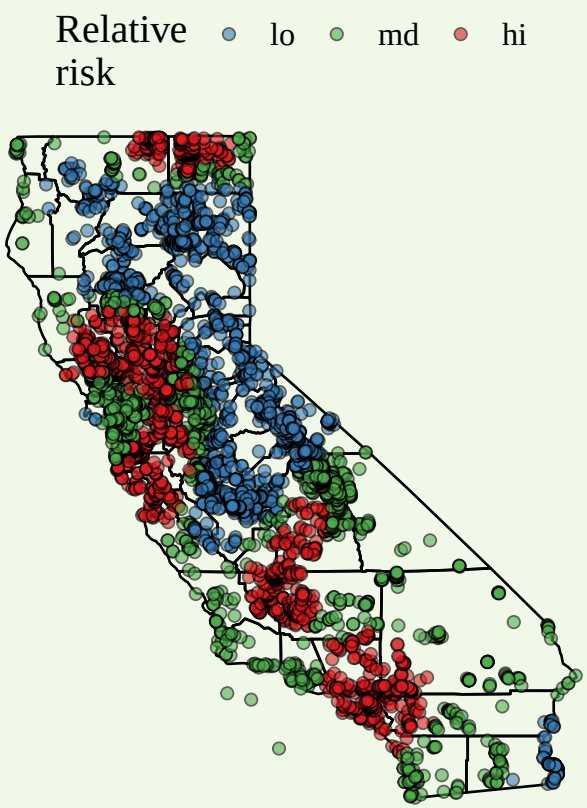


3) Estimated risk from chla prediction

Use predicted chlorophyll to estimate probability of exceeding threshold, categorize relative risk

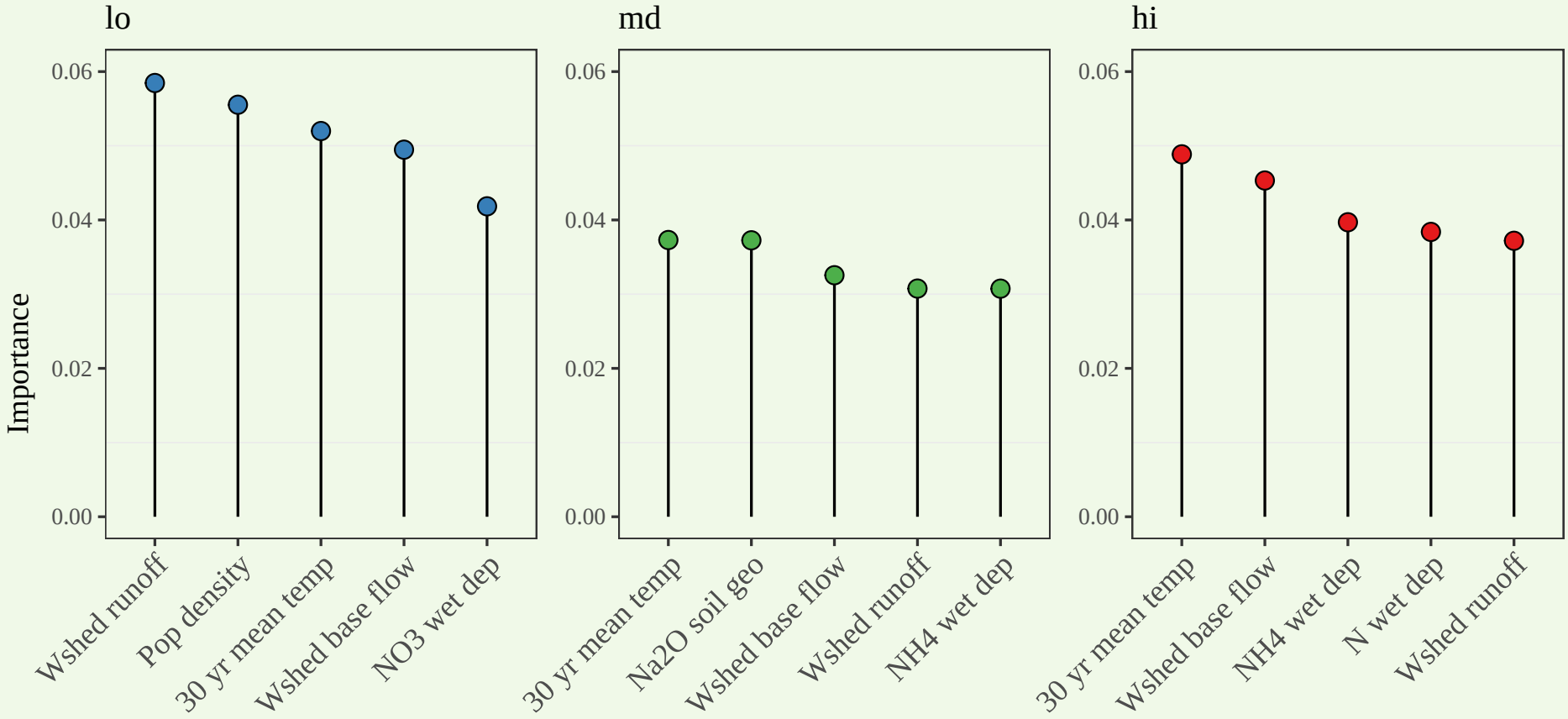






4) Identify landscape factors related to risk

Top five most important watershed factors linked to risk categories



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A vision for lake bioassessment in CA

- Despite limited data, we effectively screened lakes by HAB risk
- Relatively low risk in the Sierra Nevada, North Coasts, portions of Central Valley
- Higher risk in Chapparal, Desert, Urban centers
- Landscape position is a potentially powerful predictor of water quality



A vision for lake bioassessment in CA

- Alternative data acquisition can be explored to further assess risk
- Additional *in situ* and probabilistic sampling needed
- Leverage both for rapid response to bloom incidence

https://www.epa.gov/water-research/cyanobacteria-assessment-network-cyan

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Funding sources and contact:

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GitHub (project): https://github.com/fawda123/cali_lake

GitHub (presentation): https://github.com/fawda123/SFS_2018

Twitter: @fawda123

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