Landscape scale risk assessment of cyanobacteria blooms in California lakes

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Bioassessment in California

Wadeable streams are covered statewide

- Reference sites [Ode et al., 2016]
- Macroinvertebrate, algal integrity [Mazor et al., 2016], [Theroux et al., in prep]
- Expectations of constraints [Beck et al., in prep]
- Recent proposal of biological standards



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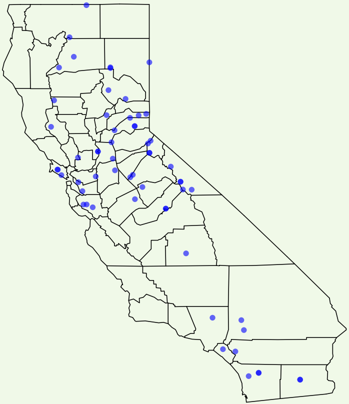
Goal: evaluate the relative risk of lakes in California of exceeding a eutrophication endpoint that is related to bloom occurrence

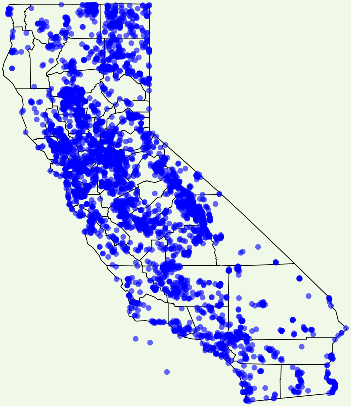
Available data

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]

Modelling approach

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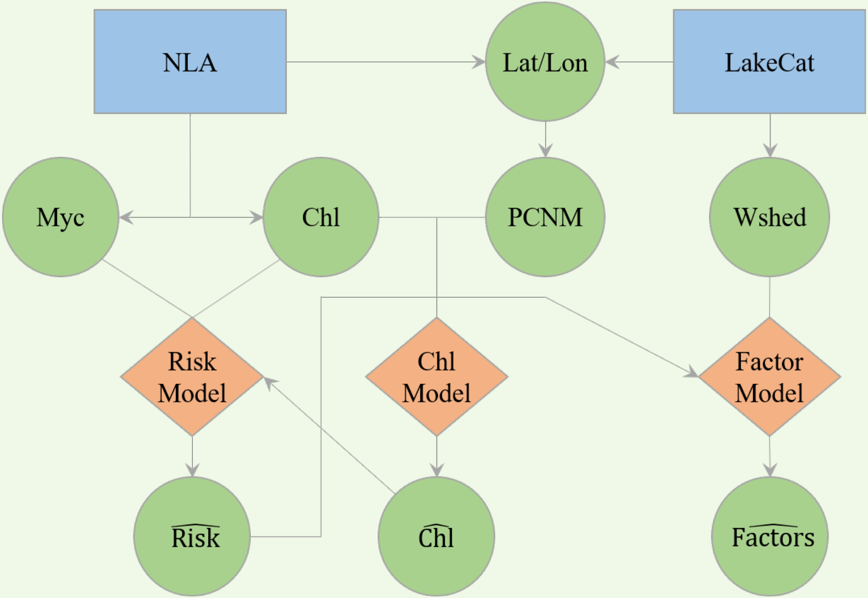
An exercise in diminishing returns...

Modelling approach



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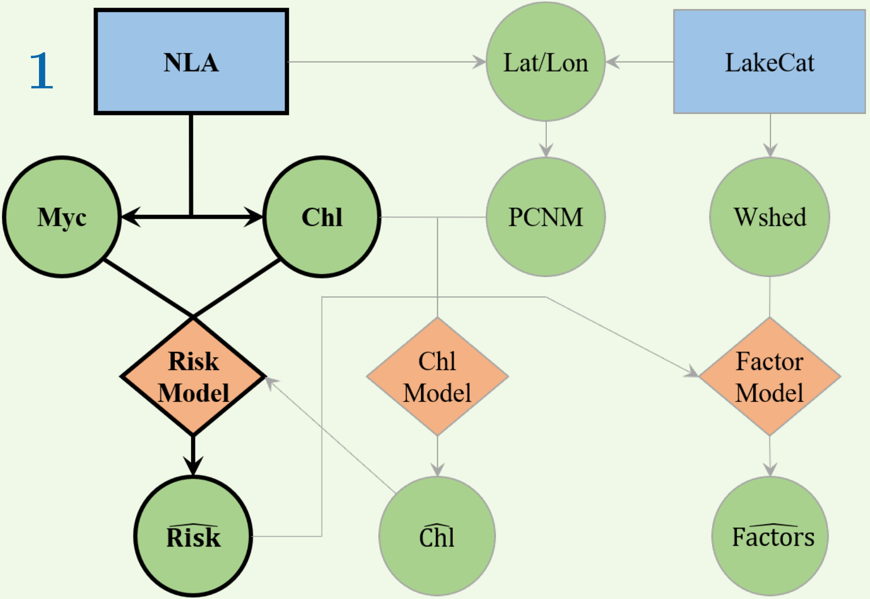
NLA
Lat/Lon
LakeCat
Myc
Chl
PCNM
Wshed
Risk Model
Chl Model
Factor Model
$\widehat{\text{Risk}}$
$\widehat{\text{Chl}}$
$\widehat{\text{Factors}}$

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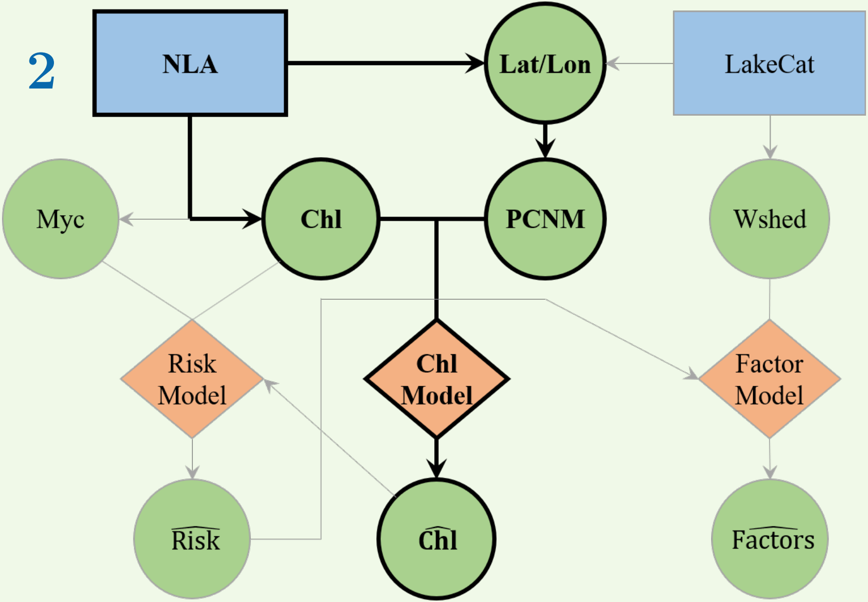

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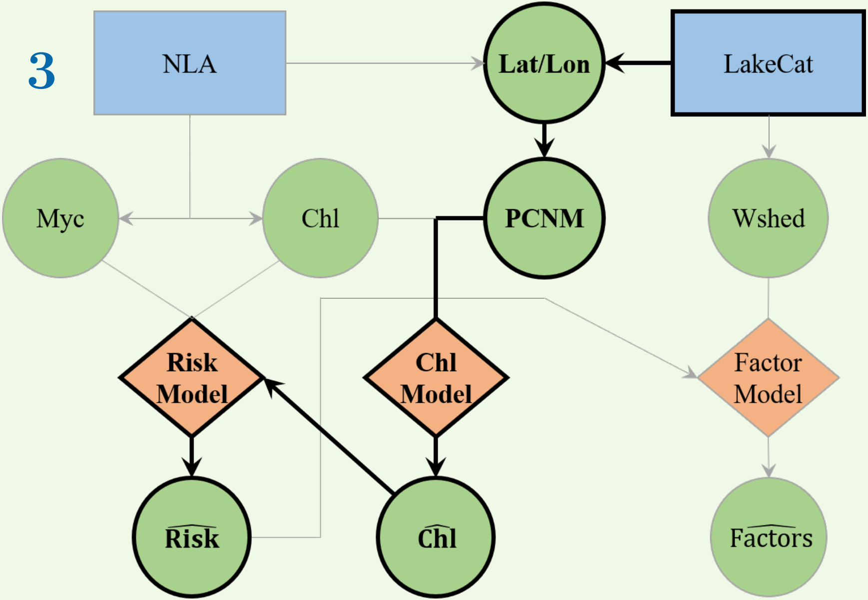

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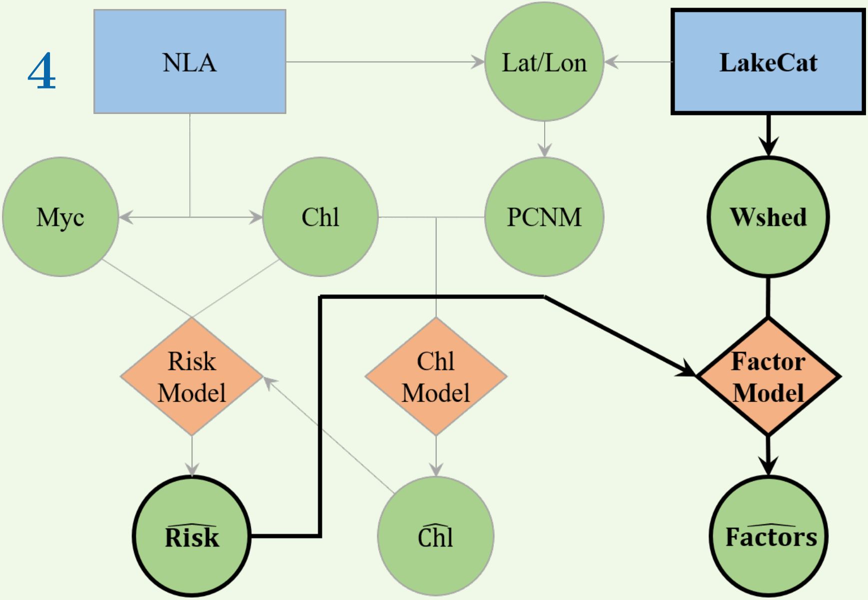

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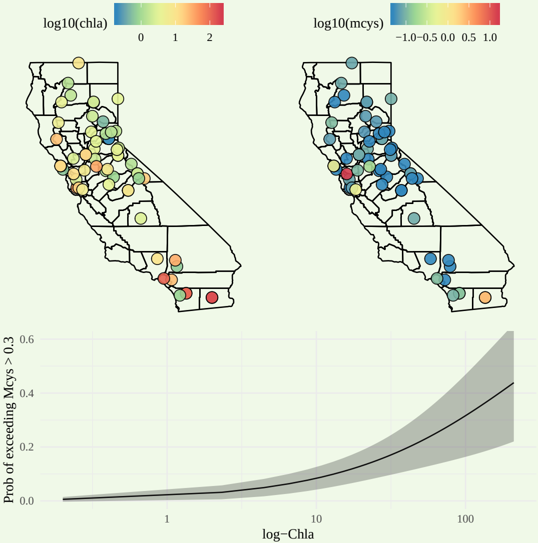
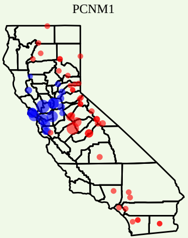
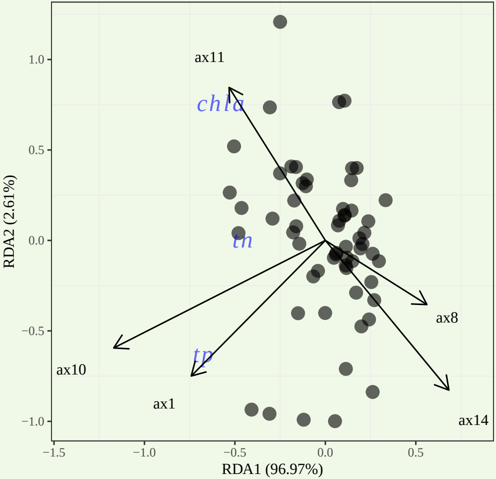


- *In situ* NLA data
- Build a simple model of the likelihood of exceeding some threshold
- WHO criteria for children drinking water

2) Link between chlorophyll and location

Making data using a spatial PCA





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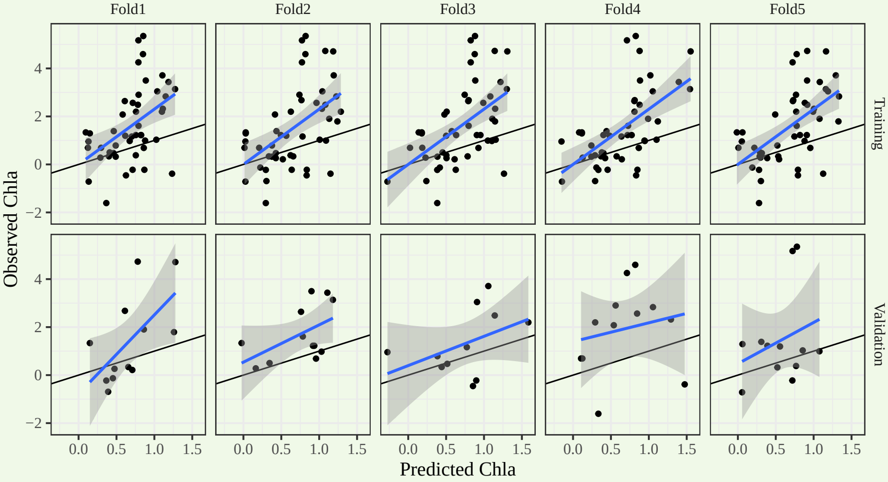
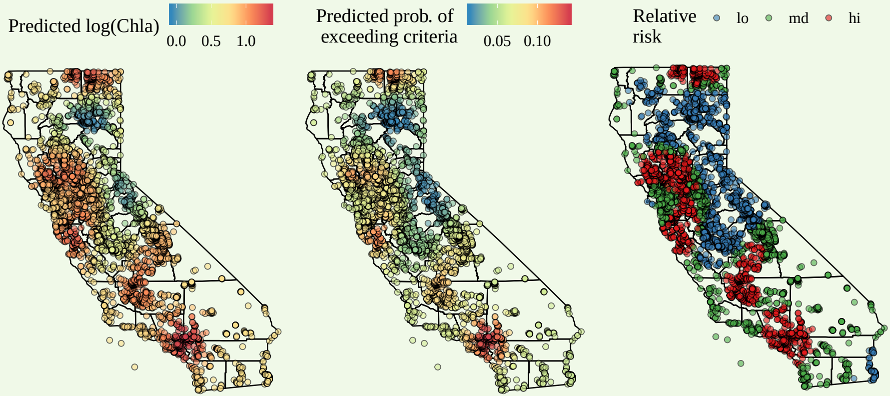
Predicted chlorophyll from location seems okay



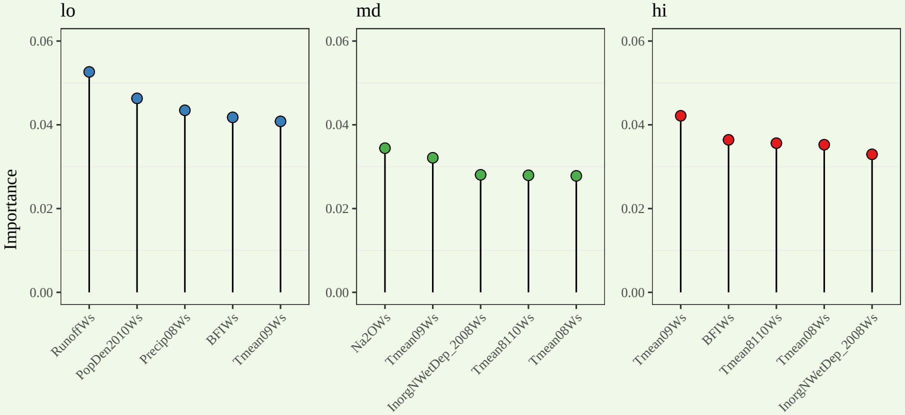
3) Estimated risk from chla prediction

An additional leap: Use predicted chlorophyll from landscape model, estimate predicted probability of exceeding threshold, categorize relative risk



4) Identify landscape factors that explain risk

Top five most important watershed factors explaining the relative risk categories



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- National level products can be leveraged for exploratory analysis

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- National level products can be leveraged for exploratory analysis
- Chlorophyll could be used as an assessment endpoint of HAB risk
- Landscape position is a potentially powerful predictor of water quality
- HAB risks are relatively low statewide, but possibly a byproduct of the model



Issues and future work

This is a very simplistic model wrought with assumptions, good for exploration but not on a case basis

Alternative data acquisition can be explored:

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

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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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