Landscape scale risk assessment of cyanobacteria blooms in California lakes

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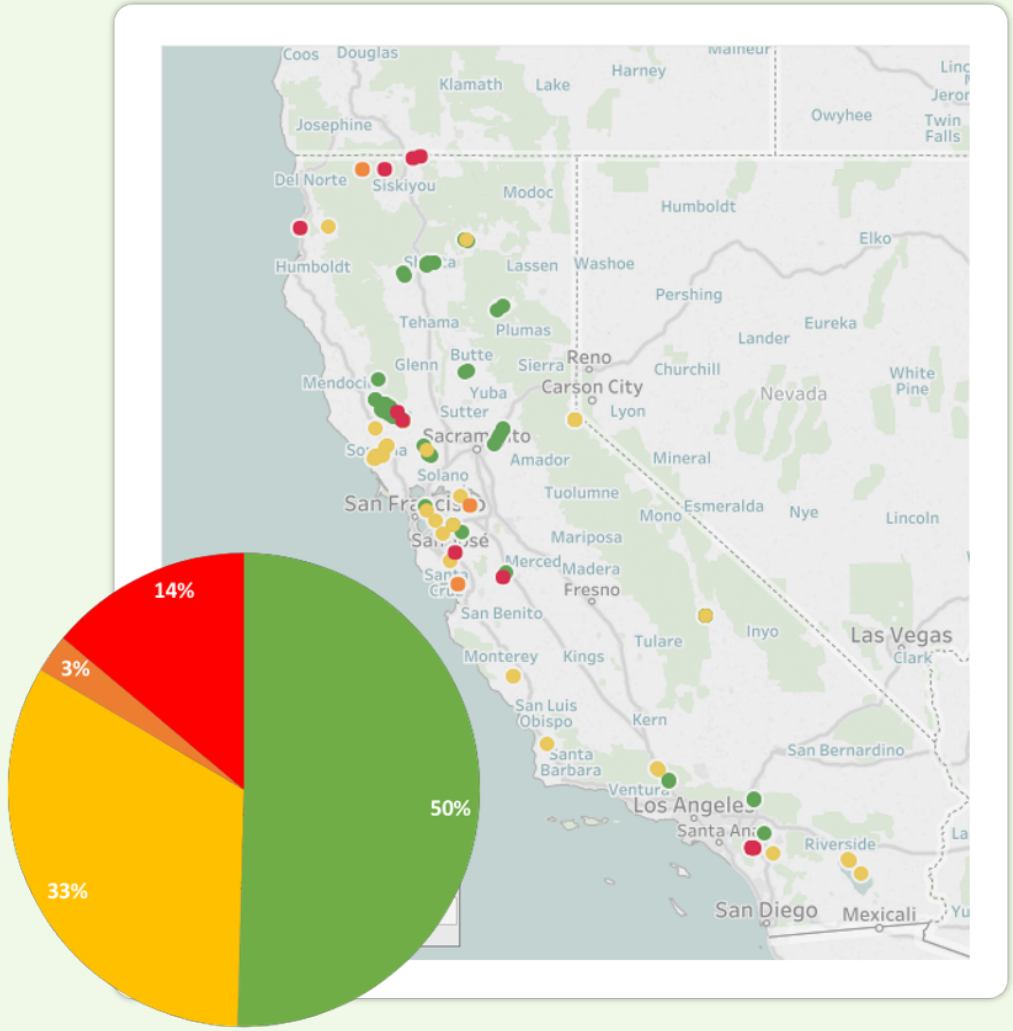
California lakes have a HAB problem

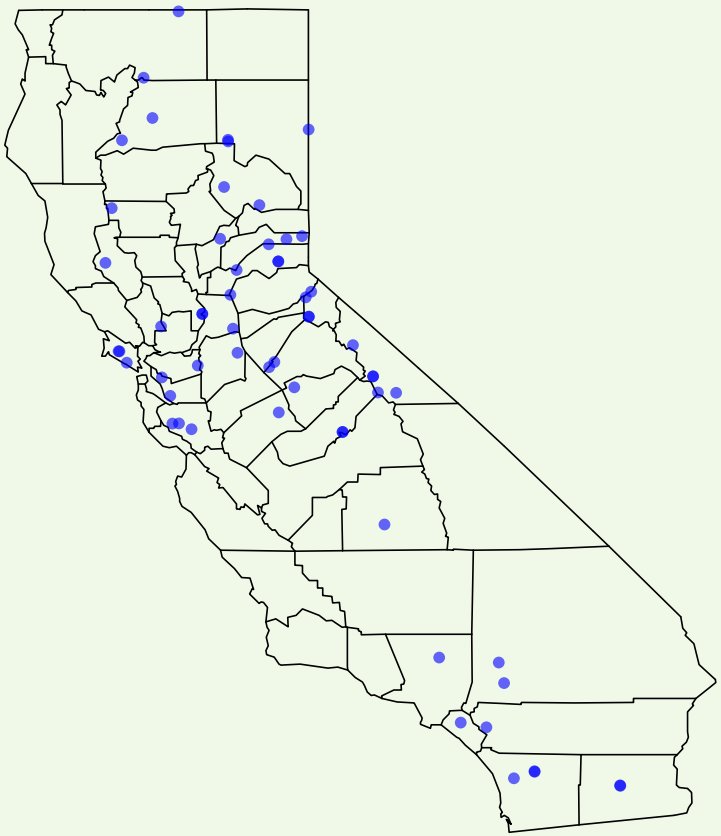
- 2017 targeted sampling on Labor Day revealed a problem
- Over half of sampled lakes exceeded a proposed recreational criteria



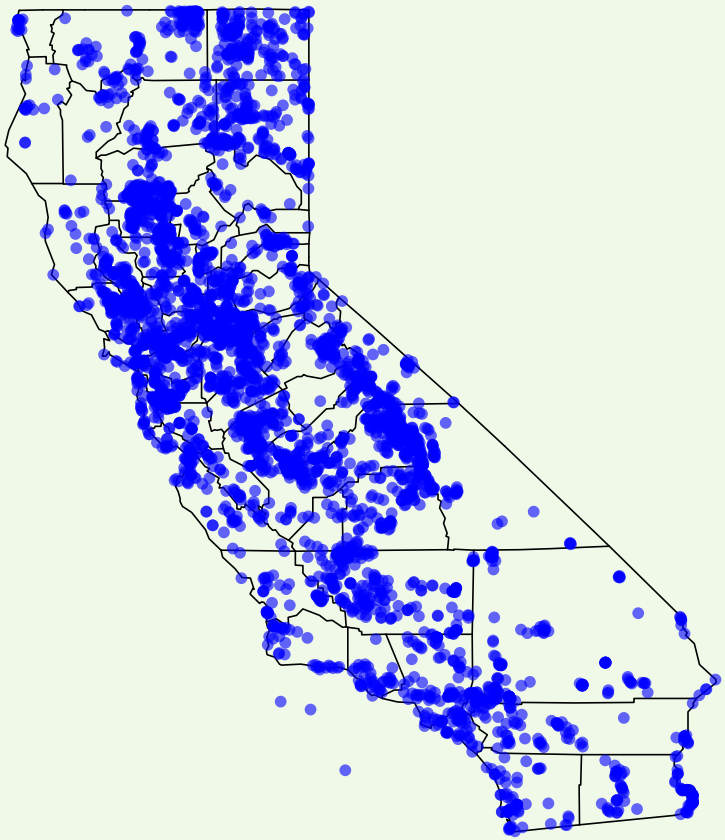
California lakes have a data problem

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]

Develop a screening tool for HAB risk

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Goal: develop screening tool to evaluate the relative risk of lakes exceeding a eutrophication endpoint related to bloom occurrence

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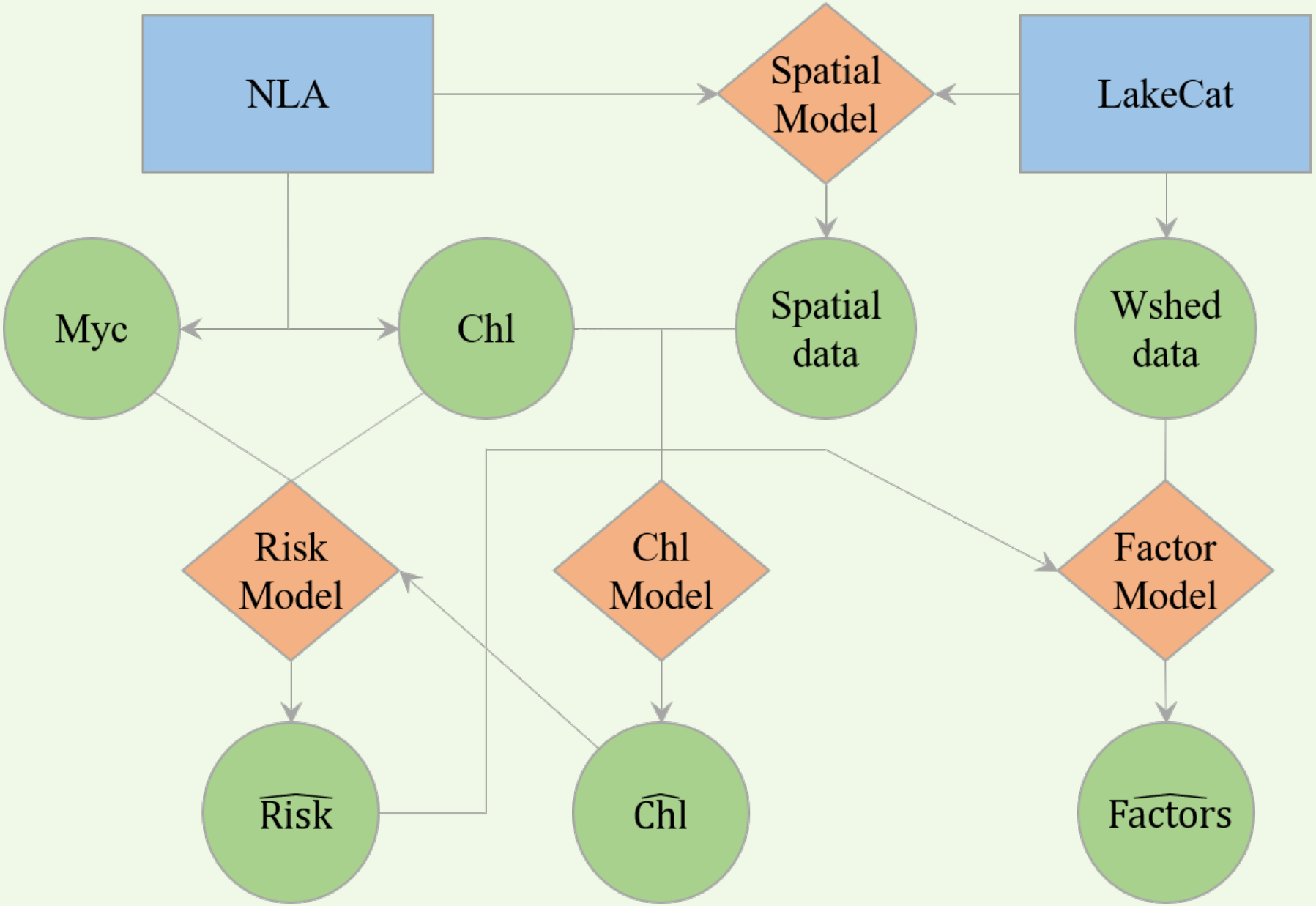
An exercise in diminishing returns...

Modelling approach



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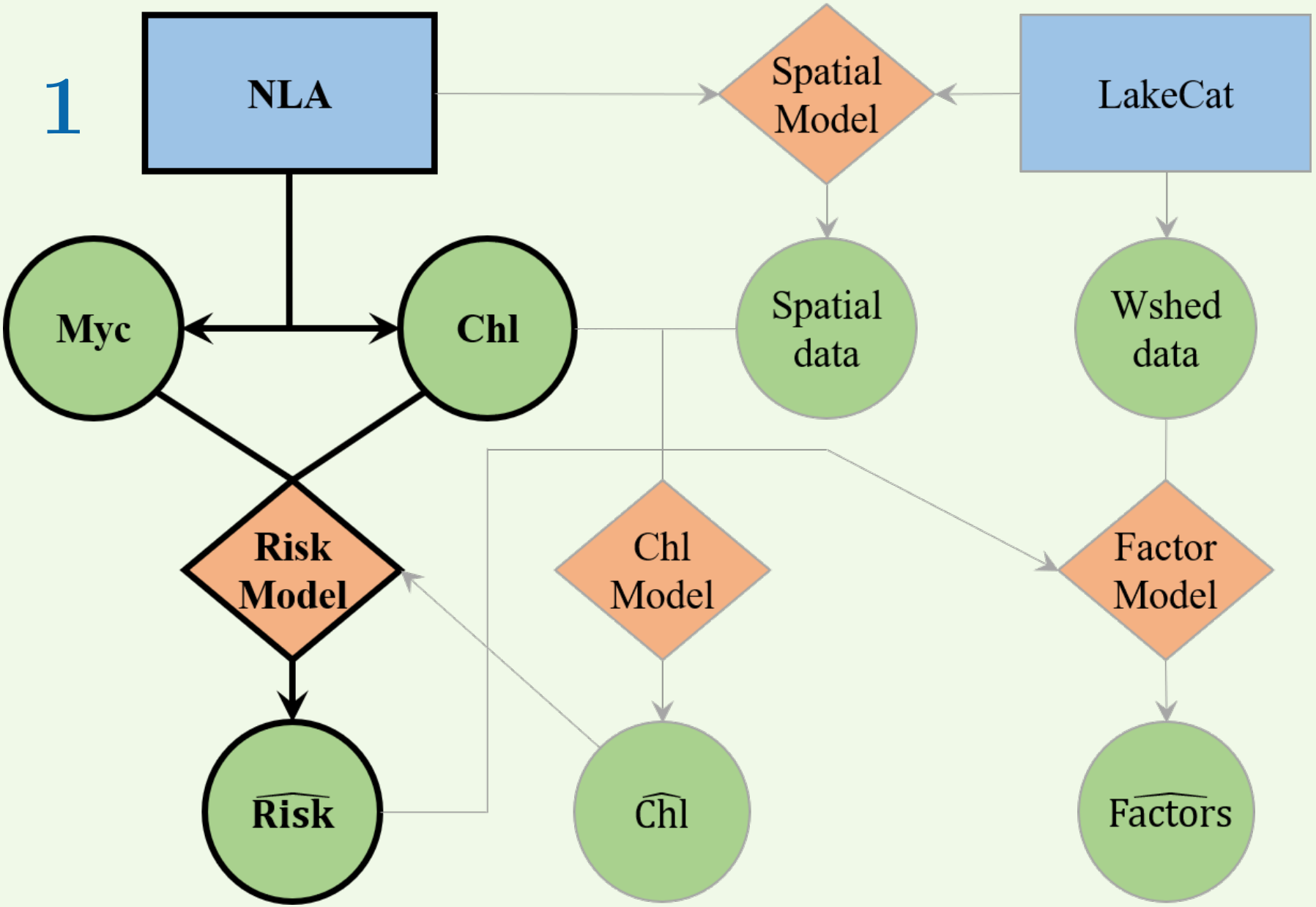

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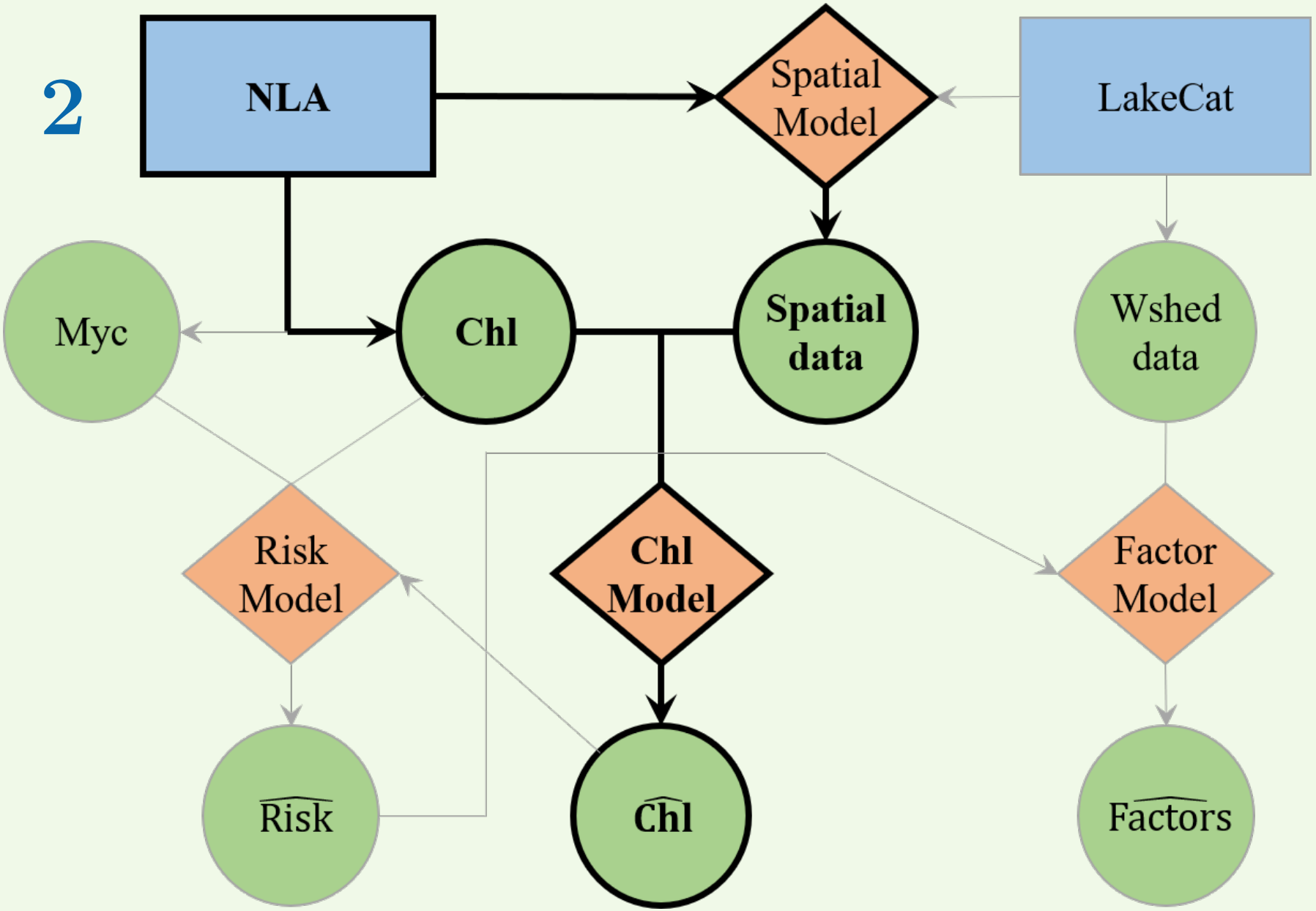

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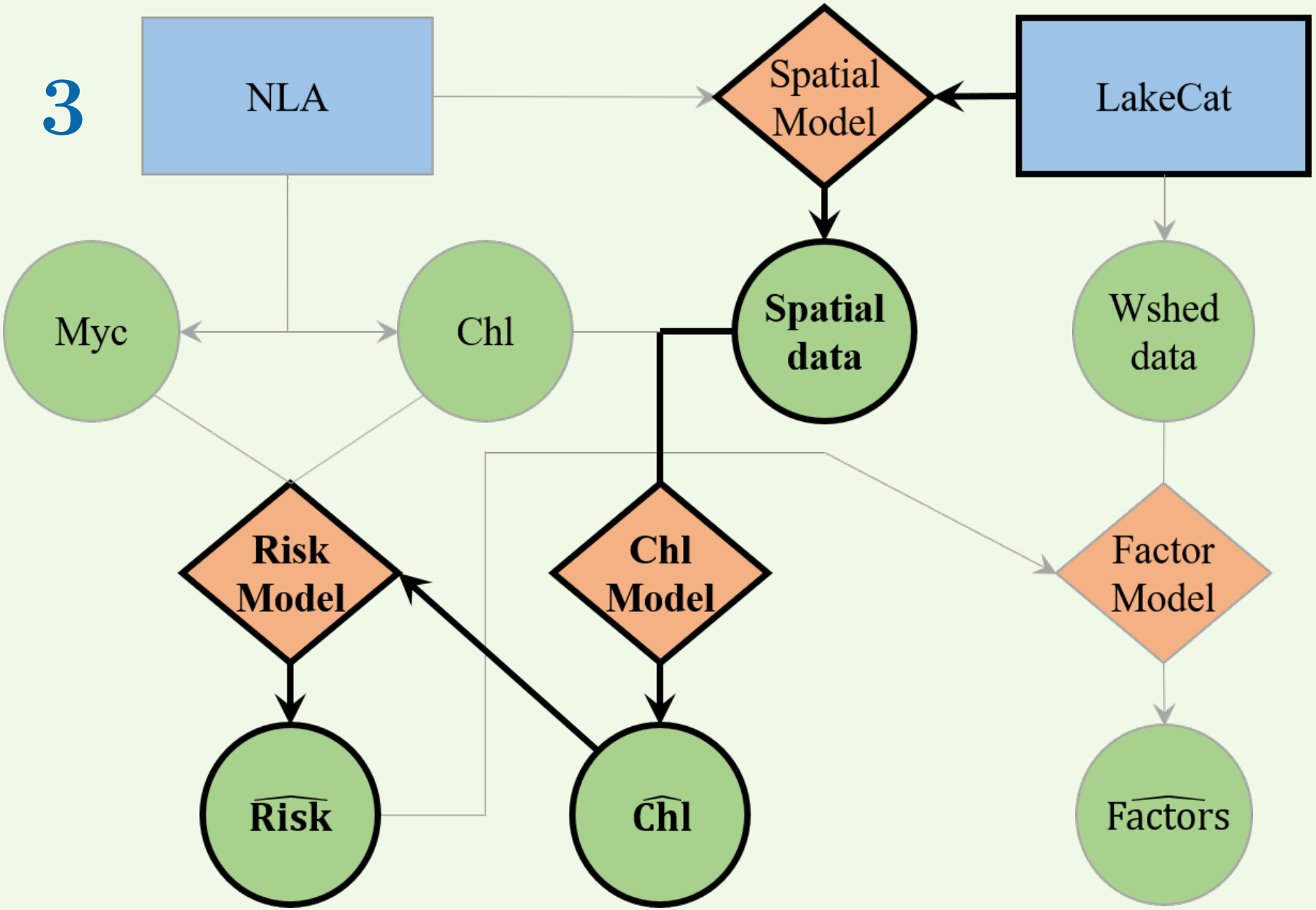

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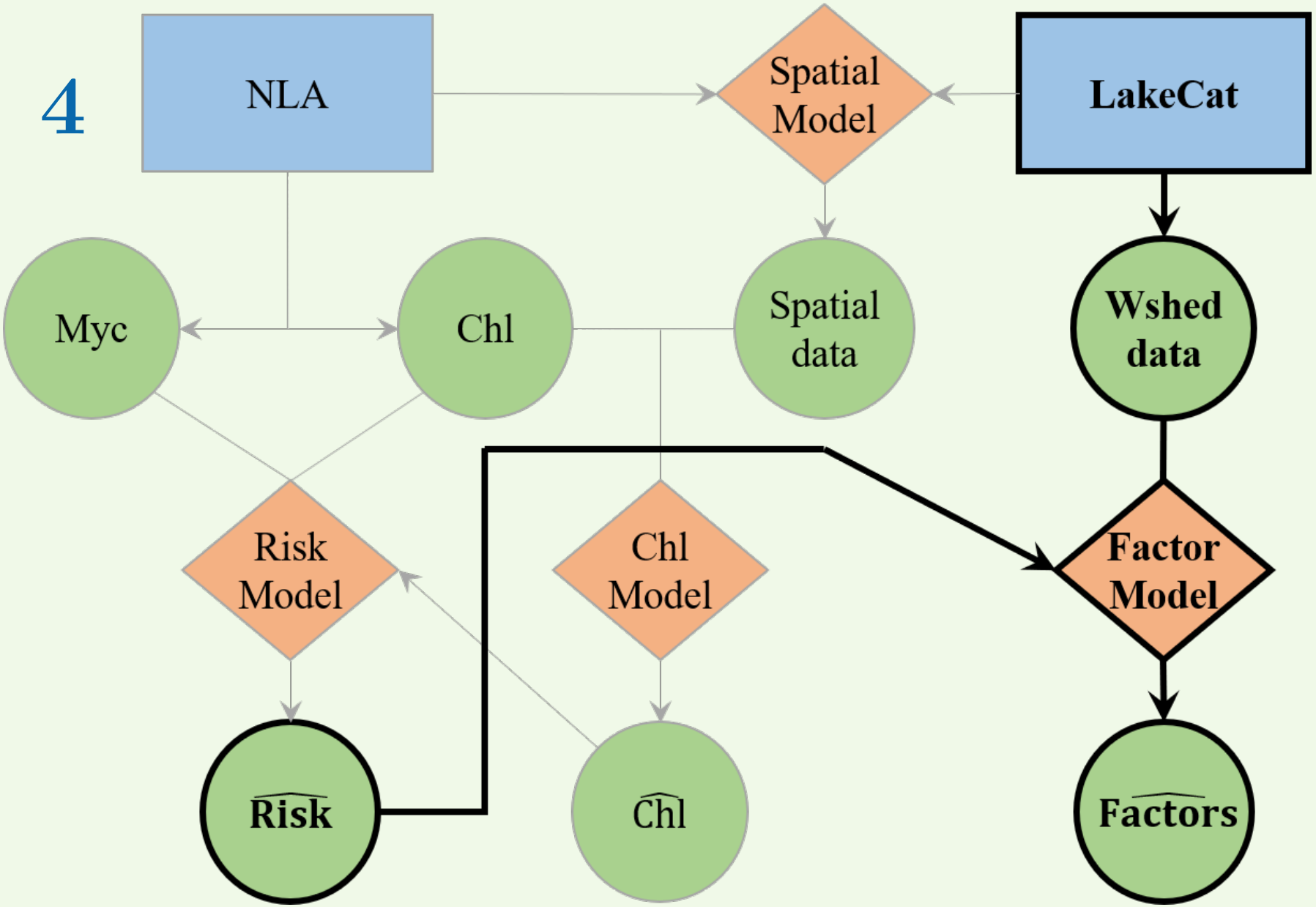
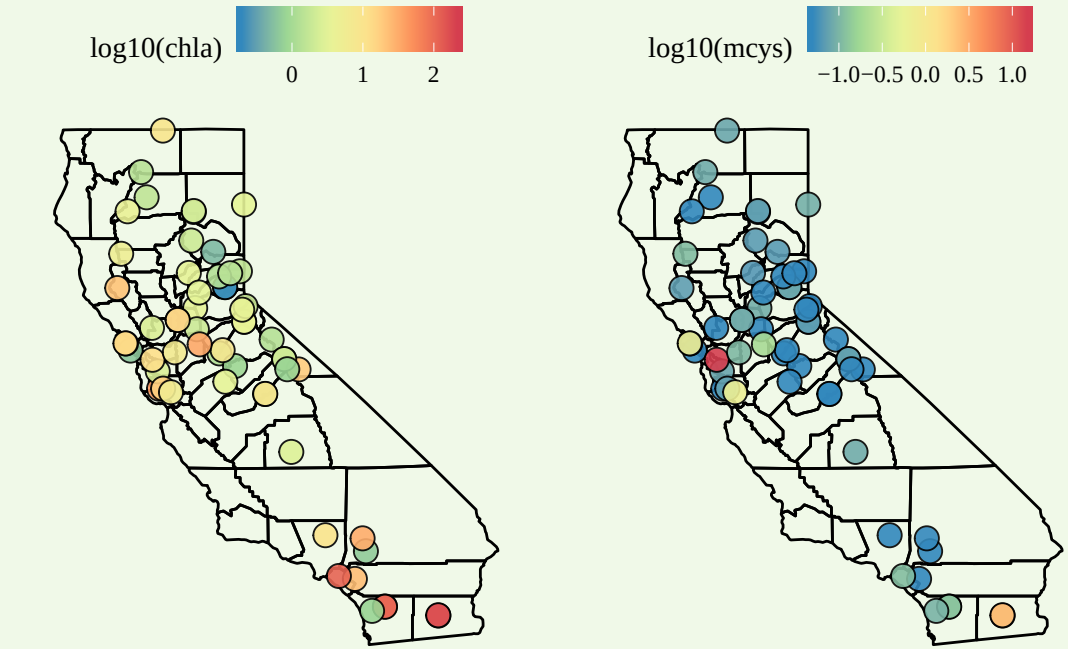
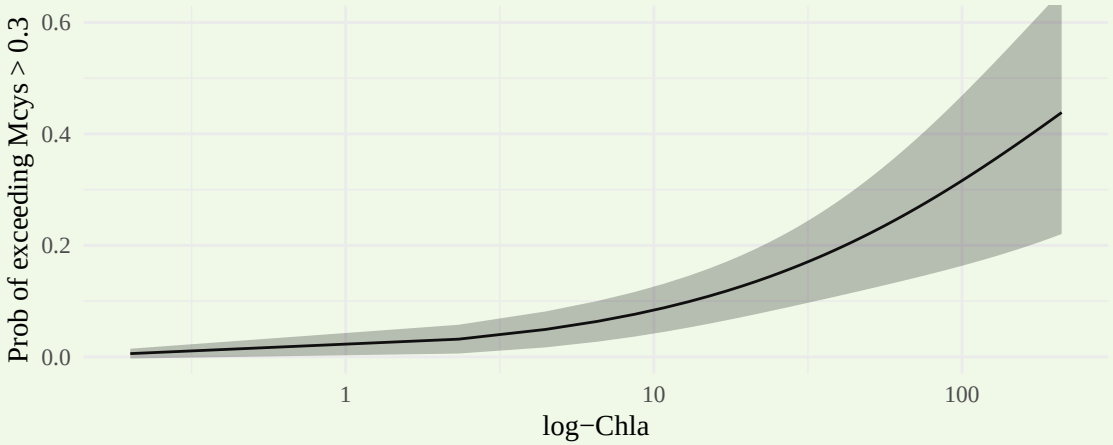


1) Link between chlorophyll and microcystin

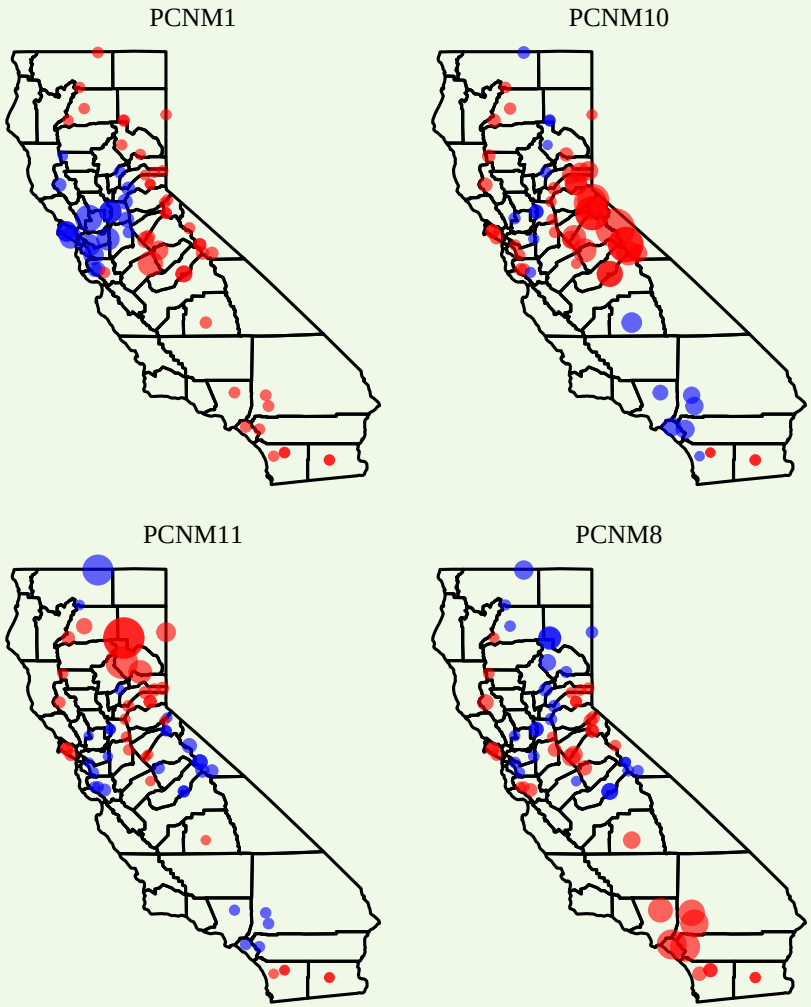


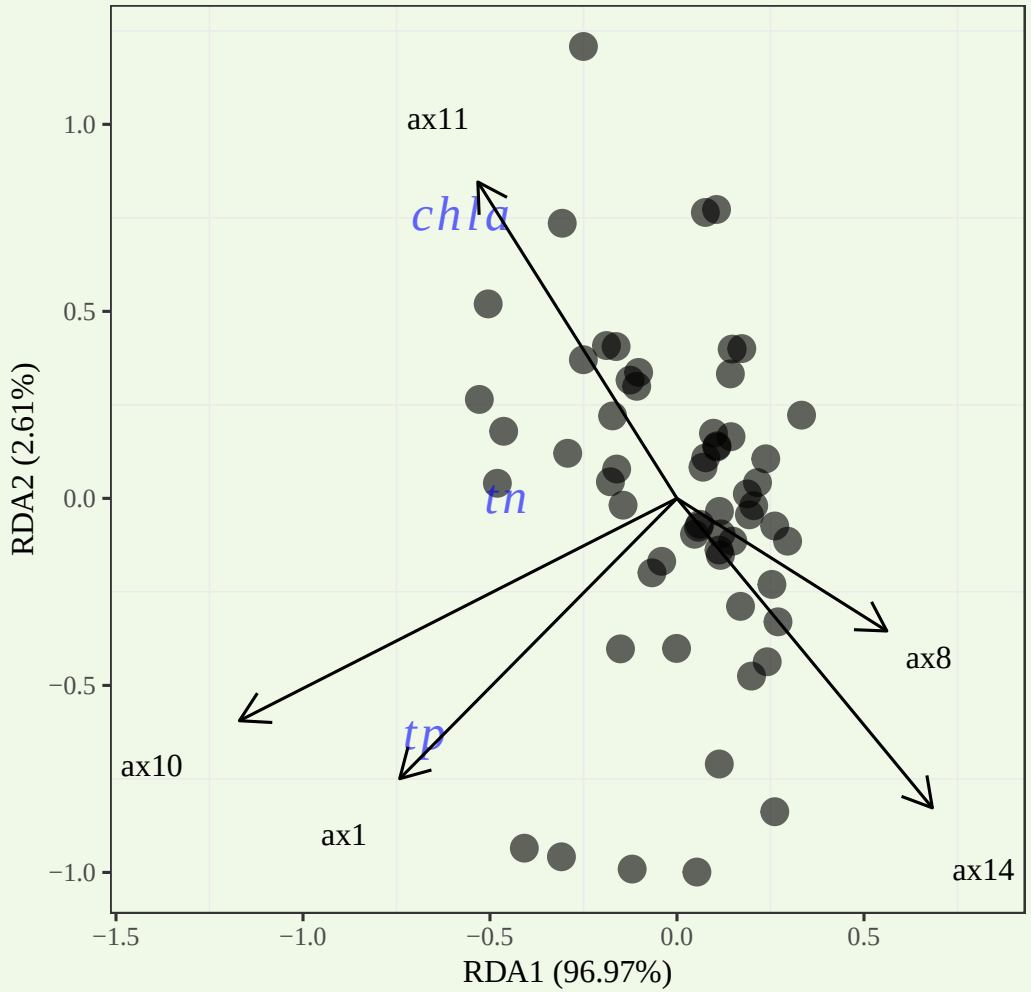


- *In situ* NLA data as probabilistic survey
- Build a simple model of the likelihood of exceeding some threshold
- Define a criteria threshold, arbitrary at this point

2) Link between chlorophyll and location

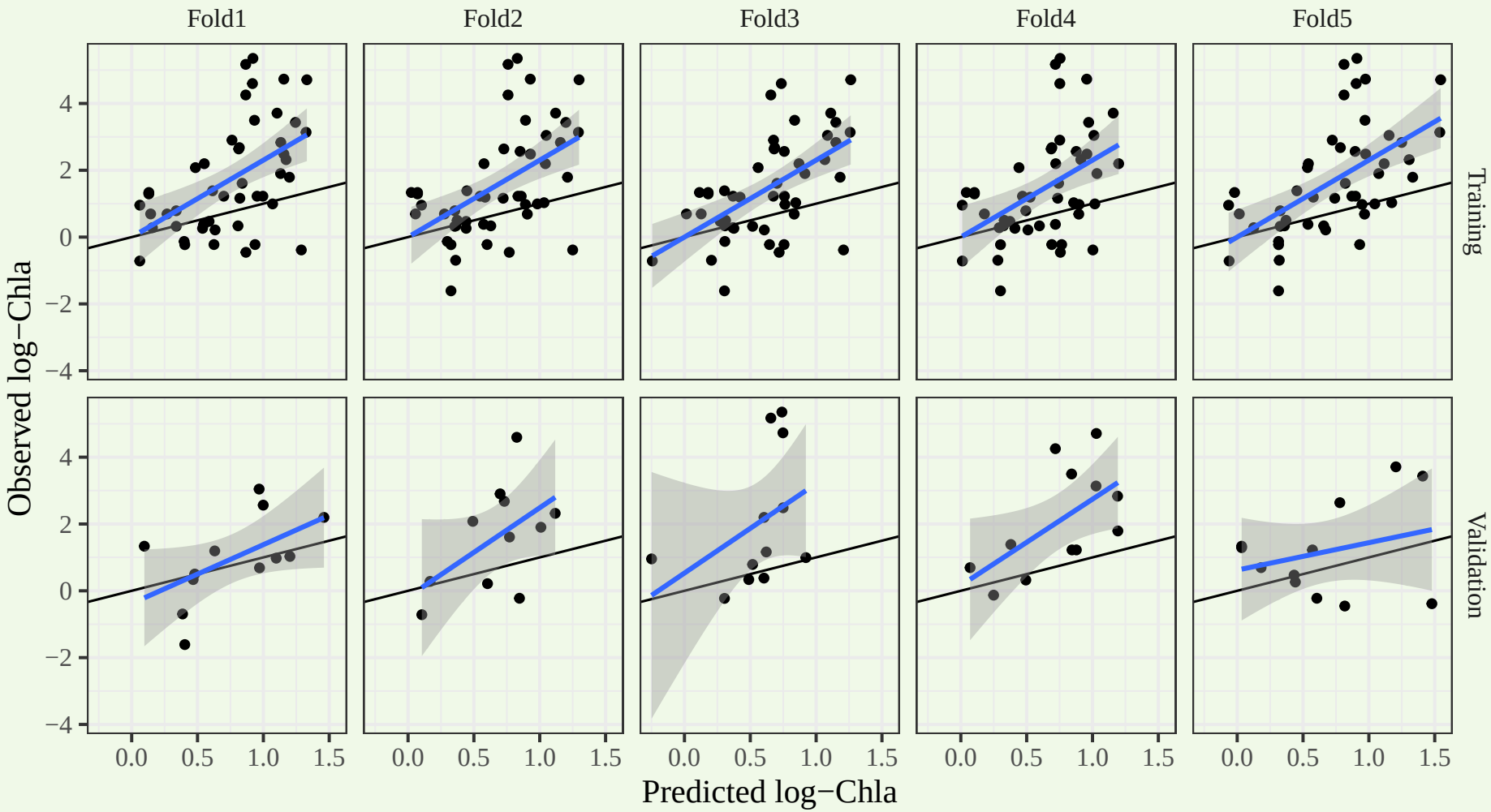
Using a spatial model to predict chlorophyll from location





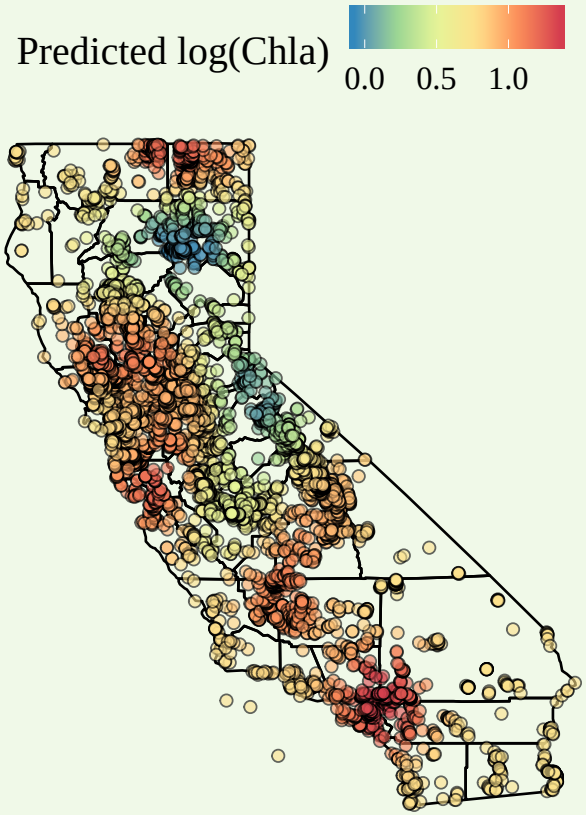
2) Link between chlorophyll and location

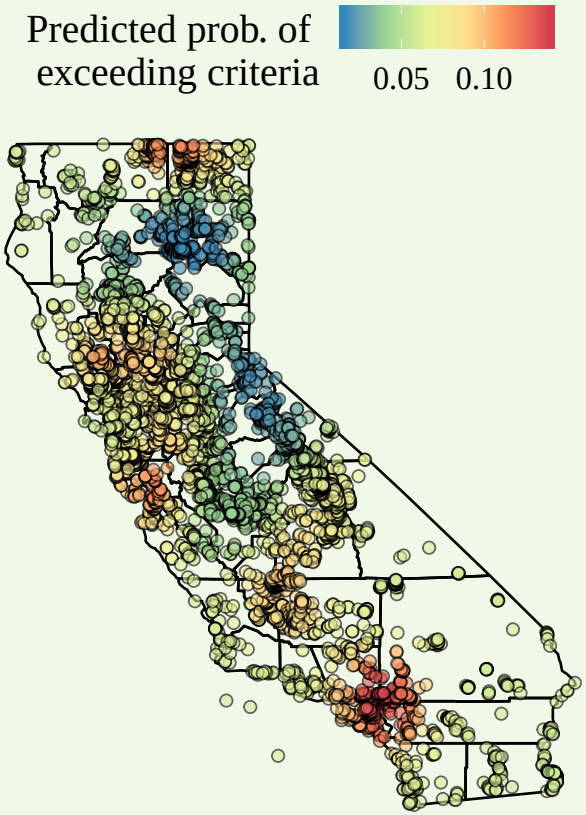
Predicted chlorophyll from location seems okay

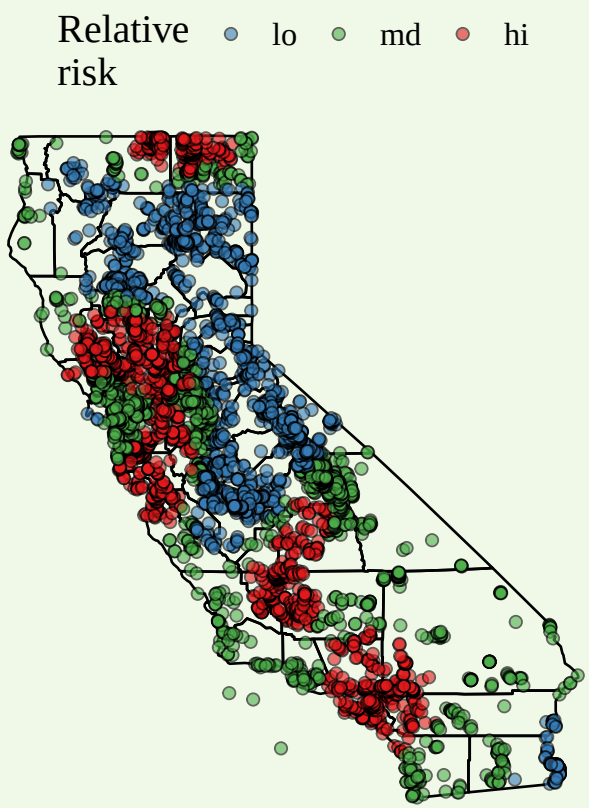


3) Estimated risk from chla prediction

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

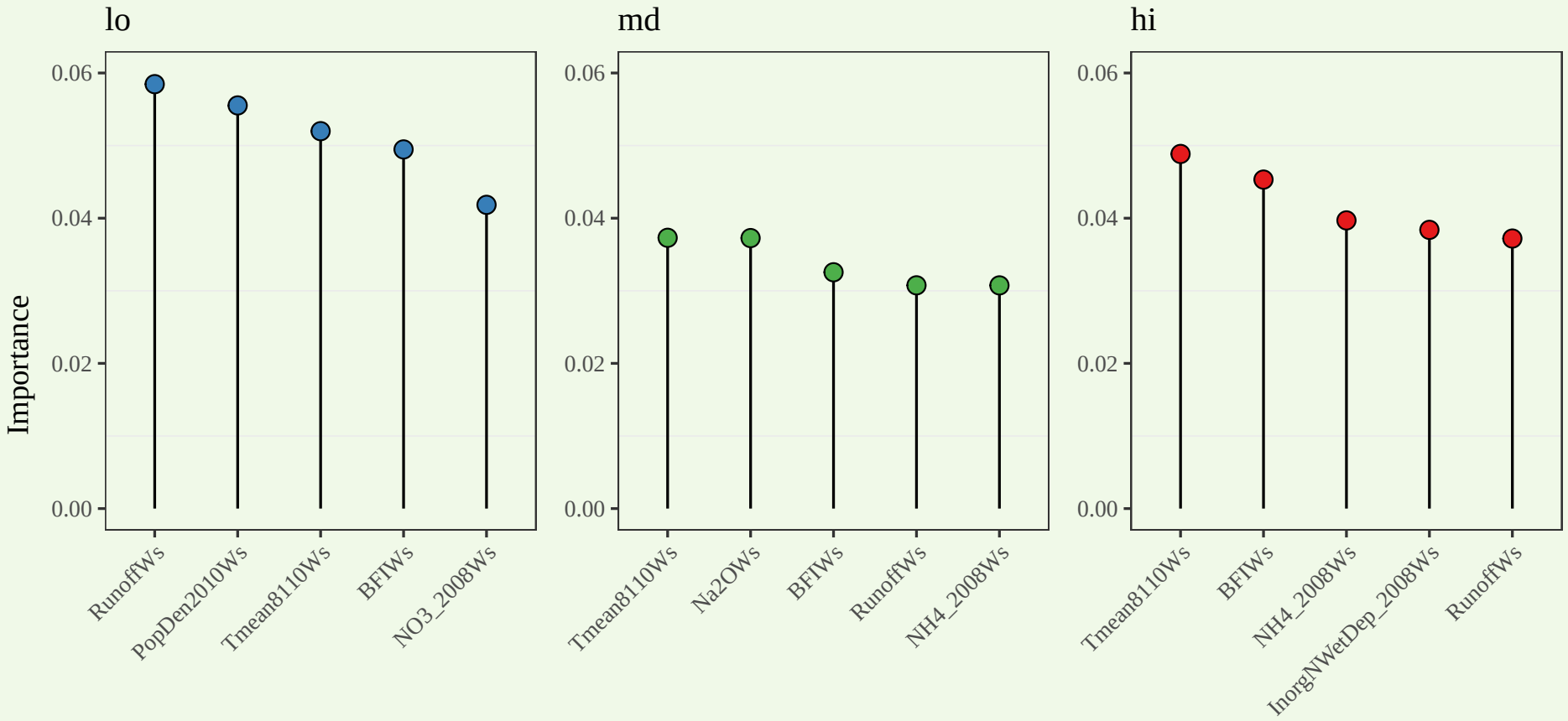






4) Identify landscape factors that explain risk

Top five most important watershed factors explaining the relative risk categories



A vision for lake bioassessment in CA

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- Relatively low risk in the Sierra Nevada, North Coasts, portions of Central Valley



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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

Acknowledgments:

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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

References

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